When Recorded Mail To:
American Fork City
51 East Main
American Fork UT 84003

ENT 106567:2022 PG 1 of 66
ANDREA ALLEN
UTAH COUNTY RECORDER
2022 Oct 03 1:00 pm FEE 40.00 BY CH
RECORDED FOR AMERICAN FORK CITY

NOTICE OF INTEREST, BUILDING REQUIREMENTS, AND ESTABLISHMENT OF RESTRICTIVE COVENANTS

This Notice is recorded to bind the attached Geotechnical Study dated March 9, 2021 along with the site grading plan to the property generally located at 620 S 860 E (address), American Fork, UT 84003 and therefore mandating that all construction be in compliance with said Geotechnical Study and site grading plan per the requirements of American Fork City ordinances and standards and specification including specifically Ordinance 07-10-47, Section 6-5, Restrictive Covenant Required and 6-2-4, Liquefiable Soils. Said Sections require establishment of a restrictive covenant and notice to property owners of liquefiable soils or other unique soil conditions and construction methods associated with the property.

Exhibit A – Legal Description of Property
Exhibit B – Geotechnical Study
Exhibit C – Site Grading Plan

Dated this 26 day of APRIL, 2022.

OWNER(S):

(Signature) _____

AF III QUZB, LLC

By: PAUL W. RITCHIE
(Printed Name)

MANAGER
(Title)

(Signature) _____

(Printed Name) _____

(Title) _____

STATE OF UTAH)
§
COUNTY OF UTAH)

On the 26th day of April, 2022, personally appeared before me Paul W. Ritchie and _____, Owner(s) of said Property, as (individuals and/or authorized representatives of a company), and acknowledged to me that such individuals or company executed the within instrument freely of their own volition and pursuant to the articles of organization where applicable.

STEPHANIE ACTON
Notary Public - State of Utah
Comm. No. 718620
My Commission Expires on
Jun 1, 2025

Notary Public
My Commission Expires: 6-1-25

Approved as to form: American Fork City Attorney

Rev. 12/4/18

EXHIBIT A

A parcel of ground lying and situate in the East Half of the South East Quarter, Section 24, and in the North Half of the Northeast Quarter, Section 25, Township 5 South, Range 1 East, SLB&M (Tax Parcel # 13:059:0129 being the remainder parcel M-I-B identified on the ALTA survey by Johanson Surveying on file at the Utah County Surveyor's office as # 20-449 and a 6.43 acre remainder of Tax Parcel # 13:059:0109).

Basis of Bearing for subject parcel being South 45° 01'56" East 3791.23 feet measured between the found Utah County Brass Caps monumenting the North Quarter Corner and East Quarter Corner of Section 25, Township 5 South, Range 1 East, SLB&M.

Commencing at said North Quarter Corner of Section 25, Thence South 89° 35'49" East 1339.53 feet; Thence North 00° 29'02" East 38.14 feet; Thence North 00° 30'38" East 22.57 feet; Thence North 09° 35'42" East 131.64 feet to the True Point of Beginning:

Thence North 09° 35'42" East 353.31 feet to a point on the south Right of Way line of 620 South Street as shown on the Vest Road Dedication Plat recorded as Entry 54716:2019, Map 16589 of the Utah County Records; Thence the following three (3) calls coincident with said Right of Way line: 1) South 80° 25'43" East 318.81 feet, 2) South 80° 25'43" East 155.62 feet to a point of curvature, 3) Southeasterly 96.61 feet along the arc of a 1300.00 ft. radius curve to the left (center bears North 09° 34'17" East with a Delta of 04° 15'27"); Thence South 82° 35'08" East 38.28 feet to a point of curvature; Thence Southeasterly 44.86 feet along the arc of a 176.37 ft. radius curve to the left (center bears North 07° 24'52" East with a Delta of 14° 34'22") to a non-tangent point of curvature and a point on said south Right of Way line; Thence the following two (2) calls coincident with said Right of Way line: 1) Southeasterly 37.70 feet along the arc of a 1300.00 ft. radius curve to the left (center bears North 01° 39'41" East with a Delta of 01° 39'41"), 2) EAST 54.25 feet; Thence Southeasterly 143.58 feet along the arc of a 176.44 ft. radius non-tangent curve to the right (center bears South 30° 42'56" West with a Delta of 46° 37'34") to a point on the west Right of Way line of 860 East Street per said Vest Plat; Thence coincident with said west Right of Way Line South 00° 54'51" East 424.15 feet to a point of curvature; Thence Southwesterly 15.90 feet along the arc of a 10.00 ft radius curve to the right (Center bears South 89° 05' 09" West with a Delta of 91° 06'44") to a point on the north Right of Way line of Quality Drive per said Vest Plat; Thence North 89° 48'07" West 501.53 feet coincident with said north Right of Way; Thence North 00° 06'23" West 292.88 feet; Thence North 89° 48'07" West 373.82 feet to the Point of Beginning.

GSH

REPORT
GEOTECHNICAL STUDY
PROPOSED VEST PROPERTY
(AMERICAN FORK NORTH) APARTMENTS
860 EAST BETWEEN QUALITY DRIVE
AND 620 SOUTH
AMERICAN FORK, UTAH

Submitted To:

The Ritchie Group
1245 East Brickyard Road, Suite 70
Salt Lake City, Utah 84106

Submitted By:

GSH Geotechnical, Inc.
473 West 4800 South
Salt Lake City, Utah 84123

March 9, 2021

Job No. 2093-011-21

GSH

March 9, 2021
Job No. 2093-011-21

Mr. Tyler Ritchie
The Ritchie Group
1245 East Brickyard Road, Suite 70
Salt Lake City, Utah 84106

Mr. Ritchie:

Re: Report
Geotechnical Study
Proposed Vest Property (American Fork North) Apartments
860 East between Quality Drive and 620 South
American Fork, Utah

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our geotechnical study performed at the site of the proposed Vest Property (American Fork North) Apartments to be located at 860 East between Quality Drive and 620 South in American Fork, Utah. The general location of the site with respect to existing roadways, as of 2021, is presented on Figure 1, Vicinity Map. A more detailed layout of the site showing proposed facilities and borings drilled in conjunction with this study is presented on Figure 2, Site Plan.

1.2 OBJECTIVES AND SCOPE

The objectives and scope of the study were planned in discussions between Mr. Tyler Ritchie of The Ritchie Group and Mr. Robert Gifford of GSH Geotechnical, Inc. (GSH).

In general, the objectives of this study were to:

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

2. Provide appropriate foundation, earthwork, pavement, and geoseismic recommendations to be utilized in the design and construction of the proposed facilities.

GSH Geotechnical, Inc.
473 West 4800 South
Salt Lake City, Utah 84123
Tel: 801.685.9190 Fax: 801.685.2990
www.gshgeo.com

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

1. A field program consisting of the drilling, logging, and sampling of 17 exploration borings as well as 2 cone penetrometer tests (CPT).

2. A laboratory testing program.

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

1.3 AUTHORIZATION

Authorization was provided by returning a signed copy of the Professional Services Agreement No. 21-0126 dated January 15, 2021.

1.4 PROFESSIONAL STATEMENTS

Supporting data upon which our recommendations are based are presented in subsequent sections of this report. Recommendations presented herein are governed by the physical properties of the soils encountered in the exploration borings, projected groundwater conditions, and the layout and design data discussed in Section 2, Proposed Construction. If subsurface conditions other than those described in this report are encountered and/or if design and layout changes are implemented, GSH must be informed so that our recommendations can be reviewed and amended, if necessary.

Our professional services have been performed, our findings developed, and our recommendations prepared in accordance with generally accepted engineering principles and practices in this area at this time.

2. PROPOSED CONSTRUCTION

The project is to consist of the construction of 3 residential apartment structures and a clubhouse with an associated pool area and surrounding pavements. The structures are anticipated to be 5-stories, placed slab on grade, and supported upon conventional spread and continuous wall footings.

Maximum real column and wall loads are anticipated to be on the order of up to 250 kips and up to 8 kips per lineal foot, respectively. Real loads are defined as the total of all dead plus frequently applied (reduced) live loads.

Paved parking areas and drive lanes are planned around the structure. Projected traffic in the parking areas is anticipated to consist of a light volume of automobiles and light trucks, occasional medium-weight trucks, and no heavy-weight trucks. Projected traffic in the drive lanes is anticipated to consist of a moderate volume of automobiles and light trucks, a light volume of medium-weight trucks, and occasional heavy-weight trucks (garbage trucks).

Site development will require some earthwork in the form of minor cutting and filling. At this time, we anticipate that maximum site grading cuts and fills, excluding utilities, will be on the order of 1 to 3 feet.

3. SITE INVESTIGATIONS

3.1 GENERAL

Subsurface conditions in unexplored locations or at other times may vary from those encountered at specific boring locations. If such variations are noted during construction or if project development plans are changed, GSH must review the changes and amend our recommendations, if necessary.

Boring locations were established by estimating distances and angles from site landmarks. If increased accuracy is desired by the client, we recommend that the boring locations and elevations be surveyed.

3.2 FIELD PROGRAM

To define and evaluate the subsurface soil and groundwater conditions across the site, 17 borings were drilled within the accessible areas. These borings were completed to depths ranging from 5 to 51 feet with a truck-mounted drill rig equipped with hollow-stem augers. Additionally, GSH performed 2 cone penetrometer tests directly adjacent to Borings B-1 and B-3. The approximate locations of the borings and CPT tests are presented on Figure 2.

The field portion of our study was under the direct control and continual supervision of an experienced member of our geotechnical staff. During the course of the drilling operations, a continuous log of the subsurface conditions encountered was maintained. In addition, samples of the typical soils encountered were obtained for subsequent laboratory testing and examination. The soils were classified in the field based upon visual and textural examination. These classifications were supplemented by subsequent inspection and testing in our laboratory. Graphical representation of the subsurface conditions encountered is presented on Figures 3A through 3Q, Boring Logs. Soils were classified in accordance with the nomenclature described on Figure 4, Key to Boring Log (USCS).

A 3.25-inch outside diameter, 2.42-inch inside diameter drive sampler (Dames & Moore) and a 2.0-inch outside diameter, 1.38-inch inside diameter drive sampler (SPT) were utilized at select locations and depths. The blow counts recorded on the boring logs were those required to drive the sampler 12 inches with a 140-pound hammer dropping 30 inches.

Following completion of excavation operations, 1.25-inch diameter slotted PVC pipe was installed in Borings B-1 through B-7, B-9, and B-15 through B-17 to provide a means of monitoring the groundwater fluctuations. The borings were backfilled with auger cuttings.

3.3 LABORATORY TESTING

3.3.1 General

To provide data necessary for our engineering analysis, a laboratory testing program was performed. This program included moisture, density, partial gradation, Atterberg limits, consolidation, and chemical tests. The following paragraphs describe the tests and summarize the test data.

3.3.2 Moisture and Density Tests

To provide index parameters and to correlate other test data, moisture and density tests were performed on selected samples. The results of these tests are presented on the boring logs, Figures 3A through 3Q.

3.3.3 Partial Gradation Tests

To aid in classifying the granular soils, partial gradation tests were performed. Results of the tests are tabulated below, on the following page, and presented on the boring logs, Figures 3A through 3Q.

Boring No.	Depth (feet)	Percent Passing No. 200 Sieve	Moisture Content Percent	Soil Classification
B-1	10.0	44.0	32.8	SM
B-1	25.0	53.8	22.3	ML/SM
B-1	35.0	15.3	14.9	SM
B-1	40.0	3.7	27.5	SP
B-1	45.0	8.3	23.1	SP/SM
B-2	7.5	34.7	17.3	SM
B-3	10.0	44.2	28.6	SM/SC
B-6	10.0	54.3	26.7	ML/SM
B-6	15.0	38.8	24.1	SM/SC
B-7	10.0	49.1	25.8	SM/ML
B-9	7.5	0.5	2.9	GP
B-15	5.0	22.6	28.4	SM/SC
B-15	10.0	5.4	21.9	SP/SM

Boring No.	Depth (feet)	Percent Passing No. 200 Sieve	Moisture Content Percent	Soil Classification
B-17	2.5	60.7	41.5	ML
B-17	5.0	48.3	37.4	SM/ML
B-17	10.0	0.9	3.5	GP

3.3.4 Atterberg Limits Test

To aid in classifying the soils, Atterberg limits test were performed on samples of the fine-grained cohesive soils. Results of the tests are tabulated below and presented on the boring logs, Figures 3A through 3Q:

Boring No.	Depth (feet)	Liquid Limit (percent)	Plastic Limit (percent)	Plasticity Index (percent)	Soil Classification
B-1	15.0	38	27	11	ML
B-1	30.0	43	24	19	CL
B-1	50.0	36	22	14	CL
B-15	15.0	45	25	20	CL
B-16	5.0	33	26	7	ML

3.3.5 Consolidation Tests

To provide data necessary for our settlement analysis, consolidation testing was performed on 5 representative samples of the natural fine-grained clay soils encountered at the site. The results of these tests indicate that the samples tested were slightly- to moderately over-consolidated and will exhibit low- to moderate strength and compressibility characteristics under the anticipated loading. Detailed results of the tests are maintained within our files and can be transmitted to you, upon your request.

3.3.6 Chemical Tests

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

Boring No.	Depth (feet)	Soil Classification	pH	Total Water Soluble Sulfate (mg/kg-dry)
B-17	2.5	ML	8.04	60.9

4. SITE CONDITIONS

4.1 SURFACE

The site is located at 860 East between Quality Drive and 620 South in American Fork, Utah. The site is currently vacant/undeveloped brush/grass land previously used for agricultural purposes with small agricultural structures on east side of the site. The site is undergoing construction operations in the form of grading and filling on the northern and western portions of the site. The topography of the site is relatively flat, grading down to the southeast with a total relief of approximately 10 to 12 feet. Site vegetation consists of various weeds and brush/grass throughout.

The site is bounded to the north by similar vacant/undeveloped brush/grass land followed by multi-family residential structures; to the east by 4850 West Street followed by vacant/undeveloped brush/grass land along with a single-family residential structure followed and associated agricultural land; and to the south and west by similar vacant/undeveloped brush/grass land as well as active construction sites.

