AGEC
Applied GeoTech

GEOTECHNICAL INVESTIGATION

DXATC CAMPUS, PHASE 1

ST. GEORGE, UTAH

PREPARED FOR:

DFCM - MAIN OFFICE
SUITE 4110 STATE OFFICE BUILDING
SALT LAKE CITY, UTAH 84114

ATTENTION: KURT BAXTER

PROJECT NO. 2140888

AUGUST 20, 2014

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TABLE OF CONTENTS

SUMMARY

1. The site is suitable for the proposed construction provided recommendations within this report are followed.

2. The subsurface profile observed in the borings drilled at the site generally consists of interbedded silty sand, caliche and silty gravel with sand underlain by hard basalt caprock. Approximately ½ to 5 feet of site grading fill was observed at the surface of Borings B-2, B-6 and B-7. Additionally, 2 to 2½ inches of asphalt underlain by 6 to 12 inches of base course was observed at the surface of Borings B-1 and B-2. Practical auger refusal was encountered on basalt caprock in each of the borings drilled at depths ranging from approximately 4 to 10 feet below the existing grade.

3. Groundwater was not encountered within the borings drilled to the maximum depth investigated, approximately 10 feet. Fluctuations in the groundwater level may occur over time. An evaluation of such fluctuations is beyond the scope of this report.

4. The proposed buildings and pavilion to be constructed on the subject site may be supported on conventional spread and spot footings bearing on properly compacted structural fill. Recommendations for spread footing design and support are provided in the Foundations section of this report.

5. The proposed structures should be designed and constructed for a soil profile using "Site Class C" seismic requirements in accordance with ASCE Chapter 20 and the 2012 International Building Code.

6. Unsuitable soils (as shown on Figure 3) should be removed the full depth and replaced in properly moisture conditioned and compacted lifts, prior to placing additional fill, pavement or concrete.

7. Detailed recommendations for subgrade preparation, excavation, pavements, materials, foundations, and drainage are included in the report.

8. Properly moisture conditioned on-site soils, free of organics, debris and material larger than 6 inches in size are suitable for use as site grading fill, structural fill, wall backfill, and utility trench backfill.

9. The information provided in this summary should not be used independent of that provided in the body of this report.

SCOPE OF WORK

This report presents the results of a geotechnical investigation for the proposed DXATC Pavilion to be located in St. George, Utah as shown on Figure 1.

Field exploration, including the drilling of 7 borings, was conducted to obtain information regarding the subsurface conditions and to obtain samples for laboratory testing. Results of the field exploration and laboratory testing program were analyzed to develop recommendations for the proposed addition.

This report has been prepared to summarize the data obtained during the study and to present our conclusions and recommendations based on the proposed construction and the subsurface conditions encountered. Design parameters and a discussion of geotechnical engineering considerations related to construction are included in the report. This report was prepared in general accordance with the scope of services provided in our proposal dated July 3, 2014.

SITE CONDITIONS

The subject site is the current location of the old airport terminal and parking lot in St. George, Utah as shown on Figure 1. The site is covered with sidewalk, curb/gutter, asphaltic concrete/rigid pavement and a planter which runs north and south and contains evenly spaced trees. The site is relatively level with a gentle slope down from the south to the north. The old runway and Donlee Drive are to the west, Airport Road is to the east and additional former airport property is to the north and south.

FIELD STUDY

An engineer from AGEC visited the site on July 29, 2014 and observed the drilling of 7 borings at the approximate locations shown on the Site Plan, Figure 2. The borings were drilled utilizing a truck-mounted drill rig equipped with 8-inch hollow stem augers. Soil samples were obtained during the field investigation for laboratory testing.

SUBSURFACE CONDITIONS

The subsurface profile observed in the borings drilled at the site generally consists of interbedded silty sand, caliche and silty gravel with sand underlain by hard basalt caprock. Approximately ½ to 5 feet of site grading fill was observed at the surface of Borings B-2, B-6 and B-7. Additionally, 2 to 2½ inches of asphalt underlain by 6 to 12 inches of base course was observed at the surface of Borings B-1 and B-2. Practical auger refusal was encountered on basalt caprock in each of the borings drilled at depths ranging from approximately 4 to 10 feet below the existing grade.

Detailed descriptions of the soil types encountered follow.

Asphaltic concrete - The asphaltic concrete varies from approximately 2 to 2 ½ inches thick. It appears to be in moderate condition, and is black in color.

Base course - The base course varies from 6 to 12 inches thick. It consists of silty sand with gravel. It appears well compacted, slightly moist and reddish-yellow in color.

Fill - The fill consists of silty sand with gravel with a trace of clay. The consistency varies from poorly to moderately to well compacted. It is slightly moist to moist and light red-brown in color.

Laboratory tests conducted on a sample of the fill indicate an in-place moisture content of 10 percent and a fines content (percent pass the No. 200 sieve) of 33 percent.

Silty sand - The silty sand contains occasional gravel. It is dense, slightly moist, and reddish-brown in color.

Laboratory tests conducted on samples of the silty sand indicate in-place moisture contents ranging from 7 to 15 percent, in-place dry densities ranging from 92 to 114 pounds per cubic foot (pcf) and fines contents ranging from 21 to 34 percent.

