ENT 12207:2020 PG 1 of 44
JEFFERY SMITH
UTAH COUNTY RECORDER
2020 Jan 30 12:40 pm FEE 40.00 BY DA
RECORDED FOR AMERICAN FORK CITY

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

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

This Notice is recorded to bind the attached Geotechnical Study dated March 15, 2016 along with the site grading plan to the property generally located at 79 North 1020 West (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 specifications 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 5 day of APRIL, 2016.

OWNER(S):

[signature]	
(Signature)	(Signature)
Tom Heywood - Millpond Apts, LLC	
(Printed Name)	(Printed Name)
Manager	
(Title)	(Title)

STATE OF UTAH)
§
COUNTY OF UTAH)

On the 5 day of APRIL, 2016, personally appeared before me TOM HEYWOOD 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.

ADAM LAMBERT
Notary Public - State of Utah
Comm. No. 691380
My Commission Expires on
Oct 19, 2020

[signature]
Notary Public
My Commission Expires: OCT. 19, 2020

Exhibit A
Legal Descriptions

Millpond Apartments Parcel "A"

Beginning at a point which is 1450.72 feet S89°53'30"E along the south line of said Section 15 and 499.92 feet North from the Southeast corner of Section 16, Township 5 South, Range 1 East, Salt Lake Base & Meridian; Thence N02°55'30"E 48.87 feet; thence N07°35'43"E 179.04 feet; thence N09°45'00"E 33.01 feet; thence N14°03'33"E 31.36 feet; thence S02°36'30"W 265.47 feet; thence 40.71 feet along a non-tangent 25 foot curve to the left, chord bearing S48°41'48"W 36.32 feet to the point of beginning. (area = 4388 sqft)

Millpond Apartments Parcel "B"

Beginning at a point which is 1544.00 feet S89°53'30"E along the south line of said Section 15 and 908.26 feet North from the Southeast corner of Section 16, Township 5 South, Range 1 East, Salt Lake Base & Meridian; Thence N31°17'46"E 2.56 feet; thence N35°36'19"E 31.74 feet; thence S52°00'41"E 46.65 feet; thence N89°16'06"W 56.58 feet to the point of beginning. (area = 802 sqft)

1497 West 40 South
Lindon, Utah - 84042
Phone (801) 225-5711

3662 West 2100 South
Salt Lake City, Utah - 84120
Phone (801) 787-9138

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

GEOTECHNICAL STUDY
Walters-May Apartment Complex
1020 West Pioneer Crossing
American Fork, Utah

Project No. 168129

March 15, 2016

Prepared For:

Rimrock Construction
Attention: Mr. Adam Lambert
11635 South 700 East, Suite 100
Draper, UT 84020

Prepared By:

EARTHTEC ENGINEERING
Lindon Office

CERTIFICATE

I hereby certify that I am a licensed professional engineer, as defined in the "Sensitive Lands Ordinance" Section of American Fork City Ordinances. I have examined this 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 this report meet minimum applicable professional standards.

PROFESSIONAL ENGINEER
No. 5567049-2202
TIMOTHY ALLAN MITCHELL
3/15/16
STATE OF UTAH

Timothy A. Mitchell, P.E.
Geotechnical Engineer

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APPENDIX A

1.0 EXECUTIVE SUMMARY

This report presents the results of Earthtec Engineering's completed geotechnical study for the Walters-May Apartment Complex in American Fork, Utah. This executive summary provides a general synopsis of our recommendations and findings. Details of our findings, conclusions, and recommendations are provided within the body of this report.

- The subject property is approximately 18 acres and is proposed to be developed with the construction of several apartment buildings with associated parking and drive areas. The proposed structures will consist of conventionally framed, three-story, slab-on-grade buildings. We anticipate foundation loads for the proposed structures will not exceed 5,000 pounds per linear foot for bearing wall, 40,000 pounds for column loads, and 100 pounds per square foot for floor slabs

- Our field exploration included the boring of eight (8) borings to depths of 11½ to 41½ feet below the existing ground surface. Groundwater was encountered at depths of approximately 2½ to 7½ feet below the existing ground surface.

- The subsurface soils encountered generally consisted of fill and topsoil overlying near-surface very soft to very stiff clay and silt, and very loose to very dense sand and gravel. All fill encountered appears to be undocumented. Fill and topsoil should be removed beneath the entire building footprints, exterior flatwork, and pavements prior to construction.

- The native clay and silt soils have a negligible to moderate potential for collapse (settlement) and a slight to moderate potential for compressibility under increased moisture contents and anticipated load conditions.

- The silt and sand layers encountered in Borings 1, 3, 7 and 8 (B-1, B-3, B-7, B-8) have a "High" potential for liquefaction during a moderate to large earthquake event; should these layers liquefy, we estimate that up to 2½ inches of liquefaction-induced settlement and up to 3 feet of liquefaction-induced lateral movements could occur.

- Conventional strip and spread footings may be used to support the structure, with foundations placed entirely on entirely on a minimum of 36 inches of undisturbed, native gravel soils or on a minimum of 36 inches of properly placed, compacted, and tested structural fill extending to undisturbed native soils.

- Minimum roadway section consists of 3 inches of asphalt, 8 inches of road-base, and 8 inches of granular borrow or sub-base. Areas that are soft or deflect under construction traffic should be removed and replaced with granular material or structural fill.

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

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

2.0 INTRODUCTION

The project is located at approximately 1020 West Pioneer Crossing in American Fork, Utah. The general location of the site is shown on Figure No. 1, *Vicinity Map* and Figure No. 2, *Aerial Photograph Showing Location of Borings*, at the end of this report. The purposes of this study are to:

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

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

3.0 PROPOSED CONSTRUCTION

We understand that the proposed project as described to us by Mr. Adam Lambert with Rimrock Construction, consists of developing the approximately 18-arce existing parcel into several apartment buildings. The proposed structures will consist of conventionally framed, three-story, slab-on-grade buildings We have based our recommendations in this report on the assumption that or anticipated foundation loads for the proposed structures will not exceed 5,000 pounds per linear foot for bearing wall, 40,000 pounds for column loads, and 100 pounds per square foot for floor slabs. If structural loads will be greater Earthtec should be notified so that we may review our recommendations and make modifications, if necessary.

In addition to the construction described above, we anticipate that

- Utilities will be installed to service the proposed buildings,
- Exterior concrete flatwork will be placed in the form of curb, gutter, and sidewalks, and
- Asphalt paved parking and drive areas will be constructed.

4.0 GENERAL SITE DESCRIPTION

4.1 Site Description

At the time of our subsurface exploration the site was a partially developed lot vegetated with grasses, trees and weeds. There are two residences currently on the southern end of the site. Just north of the residences is a fenced horse pasture that extends to Interstate 15. The ground surface appears to be relatively flat, we anticipate less than 3 feet of cut and fill may be required for site grading. The lot was bounded on the north by Interstate 15, on the east by commercial properties, and on the south and west by vacant lots.

4.2 Geologic Setting

The subject property is located in the central portion of Utah Valley near the northeastern shore of Utah Lake. Utah Valley is a deep, sediment-filled basin that is part of the Basin and Range Physiographic Province. The valley was formed by extensional tectonic processes during the Tertiary and Quaternary geologic time periods. The valley is bordered by the Wasatch Mountain Range on the east and the Lake Mountains on the west. Much of northwestern Utah, including Utah Valley, was previously covered by the Pleistocene age Lake Bonneville. Utah Lake, which currently covers much of the western portion of the valley, is a remnant of this ancient fresh water lake. The surficial geology of much of the eastern margin of the valley has been mapped by *Constenius, 2011*[1]. The surficial geology at the location of the subject site and adjacent properties is mapped as "Fine-grained lacustrine deposits" (Map Unit Qlf) dated to be upper Pleistocene. These soil or deposits are generally described in the referenced mapping as "silt and clay with some fine grained sand." Based on our observations of the site and the referenced geologic map, no other geologic hazards appear to pose a significant risk to the property and the proposed development.

5.0 SUBSURFACE EXPLORATION

5.1 Soil Exploration

Under the direction of a qualified member of our geotechnical staff, subsurface explorations were conducted at the site on February 22 and 23, 2016 by the boring of eight (8) borings to depths of 11½ to 41½ feet below the existing ground surface using a an all-terrain hydraulic drill rig. The approximate locations of the borings are shown on Figure No. 2, *Aerial Photograph Showing Location of Borings*. Graphical representations and detailed descriptions of the soils encountered are shown on Figure Nos. 3 through 10, *Boring Logs* at the end of this report. The stratification lines shown on the logs represent the approximate boundary between soil units; the actual transition may be gradual. Due to potential natural variations inherent in soil

[1] Constenius, K.N., Clark, D.L., King, J.K., Ehler, J.B., 2011, Interim Geologic Map of the Provo Quadrangle, *Utah, Wasatch and Salt Lake Counties, Utah*; U.S. Geological Survey, Open-File 586DM, Scale 1: 62,500.

deposits, care should be taken in interpolating between and extrapolating beyond exploration points. A key to the symbols and terms on the logs is presented on Figure No. 11, *Legend.*

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

6.0 LABORATORY TESTING

Representative soil samples collected during our field exploration were tested in the laboratory to assess pertinent engineering properties and to aid in refining field classifications, if needed. Tests performed included natural moisture content, dry density tests, liquid and plastic limits determinations, mechanical (partial) gradation analyses, one-dimensional consolidation tests, and a soluble sulfate test. The table below summarizes the laboratory test results, which are also included on the attached *Boring Logs* at the respective sample depths, and on Figure Nos. 12 through 14, *Consolidation-Swell Test.*

Table 1: Laboratory Test Results

Boring No.	Depth (ft.)	Natural Moisture (%)	Natural Dry Density (pcf)	Atterberg Limits		Grain Size Distribution (%)			Soil Type
				Liquid Limit	Plasticity Index	Gravel (+ #4)	Sand	Silt/Clay (- #200)	
B-1	2½	23	---	29	9	22	23	55	CL
B-2	10	23	100	24	7	14	16	70	CL-ML
B-3	7½	17	---	---	---	35	49	16	SM
B-4	5	21	67	30	13	1	23	76	CL
B-5	7½	28	---	47	30	3	7	90	CL
B-6	15	63	75	88	32	2	32	66	MH
B-6	30	24	---	23	NP	0	24	76	ML
B-6	35	38	---	31	12	0	6	94	CL
B-7	7½	26	---	---	---	2	90	8	SP-SM

NP* = Non-Plastic

As part of the consolidation test procedure, water was added to the samples to assess moisture sensitivity when the samples were loaded to an equivalent pressure of approximately 1,000 psf. The native clay and silt soils have a negligible to moderate potential for collapse (settlement) and a slight to moderate potential for compressibility under increased moisture contents and anticipated load conditions.