4.2 SUBSURFACE SOIL

The following paragraphs provide generalized descriptions of the subsurface profiles and soil conditions encountered within the borings conducted during this study. As previously noted, soil conditions may vary in unexplored locations.

The borings were drilled to depths ranging from 5 to 51 feet. The soil conditions encountered in each of the borings, to the depths penetrated, were generally similar across the boring locations.

- Approximately 4 to 6 inches of topsoil was encountered in most of the borings. Topsoil thickness is frequently erratic and thicker zones of topsoil should be anticipated.

- Non-engineered fill soils were encountered in each boring to depths ranging from 1.5 to 5.5 feet beneath the existing ground surface. The non-engineered fill soils primarily consisted of clay, sand, and gravel with varying silt and cobble content.

- Natural soils were encountered below the non-engineered fill or the ground surface in Borings B-1 through B-7, B-9, and B-15 through B-17. The natural soils consisted primarily of alternating layers of cohesive clay/silt with varying sand and gravel content, and non-cohesive silt/sand/gravel with varying clay and cobble content.

The natural cohesive clay/silt soils were very soft to stiff, moist to saturated, gray and brown in color, and moderately over-consolidated. The natural clay soils are anticipated to exhibit moderate strength and compressibility characteristics under the anticipated loading.

The natural non-cohesive silt, sand, and gravel soils were very loose to medium dense, slightly moist to saturated, and gray and brown in color. The natural sand soils are anticipated to exhibit moderately high strength and moderately low compressibility characteristics under the anticipated load range.

For a more descriptive interpretation of subsurface conditions, please refer to Figures 3A through 3Q, Boring Logs. The lines designating the interface between soil types on the boring logs generally represent approximate boundaries. In situ, the transition between soil types may be gradual.

4.3 GROUNDWATER

On February 10, 2021 (13 days following drilling), groundwater was measured within the PVC pipes installed as tabulated below:

Boring No.	Groundwater Depth (feet)
	February 10, 2021
B-1	7.0
B-2	4.9
B-3	8.2
B-4	6.7
B-5	5.1
B-6	4.2
B-7	6.7
B-9	5.2
B-15	4.6
B-16	9.4
B-17	6.2

Groundwater levels vary with changes in season and rainfall, construction activity, irrigation, snow melt, surface water run-off, and other site-specific factors.

GSH

5. DISCUSSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

The most significant geotechnical aspects at the site are:

1. The existing non-engineered fills across some areas of the site.

2. The relatively shallow depth to groundwater.

3. The potentially liquefiable sand layers encountered in Borings B-1, B-3, B-6, B-15, and B-17.

Very loose to medium dense, saturated sand layers were encountered in Borings B-1, B-3, B-6, B-15, and B-17. Due to liquefiable soils being present, the site has been determined to be Site Class F (in accordance with Section 20.3.1, Site Class F of ASCE 7-16). According to ASCE 7-16, a site-specific response analysis is required. Section 20.3.1 of ASCE 7-16 provides exception to this requirement under certain conditions. These options will need to be reviewed and evaluated by the project structural engineer. If needed, GSH can provide additional information and analysis, including a complete site-specific response analysis.

Our analysis indicates that a consistent shallow zone of potentially liquefiable sand soils is present across the site. Because of the lack of a thick surface layer of non-liquefiable soil and the thickness of the potentially liquefiable sands soils, our analysis indicates that ground rupture and possible lateral spread could occur as the result of liquefaction during the design seismic event. This, in our opinion, is unacceptable from a building standpoint as it could jeopardize life safety.

To best remediate the liquefiable soils, GSH recommends the installation of rammed-aggregate piers. Conventional spread and continuous wall foundations and footings may be placed over the rammed-aggregate piers.

Prior to proceeding with construction, removal of any existing debris, surface vegetation, root systems, topsoil, non-engineered fill, and any deleterious materials from beneath an area extending out at least 5 feet from the perimeter of the proposed structure footprints and 3 feet beyond rigid pavements and exterior flatwork areas will be required. All existing utility locations should be reviewed to assess their impact on the proposed construction and abandoned and/or relocated as appropriate.

Due to the developed nature of this site and the surrounding area, additional non-engineered fills may exist in unexplored areas of the site. Based on our experience, non-engineered fills are frequently erratic in composition and consistency. All surficial loose/disturbed soils and non-engineered fills must be removed below all footings, floor slabs, and rigid pavements. The in situ, non-engineered fills may remain below flexible pavements if free of any deleterious materials, of limited thickness, and if properly prepared, as discussed later in this report.

Some of the on-site non-engineered fill soils encountered were granular. On-site granular soils, including existing non-engineered fills, may be re-utilized as structural site grading fill if they meet the criteria for such, as stated later in this report.

Groundwater was measured as shallow as 4.2 feet below the ground surface. GSH recommends placing floor slabs no closer than 4 feet from the highest groundwater elevation.

Proof rolling of the natural clay subgrade must not be completed if cuts extend to within 1 foot of the groundwater surface. In areas where cuts are to extend to within 1 foot of the groundwater surface, stabilization must be anticipated.

To reduce disturbance of the natural soils during excavation, it is recommended that low-impact, track-mounted equipment with smooth edge buckets/blades be utilized.

Detailed discussions pertaining to earthwork, foundations, pavements, and the geoseismic setting of the site are presented in the following sections.

5.2 EARTHWORK

5.2.1 Site Preparation

Initial site preparation will consist of the removal of the existing debris, non-engineered fills, surface vegetation, root systems, topsoil, and any deleterious materials from beneath an area extending out at least 5 feet from the perimeter of the proposed structure footprint and 3 feet beyond rigid pavements and exterior flatwork areas. All existing utility locations should be reviewed to assess their impact on the proposed construction and abandoned and/or relocated as appropriate.

In situ, non-engineered fills may remain below flexible pavements if free of debris and deleterious materials, less than 3 feet in thickness, and if properly prepared. Proper preparation below pavements will consist of the scarification of the upper 12 inches below asphalt concrete (flexible pavement), followed by moisture preparation and re-compaction to the requirements of structural fill. Even with proper preparation, pavements established overlying non-engineered fills may encounter some long-term movements unless the non-engineered fills are completely removed.

It must be noted that from a handling and compaction standpoint, soils containing high amounts of fines (silts and clays) are inherently more difficult to rework and are very sensitive to changes in moisture content, requiring very close moisture control during placement and compaction. This will be very difficult, if not impossible, during wet and cold periods of the year. Additionally, the on-site soils are likely above optimum moisture content for compacting at present and would require some drying prior to re-compacting.

Subsequent to stripping and prior to the placement of floor slabs, foundations, structural site grading fills, exterior flatwork, and pavements, the exposed subgrade must be proof rolled by

passing moderate-weight rubber tire-mounted construction equipment over the surface at least twice. If excessively soft or otherwise unsuitable soils are encountered beneath footings, they must be completely removed. If removal depth required is greater than 2 feet below footings, GSH must be notified to provide further recommendations. In pavement, floor slab, and outside flatwork areas, unsuitable natural soils should be removed to a maximum depth of 2 feet and replaced with compacted granular structural fill.

Subgrade preparation as described must be completed prior to placing overlying structural site grading fills.

Due to the relatively high groundwater, site grading cuts should be kept to a minimum. Cuts extending to within 1 foot of the groundwater elevation will likely disturb the natural clay soils and proof rolling must not be completed. Stabilization must be anticipated in areas where cuts are to extend to within 1 foot of the groundwater surface.

GSH must be notified prior to the placement of structural site grading fills, floor slabs, footings, and pavements to verify that all loose/disturbed soils and non-engineered fills have been completely removed and/or properly prepared.

5.2.2 Temporary Excavations

Temporary excavations up to 8 feet deep in fine-grained cohesive soils, above or below the water table, may be constructed with sideslopes no steeper than one-half horizontal to one vertical (0.5H:1.0V).

For granular (cohesionless) soils, construction excavations above the water table, not exceeding 4 feet, should be no steeper than one-half horizontal to one vertical (0.5H:1.0V). For excavations up to 8 feet, in granular soils and above the water table, the slopes should be no steeper than one horizontal to one vertical (1H:1V). Excavations encountering saturated cohesionless soils will be very difficult and will require very flat sideslopes and/or shoring, bracing, and dewatering.

Excavations deeper than 8 feet are not anticipated at the site.

The static groundwater table was encountered as shallow as 4.2 feet below the existing surface and may be shallower with seasonal fluctuations. Consideration for dewatering of utility trenches, excavations for the removal of non-engineered fill, and other excavations below this level should be incorporated into the design and bidding process.

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

5.2.3 Structural Fill

Structural fill is defined as all fill which will ultimately be subjected to structural loadings, such as imposed by footings, floor slabs, pavements, etc. Structural fill will be required as backfill over foundations and utilities, as site grading fill, and as replacement fill below footings. All structural fill must be free of surface vegetation, root systems, rubbish, topsoil, frozen soil, and other deleterious materials.

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

On-site soils, including existing non-engineered fills, may be re-utilized as structural site grading fill if they do not contain construction debris or deleterious material and meet the requirements of structural fill. Fine-grained soils will require very close moisture control and may be very difficult, if not impossible, to properly place and compact during wet and cold periods of the year.

Imported structural fill below foundations and floor slabs shall consist of a well graded sand and gravel mixture with less than 30 percent retained on the three-quarter-inch sieve and less than 20 percent passing the No. 200 Sieve (clays and silts).

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

5.2.4 Fill Placement and Compaction

All structural fill shall be placed in lifts not exceeding 8 inches in loose thickness. Structural fills shall be compacted in accordance with the percent of the maximum dry density as determined by the AASHTO[1] T-180 (ASTM[2] D1557) compaction criteria in accordance with the following table:

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

Location	Total Fill Thickness (feet)	Minimum Percentage of Maximum Dry Density
Beneath an area extending at least 5 feet beyond the perimeter of the structure	0 to 10	95
Site grading fills outside area defined above	0 to 5	90
Site grading fills outside area defined above	5 to 10	95
Utility trenches within structural areas	--	96
Road base	--	96

Structural fills greater than 10 feet thick are not anticipated at the site.

Subsequent to stripping and prior to the placement of structural site grading fill, the subgrade shall be prepared as discussed in Section 5.2.1, Site Preparation, of this report. In confined areas, subgrade preparation should consist of the removal of all loose or disturbed soils.

Coarse angular gravel and cobble mixtures (stabilizing fill), if utilized, shall be end dumped, spread to a maximum loose lift thickness of 15 inches, and compacted by dropping a backhoe bucket onto the surface continuously at least twice. As an alternative, the stabilizing fill may be compacted by passing moderately heavy construction equipment or large self-propelled compaction equipment over the surface at least twice. Subsequent fill material placed over the coarse gravels and cobbles shall be adequately compacted so that the "fines" are "worked into" the voids in the underlying coarser gravels and cobbles. Where soil fill materials are to be placed directly over more than about 18 inches of clean gravel, a separation geofabric, such as Mirafi 140N or equivalent, is recommended to be placed between the gravel and subsequent soil fills.

Non-structural fill may be placed in lifts not exceeding 12 inches in loose thickness and compacted by passing construction, spreading, or hauling equipment over the surface at least twice.

5.2.5 Utility Trenches

All utility trench backfill material below structurally loaded facilities (footings, floor slabs, flatwork, pavements, etc.) shall be placed at the same density requirements established for structural fill. If the surface of the backfill becomes disturbed during the course of construction, the backfill shall be proof rolled and/or properly compacted prior to the construction of any exterior flatwork over a backfilled trench. Proof rolling shall be performed by passing moderately loaded rubber tire-mounted construction equipment uniformly over the surface at least twice. If

excessively loose or soft areas are encountered during proof rolling, they shall be removed to a maximum depth of 2 feet below design finish grade and replaced with structural fill.

Many utility companies and City-County governments are now requiring that Type A-1a or A-1b (AASHTO Designation – granular soils with limited fines) soils be used as backfill over utilities. These organizations are also requiring that in public roadways, the backfill over major utilities be compacted over the full depth of fill to at least 96 percent of the maximum dry density as determined by the AASHTO T-180 (ASTM D1557) method of compaction. GSH recommends that as the major utilities continue onto the site that these compaction specifications are followed.

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

The static groundwater table was encountered as shallow as 4.2 feet below the existing surface and may be shallower with seasonal fluctuations. Dewatering of utility trenches and other excavations below this level should be anticipated.

5.3 GROUNDWATER

On February 10, 2021 (13 days following drilling), groundwater was measured within the PVC pipes installed as tabulated below:

Boring No.	Groundwater Depth (feet)
	February 10, 2021
B-1	7.0
B-2	4.9
B-3	8.2
B-4	6.7
B-5	5.1
B-6	4.2
B-7	6.7
B-9	5.2
B-15	4.6
B-16	9.4
B-17	6.2

Based on the anticipated cuts necessary to reach design subgrades, we anticipate temporary and permanent dewatering may be necessary. Floor slabs must be placed a minimum of 4 feet from the stabilized groundwater elevation. Site grading fill may be utilized to raise the overall grade to achieve the required separation between the floor slab and the highest groundwater elevation.

The groundwater measurements presented are conditions at the time of the field exploration and may not be representative of other times or locations. Groundwater levels may vary seasonally and with precipitation, as well as other factors including irrigation. Evaluation of these factors is beyond the scope of this study. Groundwater levels may, therefore, be at shallower or deeper depths than those measured during this study, including during construction and over the life of the structure.

The extent and nature of any dewatering required during construction will be dependent on the actual groundwater conditions prevalent at the time of construction and the effectiveness of construction drainage to prevent run-off into open excavations.

5.4 FOUNDATIONS

5.4.1 General

Our analysis indicates that a consistent shallow zone of potentially liquefiable and soils is present across the site. Due to the lack of a thick surface layer of non-liquefiable soils in addition to the thickness of the potentially liquefiable sand soils, our analysis indicates that ground rupture and possible lateral spread could occur as the result of liquefaction during the design seismic event. This, in our opinion, is unacceptable from a building standpoint as it could jeopardize life safety.

