GEOTECHNICAL ENGINEERING REPORT
EMPIRE STORAGE
12367 SOUTH 4000 West
RIVERTON, UTAH

Prepared for:

MR. RICHARD GALLEGHER
EMPIRE STORAGE
P. O. BOX 901054
SANDY, UTAH 84090

Prepared by:

SUMMIT ENGINEERING SERVICES, INC.
3640 SOUTH 500 WEST
SALT LAKE CITY, UTAH 84115
(801) 261-2800

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SES PROJECT NO. G-1661

APRIL, 2007

April 24, 2007

Summit Engineering Services, Inc.

Mr. Richard Gallegher
Empire Storage
P. O. Box 901054
Sandy, Utah 84060

RE: Geotechnical Engineering Study
Empire Storage
4000 West 12311 South
Riverton, Utah

SES Job Number: G-1661

Dear Mr. Gallegher:

At your request, Summit Engineering Services, Inc. (SES) has conducted a geotechnical study for the above-referenced project. Details of our findings and recommendations, along with the supporting field and laboratory data, are presented in the attached report.

The subsoils correlated well between the test pits. Test Pits 1, 2 and 3 encountered up to 6 inches of topsoil underlain by SILT (ML) imbedded with layers of sand to a depth of 12 feet. Test Pits 3, 4, and 5 encountered 1.5 to 6 feet of manmade fill underlain by SILT (ML) with layers of sand. Test Pit 5 encountered a SAND at 10 feet which extended to the bottom of the test pit. The upper silt layers are moisture-sensitive and collapsed about 1.5 to 10 percent under a static load of 1-ksf when inundated with water. Groundwater was not encountered in any of the test pits. Details of soils encountered in the test pits are presented on Figures A-3 thru A-7 in Appendix A. Figure A-8 is the Key to Test Pits.

The site is suitable for the proposed construction provided the recommendations of this report are complied with. Conventional spread footings bearing on re-compacted native soils are recommended for foundation support. The footings can be proportioned for a maximum allowable soil bearing pressure of 1,800 pounds per square foot.

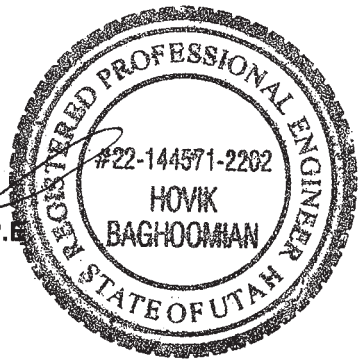
We appreciate the opportunity to be of service to you on this project. Please call us if you have any questions or need additional information.

Sincerely,

SUMMIT ENGINEERING SERVICES, INC.

CURT STRIPEIKA
Project Engineer

Reviewed by:



HOVIK BAGHOOMIAN, Ph.D., P.E.
Geotechnical Engineer

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GEOTECHNICAL ENGINEERING REPORT
EMPIRE STORAGE
4000 WEST 12311 SOUTH
RIVERTON, UTAH

INTRODUCTION

This report presents the results of our geotechnical study conducted at the site of the proposed construction. The purpose of our study was to provide information on subsoil and groundwater conditions, recommendations for foundation types and depths, soil bearing capacities, anticipated total and differential settlement, pavement design, and other design and construction considerations influenced by the subsoil conditions.

The study included site reconnaissance, subsurface exploration and soil sampling, laboratory testing, engineering analysis, client consultation, and preparation of this report.

PROPOSED CONSTRUCTION

We understand that the proposed development will consist of several storage units, varying in size from 1,940 to 12,892 square feet. Wood framed with monolithic slabs are planned. Asphaltic concrete is planned around the buildings. Interior floor grades are unknown at this time but are expected to be near existing site grades.

Structural loads were not available at the time of this study; however, no unusually heavy loads are anticipated.

PROPOSED CONSTRUCTION

The property is 1.88 acres in size, generally rectangular, and was vacant except a residential home and an out building at the time of our field study. Much of the topsoil and vegetation had been stripped on the east side of the lot. The ground surface slopes slightly down towards the north. Surface drainage appears to be fair.