A water soluble sulfate test was performed on a representative sample obtained during our field exploration. Water soluble sulfate testing indicated a value of 25.0 parts per million. Based on this result, the risk of sulfate attack to concrete appears to be "negligible" according to American Concrete Institute standards. Therefore, we recommend that Type I Portland cement be used for concrete in contact with on-site soils. The results can be found in Appendix A.

7.0 SUBSURFACE CONDITIONS

7.1 Soil Types

On the surface of the site, we encountered fill and topsoil which is estimated to extend about ½ to 2½ feet in depth at the boring locations. Below the fill and topsoil we encountered layers of clay, silt, sand and gravel extending to depths of 11½ to 41½ feet below the existing ground surface. Graphical representations and detailed descriptions of the soils encountered are shown on Figure Nos. 3 through 10, *Boring Log* at the end of this report. Based on the blow counts obtained during field exploration, the clay and silt soils ranged from very soft to very stiff in consistency and the sand and gravel soils had a relative density varying from very loose to very dense.

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

7.2 Groundwater Conditions

Groundwater was encountered at depths of approximately 2½ to 7½ feet below the existing ground surface. Note that groundwater levels will fluctuate in response to the season, precipitation, snow melt, irrigation, and other on and off-site influences. Quantifying these fluctuations would require long term monitoring, which is beyond the scope of this study. The contractor should be prepared to dewater excavations as needed.

8.0 SITE GRADING

8.1 General Site Grading

All surface vegetation and unsuitable soils (such as topsoil, organic soils, undocumented fill, soft, loose, or disturbed native soils, and any other inapt materials) should be removed from below foundations, floor slabs, exterior concrete flatwork, and pavement areas. We encountered fill and topsoil on the surface of the site. The fill encountered on the site is considered undocumented (untested). The fill and topsoil (including soil with roots larger than about ¼ inch in diameter) should be completely removed, even if found to extend deeper, along with any other unsuitable soils that may be encountered. Over-excavations below footings and slabs will be needed, as discussed in Section 10.0.

Fill placed over large areas, even if only a few feet in depth, can cause consolidation in the underlying native soils resulting in settlement of the fill. Because the site is relatively flat, we anticipate that less than 3 feet of grading fill will be placed. If more than 3 feet of grading fill will be placed above the existing surface (to raise site grades), Earthtec should be notified so that we may provide additional recommendations, if required. Such recommendations will likely include placing the fill several weeks (or possibly more) prior to construction to allow settlement to occur.

8.2 Temporary Excavations

Temporary excavations that are less than 4 feet in depth and above groundwater should have side slopes no steeper than ½H:1V (Horizontal:Vertical). Temporary excavations where water is encountered in the upper 4 feet or that extend deeper than 4 feet below site grades should be sloped or braced in accordance with OSHA[2] requirements for Type A soils

8.3 Fill Material Composition

The existing fill and native soils are not suitable for use as placed and compacted structural fill. Excavated soils, including clay and silt, may be stockpiled for use as fill in landscape areas.

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

Table 2: Structural Fill Recommendations

Sieve Size/Other	Percent Passing (by weight)
4 inches	100
3/4 inches	70 – 100
No. 4	40 – 80
No. 40	15 – 50
No. 200	0 – 25
Liquid Limit	35 maximum
Plasticity Index	15 maximum

In some situations, particles larger than 4 inches and/or more than 30 percent coarse gravel

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

may be acceptable, but would likely make compaction more difficult and/or significantly reduce the possibility of successful compaction testing. Consequently, stricter quality control measures than normally used may be required, such as using thinner lifts and increased or full time observation of fill placement.

We recommend that utility trenches below any structural load be backfilled using structural fill. Note that most local governments and utility companies require Type A-1-a or A-1-b (AASHTO classification) soils (which overall is stricter than our recommendations for structural fill) be used as backfill above utilities in certain areas. In other areas or situations, utility trenches may be backfilled with the native soil, but the contractor should be aware that native clay and silt soils (as observed in the explorations) may be time consuming to compact due to potential difficulties in controlling the moisture content needed to obtain optimum compaction. All backfill soil should have a maximum particle size of 4 inches, a maximum Liquid Limit of 35 and a maximum Plasticity Index of 15.

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

Table 3: Free-Draining Fill Recommendations

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

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

8.4 Fill Placement and Compaction

Fill should be placed on level, horizontal surfaces. Where fill will be placed on slopes steeper than 5H:1V, the existing ground should be benched prior to placing fill. We recommend bench heights of 1 to 4 feet, with the lowest bench being a minimum 3 feet below adjacent grade and at least 10 feet wide.

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

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

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

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

8.5 Stabilization Recommendations

Near surface layers of clay soils may rut and pump during grading and construction. The likelihood of rutting and/or pumping, and the depth of disturbance, is proportional to the moisture content in the soil, the load applied to the ground surface, and the frequency of the load. Consequently, rutting and pumping can be minimized by avoiding concentrated traffic, minimizing the load applied to the ground surface by using lighter equipment, partially loaded equipment, tracked equipment, by working in dry times of the year, and/or by providing a working surface for equipment. However, because of the relatively shallow depth of groundwater, it is likely that rutting and pumping may not be avoidable.

During grading the soil in any obvious soft spots should be removed and replaced with granular material. If rutting or pumping occurs traffic should be stopped in the area of concern. The soil in rutted areas should be removed and replaced with granular material. In areas where pumping occurs the soil should either be allowed to sit until pore pressures dissipate (several hours to several days) and the soil firms up, or be removed and replaced with granular material. Typically, we recommend removal to a minimum depth of 24 inches.

For granular material, we recommend using angular well-graded gravel, such as pit run, or crushed rock with a maximum particle size of four inches. We suggest that the initial lift be approximately 12 inches thick and be compacted with a static roller-type compactor. A finer granular material such as sand, gravelly sand, sandy gravel or road base may also be used. Materials which are more angular and coarse may require thinner lifts in order to achieve compaction. We recommend that the fines content (percent passing the No. 200 sieve) be less than 15%, the liquid limit be less than 35, and the plasticity index be less than 15.

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

9.0 SEISMIC AND GEOLOGIC CONSIDERATIONS

9.1 Seismic Design

The State of Utah has adopted the 2012 International Building Code (IBC) for seismic design and the structure should be designed in accordance with Chapter 16 of the IBC. The Site Class definitions in the IBC are based upon the soil properties in the upper 100 feet of the soil profile, according to Chapter 20 in ASCE 7. These properties are determined from sampler blow counts, undrained shear strength values, and/or shear velocity measurements. The code states, "When the soil properties are not known in sufficient detail to determine the site class, Site Class D shall be used unless the building official or geotechnical data determines that Site Class E or F soil is likely to be present at the site." The Sensitive Land Ordinance requires that seismic site class determination be based on at least one boring drilled to a depth of at least 30 feet below the ground surface at the site, and at least one boring drilled to at least 70 feet below the ground surface within 2000 feet of the site. Based on information of Boring ET-03-1 in RB&G's American Fork Sensitive Land's Report dated December, 2006 is located within 2,000 feet from the site, and was drilled to a depth of 95½ feet below the adjacent ground surface, and the boring to 41½ preformed during our site investigation, we recommend using Site Class D.

The site is located at approximately 40.379 degrees latitude and -111.826 degrees longitude. Using Site Class D, the design spectral response acceleration parameters are given below.

Table 4: Design Accelerations

S_S	F_a	S_{MS}	S_{DS}
1.155 g	1.038	1.199 g	0.799 g
S_1	F_v	S_{M1}	S_{D1}
0.392 g	1.615	0.634 g	0.423 g

S_S = Mapped spectral acceleration for short periods
S_1 = Mapped spectral acceleration for 1-second period
$S_{DS} = \frac{2}{3}S_{MS} = \frac{2}{3}(F_a \cdot S_s)$ = 5% damped design spectral response acceleration for short periods
$S_{D1} = \frac{2}{3}S_{MS} = \frac{2}{3}(F_v \cdot S_1)$ = 5% damped design spectral response acceleration for 1-second period

9.2 Faulting

The subject property is located within the Intermountain Seismic Belt where the potential for active faulting and related earthquakes is present. Based upon published geologic maps[3], no active faults traverse through or immediately adjacent to the site and the site is not located within local fault study zones. The nearest mapped fault trace is part of a group of fault beneath Utah Lake located about 3¼ miles southeast of the site.

9.3 Liquefaction Potential

According to current liquefaction maps[4] for Utah County, the site is located within an area designated as "High" in liquefaction potential. Liquefaction can occur when saturated subsurface soils below groundwater lose their inter-granular strength due to an increase in soil pore water pressures during a dynamic event such as an earthquake. As part of this study, the potential for liquefaction to occur in the soils we encountered was assessed using Youd *et al*[5] and Boulanger & Idriss[6]. Potential liquefaction-induced movements were evaluated using Tokimatsu & Seed[7] and Youd, Hansen & Bartlett[8].

Loose, saturated sands are most susceptible to liquefaction, but some loose, saturated gravels and relatively sensitive silt to low-plasticity silty clay soils can also liquefy during a seismic event. Subsurface soils were composed of clay and sand soils. Our analysis indicates that approximately up to 2½ inches of liquefaction-induced settlement and possibly up to 3 feet of lateral spreading could occur in the vicinity of B-1, B-3, B-7 and B-8 during a moderate to large earthquake event. Given the amount of movement, it is our opinion that liquefaction mitigation is not needed at the site, however the liquefaction potential at the site can be mitigated using one of the following alternatives:

- Densify the liquefiable soils by installing aggregate piers on a grid pattern below the building and extending at least 5 feet beyond the perimeter footings.
- Densify the liquefiable soils by installing grouted columns in a grid pattern below the building and extending at least 5 feet beyond the perimeter footings.
- Install earthquake drains, such as Nilex drains, to relieve increases in pore water pressure during a seismic event.
- Connect/tie all footings together using reinforced grade beams and connect reinforced slabs to the footings so that the building will react as a cohesive unit. This may result in some

[3] U.S. Geological Survey, Quaternary Fault and Fold Database of the United States, November 3, 2010
[4] Utah Geological Survey, Liquefaction-Potential Map For A Part Of Utah County, Utah, Public Information Series 28, August 1994
[5] Youd, T.L. (Chair), Idriss, I.M. (Co-Chair), and 20 other authors, 2001, Liquefaction Resistance Of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, October 2001, p. 817-833.
[6] Boulanger, R.W. and Idriss, I.M., 2006, Liquefaction Susceptibility Criteria for Silts and Clays, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, November 2006, p. 1413-1426.
[7] Tokimatsu, K. and Seed, H.B., 1987, Evaluation of Settlements in Sands due to Earthquake Shaking, Journal of Geotechnical Engineering, ASCE, p. 861-878.
[8] Youd, T.L., Hansen, C.M. and Bartlett, S.F., 2002, Revised Multilinear Regression Equations for Prediction of Lateral Spread Displacement, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, December 2002, p. 1007-1017.

tilting of the building due to differential liquefaction-induced movements. The building may also move laterally due to lateral spreading.