Two one-dimensional consolidation/collapse tests conducted on samples of the silty sand indicate it is slightly moisture sensitive (collapsible) when wetted under a constant pressure of approximately 1,000 psf and slightly to moderately compressible under additional loading. Collapse percentages ranging from approximately 1 to 1¼ percent were measured.

Silty gravel with sand - The silty gravel with sand is loose (near surface) dense, dry to slightly moist and red to brown in color.

Laboratory tests conducted on samples of the silty gravel with sand indicate in-place moisture contents ranging from 6 to 8 percent, a fines content of 30 percent and a relatively low solubility of 1.8 percent.

Caliche - The caliche consists of moderately cemented silty sand with gravel. It is dry to slightly moist, calcareous and reddish-brown in color.

Basalt caprock - The basalt caprock is hard, dry and black to grey in color.

The Logs, Legend and Notes of Exploratory Borings are shown on Figure 3. The results of laboratory testing are also shown on Figure 3 and are summarized in the Summary of

Laboratory Test Results, Table 1. The consolidation/collapse test results are shown graphically on Figures 4-5.

SUBSURFACE WATER

Groundwater was not encountered within the borings drilled to the maximum depth investigated, approximately 10 feet. Fluctuations in the groundwater level may occur over time. An evaluation of such fluctuations is beyond the scope of this report.

PROPOSED CONSTRUCTION

We understand it is proposed to develop the 30 acre DXATC Campus site in multiple phases. It is proposed to construct 2 buildings and one steel shade pavilion on the subject site during the initial phase of construction. The 2 buildings will include the Administration/Manufacturing/Health/IT building and the second building will include the Diesel/Auto Technology.

The Admin/IT building will be a 3-story, steel-framed structure with a flat membrane roof. The Auto Tech Building will be a high bay (15 to 18 feet) concrete tilt up building. We understand it is currently proposed to support the buildings on conventional spread and spot footings with concrete slab on grade floors. We anticipate wall loads will be less than 4 kips per lineal foot and column loads will be less than 75 kips.

A grading plan was not available for review. Based on the existing grades, we anticipate the buildings and site improvements will be constructed near the existing grade. Portions of the site will also be paved with asphaltic pavement to facilitate relatively light duty traffic including passenger cars and pickup trucks. We also understand that portions of the site will also facility heavy duty traffic such as semis, weekly delivery trucks and a garbage truck and may include rigid pavement or asphaltic concrete pavement.

If the proposed construction, loading conditions, or grading are significantly different from what is described above, we should be notified so we may reevaluate our recommendations.

RECOMMENDATIONS

Based on our experience in the area and the conditions observed, the following recommendations are provided for the proposed construction:

A. Site Grading

The following grading recommendations are provided:

1. Subgrade Preparation

Prior to conducting site grading, the site should be grubbed to remove vegetation/trees. Minimal vegetation is present at the site with the exception of the a row of trees in a planter which runs north to south on the eastern end of the site. The vegetation should be disposed of off-site. Roots associated with the trees larger than ¼ inch in diameter should also be removed. The existing terminal building, associated concrete, sidewalk and curbing should also be removed. Debris associated with the demolition should be disposed of off site.

Additionally, existing asphalt in areas which will receive fill, or support improvements/structures, should be removed and disposed of. Alternatively, the asphalt may be roto-milled the full depth and mixed with the underlying base course. This material may be removed and stockpiled for use as site grading or structural fill.

Subsequent to grubbing and removal of unsuitable soils as described above, the exposed subgrade should be overexcavated to remove the full depth of existing site grading fill and near surface, unsuitable soils as shown on Figures 3. The removed soil, free from organics and debris, may be replaced in properly moisture conditioned and compacted lifts.

Prior to replacing site grading fill beneath hard surfaces or structural areas, the exposed subgrade should be scarified to a depth of at least 8 inches moisture conditioned and compacted to meet the recommendations in the Compaction section of this report.

2. Excavation/Earthwork

We anticipate that excavation of the near surface soils at the site may be accomplished with typical heavy duty excavation equipment. Excavations into the basalt caprock will likely a rock hammer, or trackhoe equipped with a single toothed ripper, particularly in confined excavations such as utility trenches. Light blasting may also be necessary.

3. Grading Slopes and Trenches

Permanent cut slopes, excavated into the overburden soils, should be cut no steeper than 2:1 (horizontal to vertical). Cut slopes in the basalt caprock may be steepened to ½:1 (horizontal to vertical).

Unretained fill slopes constructed with properly compacted on-site soil or processed basalt should be graded no steeper than 2:1 (horizontal to vertical). Slopes should include benches in accordance with the 2012 IBC. The granular fill slopes will be highly susceptible to erosion. To reduce erosion, the fill slopes should be flattened to 3:1 or flatter (horizontal to vertical) or they may be retained. Fill slopes may also be protected from erosion with an appropriate geotextile or riprap underlain with filter fabric. More detailed recommendations for riprap erosion control may be provided if requested.

Fill slopes should be graded by overbuilding and then cutting back to the desired grade to provide a compacted slope face. Fill placed on existing slopes steeper than 3:1 (horizontal to vertical) should be placed using a benching procedure to "key" the fill into the existing slope. Benches should be of sufficient width to allow adequate area for the compaction equipment.