SUBSURFACE CONDITIONS

Five (5) Test Pits were excavated at this site. The test pits extended to a depth of 12 feet.

The subsoils correlated well between the test pits. Test Pits 1, 2 and 3 encountered up to 6 inches of topsoil underlain by SILT (ML) imbedded with layers of sand to a depth of 12 feet. Test Pits 3, 4, and 5 encountered 1.5 to 6 feet of manmade fill underlain by SILT (ML) with layers of sand. Test Pit 5 encountered a SAND at 10 feet which extended to the bottom of the test pit. The upper silt layers are moisture-sensitive and collapsed about 1.5 to 10 percent under a static load of 1-ksf when inundated with water. Groundwater was not encountered in any of the test pits. Details of soils encountered in the test pits are presented on Figures A-3 thru A-7 in Appendix A. Figure A-8 is the Key to Test Pits.

The test pit logs and related information depict subsurface conditions only at the specific locations shown on the site plan. Subsurface conditions at other locations may differ from conditions observed in these test pits.

ANALYSIS AND CONCLUSIONS

Laboratory tests conducted on soil samples included natural moisture and density, and swell-consolidation tests. The near surface SILT layers are moisture-sensitive and collapsed up to 10 percent when inundated with water under a 1-ksf load. All tests were conducted in accordance with ASTM standards.

The water content and dry density results are shown on Table B-1. The silt water content ranged from 9 to 30 percent.

Please refer to Appendix B for test results.

SITE PREPARATION AND GRADING

In general, all manmade fill capping the site and the top 6 inches of topsoil should be stripped from the proposed building and pavement areas prior to site grading. The topsoil and fill may be stockpiled for later use in landscaped areas. In addition to the removal of the fill and TOPSOIL, the underlying SILT layer should be undercut from under the building footprints to a depth of 2 feet and to a depth of 1.5 feet below the pavement areas. Following undercutting of the silt in the foundation and pavement areas, the exposed subgrade should be well saturated and compacted to a firm, non-yielding surface prior to structural fill placement or placement of the footings. Pockets of fill, soft or loose soils detected during compaction of the subgrade should be removed and replaced with structural fill.

Structural fill should be placed up to required grades in 8-inch maximum loose lifts, at the moisture content optimum for compaction, and compacted to at least 95 percent modified Proctor (ASTM D 1557) maximum dry density under the building and 90 percent density in the pavement and exterior slab areas.

Structural fill to bring excavations to desired grades should consist of on-site or similar material, free of organics and other deleterious materials. All imported fill should be approved by the Geotechnical Engineer for the project prior to its delivery to the site. In general, imported fill should contain not less than 20 percent fines (material passing the No. 200 sieve, based on the minus 3/4-inch fraction), should be well graded, and should have a maximum particle size of 1.5 inches. The plasticity index of the fines should not exceed 15 and the liquid limit should not exceed 35.

We recommend using a vibratory roller with a minimum drum weight of 4,000 pounds to compact the natural subgrade and subsequent fill lifts. Vibratory rollers should not be permitted within 150 feet of existing building

Utility trenches should be backfilled with compacted fill. Backfill material should be placed in lift thicknesses appropriate to the type of compaction equipment utilized and compacted to a minimum degree of compaction of 88 percent by mechanical means. In pavement areas that portion of the trench backfill within the pavement section should conform to the material and compaction requirements of the adjacent pavement section.

All site grading and fill operations should be observed by a representative from SES to determine the adequacy of site preparation, the suitability of fill materials, and compliance with compaction requirements. Further, the site should be inspected immediately after the completion of the excavation for the foundation and pavement areas to possibly identify prior fill areas or unexpected soil conditions that may underlie the site.