10.0 FOUNDATIONS

10.1 General

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

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

10.2 Strip/Spread Footings

We recommend that conventional strip and spread foundations be constructed entirely on a minimum of 36 inches of undisturbed, native gravel soils or on a minimum of 36 inches of properly placed, compacted, and tested structural fill extending to undisturbed native soils. For foundation design we recommend the following:

- Footings founded on a minimum 36 inches of structural fill or undisturbed gravel soils may be designed using a maximum allowable bearing capacity of 2,000 pounds per square foot. The values for vertical foundation pressure can be increased by one-third for wind and seismic conditions per Section 1806.1 when used with the Alternative Basic Load Combinations found in Section 1605.3.2 of the 2012 International Building Code.
- Continuous and spot footings should be uniformly loaded and should have a minimum width of 20 and 30 inches, respectively.
- Exterior footings should be placed below frost depth which is determined by local building codes. In general, 30 inches of cover is adequate for most sites; however local code should be verified by the end design professional. Interior footings, not subject to frost (heated structures), should extend at least 18 inches below the lowest adjacent grade.
- Foundation walls and footings should be properly reinforced to resist all vertical and lateral loads and differential settlement.
- The bottom of footing excavations should be compacted with at least 4 passes of an approved non-vibratory roller prior to erection of forms or placement of structural fill to

densify soils that may have been loosened during excavation and to identify soft spots. If soft areas are encountered, they should be stabilized as recommended in Section 8.5.

- Footing excavations should be observed by the geotechnical engineer prior to beginning footing construction to evaluate whether suitable bearing soils have been exposed and whether excavation bottoms are free of loose or disturbed soils.
- Due to shallow groundwater encountered at the site and the variability of the groundwater levels encountered, the lowest floor slab depths should have 3 feet of separation between the slab and observed groundwater.
- Structural fill used below foundations should extend laterally a minimum of 6 inches for every 12 vertical inches of structural fill placed. For example, if 18 inches of structural fill are required to bring the excavation to footing grade, the structural fill should extend laterally a minimum of 9 inches beyond the edge of the footings on both sides.

10.3 Estimated Settlements

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

10.4 Lateral Load Resistance

Lateral loads are typically resisted by friction between the underlying soil and footing bottoms. Resistance to sliding may incorporate the friction acting along the base of foundations, which may be computed using a coefficient of friction of soils against concrete of 0.55 for structural fill meeting the recommendations presented herein. The values for lateral resistance can be increased by one-third for wind and seismic conditions per Section 1806.1 when used with the Alternative Basic Load Combinations found in Section 1605.3.2 of the 2012 International Building Code.

11.0 FLOOR SLABS AND FLATWORK

Due to shallow groundwater encountered at the site and the variability of the groundwater levels encountered, the lowest floor slab depths should have 3 feet of separation between the slab and observed groundwater.

Concrete floor slabs and exterior flatwork may be supported on 18 inches of properly placed and compacted structural fill after appropriate removals and grading as outlined in Section 8.1 are completed. We recommend placing a minimum 4 inches of free-draining fill material (see Section 8.3) beneath floor slabs to facilitate construction, act as a capillary break, and aid in distributing floor loads. For exterior flatwork, we recommend placing a minimum 4 inches of road-base material. Prior to placing the free-draining fill or road-base materials, the native sub-grade should be proof-rolled to identify soft spots, which should be stabilized as discussed above in Section 8.5.

For slab design, we recommend using a modulus of sub-grade reaction of 120 pounds per cubic inch. The thickness of slabs supported directly on the ground shall not be less than 3½ inches. A 6-mil polyethylene vapor retarder with joints lapped not less than 6 inches shall be placed between the ground surface and the concrete, as per Section 1907.1 of the 2012 International Building Code.

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

12.0 DRAINAGE

12.1 Surface Drainage

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

- The contractor should take precautions to prevent significant wetting of the soil at the base of the excavation. Such precautions may include: grading to prevent runoff from entering the excavation, excavating during normally dry times of the year, covering the base of the excavation if significant rain or snow is forecast, backfill at the earliest possible date, frame floors and/or the roof at the earliest possible date, other precautions that might become evident during construction.
- Adequate compaction of foundation backfill should be provided i.e. a minimum of 90% of ASTM D-1557. Water consolidation methods should not be used.
- The ground surface should be graded to drain away from the building in all directions. We recommend a minimum fall of 8 inches in the first 10 feet.
- Roof runoff should be collected in rain gutters with down spouts designed to discharge well outside of the backfill limits, or at least 10 feet from foundations, whichever is greater.

- Sprinkler nozzles should be aimed away, and all sprinkler components kept at least 5 feet, from foundation walls. Also, sprinklers should not be placed at the top or on the face of slopes. Sprinkler systems should be designed with proper drainage and well maintained. Over-watering should be avoided.
- Any additional precautions which may become evident during construction.

12.2 Subsurface Drainage

Walls or portions thereof that retain earth and enclose interior spaces and floors below grade shall conform to Section 1805 of the 2012 International Building Code for damp proofing and water proofing.

13.0 PAVEMENT RECOMMENDATIONS

We understand that asphalt paved parking and drive areas will be constructed as part of the project. The native soils encountered beneath the fill and topsoil during our field exploration were predominantly composed of clays. We estimate that a California Bearing Ratio (CBR) value of 3 is appropriate for these soils. If the fill material and topsoil is left beneath concrete flatwork and pavement areas, increased maintenance costs over time should be anticipated.

We anticipate that the traffic volume will be about 1,000 vehicles a day or less for the parking and drive areas, consisting of mostly cars and pickup trucks, with a daily delivery truck and a weekly garbage truck. Based on these traffic parameters, the estimated CBR given above, and the procedures and typical design inputs outlined in the UDOT Pavement Design Manual (1998), we recommend the minimum asphalt pavement section presented below.

Table 5: Pavement Section Recommendations

Asphalt Thickness (in)	Compacted Road Base Thickness (in)	Compacted Subbase Thickness (in)
3	8	8*
3	12*	0

* Stabilization may be required

If the pavement will be required to support construction traffic, more than an occasional semi-tractor or fire truck, or more traffic than listed above, our office should be notified so that we can re-evaluate the pavement section recommendations. The following also apply:

- The subgrade should be prepared by proof rolling to a firm, non-yielding surface, with any identified soft areas stabilized as discussed above in Section 8.5.
- Site grading fills below the pavements should meet structural fill composition and placement recommendations per Sections 8.3 and 8.4 herein.
- Asphaltic concrete, aggregate base and sub-base material composition should meet local,

APWA or UDOT requirements.

- Aggregate base and sub-base is compacted to local, APWA, or UDOT requirements, or to at least 95 percent of maximum dry density (ASTM D 1557).
- Asphaltic concrete is compacted to local or UDOT requirements, or to at least 96 percent of the laboratory Marshall density (ASTM D 6927).

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

14.0 GENERAL CONDITIONS

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

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

This geotechnical report is based on relatively limited subsurface explorations and laboratory testing. Subsurface conditions may differ in some locations of the site from those described herein, which may require additional analyses and possibly modified recommendations. Thus we strongly recommend consulting with Earthtec regarding any changes made during design and construction of the project from those discussed herein. Failure to consult with Earthtec regarding any such changes relieves Earthtec from any liability arising from changed conditions at the site.

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

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

Respectfully;

EARTHTEC ENGINEERING

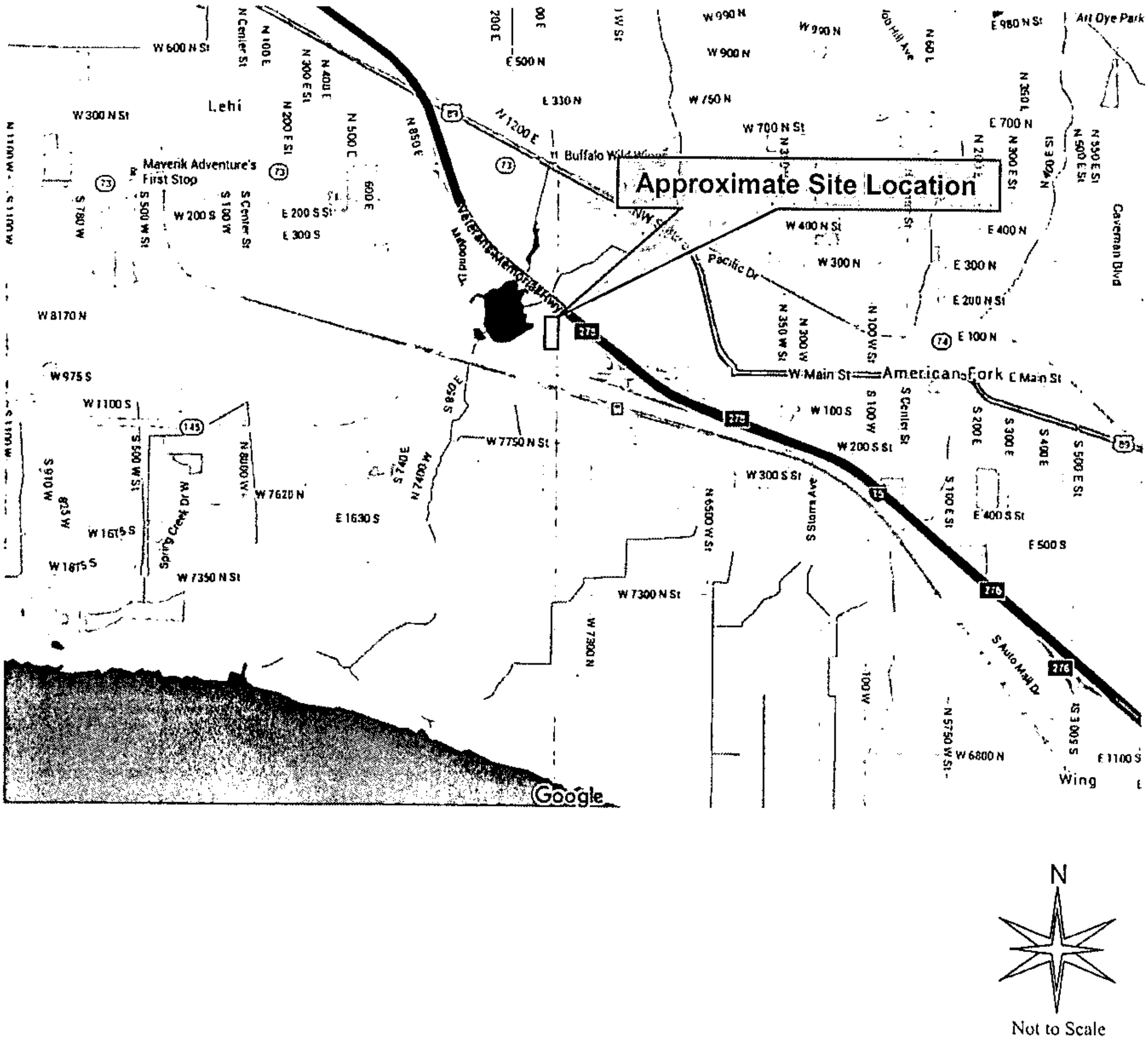
PROFESSIONAL ENGINEER
No. 5567049-2202
TIMOTHY ALLAN MITCHELL
3/15/16
STATE OF UTAH