Temporary trenches and excavations cut into the overburden soils should be sloped/constructed in accordance with OSHA guidelines for Type C soil or a trench box/shoring should be used. In particular, temporary cut slopes should be constructed no steeper than 1½ to 1 (horizontal to vertical). Temporary excavations/trenches cut into the basalt bedrock my be constructed in accordance with OSHA guidelines for Type A soil and should be no steeper than ¾ to 1 (horizontal to vertical). The method of trenching or shoring is the responsibility of, and should be chosen by the contractor.

4. <u>Material Suitability</u>

Properly moisture conditioned on-site soils, free of organics, debris and material larger than 6 inches in size and roto-milled asphalt/road mixture are suitable for use as site grading fill, structural fill, wall backfill, and utility trench backfill.

The on-site basalt caprock is also suitable for use as structural fill, site grading fill, wall backfill and utility trench backfill provided it is processed such that the maximum particle size is 6 inches and at least 50 percent of the material passes the number 4 sieve.

The removed soil which contains organics may be stockpiled for reuse in landscaped areas, but acceptance will be dependant on the Architect approval. The removed vegetation should be disposed of off-site.

The on-site soils are not suitable for use as pipe bedding. Imported soils will be necessary for pipe bedding.

5. Imported Materials

Import materials should consist of granular, non-expansive soil and should be approved by the geotechnical engineer prior to delivery to site. Import material should also meet the following criteria for materials used in the listed condition.

Area	Fill Type	Recommendations
Building/Foundations	Structural and Site Grading	**-200** <35%, +**4**<50%, **LL** <30% Maximum size: 6 inches Solubility < 1%
Site Work	Site Grading	**-200** <50%, **LL** <30% Maximum size: 4 inches Solubility < 1%
Pipe Bedding	Backfill	Non-plastic, **-200** <15%, 100 percent passing the **#4** Sieve (Sand Size)
Pavement/Flatwork	Base Course	4≤**-200** ≤12% Maximum aggregate size: ¾ inch **CBR**≥50% (for paved areas)

-200 = Percent Passing the No. 200 Sieve

+4 = Percent retained on the No. 4 Sieve.

LL = Liquid Limit

6. Compaction

Compaction of fill placed at the site should equal or exceed the following percentages of the maximum dry densities as determined by ASTM D-1557.

Area	Percent Compaction
Subgrade	90
Site grading fill	95
Landscaping (upper 1 foot)	85 - 90
Landscaping (greater than 1 foot)	95
Footings/foundations	95
Wall backfill	95
Utility trench backfill	95
Utility trench backfill (pipe zone)	90
Pavement	95
Base course	95

Fill placed at the site should be frequently tested to verify proper compaction. Fill should be placed in lift thicknesses which do not exceed the capability of the compaction equipment utilized. Generally, loose lift thicknesses of 6 to 8 inches are adequate for heavy equipment. Lift thicknesses should be reduced to 4 inches for light hand compaction equipment.

To facilitate compaction of site grading fill, the moisture content should be within 2 percentage points of the optimum moisture content.

7. Drainage

Drainage of surface water away from the buildings should be maintained through the course of construction and during the lives of the structures. In no case should water be allowed to accumulate and pond adjacent to foundations. We recommend a minimum slope of 6 inches in the first 10 feet away from the perimeter of the structures.

Roof drains should be utilized as needed and roof downspouts should discharge away from foundations or on to hard surfaces to decrease potential for infiltration of water into the underlying soils.

Desert landscaping, which requires no water, should be implemented within 5 feet of foundation to reduce the risk of wetting of the underlying foundation support soils.

We also recommend that desert landscaping, which requires little to no water, be used adjacent to foundations and masonry walls or other cement containing elements to reduce salt migration and the subsequent salt weathering and sulfate attack on cement containing elements. Further, the below grade portions of walls/fences which are backfilled with soil should be protected with an impermeable membrane. A gravel covered, perforated PVC pipe should also be placed at the base of the wall to carry water to a discharge point. This is intended to reduce the potential for salt weathering and sulfate attack on concrete/masonry.

B. Foundations

The proposed middle school additions may be supported on conventional spread and spot footings bearing on properly compacted structural fill underlain by a properly prepared subgrade as recommended in the Subgrade Preparation. Recommendations for spread footing design and support follow.

1. Bearing Capacity and Bearing Material

Conventional spread and spot footings may be designed for the following allowable bearing pressures and structural fill depths:

Load Type	Maximum Load	Footing Width "B"	Net Allowable Bearing Pressures (psf)	Minimum Structural Fill Thickness (ft)
Wall/Continuous	4 klf	B≤2 ft	2,000	1
Column/Spot	22.5 kips	B≤3 ft	2,500	1
Column/Spot	75 kips	3<B≤5 ft	3,000	1

The structural fill is necessary to develop the recommended allowable bearing pressures and to reduce potential settlement. It should extend a horizontal distance beyond the footing perimeter at least ½ of the fill thickness.

2. Temporary Loading Conditions

The bearing pressures indicated may be increased by one-half for temporary loading conditions such as for wind and seismic loads.