FOUNDATION RECOMMENDATIONS

Spread footings placed on re-compacted native soils or structural fill should provide adequate support for the proposed structure. The following design and construction details should be observed:

1. Footings on the native soils or structural fill should be designed for a maximum soil pressure of 1,800 psf. This may be increased by one-third for short-term transient wind and seismic loads. Under this pressure the total footing settlement is expected to be about 1 inch. The differential settlement between adjacent footings or for a 25-foot span of continuous wall footing should be about 0.5 inch.
2. Continuous (wall) and individual (column) footings should be at least 18 and 24 inches wide, respectively, and should be placed a minimum of 2 feet below the lowest adjacent final grade.
3. All exterior footings should be placed below frost depth.
4. Structural fill should extend a minimum one-half footing width or fill depth, whichever is greater, outside the footing perimeter.
5. Continuous foundation walls should be adequately reinforced both top and bottom. As a guide, we suggest an amount of steel equivalent to that required for a simply supported span of 15 feet.

FLOOR SLABS

The interior floor slabs will likely be on structural fill. Four inches of free-draining gravel should be placed underneath the slabs to distribute floor loads and equalize moisture conditions. The native soils should be saturated and compacted to a firm, non-yielding surface prior to gravel base placement. The slabs should be provided with frequent joints to minimize damage due to shrinkage cracking. Further, the slabs should be adequately reinforced for loading conditions utilized by the space. The slabs should be fully ground supported and separated from all bearing walls and partitions with a slip joint.

PAVEMENT

We recommend a pavement section consisting of 3 inches of asphaltic concrete and 8 inches of high quality base material in drive areas. This recommendation assumes the subgrade material below the base will consist of at least 12 inches of well-compacted imported sand and/or gravel sand subbase and assumes low volume, light vehicular loading. Compaction of the subbase should be to a minimum of 95 percent of modified Proctor maximum dry density (ASTM D 1557).

BACKFILL AROUND THE BUILDING

The on-site native soils may be used as backfill around the building. The backfill should be free of organics and other deleterious materials and should be moistened, placed in maximum 8-inch loose lifts, and compacted to at least 88 percent of the maximum dry density as determined by ASTM D1557.

SURFACE DRAINAGE

Adequate surface drainage must be maintained during the course of construction and after construction has been completed. Backfill against the exterior face of footings and foundation walls should be moistened and compacted to at least 88 percent of the maximum dry density as determined by the ASTM D1557-78 method. The ground surface surrounding the exterior of the buildings should be sloped to drain away from the building in all directions. We recommend a minimum slope of 6 inches in the first 10 feet. Roof downspouts should discharge into splash blocks extended beyond the limits of all backfill. All sprinkler heads should be aimed away and kept at least 2 feet from the foundation walls.

CONSTRUCTION INSPECTION

There is the possibility that variations in soil conditions will be encountered during construction. In order to permit correlation between the preliminary soil data and the actual soil conditions encountered during construction and to insure conformance with the plans and specifications as originally contemplated, it is recommended that the soil and foundation engineer be retained to perform continuous construction review during construction of the excavation and foundation phases of the work.

LIMITATIONS

The analysis and recommendations submitted in this report are based upon the data obtained from five (5) test pits excavated at the location of the proposed structure as indicated on Figure A-2. The nature and extent of variations may not become evident until the course of construction and are sometimes sufficient to necessitate changes in the designs; thus, it is important that we observe subsurface materials exposed in the excavations to take advantage of all opportunities to recognize differing conditions, which would affect the performance of the facility being planned.

This report has been prepared in order to assist the architect and engineer in the design of this project. In the event that any changes are planned in the design, location or elevation of the building as outlined in this report, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or approved in writing by the geotechnical engineer. We also recommend that final plans and specifications be reviewed by our office to evaluate whether our recommendations were properly understood and implemented.