Jeremy A. Balleck, E.I.T.
Staff Engineer

Timothy A. Mitchell, P.E.
Geotechnical Engineer

VICINITY MAP

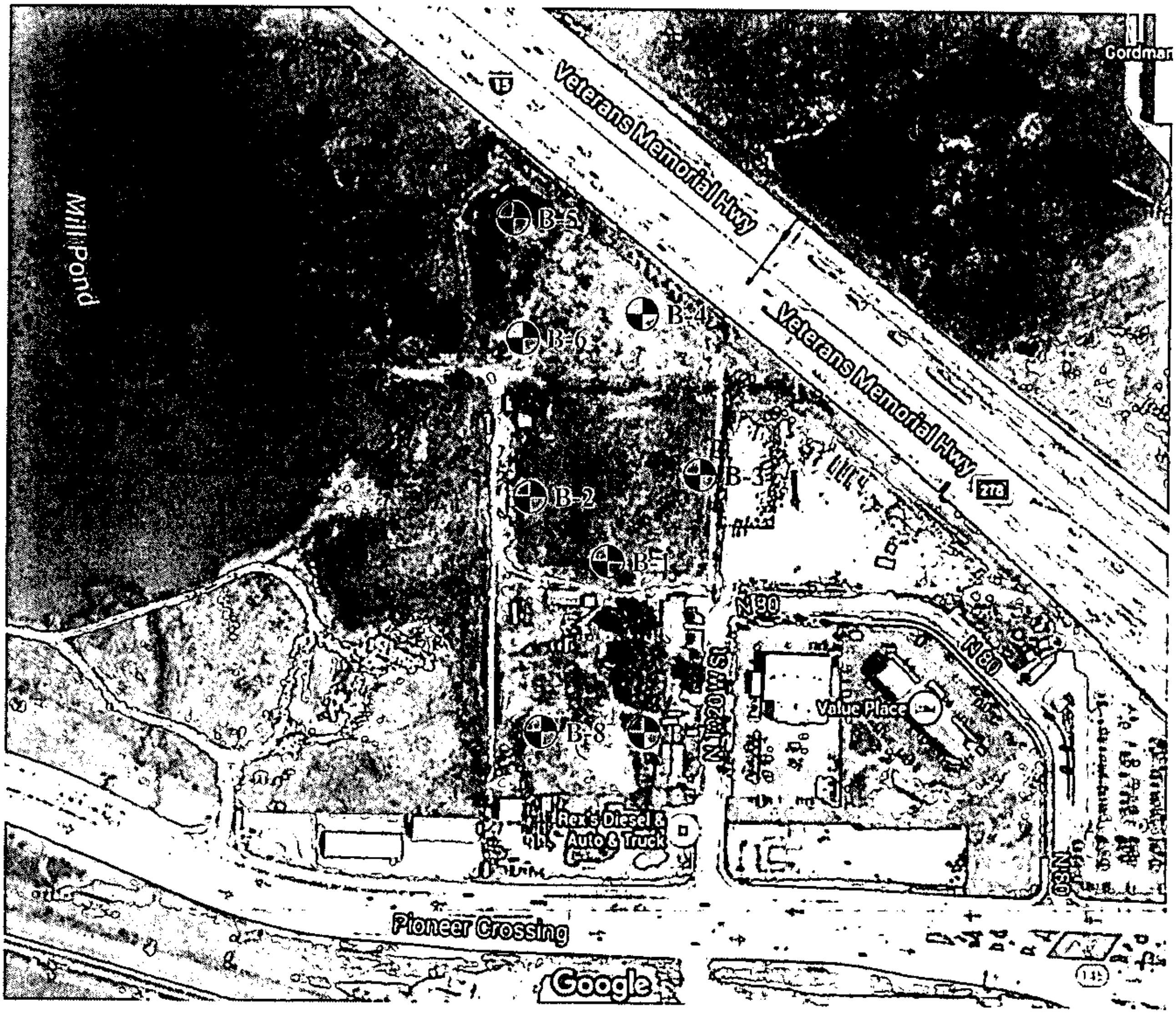
Walters-May Apartment Complex
1020 West Pioneer Crossing
American Fork, Utah



PROJECT NO.: 168129	EARTHTEC ENGINEERING	FIGURE NO.: 1

AERIAL PHOTOGRAPH SHOWING LOCATION OF BORINGS

Walters-May Apartment Complex
1020 West Pioneer Crossing
American Fork, UTAH



Approximate Boring Locations

N

Not to Scale

PROJECT NO.: 168129	EARTHTEC ENGINEERING	FIGURE NO.: 2

BORING LOG

NO.: B-1

PROJECT: Walters-May Apartment Complex
CLIENT: Rimrock Construction
LOCATION: See Figure 2
OPERATOR: Great Basin
EQUIPMENT: ATV Drill Rig
DEPTH TO WATER; INITIAL ▽:

PROJECT NO.: 168129
DATE: 02/22/16
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼: 3 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, lean clay, moist, brown										
		CL	Sandy Lean CLAY with gravel, medium stiff, wet, brown										
3			▼		6	23		29	9	22	23	55	
6		SM	Silty SAND, very loose, wet, brown		3								
		CL	Lean CLAY, medium stiff, wet, brown										
9					5								
					5								
12													
15					8								
			Maximum depth explored approximately 16½ feet										
18													
21													

Notes: Groundwater was encountered at approximately 3 feet

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

PROJECT NO.: 168129

EARTHTEC ENGINEERING

FIGURE NO.: 3

LOG OF TESTHOLE 168129 LOGS.GPJ EARTHTEC.GDT 3/15/16

BORING LOG

NO.: B-2

PROJECT: Walters-May Apartment Complex
PROJECT NO.: 168129
CLIENT: Rimrock Construction
DATE: 02/22/16
LOCATION: See Figure 2
ELEVATION: Not Measured
OPERATOR: Great Basin
LOGGED BY: J. Balleck
EQUIPMENT: ATV Drill Rig
DEPTH TO WATER; INITIAL ▽ :
AT COMPLETION ▼ : 2.5 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, lean clay, moist, brown										
		CL	Lean CLAY with gravel, medium stiff, wet, brown										
3					6								
6													
9		CL-ML	Sandy Silty CLAY, medium stiff, wet, brown to gray		7								
12						23	100	24	7	14	16	70	C
15			Maximum depth explored approximately 12 feet										
18													
21													

Notes: Groundwater was encountered at approximately 2½ feet

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

PROJECT NO.: 168129

EARTHTEC ENGINEERING

FIGURE NO.: 4

BORING LOG

NO.: B-3

PROJECT: Walters-May Apartment Complex
CLIENT: Rimrock Construction
LOCATION: See Figure 2
OPERATOR: Great Basin
EQUIPMENT: ATV Drill Rig
DEPTH TO WATER; INITIAL ∇ :

PROJECT NO.: 168129
DATE: 02/22/16
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼ : 2.5 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, lean clay, moist, brown										
3		CL ▼	Gravelly CLAY, medium stiff (estimated), wet, gray										
6		GC	Clayey GRAVEL, medium dense, wet, brown		30								
9		SM	Silty SAND with gravel, medium dense, wet, brown		11	17				35	49	16	
		CL	Lean CLAY, stiff, wet, brown		15								
12			Maximum depth explored approximately 11½ feet										
15													
18													
21													

Notes: Groundwater was encountered at approximately 2½ feet

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

PROJECT NO.: 168129

EARTHTEC ENGINEERING

FIGURE NO.: 5

BORING LOG

NO.: B-4

PROJECT: Walters-May Apartment Complex
CLIENT: Rimrock Construction
LOCATION: See Figure 2
OPERATOR: Great Basin
EQUIPMENT: ATV Drill Rig
DEPTH TO WATER; INITIAL ∇:

PROJECT NO.: 168129
DATE: 02/22/16
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼: 7.5 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			FILL, silty gravel with sand, dry, brown										
3		CL	Sandy Lean CLAY, soft, moist, gray to brown		2								
6		CL	Lean CLAY with sand, very soft to stiff, moist to wet, brown to black			21	67	30	13	1	23	76	C
9					1								
					0								
12													
15					15								
18			Maximum depth explored approximately 16½ feet										
21													

Notes: Groundwater was encountered at approximately 7½ feet

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

PROJECT NO.: 168129

EARTHTEC ENGINEERING

FIGURE NO.: 6

LOG OF TESTHOLE 168129 LOGS.GPJ EARTHTEC.GDT 3/15/16

BORING LOG

NO.: B-5

PROJECT: Walters-May Apartment Complex
CLIENT: Rimrock Construction
LOCATION: See Figure 2
OPERATOR: Great Basin
EQUIPMENT: ATV Drill Rig
DEPTH TO WATER; INITIAL ∇:

PROJECT NO.: 168129
DATE: 02/22/16
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼: 7.5 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			FILL, silty gravel with sand, dry, brown										
3		CL	Lean CLAY, soft to medium stiff, moist to wet, brown to gray	■	3								
6				■	4								
7.5			▼										
9				■	6	28		47	30	3	7	90	
				■	4								
12			Maximum depth explored approximately 11½ feet										
15													
18													
21													

Notes: Groundwater was encountered at approximately 7½ feet

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

PROJECT NO.: 168129

EARTHTEC ENGINEERING

FIGURE NO.: 7

LOG OF TESTHOLE 168129 LOGS.GPJ EARTHTEC.GDT 3/15/16

BORING LOG
NO.: B-6

PROJECT: Walters-May Apartment Complex
CLIENT: Rimrock Construction
LOCATION: See Figure 2
OPERATOR: Great Basin
EQUIPMENT: ATV Drill Rig
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 168129
DATE: 02/22/16
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼ : 5 ft.