To best remediate the liquefiable soils, GSH recommends that the proposed structures be supported upon conventional spread and continuous wall foundations supported upon soil reinforcement methods such as a grid of rammed-aggregate piers.

5.4.2 Design Data

Rammed-aggregate piers soil reinforcement elements are constructed by drilling a 24- or 30-inch diameter hole and then building a bottom bulb of clean, open-graded stone using a beveled, high-energy tamper. The rammed-aggregate piers shaft is constructed on top of the bottom bulb using well graded highway base course stone placed in thin lifts (12 inches compacted thickness). The result is a reinforced zone of soil directly under footings that allows for the construction of shallow spread footings proportioned for a relatively high bearing pressure. Rammed-aggregate piers elements are spaced singly under continuous footings or in close groups to support concentrated column loads.

Rammed-aggregate piers soil reinforcement is a design/build element and must be designed and constructed by a licensed installer. The installer should provide layout and detailed design calculations sealed by a professional engineer licensed in the State of Utah. The design

calculations should demonstrate that rammed-aggregate piers soil reinforcement is designed to control settlement to magnitudes within the criteria for this project.

For the design of conventional spread and continuous wall foundation constructed over rammed-aggregate piers elements, the following parameters are provided:

Minimum Recommended Depth of Embedment for Frost Protection	- 30 inches
Minimum Recommended Depth of Embedment for Non-frost Conditions	- 15 inches
Recommended Minimum Width for Continuous Wall Footings	- 16 inches
Minimum Recommended Width for Isolated Spread Footings	- 30 inches
Bearing Capacity for Footings Overlying Rammed-Aggregate Piers	- Approximately 4,000 to 6,000 pounds per square foot*

* To be developed as design build by a rammed-aggregate piers licensed installer.

The term "net bearing capacity" refers to the allowable pressure imposed by the portion of the structure located above lowest adjacent final grade. Therefore, the weight of the footing and backfill to lowest adjacent final grade need not be considered. Real loads are defined as the total of all dead plus frequently applied live loads. Total load includes all dead and live loads, including seismic and wind.

5.4.3 Installation

Foundations must be established directly upon the undisturbed tops of the pier systems. It is recommended that prior to installing rammed-aggregate piers, all site grading activities be completed.

Unsuitable soils shall be completely removed beneath footings. Under no circumstances shall the footings be installed overlying organics, deleterious materials, frozen soil, or within ponded water.

5.4.4 Settlements

Maximum settlements of foundations designed and installed over rammed-aggregate piers should be less than one-half inch. However, these estimates will be refined with the design of the system.

5.5 LATERAL RESISTANCE

Lateral loads imposed upon foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footings and the supporting soils. In determining frictional resistance, a coefficient of friction of 0.35 may be utilized for the footing interface with the in situ natural clay soils and 0.40 for footing interface with natural granular soils or granular structural fill. Passive resistance provided by properly placed and compacted granular structural fill above the water table may be considered equivalent to a fluid with a density of 300 pounds per cubic foot. Below the water table, this granular soil should be considered equivalent to a fluid with a density of 150 pounds per cubic foot.

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

5.6 FLOOR SLABS

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

Additionally, GSH recommends that floor slabs be constructed a minimum of 4.0 feet from the stabilized groundwater elevation. Site grading fill may be utilized to raise the overall grade to achieve the required separation between the floor slab and the highest groundwater elevation.

To facilitate curing of the concrete and to provide a capillary moisture break, it is recommended that floor slabs be directly underlain by at least 4 inches of "free-draining" fill, such as "pea" gravel or three-quarters to one-inch minus clean gap-graded gravel.

Settlement of lightly loaded floor slabs designed according to previous recommendations (average uniform pressure of 200 pounds per square foot or less) is anticipated to be less than one-quarter of an inch.

5.7 PAVEMENTS

The natural clay soils and non-engineered fills will exhibit poor pavement support characteristics when saturated. All pavement areas must be prepared as previously discussed (see Section 5.2.1, Site Preparation). Under no circumstances shall pavements be established over unprepared non-engineered fills, loose or disturbed soils, topsoil, surface vegetation, root systems, rubbish,

construction debris, other deleterious materials, frozen soils, or within ponded water. With the subgrade soils and the projected traffic as discussed in Section 2, Proposed Construction, the following pavement sections are recommended:

Parking Areas

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

Flexible Pavements:
(Asphalt Concrete)

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

Rigid Pavements:
(Non-reinforced Concrete)

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

Roadways

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

Flexible Pavements:
(Asphalt Concrete)

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

Rigid Pavements:
(Non-reinforced Concrete)

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

For dumpster pads, we recommend a pavement section consisting of 7.0 inches of Portland cement concrete, 12.0 inches of aggregate base, over properly prepared natural subgrade or site grading structural fills. Dumpster pads should not be constructed overlying non-engineered fills under any circumstances.

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

The crushed stone should conform to applicable sections of the current Utah Department of Transportation (UDOT) Standard Specifications. All asphalt material and paving operations should meet applicable specifications of the Asphalt Institute and UDOT. A GSH technician shall observe placement and perform density testing of the base course material and asphalt.

Please note that the recommended pavement section is based on estimated post-construction traffic loading. If the pavement is to be constructed and utilized by construction traffic, the above pavement section may prove insufficient for heavy truck traffic, such as concrete trucks or tractor-trailers used for construction delivery. Unexpected distress, reduced pavement life, and/or premature failure of the pavement section could result if subjected to heavy construction traffic and the owner should be made aware of this risk. If the estimated traffic loading stated herein is not correct, GSH must review actual pavement loading conditions to determine if revisions to these recommendations are warranted.

5.8 CEMENT TYPES

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

5.9 GEOSEISMIC SETTING

5.9.1 General

Utah municipalities have adopted the International Building Code (IBC) 2018. The IBC 2018 code refers to ASCE 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7-16) determines the seismic hazard for a site based upon mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points).

5.9.2 Faulting

Based on our review of available literature, no active faults pass through or immediately adjacent to the site. The nearest active mapped fault consists of the Utah Lake Faults, located about 2.1 miles to the southeast of the site.

5.9.3 Site Class

Due to liquefiable soils being present, the site has been determined to be Site Class F (in accordance with Section 20.3.1, Site Class F of ASCE 7-16). According to ASCE 7-16, a site-specific response analysis is required. Section 20.3.1 of ASCE 7-16 provides exception to this requirement under certain conditions. These options will need to be reviewed and evaluated by the

project structural engineer. If needed, GSH can provide additional information and analysis including a complete site-specific response analysis.

5.9.4 Ground Motions

The IBC 2018 code is based on USGS mapping, which provides values of short and long period accelerations for average bedrock values for the Western United States and must be corrected for local soil conditions. The following table summarizes the peak ground and short and long period accelerations for the MCE event and incorporates the appropriate soil amplification factor for a Site Class D – Default Profile. Based on the site latitude and longitude (40.3636 degrees north and 111.7789 degrees west, respectively), the values for this site are tabulated below:

Spectral Acceleration Value, T	Bedrock Boundary [mapped values] (% g)	Site Coefficient	Site Class * [adjusted for site class effects] (% g)	Design Values* (% g)
Peak Ground Acceleration	*	F_a = *	*	*
0.2 Seconds (Short Period Acceleration)	S_S = *	F_a = *	S_{MS} = *	S_{DS} = *
1.0 Second (Long Period Acceleration)	S_1 = *	F_v = *	S_{M1} = *	S_{D1} = *

* See Section 5.9.3, Site Class.

5.9.5 Liquefaction

The site is located in an area that has been identified by the Utah Geological Survey (UGS) as being a "high" liquefaction potential zone. Liquefaction is defined as the condition when saturated, loose, granular soils lose their support capabilities because of excessive pore water pressure, which develops during a seismic event. Clayey soils, even if saturated, will generally not liquefy during a major seismic event.

Calculations were performed using the procedures described in the 2008 Soil Liquefaction During Earthquakes Monograph by Idriss and Boulanger[3]. Our calculations indicate the very loose to medium dense, saturated sand layers encountered in Borings B-1, B-3, B-6, B-15, and B-17 could liquefy during the design seismic event. Calculated settlement associated with the liquefaction of each layer within the Boring B-1 was less than 7.5 inches. GSH recommends using a ground

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

improvement method such as rammed-aggregate piers to remediate the potentially liquefiable soils and to reduce settlements to tolerable levels at the surface.

To further evaluate and refine the liquefaction potential at the site, GSH performed cone penetrometer testing (CPT) directly adjacent to Borings B-1 and B-3. The results of the tests verify the existence of the potential liquefiable sand layers encountered at the site.

5.10 SITE VISITS

GSH must verify that all topsoil/disturbed soils and any other unsuitable soils have been removed, that non-engineered fills have been removed and/or properly prepared, and that suitable soils have been encountered prior to placing site grading fills, footings, slabs, and pavements. Additionally, GSH must observe fill placement and verify in-place moisture content and density of fill materials placed at the site.

5.11 CLOSURE

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

Respectfully submitted,

GSH Geotechnical, Inc.

Robert A. Gifford, P.G.
Engineering Geologist

Reviewed by:

Alan D. Spilker, P.E.
State of Utah No. 334228
President/Senior Geotechnical Engineer

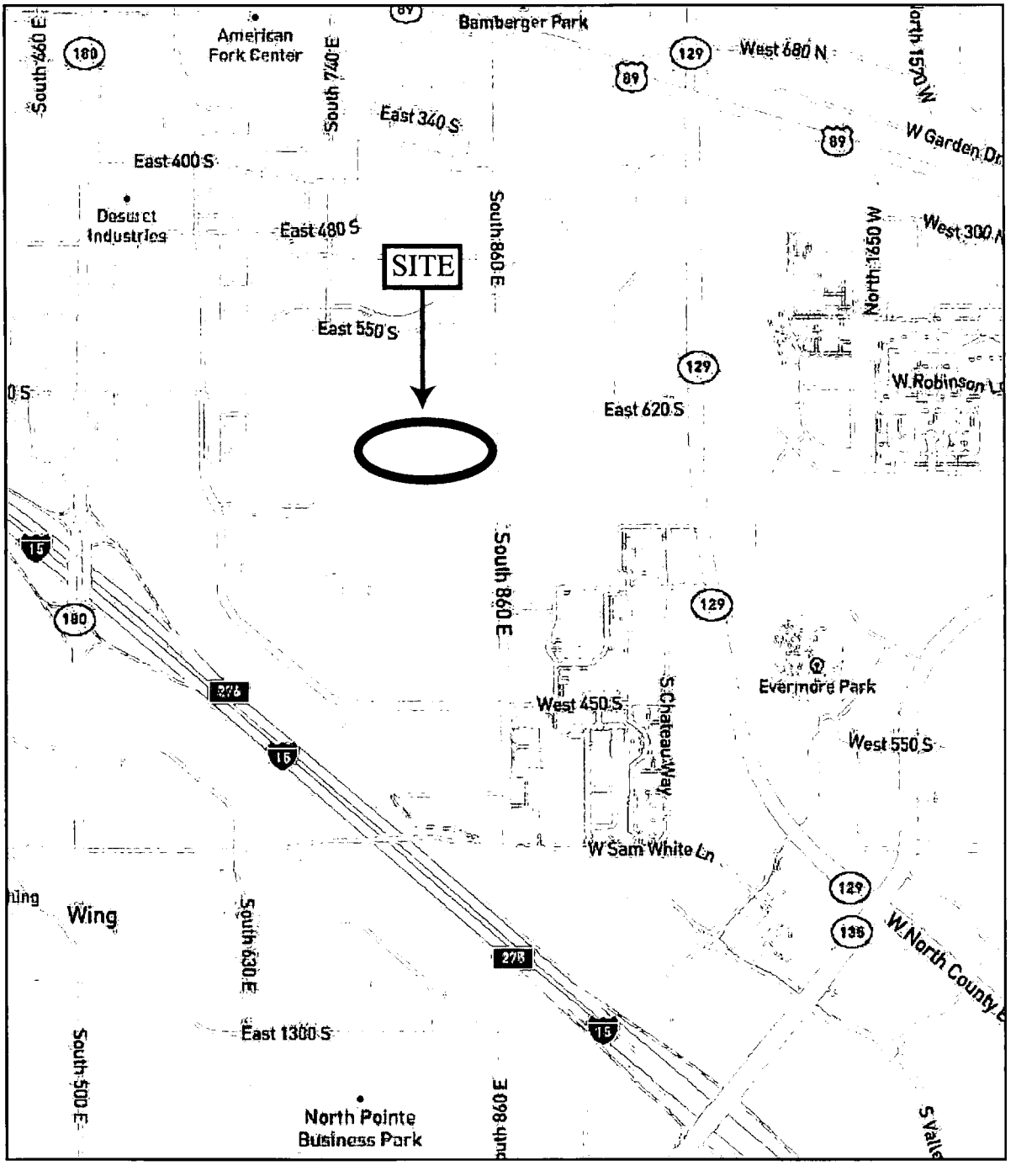
REGISTERED PROFESSIONAL ENGINEER
No. 334228
ALAN D. SPILKER
STATE OF UTAH

RAG/ADS:sp

Encl. Figure 1, Vicinity Map
Figure 2, Site Plan
Figures 3A through 3Q, Boring Logs
Figure 4, Key to Boring Log (USCS)

Addressee (email)