3. Settlement

Based on the subsoil conditions encountered and the stated building loads, we estimate total settlement for the foundations designed as indicated to be approximately 1 inch. Differential settlement is estimated to be approximately ½ inch.

4. Footing Width and Embedment

Spread footings should have a minimum width of 18 inches and should be placed at least 12 inches below the lowest adjacent grade.

5. Foundation Base

The base of the footings should be cleared of loose or deleterious material prior to placing fill or concrete. Footing areas should be tested to verify compaction.

C. Concrete Slab-on-Grade

1. Interior Slab Support

Interior concrete slabs should be supported on at least 12 inches of properly compacted structural fill underlain by a properly prepared subgrade as recommended in the Subgrade Preparation section of this report.

2. Exterior Flatwork

Exterior flatwork should be supported on a properly prepared and properly compacted subgrade as recommended in the Subgrade Preparation section of this report.

3. Under-slab Base Course

A 4-inch layer of properly compacted base course should be placed below the concrete slabs to provide a stable subgrade and to promote even curing of the slab concrete.

4. Vapor Barrier

Floor slab areas receiving floor coverings sensitive to moisture (tile or wood) or impermeable floor coverings should be underlain by a water proof membrane.

D. Lateral Earth Pressures

1. Lateral Resistance for Footings

Lateral resistance for spread footings is controlled by sliding resistance developed between the footing and the subgrade soil. The following ultimate friction values may be used in design for lateral sliding resistance of footings:

Subgrade Support Soil	Ultimate friction value - μ
On-site soil	0.45
Select aggregate base course	0.55

The values provided above are considered ultimate. The structural design should incorporate an appropriate factor of safety.

2. Retaining Structures

The following equivalent fluid weights are given for design of subgrade walls and retaining structures. The active condition is where the wall moves away from the soil. The passive condition is where the wall moves into the soil and the at-rest condition is where the wall does not move. We recommend the basement walls be designed in an at-rest condition.

The values listed below assume a horizontal surface adjacent the top and bottom of the wall.

Soil Type	Active	At-Rest	Passive
Granular Backfill	35 pcf	55 pcf	300 pcf
Earth pressure coefficient	0.29	0.46	-

It should be recognized that the above values account for the lateral earth pressures due to the soil and level backfill conditions and do not account for hydrostatic pressures or surcharge loads.

Lateral loading should be increased to account for surcharge loading (using the appropriate earth pressure coefficient) and a rectangular distribution if structures are placed above the wall and are within a horizontal distance equal to the height of the wall. If the ground surface slopes up away from the wall, the equivalent fluid weights should also be increased.

Care should be taken to prevent percolation of surface water into the backfill material adjacent to the retaining walls. The risk of hydrostatic buildup may be reduced by placing a subdrain behind the walls consisting of free-draining gravel wrapped in a filter fabric.

3. Seismic Conditions

Under seismic conditions, the equivalent fluid weight should be modified as follows according to the Mononobe-Okabe method assuming a level backfill condition:

Lateral Earth Pressure Condition	Seismic Modification (2% PE in 50 yrs)
Active	14 pcf increase
At-rest	0 pcf increase
Passive	36 pcf decrease

The seismic increases and decrease assume a peak ground acceleration of 0.20g using the Mononobe-Okabe pressure distribution. The resultant of the seismic increase should be placed at the mid height of the wall.

4. Safety Factors

The values recommended assume mobilization of the soil to achieve the assumed soil strength. Conventional safety factors used for structural analysis for such items as overturning and sliding resistance should be used in design.

E. Seismicity, Liquefaction and Faults

1. Seismicity

Listed below is a summary of the site parameters as required by the 2012 International Building Code (IBC) and ASCE 7, Chapters 7 and 20:

Description	Seismic Event - 2% PE in 50 Yrs
	Value
2012 IBC Site Class	C
Site Longitude	-113.0965°
Site Latitude	37.5919°
Ss (0.2 second period) - Site Class B	0.49g
S_1 (1 second period) - Site Class B	0.15g
PGA - Site Class B	0.20g
F_a - Site Class Factor	1.200
Fv - Site Class Factor	1.649
F_{PGA} - Site Class Factor	1.196

2. Liquefaction

Liquefaction is a condition where a soil loses strength due to an increase in soil pore water pressures during a dynamic event such as an earthquake. Research indicates that the soil type most susceptible to liquefaction during a severe seismic event is loose, clean sand. For the sand to liquefy, it must be located beneath the groundwater level and exist in a relatively loose condition. The liquefaction potential for soil tends to decrease with an increase in fines content and density (Standard Penetration Resistance Values).

Based on our field investigation and engineering analysis, the following subsurface conditions exist at the subject site:

a. Groundwater was not encountered at the site.
b. Shallow caprock was encountered at the site.
c. Soils are non-liquefiable to depths investigated.

3. Faults

Based on a review of available geologic literature, there are no mapped faults extend through or near the site.