Depth (Ft.)	USCS	Description	Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0		FILL, silty gravel with sand, dry, brown									
3	CL	Lean CLAY, soft to medium stiff, moist to wet, brown	4								
6			5								
	GM	Silty GRAVEL, medium dense, wet, brown									
9			21								
	MH	Sandy Elastic SILT, very soft, wet, black	0								
12											
15				63	75	88	32	2	32	66	C
18											
21	SM	Silty SAND, medium dense, wet, brown	18								

Notes: Groundwater was encountered at approximately 5 feet

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

PROJECT NO.: 168129

EARTHTEC ENGINEERING

FIGURE NO.: 8a

BORING LOG

NO.: B-6

PROJECT:	Walters-May Apartment Complex	**PROJECT NO.:**	168129
CLIENT:	Rimrock Construction	**DATE:**	02/22/16
LOCATION:	See Figure 2	**ELEVATION:**	Not Measured
OPERATOR:	Great Basin	**LOGGED BY:**	J. Balleck
EQUIPMENT:	ATV Drill Rig		

DEPTH TO WATER; INITIAL ▽ : **AT COMPLETION ▼ :** 5 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
					TEST RESULTS								
24–30		SM	Silty SAND, medium dense, wet, brown	◤	18								
30–35		ML	SILT with sand, very stiff, wet, brown	◤	16	24		23	NP	0	24	76	
35–40		CL	Lean CLAY, soft, wet, blue-gray	◤	4	38		31	12	0	6	94	
40–41½		GM	Silty GRAVEL with sand, very dense, wet, gray	◤	80								
42			Maximum depth explored approximately 41½ feet										

Notes: Groundwater was encountered at approximately 5 feet

Tests Key

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

PROJECT NO.: 168129 EARTHTEC ENGINEERING **FIGURE NO.:** 8b

BORING LOG

NO.: B-7

PROJECT: Walters-May Apartment Complex
CLIENT: Rimrock Construction
LOCATION: See Figure 2
OPERATOR: Great Basin
EQUIPMENT: ATV Drill Rig
DEPTH TO WATER; INITIAL ▽:

PROJECT NO.: 168129
DATE: 02/23/16
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼: 5 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			FILL, silty sand, dry, brown										
3		SC	Clayey SAND, medium dense, moist, gray		17								
6		SM	Silty SAND, loose, wet, brown		5								
9		SP-SM	Poorly Graded SAND with silt, loose, wet, brown		5	26				2	90	8	
		CL	Lean Clay, medium stiff, wet, brown		5								
12			Maximum depth explored approximately 11½ feet										
15													
18													
21													

Notes: Groundwater was encountered at approximately 5 feet

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

PROJECT NO.: 168129

EARTHTEC ENGINEERING

FIGURE NO.: 9

LOG OF TESTHOLE 168129 LOGS.GPJ EARTHTEC.GDT 3/15/16

BORING LOG

NO.: B-8

PROJECT: Walters-May Apartment Complex
CLIENT: Rimrock Construction
LOCATION: See Figure 2
OPERATOR: Great Basin
EQUIPMENT: ATV Drill Rig
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 168129
DATE: 02/23/16
ELEVATION: Not Measured
LOGGED BY: J. Balleck
AT COMPLETION ▼ : 3 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			FILL, silty sand, dry, brown										
3		SM	Silty SAND, loose to medium dense, wet, brown		4								
6					11								SS
9		CL	Lean CLAY, medium stiff, wet, light brown		5								
12					6								
15					8								
18			Maximum depth explored approximately 16½ feet										
21													

Notes: Groundwater was encountered at approximately 3 feet

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

PROJECT NO.: 168129

EARTHTEC ENGINEERING

FIGURE NO.: 10

LOG OF TESTHOLE 168129 LOGS.GPJ EARTHTEC.GDT 3/15/16

LEGEND

PROJECT: Walters-May Apartment Complex **DATE:** 02/22/16 - 02/23/16
CLIENT: Rimrock Construction **LOGGED BY:** J. Balleck