THE RITCHIE GROUP
JOB NO. 2093-011-21



200 0 200 400 600 800 M 1000

0.2 0 0.2 MI 0.4

FIGURE 1
VICINITY MAP

REFERENCE:
ALL TRAILS - NATIONAL GEOGRAPHIC TERRAIN
DATED 2021

GSH

THE RITCHIE GROUP
JOB NO. 2093-011-21

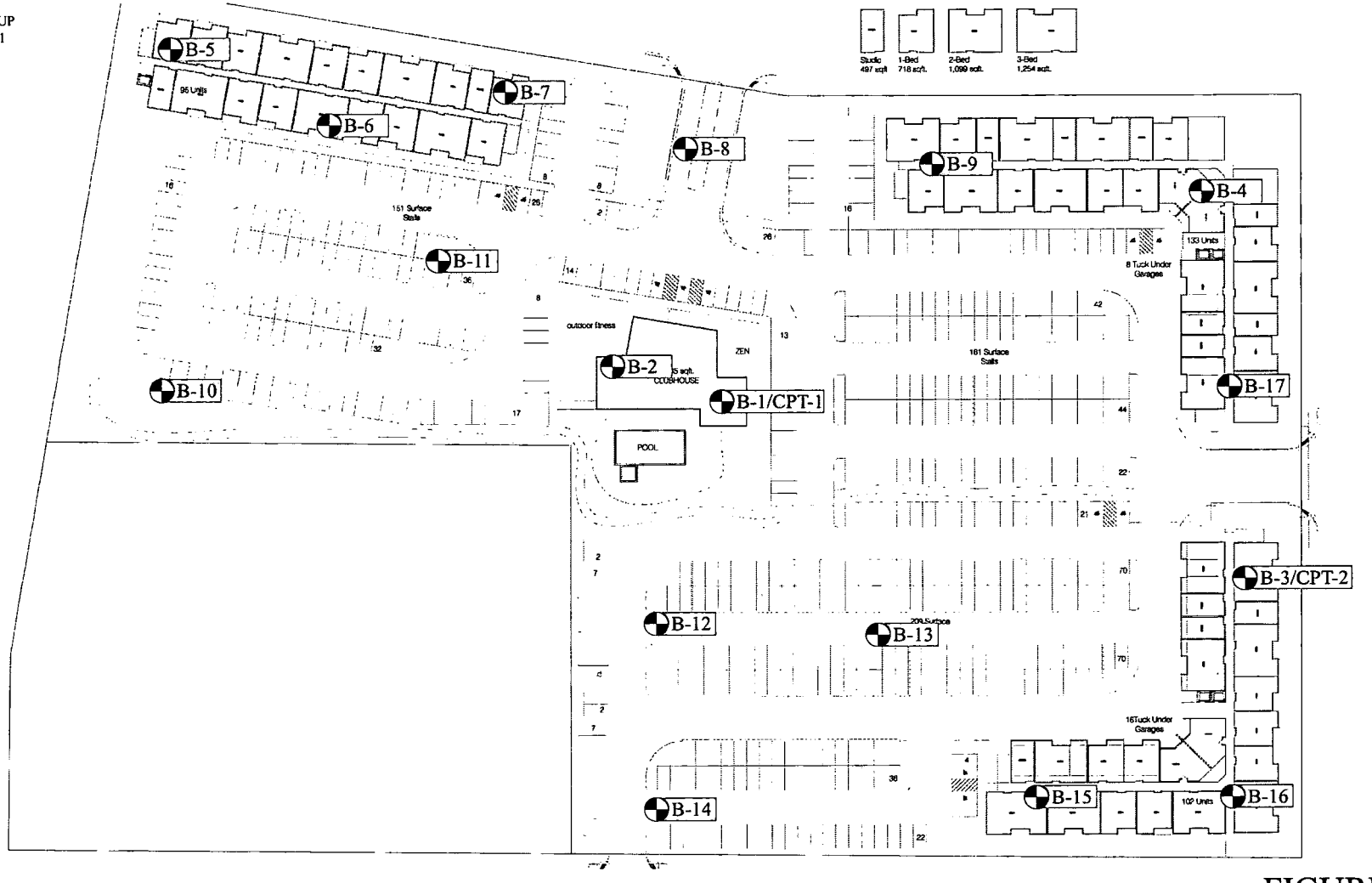


FIGURE 2
SITE PLAN

REFERENCE:
ADAPTED FROM DRAWING ENTITLED
"CONCEPTUAL SITE PLAN" BY FFKR ARCHITECTS
DATED DECEMBER 8, 2020

APPROXIMATE SCALE IN FEET
35 0 35 70

GSH

GSH	BORING LOG Page: 1 of 2	BORING: B-1

CLIENT: The Ritchie Group — PROJECT NUMBER: 2093-011-21

PROJECT: Vest Property (American Fork North) Apartments — DATE STARTED: 1/27/21 — DATE FINISHED: 1/27/21

LOCATION: 860 East between Quality Drive and 620 South, American Fork, Utah — GSH FIELD REP.: JC

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

GROUNDWATER DEPTH: 7.0' (2/10/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL FILL	SILTY CLAY, FILL with major roots (topsoil) to 6"; brown									disturbed moist stiff
	GP FILL	FINE TO COARSE SANDY FINE AND COARSE GRAVEL, FILL brown		22							moist medium dense
			5	10							
▼	SM	SILTY FINE TO MEDIUM SAND with some fine gravel; gray									moist very loose saturated
			10	3		32.8		44			
	ML	CLAYEY SILT with fine sand and layers of fine to coarse sand up to 2"; gray									saturated medium stiff
			15	7					38	11	
			20	6							
	ML/SM	FINE TO MEDIUM SANDY SILT/SILTY FINE TO MEDIUM SAND with clay and layers of fine to coarse sand up to 1" thick; gray									saturated medium dense
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3A

GSH	BORING LOG Page: 2 of 2	BORING: B-1

CLIENT: The Ritchie Group — PROJECT NUMBER: 2093-011-21

PROJECT: Vest Property (American Fork North) Apartments — DATE STARTED: 1/27/21 — DATE FINISHED: 1/27/21

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
			25								
				16		22.3		53.8			
	CL	FINE SANDY CLAY brown									saturated stiff
			30	13					43	19	
	SM	SILTY FINE TO COARSE SAND with some fine gravel; brown									saturated medium dense
			35	16		14.9		15.3			
	SP	FINE TO COARSE SAND with some fine gravel; gray									saturated medium dense
			40	11		27.5		3.7			
	SP/ SM	FINE TO COARSE SAND with some silt and some fine gravel; gray									saturated loose
			45	6		23.1		8.3			
	CL	FINE SANDY CLAY with silt; gray									saturated stiff
			50	9					36	14	
		End of Exploration at 51.0'. Installed 1.25" diameter slotted PVC pipe to 51.0'.									

See Subsurface Conditions section in the report for additional information.

FIGURE 3A
(continued)

GSH	BORING LOG Page: 1 of 1	BORING: B-2

CLIENT: The Ritchie Group — PROJECT NUMBER: 2093-011-21

PROJECT: Vest Property (American Fork North) Apartments — DATE STARTED: 1/27/21 — DATE FINISHED: 1/27/21

LOCATION: 860 East between Quality Drive and 620 South, American Fork, Utah — GSH FIELD REP.: JC

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

GROUNDWATER DEPTH: 4.9' (2/10/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL FILL	FINE TO MEDIUM SANDY CLAY, FILL with silt and fine gravel; major roots (topsoil) to 6"; gray									2' disturbed moist stiff
				11							
▼	SM/ SC	SILTY/CLAYEY FINE TO COARSE SAND with layers of fine to coarse gravel up to 4" thick; brown	5								moist loose saturated
				11							
	SM	SILTY FINE TO COARSE SAND with some fine gravel; brown									saturated loose
				19		17.3		34.7			
	GP	FINE TO COARSE SANDY FINE AND COARSE GRAVEL gray	10								saturated medium dense
				41							
		End of Exploration at 11.0'. Installed 1.25" diameter slotted PVC pipe to 11.0'.	15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3B

GSH	BORING LOG Page: 1 of 1	BORING: B-3

CLIENT: The Ritchie Group — PROJECT NUMBER: 2093-011-21

PROJECT: Vest Property (American Fork North) Apartments — DATE STARTED: 1/27/21 — DATE FINISHED: 1/27/21

LOCATION: 860 East between Quality Drive and 620 South, American Fork, Utah — GSH FIELD REP.: JC

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

GROUNDWATER DEPTH: 8.2' (2/10/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL FILL	SILTY CLAY, FILL with fine to coarse sand; gray									1' disturbed moist medium stiff
				5							
	SM/ SC	SILTY/CLAYEY FINE TO MEDIUM SAND with some fine gravel; gray									very moist loose
			5	16							
▼											saturated
			10	8		28.6		44.2			very loose
	CL	FINE TO MEDIUM SANDY CLAY with silt; gray									saturated very soft
			15	2							
			20	6							medium stiff
		End of Exploration at 21.0'. Installed 1.25" diameter slotted PVC pipe to 21.0'.	25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3C

GSH	BORING LOG Page: 1 of 1	BORING: B-4

CLIENT: The Ritchie Group — PROJECT NUMBER: 2093-011-21

PROJECT: Vest Property (American Fork North) Apartments — DATE STARTED: 1/27/21 — DATE FINISHED: 1/27/21

LOCATION: 860 East between Quality Drive and 620 South, American Fork, Utah — GSH FIELD REP.: JC

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

GROUNDWATER DEPTH: 6.7' (2/10/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	SP/ SM FILL	FINE TO COARSE SAND, FILL with some silt and some fine gravel; brown		18							moist loose
	CL	SILTY CLAY with fine to coarse sand; gray									very moist soft
▼			5	4							saturated
		grades fine to medium sandy clay with silt									
			10	8							medium stiff
		grades silty clay									
			15	5							soft
			20	4		44.8					
		End of Exploration at 21.0'. Installed 1.25" diameter slotted PVC pipe to 21.0'.	25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3D

GSH

BORING LOG

Page: 1 of 1

BORING: B-5

CLIENT: The Ritchie Group | PROJECT NUMBER: 2093-011-21

PROJECT: Vest Property (American Fork North) Apartments | DATE STARTED: 1/28/21 | DATE FINISHED: 1/28/21

LOCATION: 860 East between Quality Drive and 620 South, American Fork, Utah | GSH FIELD REP.: NWL

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

GROUNDWATER DEPTH: 5.1' (2/10/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	GP/GC FILL	FINE TO COARSE SANDY FINE AND COARSE GRAVEL, FILL with some clay; major roots (topsoil) to 6"; gray		97							slightly moist very dense
	GP/GM	FINE TO COARSE SANDY FINE AND COARSE GRAVEL with silt and some cobbles; gray									slightly moist medium dense
▼			5	56							saturated
	CL	SILTY CLAY with some fine to medium sand; brown/gray									saturated medium stiff
			10	9							
	SM/SC	SILTY/CLAYEY FINE SAND gray									saturated very loose
	CL	SILTY CLAY with some fine sand; gray	15	20							saturated stiff
			20	15							
		End of Exploration at 21.0'. Installed 1.25" diameter slotted PVC pipe to 21.0'.									
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3E

GSH BORING LOG

Page: 1 of 1

BORING: B-6

CLIENT: The Ritchie Group | PROJECT NUMBER: 2093-011-21

PROJECT: Vest Property (American Fork North) Apartments | DATE STARTED: 1/28/21 | DATE FINISHED: 1/28/21

LOCATION: 860 East between Quality Drive and 620 South, American Fork, Utah | GSH FIELD REP.: NWL

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

GROUNDWATER DEPTH: 4.2' (2/10/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	SM/SC FILL	SILTY/CLAYEY FINE TO COARSE SAND, FILL with fine and coarse gravel; major roots (topsoil) to 6"; tan/gray									moist medium dense
				27							
▼	CL	SILTY CLAY with fine sand and some roots; gray	5								saturated medium stiff
				5							
	ML/SM	FINE SANDY SILT/SILTY FINE SAND with some clay; gray									saturated loose
			10	11		26.7		54.3			
		grades with layers of silty fine to coarse sand up to 4" thick									
	SM/SC	SILTY FINE TO MEDIUM SAND with some clay; brown	15	14		24.1		38.8			saturated loose
		End of Exploration at 16.0'. Installed 1.25" diameter slotted PVC pipe to 16.0'.	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3F

GSH	BORING LOG Page: 1 of 1	BORING: B-7

CLIENT: The Ritchie Group — PROJECT NUMBER: 2093-011-21

PROJECT: Vest Property (American Fork North) Apartments — DATE STARTED: 1/28/21 — DATE FINISHED: 1/28/21

LOCATION: 860 East between Quality Drive and 620 South, American Fork, Utah — GSH FIELD REP.: NWL

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

GROUNDWATER DEPTH: 6.7' (2/10/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL FILL	SILTY CLAY, FILL with fine sand and some fine gravel; major roots (topsoil) to 6"; gray									moist stiff
				13							
	SM/ ML/	SILTY FINE TO COARSE SAND/FINE TO COARSE SANDY SILT with some clay and some fine and coarse gravel; gray	5	13		23.6	105				moist loose
▼											saturated
			10	9		25.8		49.1			very loose
	CL	SILTY CLAY with some fine sand; gray									saturated stiff
			15	20							
	SM/ SC	SILTY/CLAY FINE TO COARSE SAND gray									saturated loose
	CL	SILTY CLAY with some fine sand; gray									saturated stiff
		grades with layers of silty fine to coarse sand up to 4" thick	20	18							
		End of Exploration at 21.0'. Installed 1.25" diameter slotted PVC pipe to 21.0'.	25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3G

GSH	BORING LOG Page: 1 of 1	BORING: B-8

CLIENT: The Ritchie Group — PROJECT NUMBER: 2093-011-21

PROJECT: Vest Property (American Fork North) Apartments — DATE STARTED: 1/28/21 — DATE FINISHED: 1/28/21

LOCATION: 860 East between Quality Drive and 620 South, American Fork, Utah — GSH FIELD REP.: NWL

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

GROUNDWATER DEPTH: Not Encountered (1/28/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	GP/ GM FILL	FINE AND COARSE GRAVEL, FILL with fine to coarse sandy silt and cobbles; major roots (topsoil) to 4"; gray									dry very dense
		End of Exploration at 5.0'. No groundwater encountered at time of drilling.	5								
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3H

GSH	BORING LOG Page: 1 of 1	BORING: B-9

CLIENT: The Ritchie Group — PROJECT NUMBER: 2093-011-21

PROJECT: Vest Property (American Fork North) Apartments — DATE STARTED: 1/28/21 — DATE FINISHED: 1/28/21