F. Water Soluble Sulfates and Cement Type

Our experience in the area indicates on-site soil and potential imported soils sources likely contain water soluble sulfate concentrations in sufficient concentration to be corrosive to concrete. Therefore, we recommend concrete elements that will be exposed to the on-site soils be designed in accordance with provisions provided in the American Concrete Institute Manual of Concrete Practice (ACI) 318-11 and Section 1904.3 of the 2012 International Building Code. Tables 4.2.1 and 4.3.1 of ACI 318-11 should be referenced for design of concrete elements utilizing a Sulfate Exposure Class of S2, and a sulfate exposure severity of "Severe".

Consideration should also be given to cathodic protection of buried metal pipes. We recommend utilizing PVC pipes where local building codes allow.

H. Pavement

Based on the subsoil conditions encountered and the laboratory test results, the following recommendations are given:

1. Analysis

   a. Asphaltic Concrete: The flexible pavement analysis is based on AASHTO and UDOT design methods and a 20 year design life. The following parameters were considered for our analysis:

      - Base course that meets project and City of St. George specifications which would correspond to a Structural Coefficient (a_2) of at least 0.12. Asphalt that provides a Structural Coefficient (a_1) of at least 0.40.

      - Drainage Coefficient = 1.0.

      - We anticipate the subgrade materials will consist of silty sand. We have assumed CBR value of 7 percent for a properly prepared subgrade. Prior to placing base course or pavement area grading fill, the subgrade should be prepared as recommended in the Subgrade Preparation section of this report. A M_R value of 10,500 psi was used for the subgrade based upon the CBR value and the relationship between CBR and Resilient Modulus (M_R).

      - Serviceability Index: $P_o = 4.2$, $P_t = 2.0$, therefore, $\Delta PSI = 2.2$.

      - Reliability of 90 percent.

      - Standard Deviation (S_o) = 0.45.

b. Portland Cement Concrete: The rigid pavement analysis is based on AASHTO design methods and a 20 year design life. The following parameters were considered for our analysis:

- Concrete with a minimum compressive strength of at least 4,500 psi supported on high quality base course that meets specifications provided in the Materials section of this report.
- An elastic modulus of 4.0 X 10^6 psi for the concrete.
- Drainage Coefficient = 1.0.
- The subgrade support soils consist of silty sand with a subgrade modulus ranging from 200 pounds per cubic inch (pci).
- A joint transfer coefficient of 4.0 for undoweled joints.
- Serviceability Index: $P_o=4.5$, $P_t=2.5$, therefore, $\Delta PSI=2$.
- Reliability of 90 percent.
- Standard Deviation (S_o) = 0.35.

2. <u>Subgrade Support</u>

Our design assumes a properly prepared subgrade as recommended in the Subgrade Preparation section of this report. The subgrade preparation varies depending on the location on the site. Prior to placing fill, base course or pavement, the subgrade should be prepared as recommended in the Subgrade Preparation section of this report.

3. Pavement Thickness

Based on the anticipated traffic, a 20 year design life, PCC and AASHTO design methods, the following pavement sections are recommended.

	Rigid Pavement		Flexible Pavement	
Area	Portland Cement (inches)	Base Course (inches)	Asphaltic Concrete (inches)	Base Course (inches)
Light Duty Parking	--	--	2½	6
Heavy Duty Areas	5	4	3½	6

4. Pavement Materials

a. *Flexible Pavement (Asphaltic Concrete)*

The pavement materials should meet AASHTO and St. George City specifications for gradation and quality. The pavement thicknesses indicated above assume that the base course is a high quality material with a CBR values of at 50 percent. Asphalt material should have a Marshal stability of at least 1,800 pounds.

b. *Rigid Pavement (Portland Cement Concrete)*

The pavement thicknesses indicated assume that the concrete will have a 28-day compressive strength of at least 4,500 psi.

5. Jointing

Joints for concrete (rigid) pavement should be laid out in a square or rectangular pattern. Joint spacings should not exceed 30 times the thickness of the slab. The depth of joints should be at least one-quarter of the slab thickness.

6. Drainage

The collection and diversion of drainage away from the pavement surface is extremely important to the satisfactory performance of the pavement section. Proper drainage should be provided. We further recommend proper pavement maintenance to extend the pavement life.

I. Construction Materials Observation and Testing

A representative of AGEC should observe/test the following during grading and construction so that a final grading report may be issued upon completion of site work:

1. Verify the subgrade is properly prepared and overexcavated prior to placing fill.

2. Verify structural and site grading fill materials are placed in proper lift thicknesses for the compaction equipment utilized.

3. Verify fill placed is properly moisture conditioned and compacted. A sufficient number of tests should be taken to verify compaction. We recommend testing each foot of fill placed below foundations and slabs.

4. Conduct construction materials and laboratory testing for city improvements at a frequency which meets or exceeds the project and the City of St. George specifications.

5. Conduct special inspections of the structures in accordance with requirements of the architect, structural engineer and the 2012 International Building Code.

The recommended testing observations will be conducted by a qualified individuals in accordance with standard test methods ASTM, ICBO, etc.

LIMITATIONS

This report has been prepared in accordance with generally accepted soil and foundation engineering practices in the area for the use of the client for design purposes. The conclusions and recommendations included within the report are based on the information obtained from the borings drilled, laboratory test results, engineering analysis, and our experience in the area. Variations in the subsurface conditions may not become evident until additional exploration or excavation is conducted.