UNIFIED SOIL CLASSIFICATION SYSTEM

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

SAMPLER DESCRIPTIONS

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

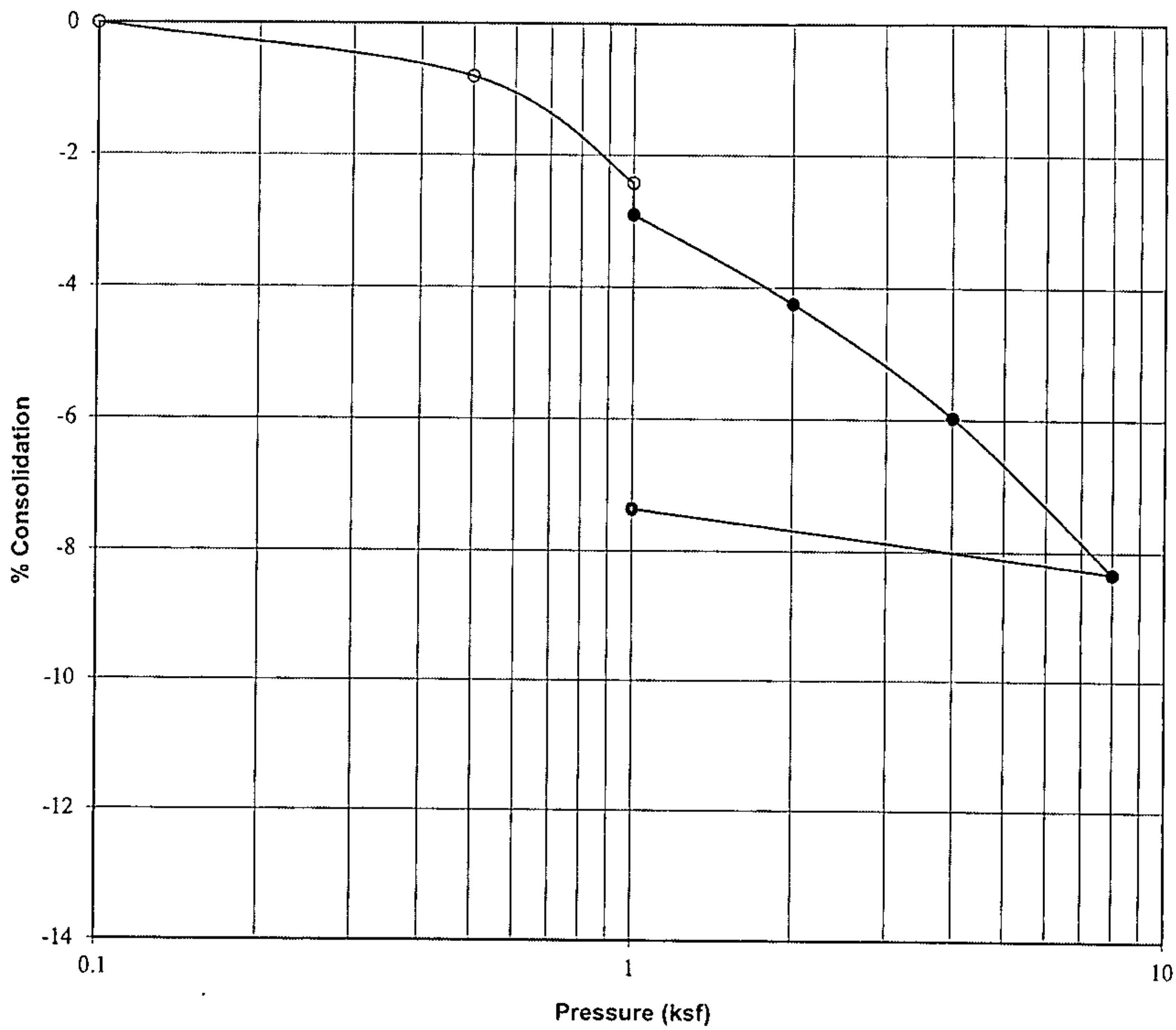
WATER SYMBOLS

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

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

PROJECT NO.: 168129 | EARTHTEC ENGINEERING | **FIGURE NO.:** 11

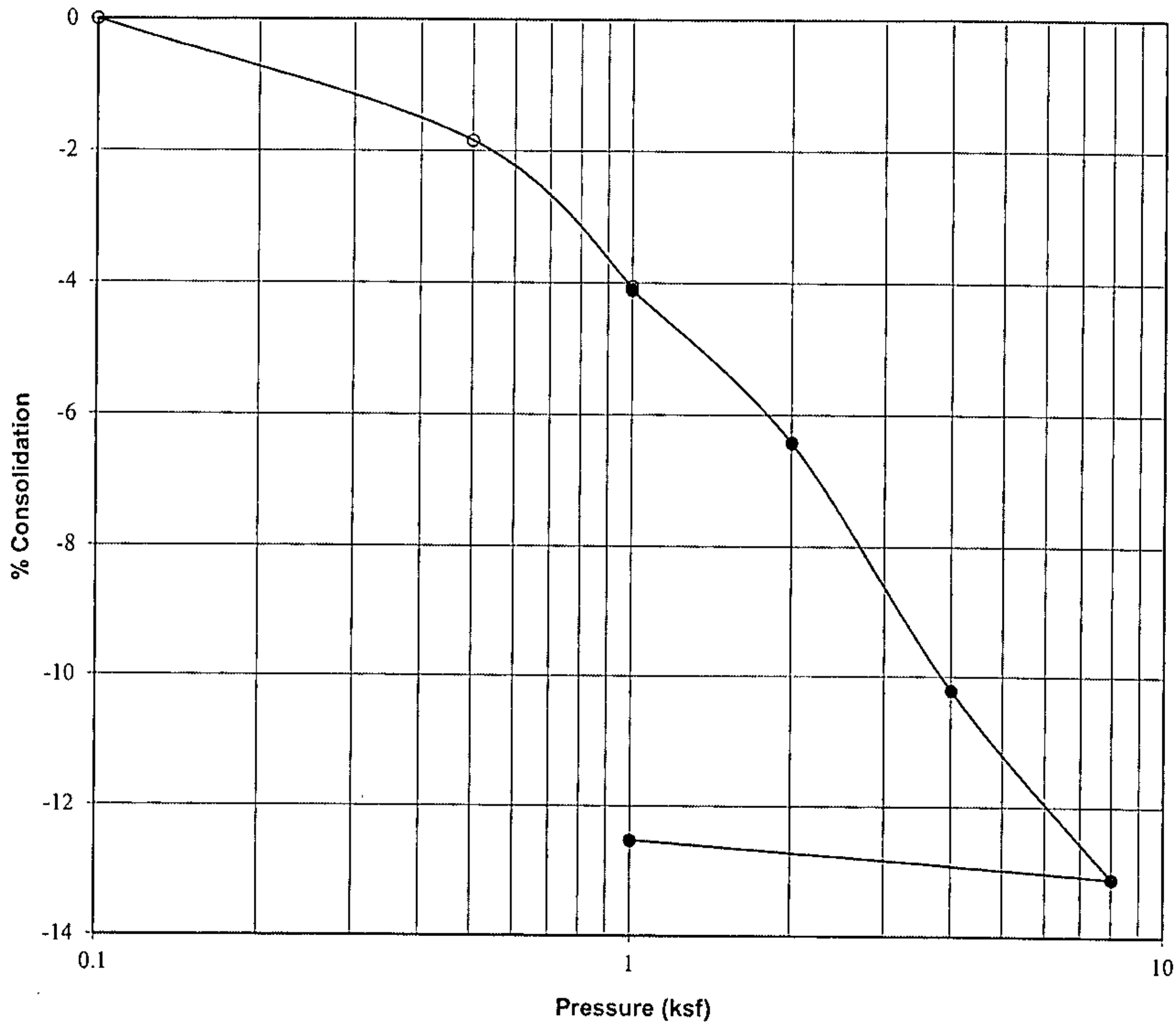
CONSOLIDATION - SWELL TEST



Project:	Walters-May Apartment Complex
Location:	B-2
Sample Depth, ft:	10
Description:	Shelby
Soil Type:	Sandy Silty CLAY (CL-ML)
Natural Moisture, %:	23
Dry Density, pcf:	100
Liquid Limit:	24
Plasticity Index:	7
Water Added at:	1 ksf
Percent Collapse:	0.5

PROJECT NO.: 168129	EARTHTEC ENGINEERING	**FIGURE NO.:** 12

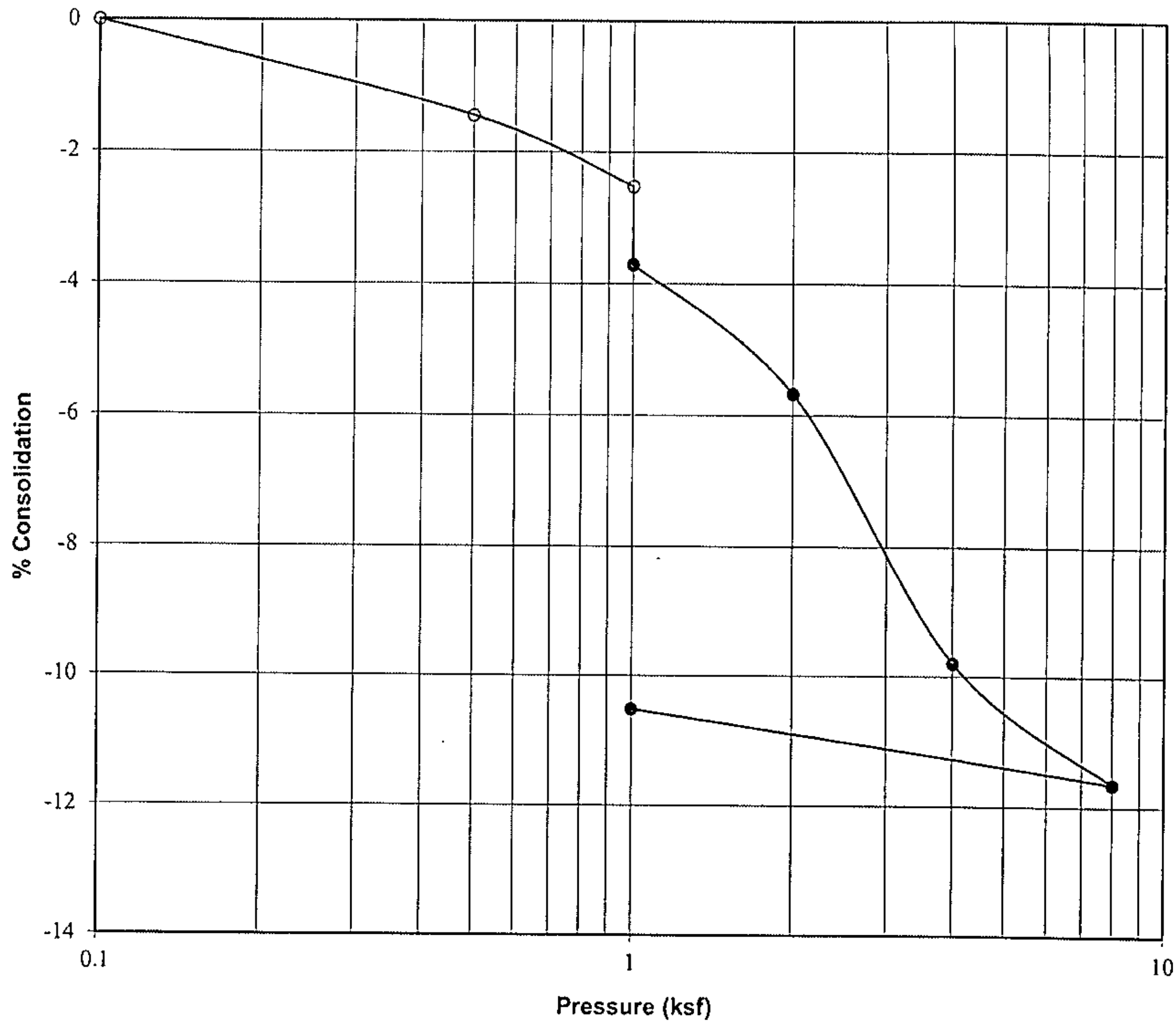
CONSOLIDATION - SWELL TEST



Project:	Walters-May Apartment Complex
Location:	B-4
Sample Depth, ft:	5
Description:	Shelby
Soil Type:	Lean CLAY with sand (CL)
Natural Moisture, %:	21
Dry Density, pcf:	67
Liquid Limit:	30
Plasticity Index:	13
Water Added at:	1 ksf
Percent Collapse:	0.1

PROJECT NO.: 168129	EARTHTEC ENGINEERING	**FIGURE NO.:** 13

CONSOLIDATION - SWELL TEST



Project:	Walters-May Apartment Complex
Location:	B-6
Sample Depth, ft:	15
Description:	Shelby
Soil Type:	Sandy Elastic SILT (MH)
Natural Moisture, %:	63
Dry Density, pcf:	75
Liquid Limit:	88
Plasticity Index:	32
Water Added at:	1 ksf
Percent Collapse:	1.2

PROJECT NO.: 168129	EARTHTEC ENGINEERING	**FIGURE NO.:** 14

APPENDIX A

Timpview Analytical Laboratories
1165 North 1600 West, Orem, Utah, 84057 (801) 229-2282

Certificate of Analysis

Earthtec Engineering
Caleb Allred
1497 W 40 S
Lindon, UT 84042
Fax:
DW System # :

Work Order #: 68897
PO# / Project Name:
Date / Time Received: 2/24/16 11:25
Batch Temp °C: 19
Date Reported: 3/3/16

Sample Name: 168129 @ B-85
Collected: 2/24/16 8:30 **Matrix:** Soil **Collected By:**

Parameter	Lab ID #	Method	Analysis Date / Time	Result	Units	MRL	Flags
Sulfate, Soluble	B624-864	4500SO4E	2/25/16 8:12	25.0	mg/kg (dry)	6.21	27 S