LOCATION: 860 East between Quality Drive and 620 South, American Fork, Utah — GSH FIELD REP.: NWL

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

GROUNDWATER DEPTH: 5.2' (2/10/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	GP/GM FILL	FINE TO COARSE FINE AND COARSE GRAVEL, FILL with some silt; gray									moist medium dense
				29							
▼	GP	FINE AND COARSE GRAVEL with some fine to coarse sand; brown	5	29							saturated medium dense
				23		2.9		0.5			loose
			10								
	CL	FINE SANDY CLAY with some silt and fine and coarse gravel; gray									saturated stiff
			15	21							
		End of Exploration at 16.0'. Installed 1.25" diameter slotted PVC pipe to 16.0'.									
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3I

GSH	BORING LOG Page: 1 of 1	BORING: B-10

CLIENT: The Ritchie Group — PROJECT NUMBER: 2093-011-21

PROJECT: Vest Property (American Fork North) Apartments — DATE STARTED: 1/28/21 — DATE FINISHED: 1/28/21

LOCATION: 860 East between Quality Drive and 620 South, American Fork, Utah — GSH FIELD REP.: NWL

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

GROUNDWATER DEPTH: Not Encountered (1/28/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL FILL	FINE TO COARSE GRAVELLY CLAY, FILL with some fine to coarse sand and some silt; major roots (topsoil) to 4"; gray									moist stiff
		End of Exploration at 5.0'. No groundwater encountered at time of drilling.	5								
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3J

GSH	BORING LOG Page: 1 of 1	BORING: B-11

CLIENT: The Ritchie Group — PROJECT NUMBER: 2093-011-21

PROJECT: Vest Property (American Fork North) Apartments — DATE STARTED: 1/28/21 — DATE FINISHED: 1/28/21

LOCATION: 860 East between Quality Drive and 620 South, American Fork, Utah — GSH FIELD REP.: NWL

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

GROUNDWATER DEPTH: Not Encountered (1/28/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	GM/GC FILL	SILTY/CLAYEY FINE AND COARSE GRAVEL, FILL with some fine to coarse sand; major roots (topsoil) to 6"; gray									moist dense
		End of Exploration at 5.0'. No groundwater encountered at time of drilling.	5								
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3K

GSH	BORING LOG Page: 1 of 1	BORING: B-12

CLIENT: The Ritchie Group — PROJECT NUMBER: 2093-011-21

PROJECT: Vest Property (American Fork North) Apartments — DATE STARTED: 1/28/21 — DATE FINISHED: 1/28/21

LOCATION: 860 East between Quality Drive and 620 South, American Fork, Utah — GSH FIELD REP.: NWL

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

GROUNDWATER DEPTH: Not Encountered (1/28/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	GM FILL	SILTY FINE AND COARSE GRAVEL, FILL with some fine to medium sand; gray									dry dense
			5								
		End of Exploration at 5.0'. No groundwater encountered at time of drilling.									
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3L

GSH	BORING LOG Page: 1 of 1	BORING: B-13

CLIENT: The Ritchie Group — PROJECT NUMBER: 2093-011-21

PROJECT: Vest Property (American Fork North) Apartments — DATE STARTED: 1/28/21 — DATE FINISHED: 1/28/21

LOCATION: 860 East between Quality Drive and 620 South, American Fork, Utah — GSH FIELD REP.: NWL

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

GROUNDWATER DEPTH: Not Encountered (1/28/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	GM FILL	SILTY FINE AND COARSE GRAVEL, FILL with some fine to coarse sand; gray									dry dense
		End of Exploration at 5.0'. No groundwater encountered at time of drilling.	5								
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3M

GSH	BORING LOG Page: 1 of 1	BORING: B-14

CLIENT: The Ritchie Group — PROJECT NUMBER: 2093-011-21

PROJECT: Vest Property (American Fork North) Apartments — DATE STARTED: 1/28/21 — DATE FINISHED: 1/28/21

LOCATION: 860 East between Quality Drive and 620 South, American Fork, Utah — GSH FIELD REP.: NWL

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

GROUNDWATER DEPTH: Not Encountered (1/28/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL FILL	FINE TO MEDIUM SANDY CLAY, FILL with some fine and coarse gravel and silt; major roots (topsoil) to 6"; gray									slightly moist medium stiff
		End of Exploration at 5.0'.	5								
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3N

GSH

BORING LOG

Page: 1 of 1

BORING: B-15

CLIENT: The Ritchie Group | PROJECT NUMBER: 2093-011-21

PROJECT: Vest Property (American Fork North) Apartments | DATE STARTED: 1/28/21 | DATE FINISHED: 1/28/21

LOCATION: 860 East between Quality Drive and 620 South, American Fork, Utah | GSH FIELD REP.: NWL

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

GROUNDWATER DEPTH: 4.6' (2/10/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	SM FILL	SILTY FINE TO COARSE SAND, FILL with trace clay and fine gravel; gray									moist loose
				19							
	SM/ SC	SILTY/CLAYEY FINE TO COARSE SAND gray									moist very loose
▼			5	5		28.4		22.6			saturated
	SP/ SM	FINE TO COARSE SAND with some silt and trace fine gravel; gray									saturated loose
			10	15		21.9		5.4			
	CL	FINE SANDY CLAY with some silt; gray									saturated medium stiff
			15	9					45	20	
			20	11							
		End of Exploration at 21.0'. Installed 1.25" diameter slotted PVC pipe to 21.0'.	25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3O

GSH	BORING LOG Page: 1 of 1	BORING: B-16

CLIENT: The Ritchie Group — PROJECT NUMBER: 2093-011-21

PROJECT: Vest Property (American Fork North) Apartments — DATE STARTED: 1/28/21 — DATE FINISHED: 1/28/21

LOCATION: 860 East between Quality Drive and 620 South, American Fork, Utah — GSH FIELD REP.: NWL

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

GROUNDWATER DEPTH: 9.4' (2/10/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL FILL	FINE TO COARSE SANDY CLAY, FILL with fine gravel; major roots (topsoil) to 6"; brown									slightly moist medium stiff
	ML	CLAYEY SILT with fine sand and trace fine gravel; gray		9							moist medium stiff
		grades brown	5	8					33	7	
▼				11		27	97				
			10								saturated
	CL	SILTY CLAY with trace fine sand; brown									saturated medium stiff
		grades gray	15	11							
		End of Exploration at 16.0'. Installed 1.25" diameter slotted PVC pipe to 16.0'.									
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3P

GSH BORING LOG

Page: 1 of 1

BORING: B-17

CLIENT: The Ritchie Group | PROJECT NUMBER: 2093-011-21

PROJECT: Vest Property (American Fork North) Apartments | DATE STARTED: 1/28/21 | DATE FINISHED: 1/28/21

LOCATION: 860 East between Quality Drive and 620 South, American Fork, Utah | GSH FIELD REP.: NWL

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

GROUNDWATER DEPTH: 6.2' (2/10/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL FILL	FINE TO COARSE SANDY CLAY, FILL with some fine gravel; brown									moist medium stiff
	ML	FINE TO MEDIUM SANDY SILT with some clay; gray		2		41.5		60.7			very moist very loose
	SM/ ML	SILTY FINE TO MEDIUM SAND/FINE TO MEDIUM SANDY SILT gray	5	3		37.4		48.3			very moist very loose
▼											saturated
	GP	FINE TO COARSE SANDY FINE AND COARSE GRAVEL with trace clay; gray									saturated loose
			10	11		3.5		0.9			
		grades with alternate layers of clayey fine sand and fine to coarse sandy fine gravel up to 5" thick									
	CL	FINE SANDY CLAY with silt; brown									saturated medium stiff
			15	10							
		End of Exploration at 16.0'. Installed 1.25" diameter slotted PVC pipe to 16.0'.									
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3Q

CLIENT: The Ritchie Group
PROJECT: Vest Property (American Fork North) Apartments
PROJECT NUMBER: 2093-011-21

KEY TO BORING LOG

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

COLUMN DESCRIPTIONS

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

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

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

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

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

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

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

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

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

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

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

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

CEMENTATION:	MODIFIERS:	MOISTURE CONTENT (FIELD TEST):
Weakly: Crumbles or breaks with handling or slight finger pressure.	**Trace** <5%	**Dry:** Absence of moisture, dusty, dry to the touch.
Moderately: Crumbles or breaks with considerable finger pressure.	**Some** 5-12%	**Moist:** Damp but no visible water.
Strongly: Will not crumble or break with finger pressure.	**With** > 12%	**Saturated:** Visible water, usually soil below water table.

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

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

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

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

STRATIFICATION:

DESCRIPTION	THICKNESS
Seam	up to 1/8"
Layer	1/8" to 12"
Occasional: One or less per 6" of thickness	
Numerous; More than one per 6" of thickness	

TYPICAL SAMPLER GRAPHIC SYMBOLS

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

WATER SYMBOL

- Water Level

FIGURE 4

GSH

GSH

August 20, 2021
Job No. 2093-011-21

Mr. Tyler Ritchie
The Ritchie Group
1245 East Brickyard Road, Suite 70
Salt Lake City, Utah 84106

Mr. Ritchie:

Re: Letter - Addendum
860 East Pavement Recommendations
Proposed Vest Property (American Fork North) Apartments
860 East between Quality Drive and 620 South
American Fork, Utah

This letter is to serve as an addendum to the geotechnical study completed by this firm dated March 9, 2021[1]. GSH Geotechnical, Inc. (GSH) was requested to provided updated pavement recommendations for 860 East Street incorporating American Fork City minimum standards for collector roadways as well as the 20-year ADT forecast (3,016 current daily trips with 0.02 growth factor) incorporating 3 percent heavy trucks. The updated pavement recommendations are presented below:

860 East Street
(Moderate Volume of Automobiles and Light Trucks,
Light Volume of Medium-Weight Trucks,
and Occasional Heavy-Weight Trucks)
[200 equivalent 18-kip axle loads per day]

Flexible Pavements:
(Asphalt Concrete)

5.0 inches	Asphalt concrete
9.0 inches	Aggregate base
13.0 inches*	Aggregate subbase

[1] "Report, Geotechnical Study, Proposed Vest Property (American Fork North) Apartments, 860 East Between Quality Drive and 620 South, American Fork, Utah." GSH Job No. 2093-011-21

GSH Geotechnical, Inc.
473 West 4800 South
Salt Lake City, Utah 84123
Tel: 801.685.9190 Fax: 801.685.2990
www.gshgeo.com

	Over	Properly prepared fills, stabilized natural subgrade soils, and/or structural site grading fill extending to properly prepared fills and/or stabilized natural subgrade soils

* Subbase may consist of granular site grading fills with a minimum California Bearing Ratio (CBR) of 30 percent.

The crushed stone should conform to applicable sections of the current Utah Department of Transportation (UDOT) Standard Specifications. All asphalt material and paving operations should meet applicable specifications of the Asphalt Institute and UDOT. A GSH technician shall observe placement and perform density testing of the base course material and asphalt.

Please note that the recommended pavement section is based on estimated post-construction traffic loading. If the pavement is to be constructed and utilized by construction traffic, the above pavement section may prove insufficient for heavy truck traffic, such as concrete trucks or tractor-trailers used for construction delivery. Unexpected distress, reduced pavement life, and/or premature failure of the pavement section could result if subjected to heavy construction traffic and the owner should be made aware of this risk. If the estimated traffic loading stated herein is not correct, GSH must review actual pavement loading conditions to determine if revisions to these recommendations are warranted.

GSH

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

Respectfully submitted,

GSH Geotechnical, Inc.

Robert A. Gifford, P.G.
Engineering Geologist

Reviewed by:

Alan D. Spilker, P.E.
State of Utah No. 334228
President/Senior Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
No. 334228
ALAN D. SPILKER
STATE OF UTAH

RAG/ADS:ab

Encl. Figure 1, Vicinity Map
Figure 2, Site Plan
Figures 3A through 3Q, Boring Logs
Figure 4, Key to Boring Log (USCS)

Addressee (email)

GSH

April 1, 2021
Job No. 2093-012-21

Mr. Tyler Ritchie
The Ritchie Group
1245 East Brickyard Road, Suite 70
Salt Lake City, Utah 84106

Mr. Ritchie:

Re: Summary Report
Site-Specific Seismic Study
Proposed Vest Property Apartments
860 East between Quality Drive and 620 South
American Fork, Utah

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our site-specific seismic study performed at the site of the proposed Vest Property (American Fork North) Apartments to be located at 860 East between Quality Drive and 620 South in American Fork, Utah. GSH Geotechnical, Inc (GSH) completed a geotechnical study[1] for the site. Data from the geotechnical study along with a geophysical survey was used for this site-specific seismic study.

The shear-wave velocity profile for the upper 350 feet at the site (including $\overline{v}_{s30}$ for the upper 100 feet) was determined utilizing boring data from our geotechnical study and a geophysical survey consisting of Refraction Microtremor (ReMi) testing.

The ground motion hazard and design ground motion response spectra at the site were developed utilizing a site-specific site response analysis (SRA). The analysis was completed in accordance with the procedures presented in ASCE 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7-16) and Supplement 1 to ASCE 7-16.

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[1] "Report, Geotechnical Study, Proposed Vest Property Apartments, 860 East between Quality Drive and 620 South, American Fork, Utah," GSH Job No. 2093-011-21, dated February 23, 2021.

GSH Geotechnical, Inc.
473 West 4800 South
Salt Lake City, Utah 84123
Tel: 801.685.9190 Fax: 801.685.2990
www.gshgeo.com

1.2 OBJECTIVES AND SCOPE

The objectives and scope of the study were planned in discussions between Mr. Tyler Ritchie of The Ritchie Group and Mr. Robert Gifford of GSH.

In general, the objectives of this study were to:

1. Further define the subsurface conditions at the site, including a shear-wave profile to a depth of 350 feet.

2. Develop site-specific and design ground motion response spectra for the site.

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

1. A review of available subsurface information from the geotechnical study completed for the site.

2. A field program consisting of the completion of a Refraction Microtremor (ReMi) geophysical exploration to a depth of 350 feet including the development of $\overline{v}_{s30}$ for the upper 100 feet.