If the subsurface soil or groundwater conditions are found to be different from what is described in this report, we should be notified to reevaluate the recommendations provided.

Sincerely,

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

Arnold DeCastro, P.E.

Reviewed by: Jon Hanson, P.E.

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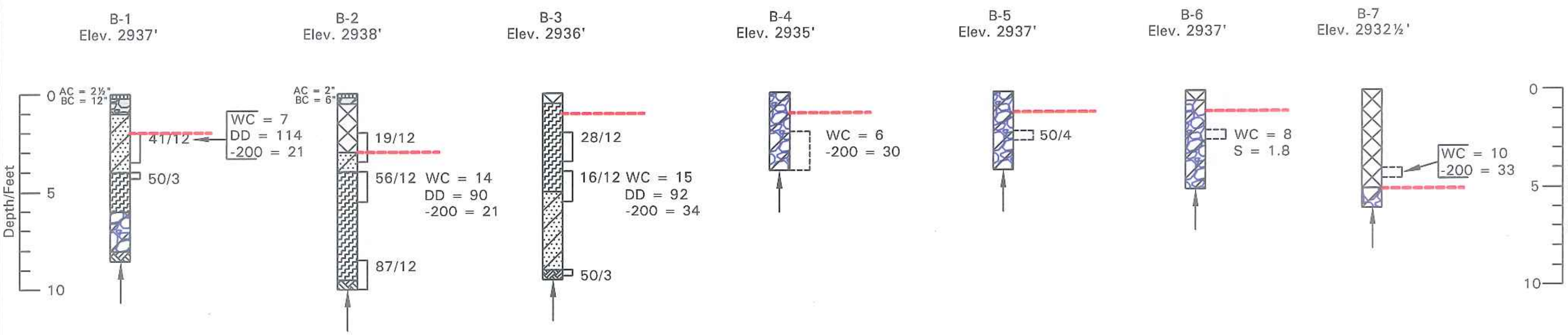
Not to Scale

DXATC CAMPUS, PHASE 1
ST. GEORGE, UTAH

2140888	AGEC	Vicinity Map	Figure 1

2140888	AGEC	Site Plan	Figure 2



LEGEND:

Asphaltic concrete; 2 to 2½ inches thick, black.

Base course; consists of silty sand with gravel, appears well compacted, slightly moist, reddish-yellow.

Fill; consists of silty sand with gravel with a trace of clay, appears poorly to well compacted, slightly moist to moist, light red-brown.

Silty sand (SM); medium dense to dense, slightly moist, contains occasional gravel, reddish-brown.

Silty gravel with sand (GM); loose (near surface) to dense, dry to slightly moist, red to brown.

Caliche; consists of moderately cemented silty sand with gravel, dry to slightly moist, calcareous, reddish brown.

Basalt caprock; hard, dry, black to grey.

10/12 California drive sample taken. The symbol 10/12 indicates that 10 blows from a 140 pound hammer falling 30 inches were required to drive the sampler 12 inches.

Indicates disturbed sample taken.

LEGEND CON'T:

Indicates practical backhoe refusal on basalt caprock or basalt boulders.

Depth to bottom of unsuitable soils which should be removed and recompacted.

NOTES:

1. The borings were drilled on July 29, 2014 with a truck mounted drill rig equipped with 8-inch hollow-stem augers.
2. The locations and elevations of the borings were measured by Alpha Engineering using Global Positioning System (GPS).
3. The boring locations and elevations should be considered accurate only to the degree implied by the method used.
4. The lines between the materials shown on the boring logs represent the approximate boundaries between material types and the transitions may be gradual.
5. Groundwater was not encountered in the borings drilled to the maximum depth investigated.
6. WC = water content (%);
   DD = dry density (pcf);
   -200 = percent passing No. 200 sieve;
   S = solubility (%).