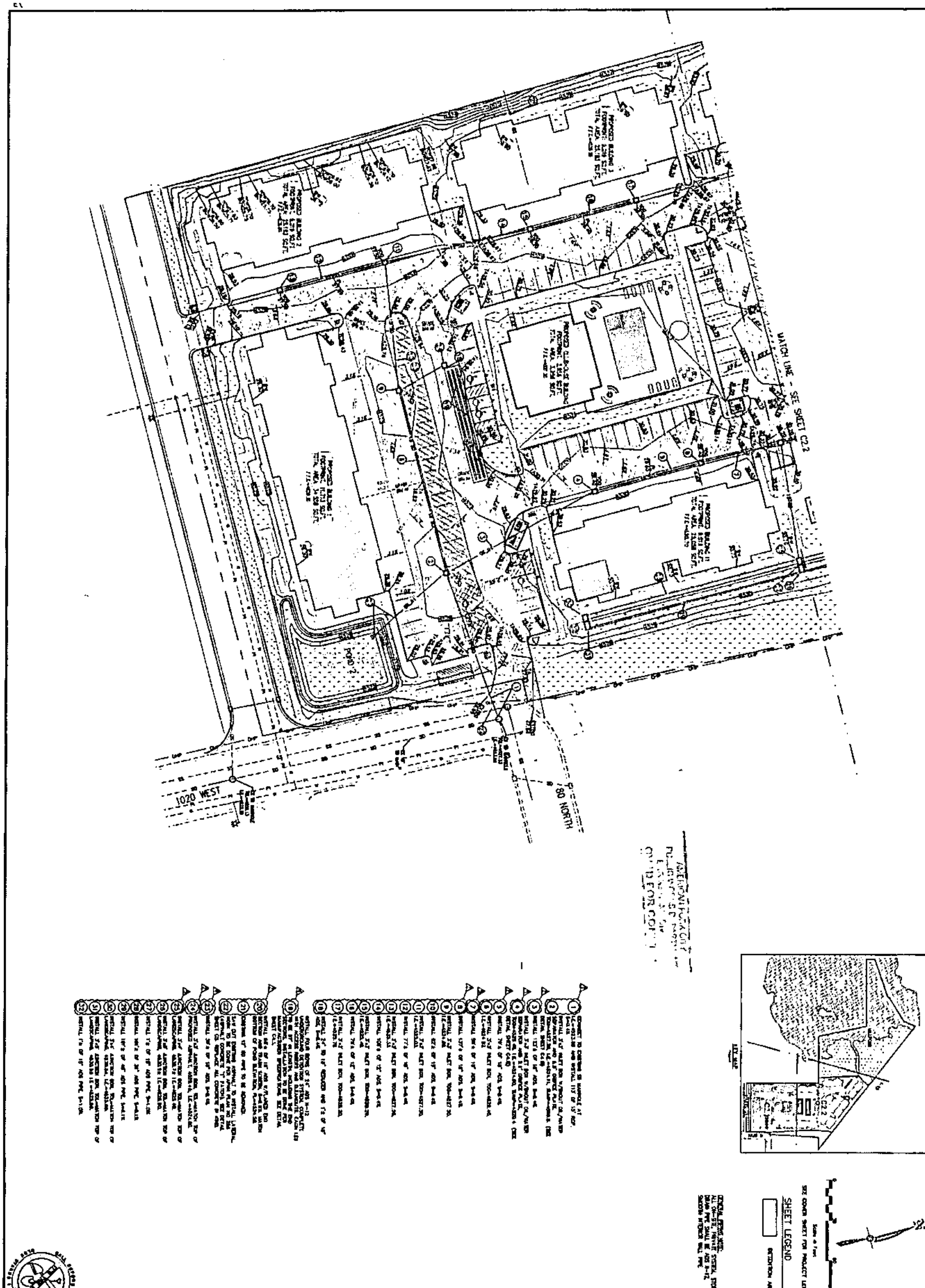
Comments:
Analysis is performed on a 1:1 DI water extract for soils

Reviewed by: Kyle R. Freeman
Kyle Freeman, President / General Manager

Flag Legend
P- Sample not properly preserved (preservative added upon receipt) C- Sample not submitted in proper container type B- Batch Blank contains analyte above MRL D- Batch Duplicate outside QC limits M- Matrix Spike recovery outside QC limits L- Lab Control Standard outside QC limits H- Sample hold time exceeded S- Analysis performed by a certified subcontract laboratory N- Not NELAP certified for this parameter J- Estimated value, result is estimated below MRL or as noted.

27- Subcontracted to American West Analytical

Analyses presented in this report were performed in accordance with the National Environmental Laboratory Accreditation Program (nelap)



C2.1

MILLPOND APARTMENTS

79 NORTH 1020 WEST, AMERICAN FORK CITY, UT 84003

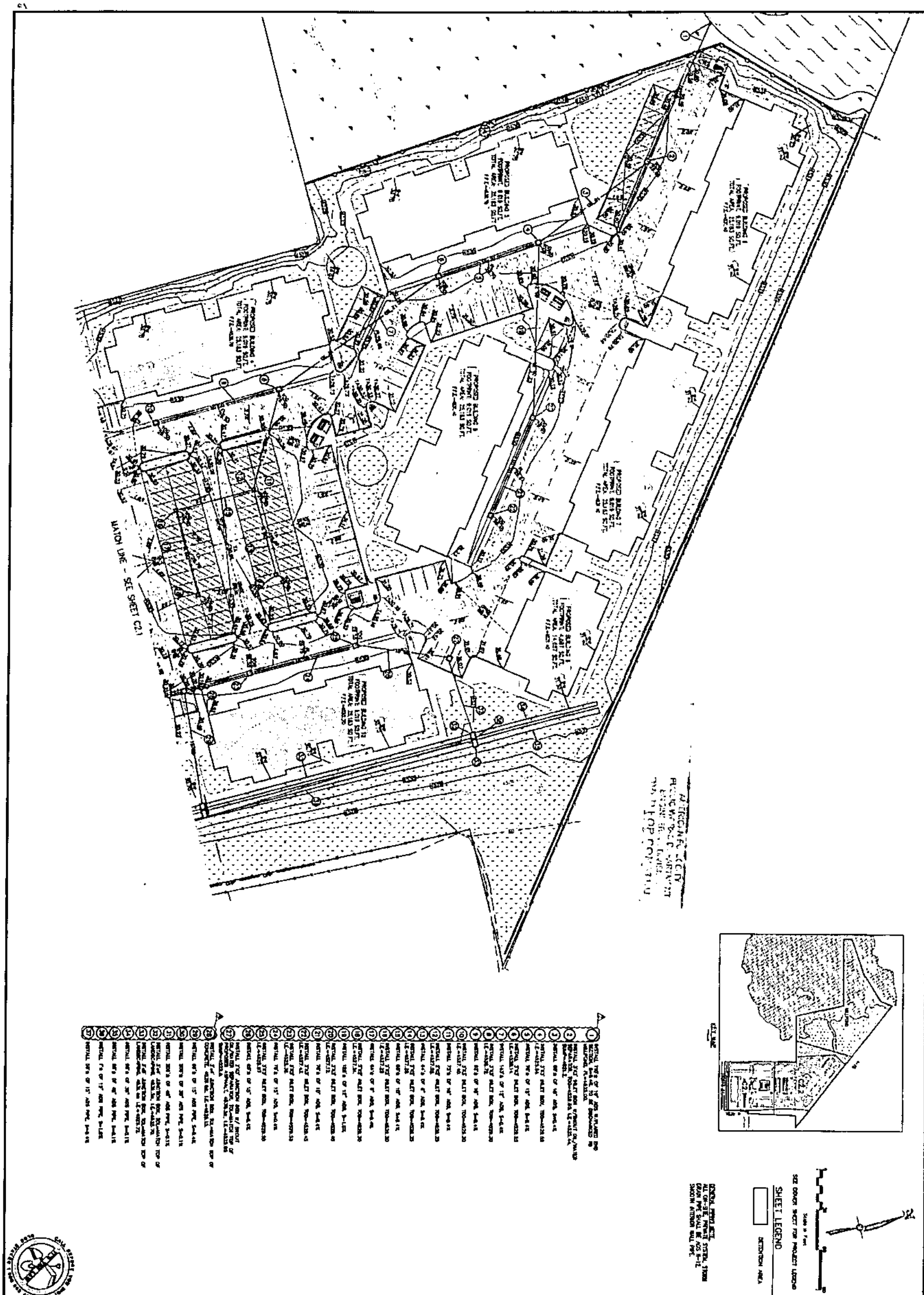
GRADING & DRAINAGE PLAN

CIR

ENGINEERING, L.L.C.

3032 SOUTH 1030 WEST, SUITE 202

SLC, Utah 84119 - 801-949-6296



SHEET NO. C2.2

MILLPOND APARTMENTS

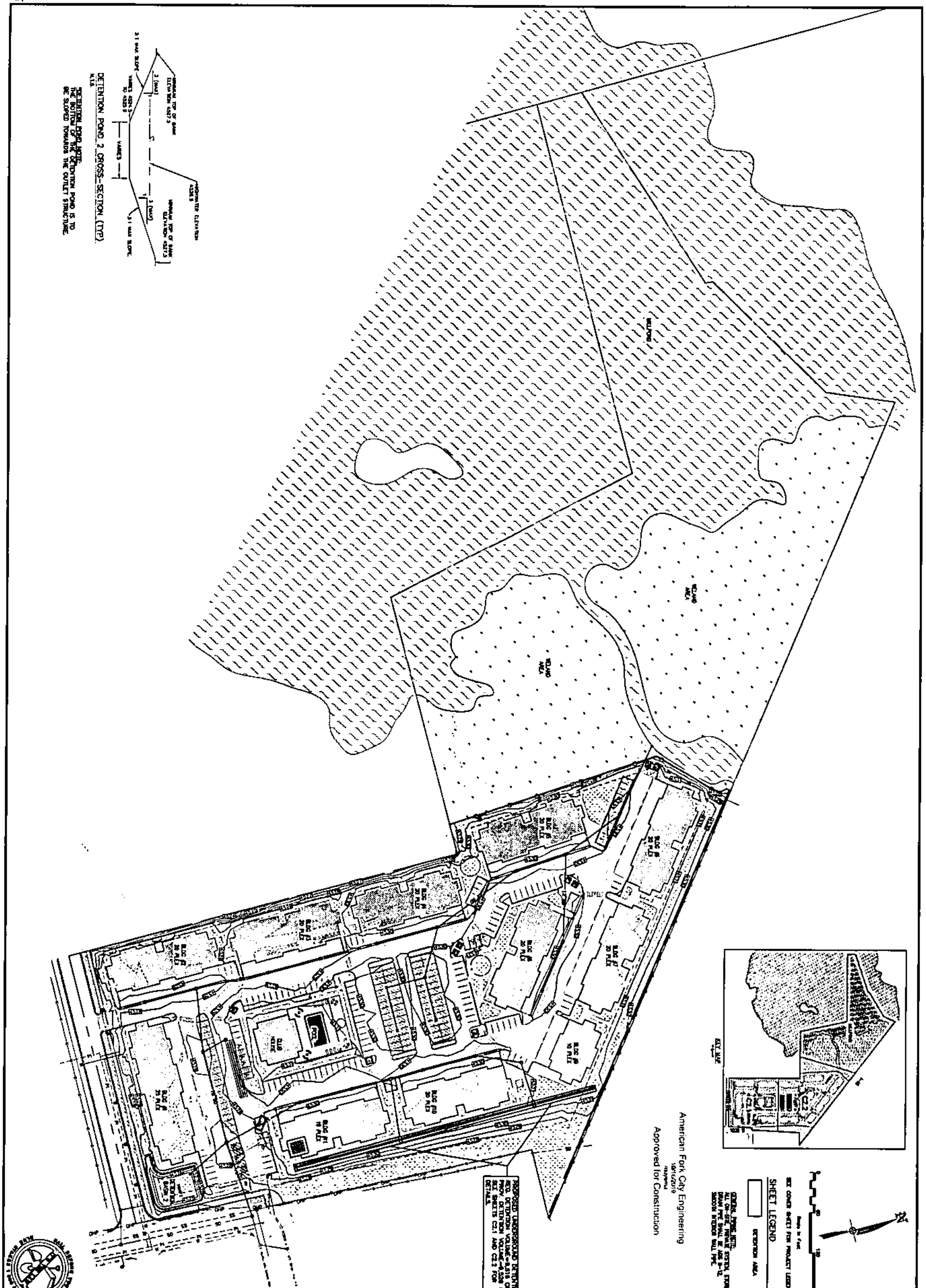
79 NORTH 1020 WEST, AMERICAN FORK CITY, UT 84003

GRADING & DRAINAGE PLAN

CIR ENGINEERING, L.L.C.