3. Performance of a site-specific site response analysis (SRA) in accordance with the ASCE 7-16 Section 21.1, Site Response Analysis.

4. Development of site-specific and design ground motion response spectra for the site in accordance with the ASCE 7-16 Section 21.3, Design Response Spectrum.

1.3 AUTHORIZATION

Authorization was provided by returning a signed copy of the Professional Services Agreement No. 21-0126 dated January 18, 2021.

1.4 PROFESSIONAL STATEMENTS

Supporting data upon which our recommendations are based are presented in subsequent sections of this report. Recommendations presented herein are governed by the physical properties of the soils encountered in the geophysical testing, exploration borings, and projected groundwater conditions. If subsurface conditions other than those described in this report are encountered, GSH must be informed so that our recommendations can be reviewed and amended, if necessary.

Our professional services have been performed, our findings developed, and our recommendations prepared in accordance with generally accepted engineering principles and practices in this area at this time.

2. PROPOSED CONSTRUCTION

The project is to consist of the construction of 3 residential apartment structures and a clubhouse with an associated pool area and surrounding pavements. The structures are anticipated to be 5 stories, placed slab on grade, and supported upon conventional spread and continuous wall footings. Paved parking areas and drive lanes are planned around the structures.

Based on information provided by the structural engineer, the structure's fundamental period will be approximately 0.5 seconds.

3. SITE CONDITIONS

3.1 SURFACE

The site is located at 860 East between Quality Drive and 620 South in American Fork, Utah. The site is currently vacant/undeveloped brush/grass land previously used for agricultural purposes with small agricultural structures on the east side of the site. The site is undergoing construction operations in the form of grading and filling on the northern and western portions of the site. The topography of the site is relatively flat, grading down to the southeast with a total relief of approximately 10 to 12 feet. Site vegetation consists of various weeds and brush/grass throughout.

The site is bounded to the north by similarly vacant/undeveloped brush/grass land followed by multi-family residential structures; to the east by 4850 West Street followed by vacant/undeveloped brush/grass land along with a single-family residential structure and associated agricultural land; and to the south and west by similarly vacant/undeveloped brush/grass land, as well as active construction sites.

3.2 SUBSURFACE SOIL AND GROUNDWATER

The following paragraphs provide generalized descriptions of the subsurface profiles and soil conditions encountered within the borings conducted during the geotechnical study. As previously noted, soil conditions may vary in unexplored locations.

The borings were drilled to depths ranging from 5 to 51 feet. The soil conditions encountered in each of the borings, to the depths penetrated, were generally similar across the boring locations.

- Non-engineered fill soils were encountered in each boring to depths ranging from 1.5 to 5.5 feet beneath the existing ground surface. The non-engineered fill soils primarily consisted of clay, sand, and gravel with varying silt and cobble content.

- Natural soils were encountered below the non-engineered fill or the ground surface in Borings B-1 through B-7, B-9, and B-15 through B-17. The natural soils consisted primarily of alternating layers of cohesive clay/silt with varying sand and gravel content, and non-cohesive silt/sand/gravel with varying clay and cobble content.

The natural cohesive clay/silt soils were very soft to stiff, moist to saturated, gray and brown in color, and moderately over-consolidated. The natural non-cohesive silt, sand, and gravel soils were very loose to medium dense, slightly moist to saturated, and gray and brown in color.

Groundwater was measured as shallow as 4.2 feet below the existing ground surface during the geotechnical study for the site.

For a more descriptive interpretation of subsurface conditions, please refer our geotechnical report completed for the site (GSH Job No. 2093-011-21).

3.3 SHEAR WAVE VELOCITY PROFILE

The site shear-wave velocity profile was completed utilizing geophysical exploration. The testing consisted of Refraction Microtremor (ReMi) testing. Testing is performed at the surface using a series of geophone sensors and a seismic source. A wavefield transformation is performed on the recorded geophone movements. The transformation is then utilized to create a shear-wave dispersion curve to model the subsurface shear-wave velocity profile.

The location of the ReMi line on the site is presented on Figure 1, Site Plan. The borings completed in conjunction with the geotechnical study are also shown on Figure 1.

The site classification for ASCE 7-16 was Site Class F in the geotechnical report due to potentially liquefiable soils at the site. As a follow up to the geotechnical report the ReMi testing results were analyzed to a depth of 350 feet with a resulting $\overline{v}_{s30}$ value of 892 ft/s. This characterizes the site as a Site Class D, Stiff Soil Profile as defined in Chapter 20 of ASCE 7-16.

The shear-wave velocity results are provided on attached Figure 2, Shear-Wave Velocity Profile.

3.4 GEOLOGIC SETTING

The site is located in the Utah Valley, which is in the Basin and Range Physiographic Province. The Utah Valley is near (west of) the transition between the Basin and Range Physiographic Province on the west and the Middle Rocky Mountain Physiographic Province to the east. The Basin and Range Province is characterized by generally north-trending valleys and mountain ranges that have formed by displacement along normal faults. The Wasatch fault forms the boundary between the 2 provinces and has been active for approximately 10 million years. The Middle Rocky Mountains were formed during a period of regional compression that occurred in Cretaceous time, about 75 to 70 million years ago (Hunt, 1967). The surficial geology of the area is characterized by materials deposited within the past 30,000 years by late Pleistocene Lake Bonneville (Currey and Oviatt, 1985), and young lacustrine and deltaic deposits (Holocene to upper Pleistocene) were deposited on delta margins as the lake receded to its present Great Salt Lake levels (Hylland and others, 2014). As the ancient lake(s) receded, streams began to regrade through shoreline deltas formed at the mouths of major Wasatch Range canyons and the eroded material was deposited in the basin as a series of recessional deltas, alluvial fans and shoreline

sequences. Younger alluvial-fan deposits (**Qafy**), Lacustrine silt and clay (**Qlmp**), and regressive alluvial-fan deposits (**Qafp**) are mapped at the site (Solomon, Et al., 2009).

3.5 FAULTING

There are a number of mapped faults near the site. The faults are primarily normal mechanism. Some of the faults included are the Utah Lake Faults (mapped 2.30 miles southwest of the site), the Provo section of the Wasatch fault zone (mapped 2.81 miles northeast of the site), the Salt Lake City section of the Wasatch fault zone (mapped 9.48 miles north-northwest of the site), and the Nephi section of the Wasatch fault zone (mapped 19.63 miles south-southeast of the site).

4. SITE RESPONSE ANALYIS

A soil model was developed from the boring, laboratory, and ReMi data from this study and the geotechnical study for the site.

A series of earthquake time histories were selected and scaled to match the MCE_R response spectrum at the base of the soil column. Histories were selected from events with similar magnitudes, distances and spectral shape in the period ranges of significance for the proposed structure (approximately 0.5 seconds). These ground motion time histories were input at the base of the soil column model as outcrop motions, propagated through the soil column model, and calculated as surface ground motions. The results of the SRA analysis are presented in the table in the following section.

5. DESIGN SPECTRAL ACCERATIONS

The response spectra produced from the site-specific seismic analysis was compared with the minimum code spectrum values per ASCE 7-16 Section 21.3, including updates presented in Supplement 1 to ASCE 7-16. This process includes taking the 2014 mapped values from the USGS and utilizing F_a from Table 11.4-1 and 2.5 as F_v to obtain the modified accelerations, then reducing them by 20 percent to obtain the code minimum spectral accelerations.

The site-specific response spectrum is lower than the minimum code spectrum at select periods; therefore, the minimum code spectrum governs the design spectrum for the site at these periods. These values are presented in the table below:

Period (sec)	Code 80% Minimum Spectral Acceleration (g)	Site-Specific Spectral Acceleration (g)	Code Modified* Site-Specific Spectral Acceleration (g)	Design Spectral Acceleration (2/3 of Code Modified Site-Specific Acceleration) (g)
0.05	0.591	0.418	0.591	0.394
0.1	0.763	0.437	0.763	0.509

Period (sec)	Code 80% Minimum Spectral Acceleration (g)	Site-Specific Spectral Acceleration (g)	Code Modified* Site-Specific Spectral Acceleration (g)	Design Spectral Acceleration (2/3 of Code Modified Site-Specific Acceleration) (g)
0.2	1.048	0.597	1.048	0.699
0.3	1.048	0.772	1.048	0.699
0.4	1.048	0.799	1.048	0.699
0.42	1.048	0.828	1.048	0.699
0.44	1.048	0.844	1.048	0.699
0.46	1.048	0.859	1.048	0.699
0.48	1.048	0.892	1.048	0.699
0.50	**1.048**	**0.945**	**1.048**	**0.699**
0.6	1.048	1.090	1.090	0.727
0.8	1.048	1.108	1.108	0.739
1.0	0.958	1.051	1.051	0.701
1.2	0.799	1.035	1.035	0.690
1.4	0.685	0.822	0.822	0.548
1.6	0.599	0.653	0.653	0.435
1.8	0.532	0.509	0.532	0.355
2.0	0.479	0.411	0.479	0.319
3.0	0.319	0.215	0.319	0.213
4.0	0.240	0.123	0.240	0.160
5.0	0.192	0.078	0.192	0.128

*The greater of the site-specific and the code minimum spectral acceleration.

GSH

5.1 CLOSURE

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

Respectfully submitted,

GSH Geotechnical, Inc.

LICENSED PROFESSIONAL ENGINEER
No. 343650
MICHAEL S. HUBER
STATE OF UTAH

Michael S. Huber, P.E.
State of Utah No. 343650
Vice President/Senior Geotechnical Engineer

Reviewed by:

Alan D. Spilker, P.E.
State of Utah No. 334228
President/Senior Geotechnical Engineer

MSH/ADS:jlh

Encl.

Figure 1, Site Plan
Figure 2, Shear-Wave Velocity Profile

Addressee (email)

Geologic References

Currey, D.R., and Oviatt, C.G., 1985, Durations, average rates, and probable causes of Lake Bonneville expansion, still-stands, and contractions during the last deep-lake cycle, 32,000 to 10,000 years ago, in Kay, P.A., and Diaz, H.F., (eds.), Problems of and prospects for predicting Great Salt Lake levels - Processing of a NOAA Conference, March 26-28, 1985: Salt Lake City, Utah

DuRoss, C.B., and Hylland, M.D., 2015, Synchronous ruptures along a major graben-forming fault system—Wasatch and West Valley fault zones, Utah: Bulletin of the Seismological Society of America, v. 105, no. 1, p. 14–37.

Hunt, C.B., 1967, Physiography of the United States: San Francisco, W.H. Freeman, 480 p.

Solomon, Barry J., Biek, Robert F., and Ritter, Scott M., 2009, Geologic Map of the Pelican Point Quadrangle, Utah County, Utah. Utah Geologic Survey, Plate 1.