2140888	AGEC	Logs, Legend and Notes of Exploratory Borings	Figure 3

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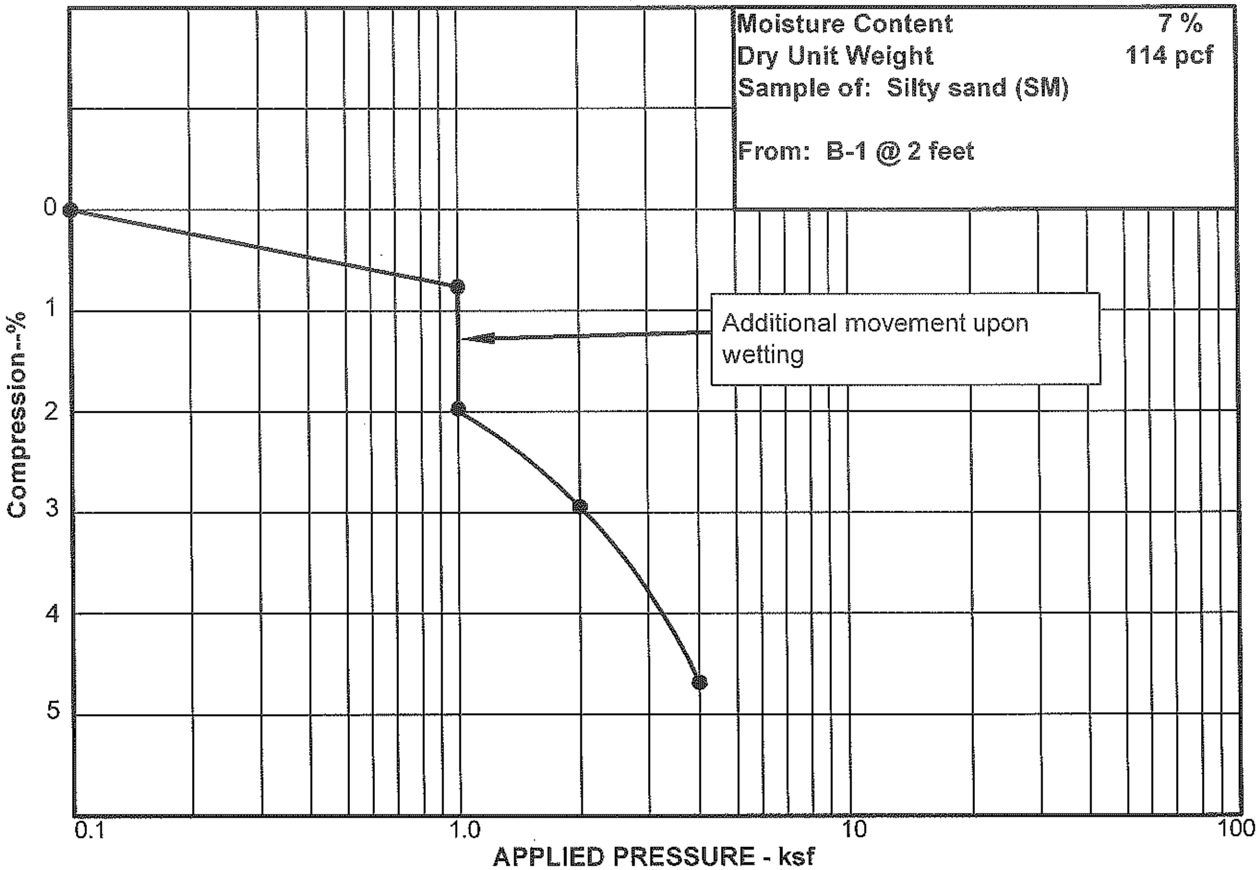