3032 SOUTH 1030 WEST, SUITE 202

SLC, Utah 84119 - 801-949-6296



MILLPOND APARTMENTS

79 NORTH 1020 WEST, AMERICAN FORK CITY, UT 84003

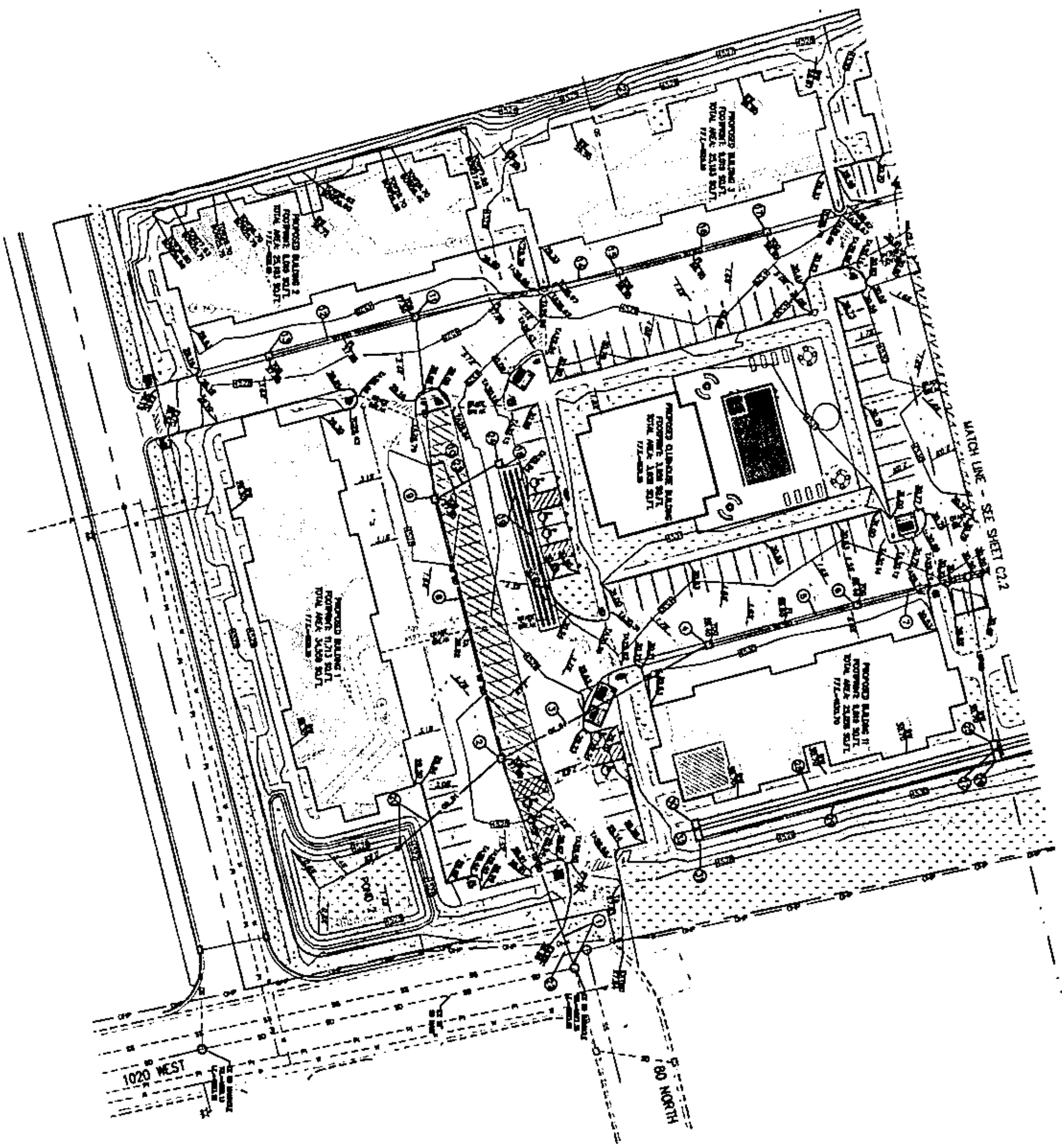
OVERALL GRADING & DRAINAGE PLAN

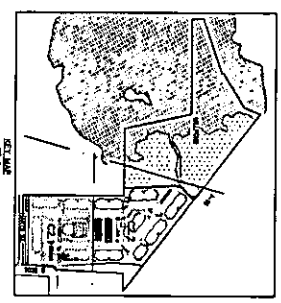
CIR ENGINEERING, L.L.C.
3032 SOUTH 1030 WEST, SUITE 202
SLC, Utah 84119 - 801-949-6296

NO	REVISIONS	BY	DATE

DESIGNED: SDT — PROJECT ENGINEER: SDT

SHEET NO. C2.0





SHEET LEGEND

DETENTION AREA

American Fork City Engineering
Approved for Construction

MILLPOND APARTMENTS

79 NORTH 1020 WEST, AMERICAN FORK CITY, UT 84003

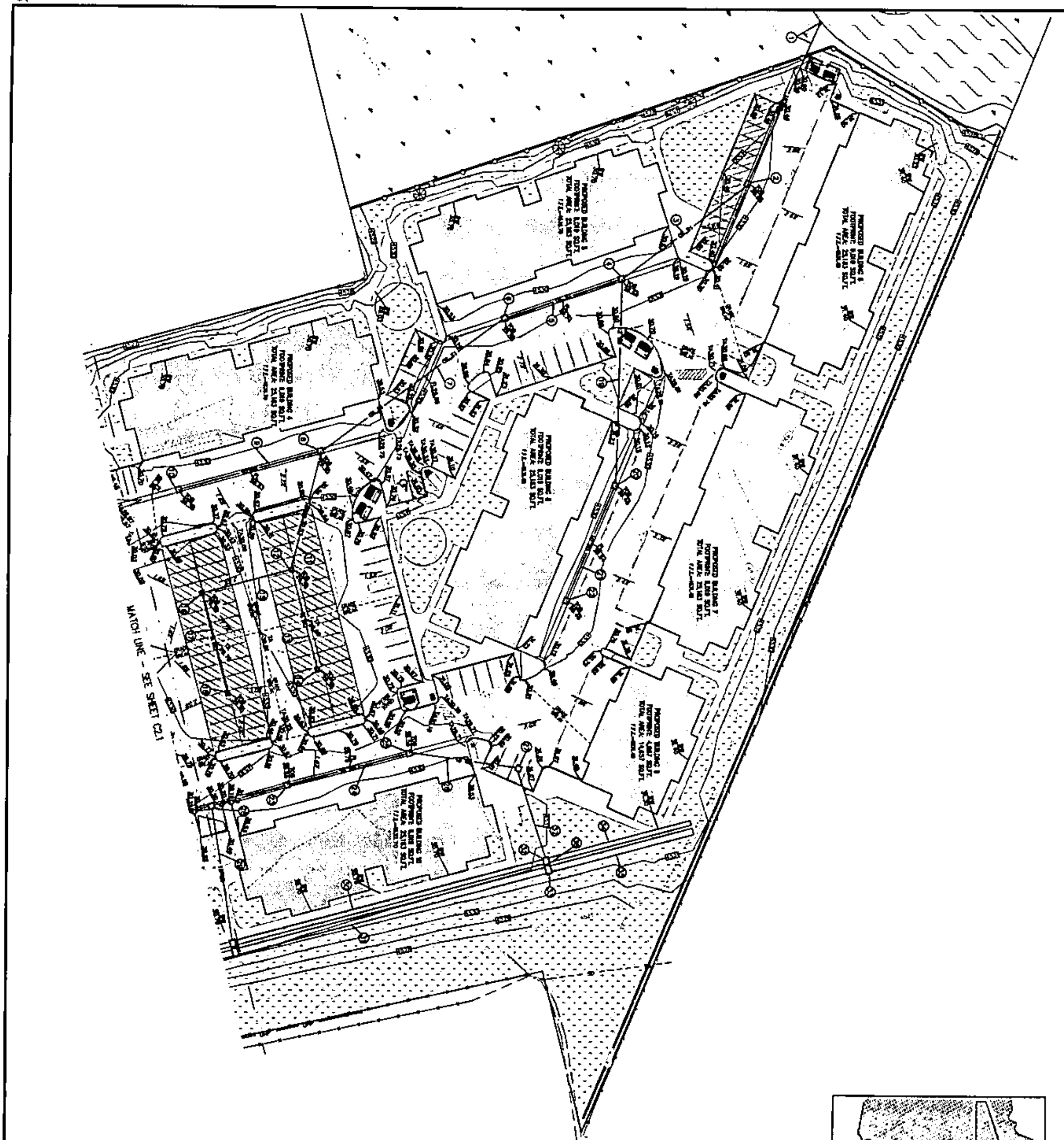
GRADING & DRAINAGE PLAN

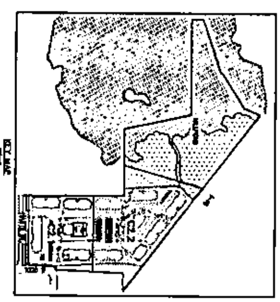
CIR
ENGINEERING, L.L.C.
3032 SOUTH 1030 WEST, SUITE 202
SLC, Utah 84119 - 801-849-6296

NO.	REVISIONS	BY	DATE

DESIGNER: SDT PROJECT ENGINEER: SDT

SHEET NO. C2.1





SHEET LEGEND

DETENTION AREA

American Fork City Engineering
Approved for Construction

MILLPOND APARTMENTS

79 NORTH 1020 WEST, AMERICAN FORK CITY, UT 84003

GRADING & DRAINAGE PLAN

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SHEET NO. C2.2

PROJECT ID: A1056-01 DATE: 11/08/18
FILE NAME: PRJ-MAC SCALE: 1"=30'

NO	REVISIONS	BY	DATE

DESIGNER: SDT PROJECT ENGINEER: SDT