THE RITCHIE GROUP
JOB NO. 2093-012-21

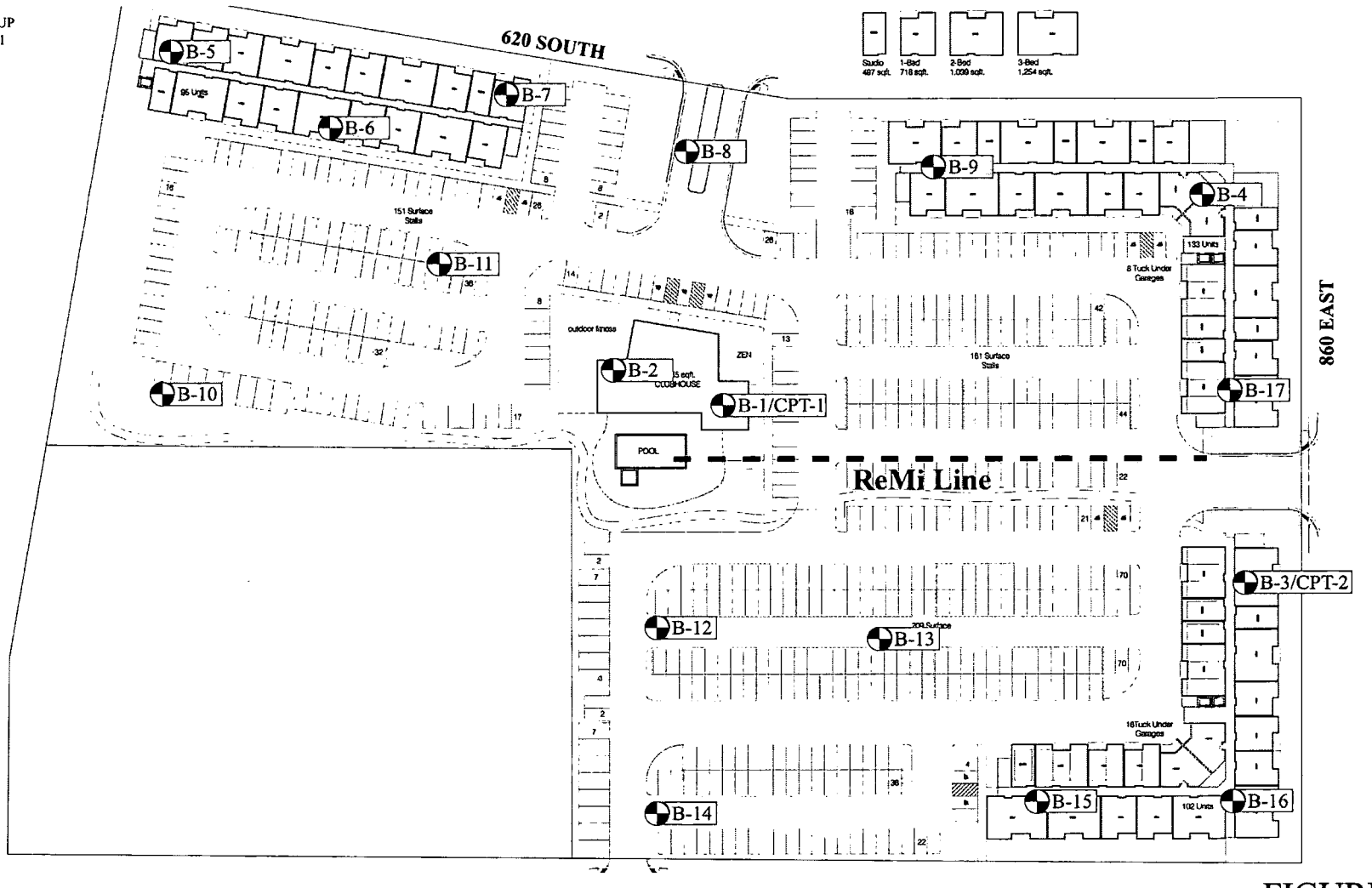


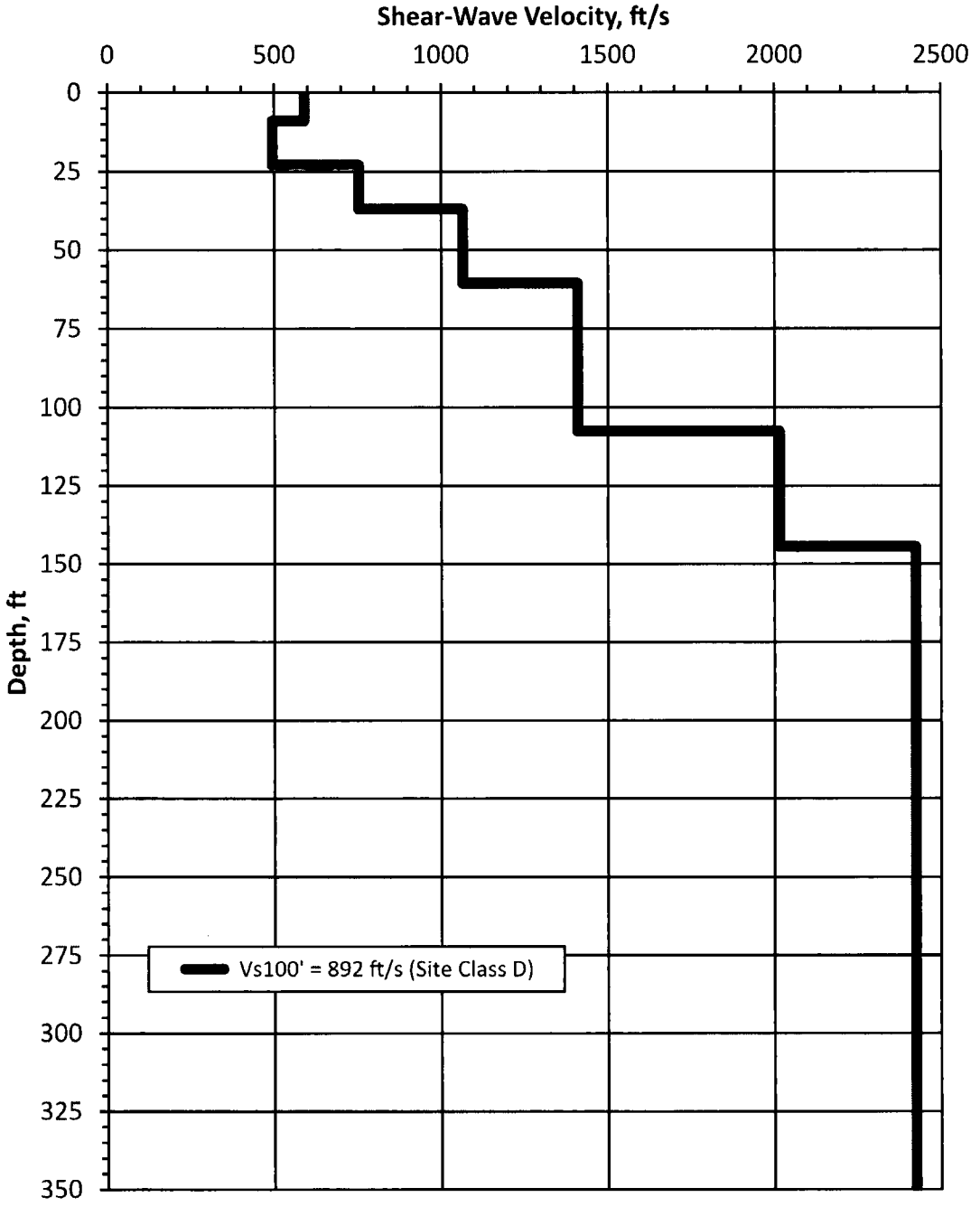
FIGURE 1
SITE PLAN

REFERENCE:
ADAPTED FROM DRAWING ENTITLED
"CONCEPTUAL SITE PLAN" BY FFKR ARCHITECTS
DATED DECEMBER 8, 2020

APPROXIMATE SCALE IN FEET
35 0 35 70

GSH

SHEAR -WAVE VELOCITY PROFILE



PROJECT NO.: 2093-012-21	GSH	FIGURE NO.: 2

CMT ENGINEERING LABORATORIES

June 28, 2020

Mr. Ben Hunter
City of American Fork
275 East 200 North
American Fork, Utah 84003

RE: Geotechnical Review
American Fork North Apartments (Vest Property)
860 East, Quality Drive to 620 South
American Fork, Utah
CMT Job No. 12566

Review Status: INCOMPLETE, More Information Requested

Mr. Hunter,

As requested, this letter presents our review of the report titled "Report, Geotechnical Study, Proposed Vest Property (American Fork North) Apartments, 860 East Between Quality Drive and 620 South, American Fork, Utah" prepared by GSH, Job No. 2093-011-21 and dated March 9, 2021. We reviewed the report with respect to the current American Fork Sensitive Lands Ordinance, specifically Section 4-2-2, as follows:

1. The nature, distribution and classification of soils encountered to depths up to about 51.5 feet were provided, which is more than 10 feet below proposed excavations and below the depth of influence from structures.

2. The strength of existing soils, bearing capacity of supporting soils, soil settlement estimates, and lateral resistance/pressures were addressed, but were not substantiated; we request that calculations for settlement, bearing capacity and passive pressures/lateral resistance be provided for review. Pavement sections were provided for parking/drive areas and for streets/roadways, but the sections for roadways did not meet the minimum values required for Sensitive Lands Ordinance areas (see Section 13 of the city's Standards and Specifications).

3. Groundwater levels that may affect the development were addressed, including potential groundwater fluctuations and providing limiting depths of the lowest habitable floor slabs.

4. Appropriate laboratory testing for classification, consistency, strength and consolidation conditions, and soil liquefaction potential were provided in the report.

5. Slope stability is not an issue for this relatively flat site.

6. Potential frost action based on material type and groundwater levels was addressed by recommending that footings be placed at least 30 inches below lowest adjacent grade.

7. Frost depth was addressed (30 inches).

8. Geologic and hydrologic hazards per Section 4-2-4 of the Ordinance were appropriately addressed in the report, but the required Geotechnical/Geologic certificate was not provided.

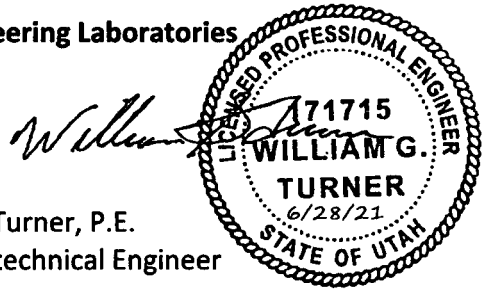
9. Soil constraints, such as compressible soils, high groundwater, organic soils (topsoil), and liquefaction, were addressed in the report. The report concluded that liquefaction at this site is likely to occur during larger seismic events, including up to approximately 7.5 inches of liquefaction-induced settlement, and provided mitigation recommendations; however, similar to item 2 above, we request that the calculations for liquefaction be provided.

10. The report is in accordance with the guidelines and recommendations of the "American Fork Sensitive Lands Geologic Hazards Study" Chapter 5. The recommended depth of borings in Chapter 5 for evaluating liquefaction is 40 feet, and the reviewed report included 1 boring that extended to a depth of about 51 feet, which satisfies this requirement.

In summary, items 2, 8 and 9 were not fully addressed to meet Section 4-2-2 of the current American Fork Sensitive Lands Ordinance; we recommend that American Fork City request these items be provided for review and/or be addressed.

If we can answer any questions or be of further assistance, please call.

Sincerely,
CMT Engineering Laboratories



William G. Turner, P.E.
Senior Geotechnical Engineer

GSH

June 22, 2022
Job No. 2093-011-21

Mr. Tyler Ritchie
The Ritchie Group
1245 East Brickyard Road, Suite 70
Salt Lake City, Utah 84106

Mr. Ritchie:

Re: Letter - Addendum
Response to Review Comments
Proposed Vest Property (American Fork North) Apartments
860 East Between Quality Drive and 620 South
American Fork, Utah

Introduction

GSH Geotechnical, Inc. (GSH) was requested to provide responses to the review comments from Mr. William Turner, P.E. of CMT Engineering Laboratories (CMT) on behalf of the City of American Fork. GSH completed the original geotechnical study for the above referenced site dated March 9, 2021[1]. This letter is to address the comments in the third-party geotechnical engineering review document provided by CMT dated June 28, 2021[2]. This letter is also intended to serve as an addendum to the referenced geotechnical study.

Review Comment 2

The strength of existing soils, bearing capacity of supporting soils, soil settlement estimates, and lateral resistance/pressures were addressed, but were not substantiated; we request that calculations for settlement, bearing capacity and passive pressures/lateral resistance be provided for review. Pavement sections were provided for parking/drive areas and for streets/roadways, but the sections for roadways did not meet the minimum values required for Sensitive Lands Ordinance areas (see Section 13 of the city's Standards and Specifications).

1 "Report, Geotechnical Study, Proposed Vest Property (American Fork North) Apartments, 860 East Between Quality Drive and 620 South, American Fork, Utah." GSH Geotechnical, Inc., Project No. 2093-011-21.

2 "Geotechnical Review, American Fork North Apartments (Vest Property), 860 East, Quality Drive to 620 South, American Fork, Utah." CMT Job No. 12566.

Comment 2 Response

Due to the shallow and thick zone of potentially liquefiable soils present across the site, soil improvement methods such as rammed-aggregate piers were recommended. Rammed-aggregate piers are a design/build element and must be designed and constructed by a licensed installer. The requested calculations for settlement and bearing capacity should be provided by the rammed-aggregate pier installer and calculations should be signed and stamped by a professional engineer licensed in the State of Utah.

The requested calculations for passive pressures/lateral resistance are provided as Figure 1.

The roadway pavement section presented in the referenced geotechnical report is for the proposed roadways/drive lanes to be located between the parking areas and apartment structures. Since these are drive lanes within the parking area and not public roads, Section 13 of the "American Fork Standards" does not apply.

Review Comment 8

Geologic and hydrologic hazards per Section 4-2-4 of the Ordinance were appropriately addressed in the report, but the required Geotechnical/Geologic certificate was not provided.

Comment 8 Response

I hereby certify that I am a licensed professional engineer or an engineering geologist, as those terms are defined in the "Sensitive Lands Ordinance" Section of the American Fork City Ordinances. I have examined the letter report/geologic report to which this certificate is attached, and the information and conclusions contained therein are, without any reasonable reservation not stated therein, accurate and complete. All procedures and tests used in said letter report/geologic report meet minimum applicable professional standards.

Review Comment 9

Soil constraints, such as compressible soils, high groundwater, organic soils (topsoil), and liquefaction, were addressed in the report. The report concluded that liquefaction at this site is likely to occur during larger seismic events, including up to approximately 7.5 inches of liquefaction-induced settlement, and provided mitigation recommendations; however, similar to item 2 above, we request that the calculations for liquefaction be provided.

Comment 9 Response

After re-evaluation of our liquefaction analysis, we have determined that seismic induced settlement will be less than 2.5 inches. The amount of seismic induced settlement has been reduced from the original report by classifying the silt encountered in Boring B-1, at a depth of approximately 12.5 feet extending to 23.0 feet, as a non-liquifiable layer. Due to the high plasticity

index of this silt (PI=11), it is not anticipated to liquefy during the design seismic event. Additionally, soils below 20 feet have already experienced multiple major earthquakes and are not anticipated to liquefy and settle further. Our updated liquefaction analysis is included as Figure 2.

Closure

All other recommendations presented in the referenced report shall continue to be followed.

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

Respectfully submitted,
GSH Geotechnical, Inc.

Giavanna Lonardo, E.I.T.
Staff Engineer

Reviewed by:

Alan D. Spilker, P.E.
State of Utah No. 334228
President/Senior Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER No. 334228 ALAN D. SPILKER STATE OF UTAH

GAL/ADS:dg

Encl. Figure 1, Lateral Resistance
Figure 2, Liquefaction Analysis

Addressee (email)

CC: Scott Laneri (Scott@theritchiegroup.com)
Sheyene Sahagun (Sheyene@theritchiegroup.com)
Scott Carlson (scarlson@twinpeakseng.com)

THE RITCHIE GROUP
JOB NO. 2093-011-21

Project:	Vest Property (American Fork Nor	**Date:**	21-Jun
Job No:	2093-011-21	**Engineer:**	GAL

	Friction Angle (degrees)	Safety Factor	Coefficient of Friction
Cohesive Soil	27	1.15	0.30
Granular Soil	35	1.15	0.40

$$\mu = \frac{tan(0.7 \times \phi)}{SF}$$

FIGURE 1

GSH

THE RITCHIE GROUP
JOB NO. 2093-011-21

EARTHQUAKE PROBABILITIES

Reference: Idriss, I. M., and Boulanger, R. W. (2008), Soil liquefaction during earthquakes: Monograph MNO-12, Earthquake Engineering Research Institute, Oakland, CA, 261 pp. and
Boulanger, R. W., and Idriss, I. M. (2014), "CPT and SPT Based Liquefaction Triggering Procedures." Report No. UCD/CGM-14/01, Center for Geotechnical Modeling, Department of Civil and Environmental Engineering, University of California, Davis, CA, 134 pp.