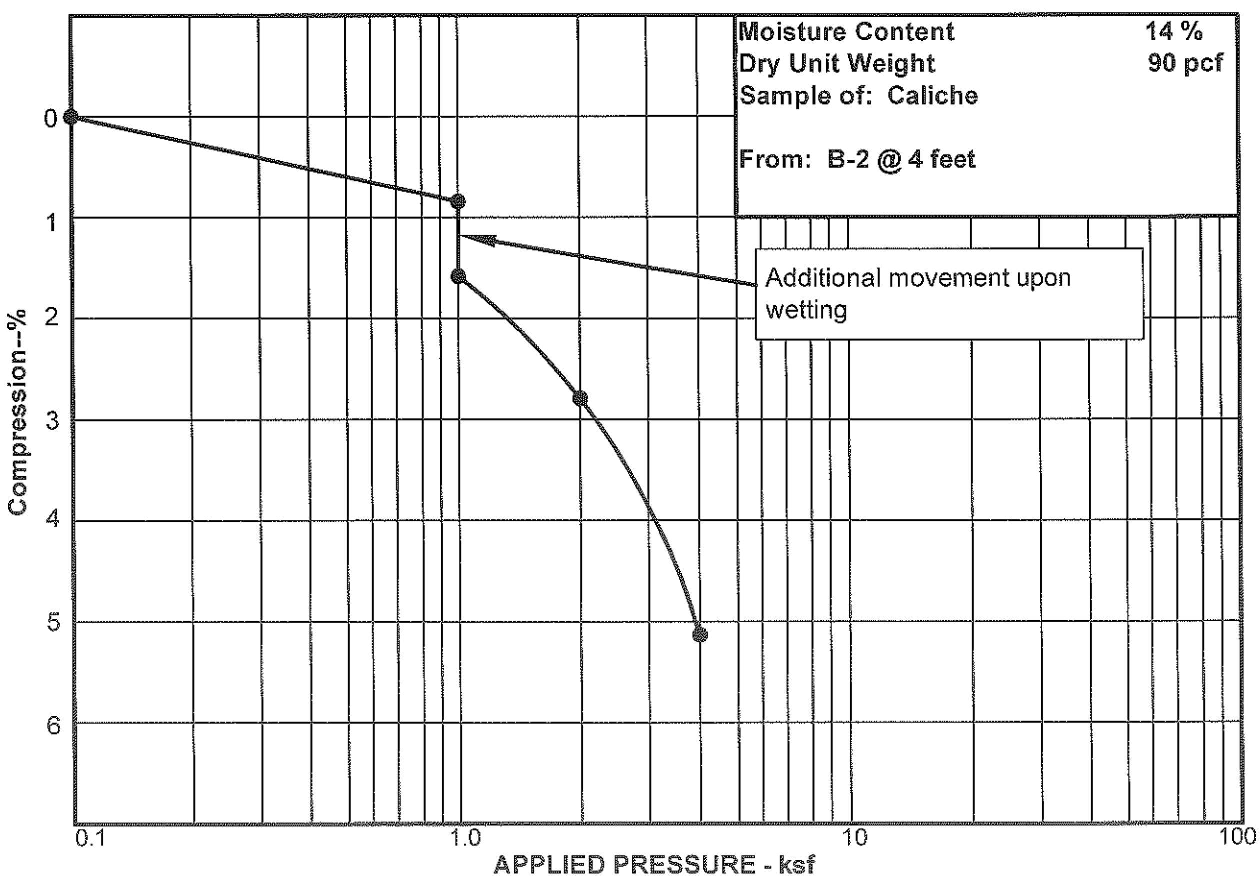

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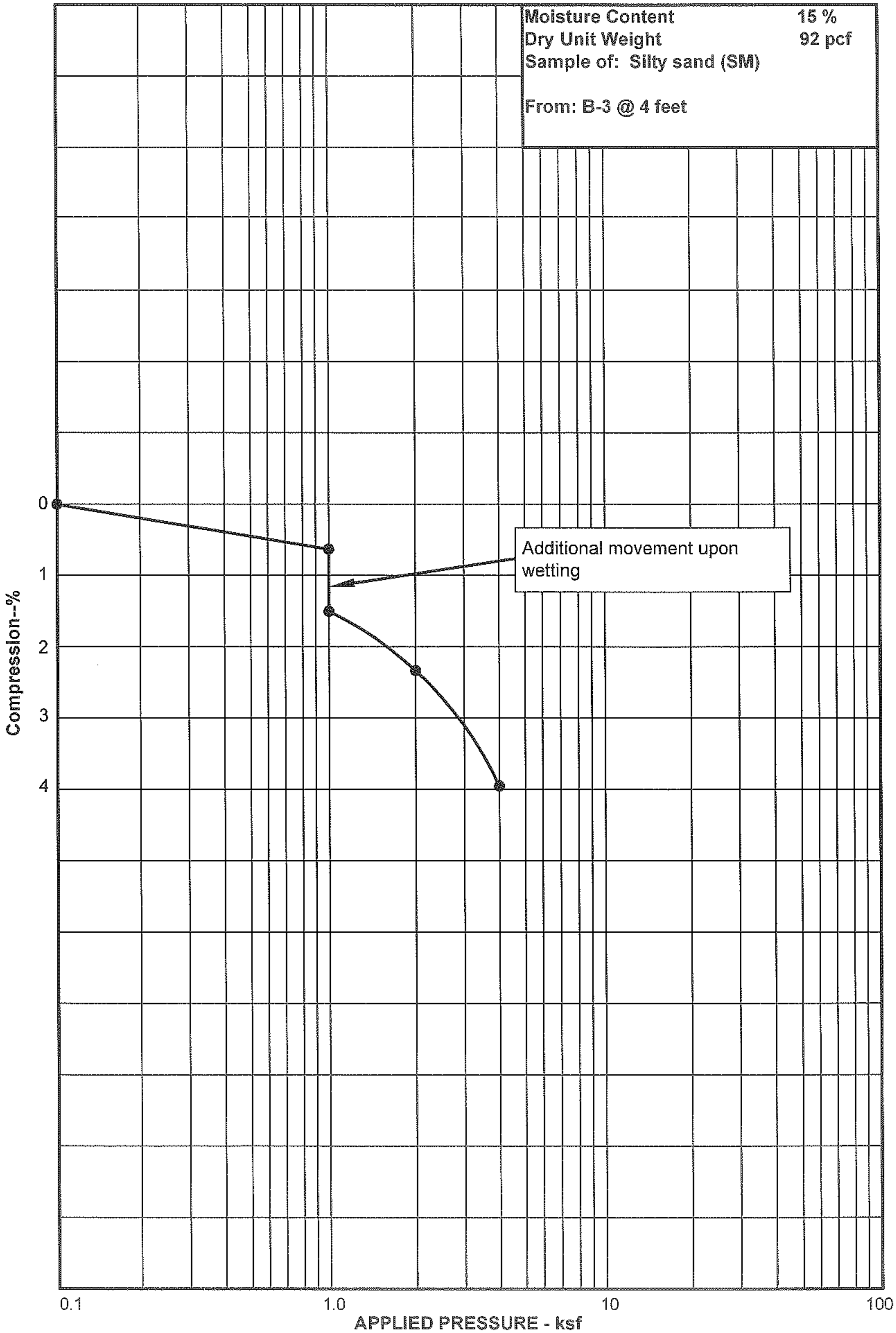

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TABLE I

SUMMARY OF LABORATORY TEST RESULTS

DXATC Campus, Phase 1

Project Number 2140888

Sample Location		Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation			Solubility (%)	Sample Classification
Boring No.	Depth (feet)			Gravel (%)	Sand (%)	Silt/ clay (%)		
B-1	2	7	114			21		Silty sand (SM)
B-2	4	14	90			21		Caliche - Silty sand with gravel (SM)
B-3	4	15	92			34		Silty sand (SM)
B-4	2-4	6				30		Silty gravel with sand (GM)
B-6	2	8					1.8	Silty gravel with sand (GM)
B-7	4	10				33		Fill; silty sand with gravel (SM)