Project: West Property (American Fork N Date: 21-Jun-22
Job No: 2093-011-21 Engineer: GA

Input Parameters:
Peak ground accel (g) = 0.850 MCEG per ASCE 7-10 11.8.3-2
Earthquake magnitude, M = 7.2 from USGS Deaggregation of Seismic Hazard for PGA
Water table depth (m) = 2.1336 7 ft
Average γ above water table (kN/m³) = 17.3 110 pcf
Average γ below water table (kN/m³) = 18.7 119 pcf
Borehole diameter (mm) = 168.275 6.625 in
Energy Ratio, ER (%) = 85 percent
Requires correction for sampler liners (YES/NO) = NO
Rod lengths assumed equal to the depth plus 1.5 m (for the above ground extension)

FOSmax 1.0

Boring	Depth (ft)	Depth (m)	Measured N	Soil Type (USCS)	Flag "Clay" "Unsaturated" "Unreliable"	Fines Content (%)	C_E	C_B	C_R	C_S	N_{60}	σ_{vc} (kPa)	σ_{vc}' (kPa)	C_N	$(N_1)_{60}$	ΔN for fines content	$(N_1)_{60-cs}$	r_d
B-1	10.0	3.0	3	SM		44.0	1.42	1.15	0.85	1.00	4.2	54	45	1.61	6.7	5.6021	12.3	0.98
	15.0	4.6	7	ML	Clay	60.0	1.42	1.15	0.95	1.00	10.8	82	59	1.15	n.a.	n.a.	n.a.	0.96
	20.0	6.1	6	ML	Clay	60.0	1.42	1.15	0.95	1.00	9.3	111	72	1.09	n.a.	n.a.	n.a.	0.94
	25.0	7.6	16	ML/SM		53.8	1.42	1.15	0.95	1.00	24.8	139	86	1.07	26.4	5.6133	32.0	0.91
	30.0	9.1	13	CL	Clay	80.0	1.42	1.15	1.00	1.00	21.2	168	99	1.00	n.a.	n.a.	n.a.	0.89
	35.0	10.7	16	SM	Unreliable	15.3	1.42	1.15	1.00	1.00	26.1	196	113	0.96	24.9	3.3601	28.3	0.86
	40.0	12.2	11	SP	Unreliable	3.7	1.42	1.15	1.00	1.00	17.9	225	126	0.90	16.1	1E-06	16.1	0.84
	45.0	13.7	6	SP/SM	Unreliable	8.3	1.42	1.15	1.00	1.00	9.8	253	140	0.83	8.1	0.462	8.6	0.81
	50.0	15.2	9	CL	Clay	80.0	1.42	1.15	1.00	1.00	14.7	282	153	0.90	n.a.	n.a.	n.a.	0.79
		0.0					1.42	1.15	0.75	1.00	0.0	0	0	#DIV/0!	#DIV/0!	0	#DIV/0!	1.01
		0.0					1.42	1.15	0.75	1.00	0.0	0	0	#DIV/0!	#DIV/0!	0	#DIV/0!	1.01
		0.0					1.42	1.15	0.75	1.00	0.0	0	0	#DIV/0!	#DIV/0!	0	#DIV/0!	1.01
		0.0					1.42	1.15	0.75	1.00	0.0	0	0	#DIV/0!	#DIV/0!	0	#DIV/0!	1.01
		0.0					1.42	1.15	0.75	1.00	0.0	0	0	#DIV/0!	#DIV/0!	0	#DIV/0!	1.01

Depth (m)	CSR	MSFmax	MSF for sand	K_σ for sand	CRR for M=7.5 & σ_{vc}' = 1atm	CRR	Factor of Safety	Limiting Shear Strain γ_{lim}	Parameter F_α	Maximum Shear Strain γ_{max}	ΔH_i (ft)	ΔH_i (m)	ΔLDI_i (m)	Vertical Reconsol. Strain ε_v	ΔS_i (m)	ΔS_i (inch)	ΔS_i (inch) for FOS < FOSmax	ΣΔSI (inch)
3.0	0.447	1.242	1.02	1.08	0.134	0.149	0.33	0.369	0.854	0.369	5.5	1.676	0.619	0.033	0.055	2.17	2.17	2.17
4.6	#VALUE!	#VALUE!	#VALUE!	1.10	n.a.	n.a.	n.a.	0.000	0.000	0.000	5.5	1.676	0.000	0.000	0.000	0.00	0.00	2.17
6.1	#VALUE!	#VALUE!	#VALUE!	1.10	n.a.	n.a.	n.a.	0.000	0.000	0.000	5.0	1.524	0.000	0.000	0.000	0.00	0.00	2.17
7.6	0.544	2.124	1.12	1.04	0.647	0.748	1.38	0.035	-0.226	0.017	5.5	1.676	0.028	0.003	0.005	0.20	0.00	2.17
9.1	#VALUE!	#VALUE!	#VALUE!	1.01	n.a.	n.a.	n.a.	0.000	0.000	0.000	4.5	1.372	0.000	0.000	0.000	0.00	0.00	2.17
10.7	0.595	1.898	1.09	0.98	0.397	?	?	0.058	0.023	0.000	4.5	1.372	0.000	0.000	0.000	0.00	0.00	2.17
12.2	0.626	1.352	1.04	0.97	0.166	?	?	0.244	0.707	0.000	6.5	1.981	0.000	0.000	0.000	0.00	0.00	2.17
13.7	0.630	1.165	1.02	0.97	0.109	?	?	0.500	0.937	0.000	3.5	1.067	0.000	0.000	0.000	0.00	0.00	2.17
15.2	#VALUE!	#VALUE!	#VALUE!	0.88	n.a.	n.a.	n.a.	0.000	0.000	0.000	3.5	1.067	0.000	0.000	0.000	0.00	0.00	2.17
0.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
0.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
0.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
0.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
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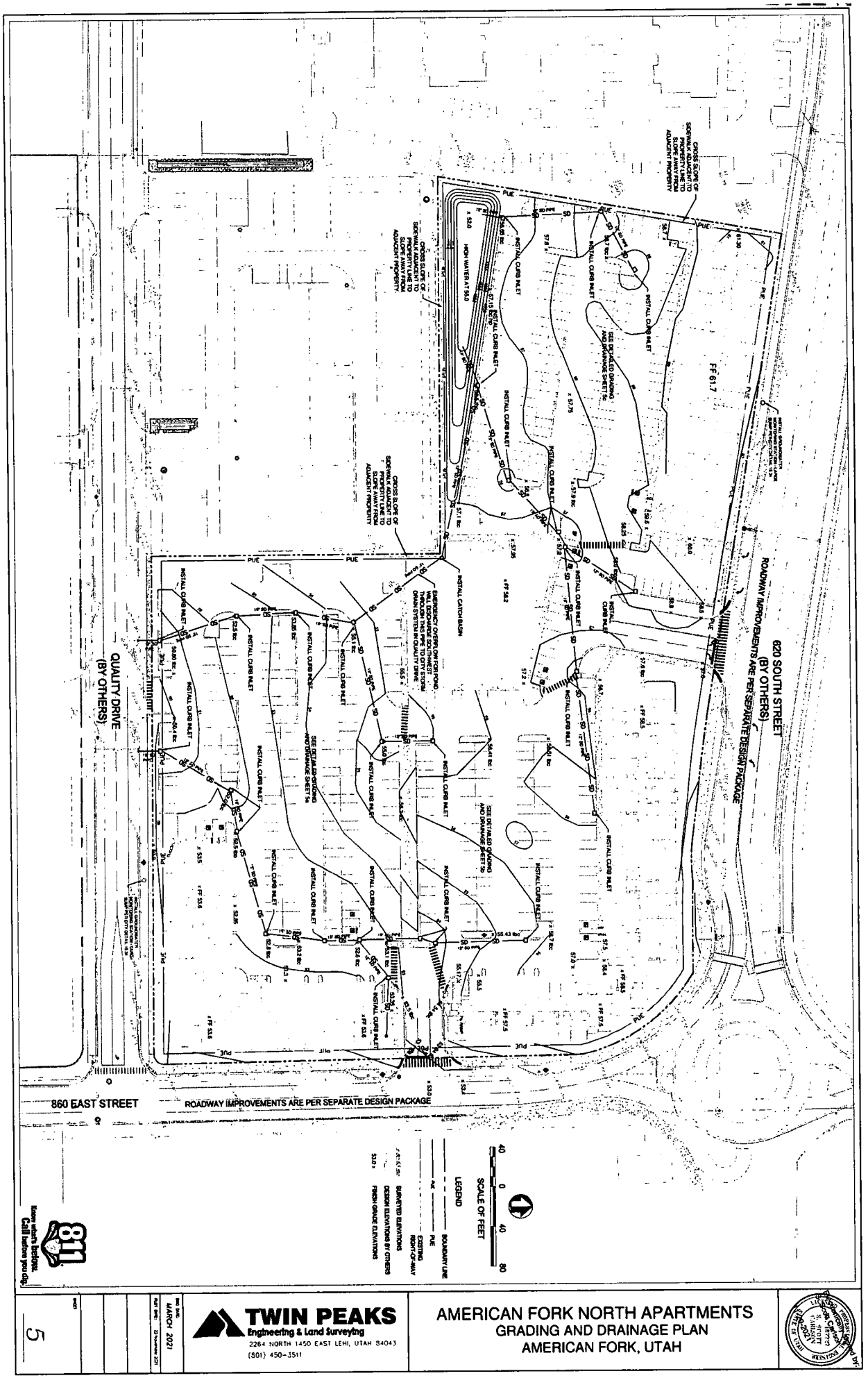
FIGURE 2
GSH



811 Know what's below. Call before you dig.

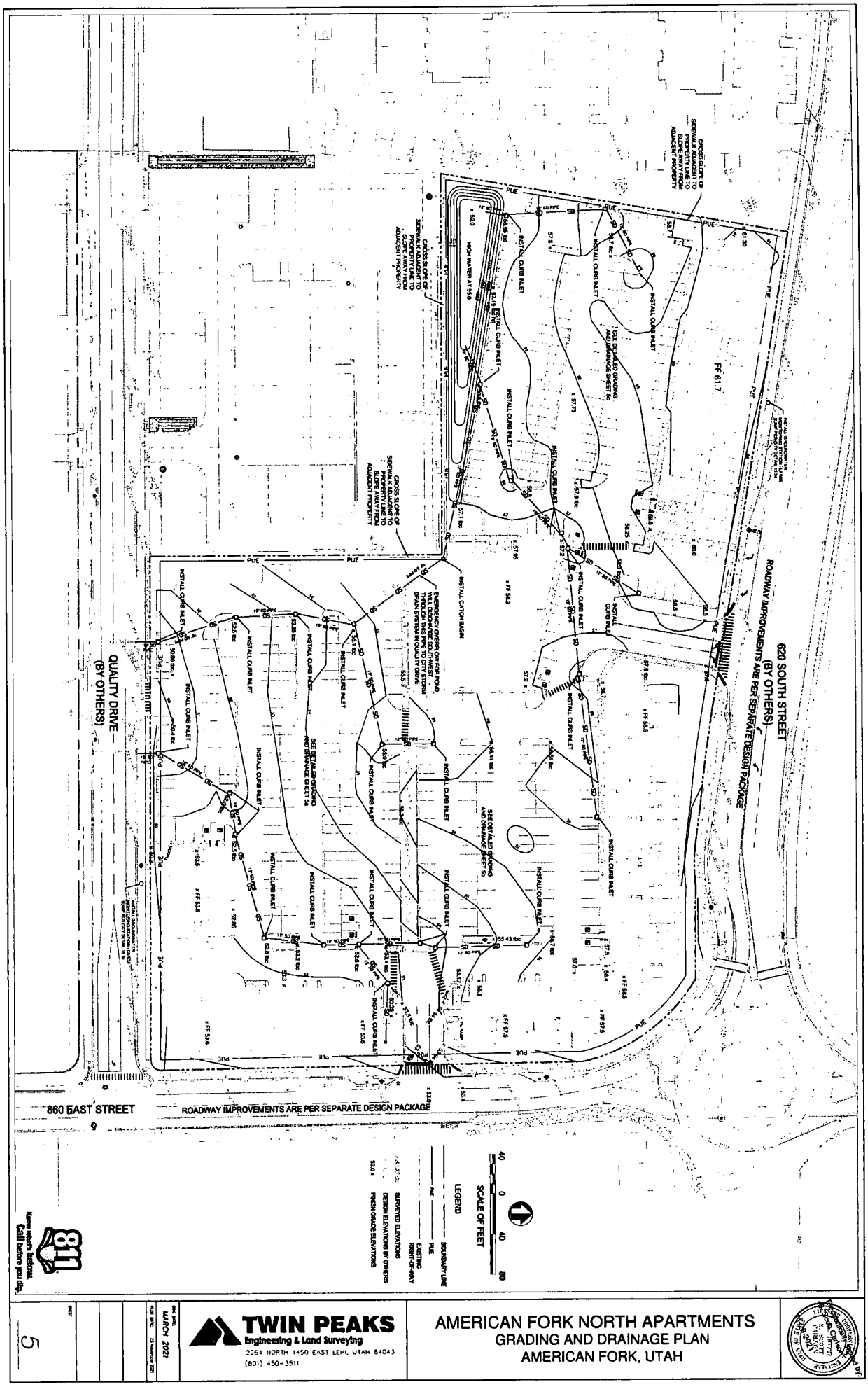
TWIN PEAKS
Engineering & Land Surveying
2264 NORTH 1450 EAST LEHI, UTAH 84043
(801) 450-3511

AMERICAN FORK NORTH APARTMENTS
GRADING AND DRAINAGE PLAN
AMERICAN FORK, UTAH

MARCH 2021

5

EXHIBIT C



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Engineering & Land Surveying
2264 NORTH 1450 EAST LEHI, UTAH 84043
(801) 450-3511

AMERICAN FORK NORTH APARTMENTS
GRADING AND DRAINAGE PLAN
AMERICAN FORK, UTAH

DRC SUBM. MARCH 2021
REVISIONS
SHEET 5

EXHIBIT C