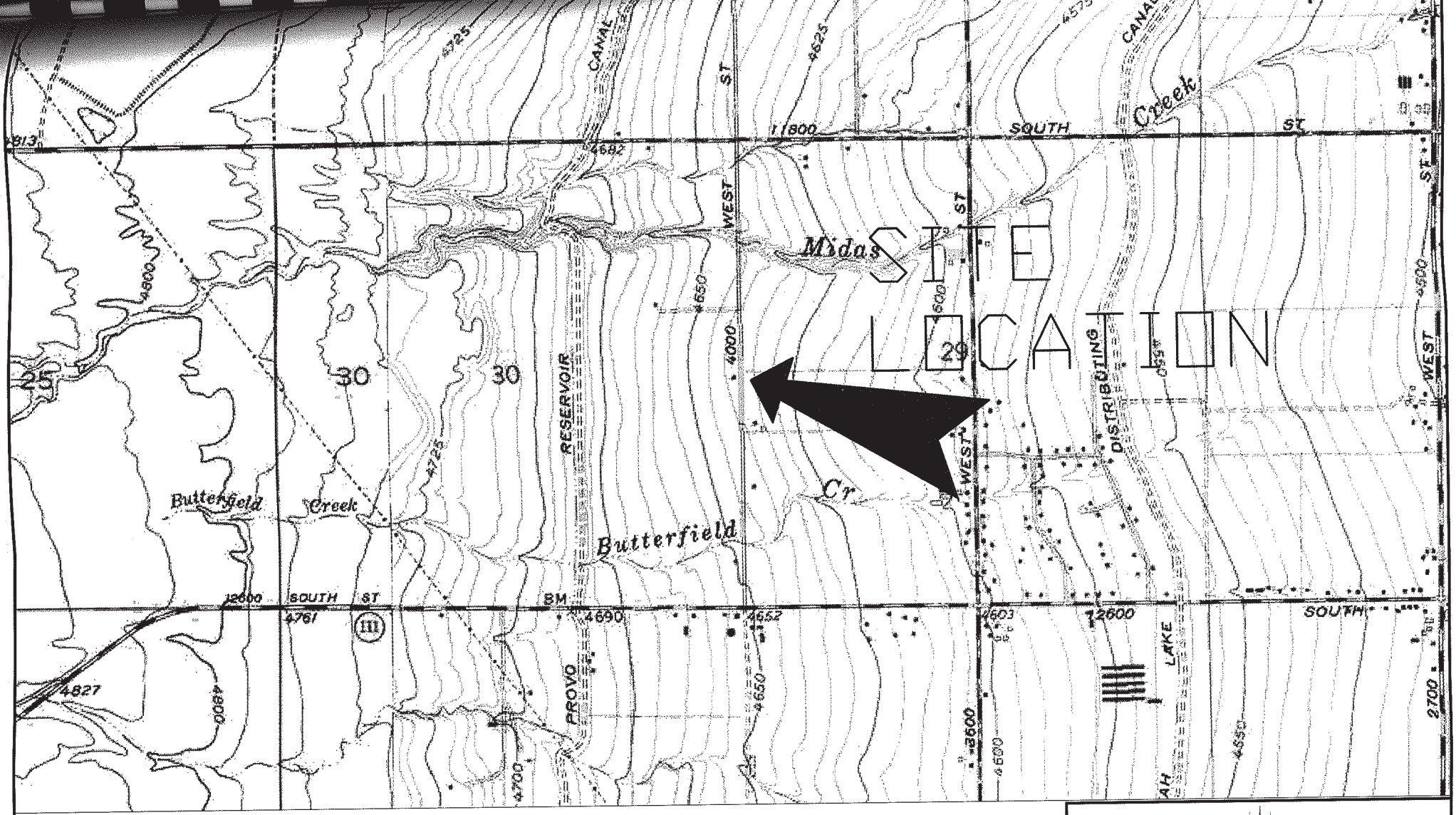
The report should be available to prospective contractors for information on technical data only as interpreted from the test pits and not as a warranty of subsurface conditions.

APPENDIX A

Figure A-1	Vicinity Map
Figure A-2	Site Plan Showing Test Pit Locations
Figures A-3 through A-7	Logs of Test Pits
Figure A-8	Key to Test Pits

FIELD EXPLORATION

Our field exploration consisted of the excavation, logging, and sampling of five (5) test pits. Locations of the test pits are shown on Figure A-2. Both disturbed and undisturbed samples were taken at selected intervals, sealed and returned to our laboratory for classification and testing. A continuous log of the subsurface conditions as encountered in the test pits was kept during the fieldwork. Ms. Jody Udell of our office supervised the excavation and sampling operations. The test pits were excavated by Skyline Contractors of Salt Lake City, Utah.

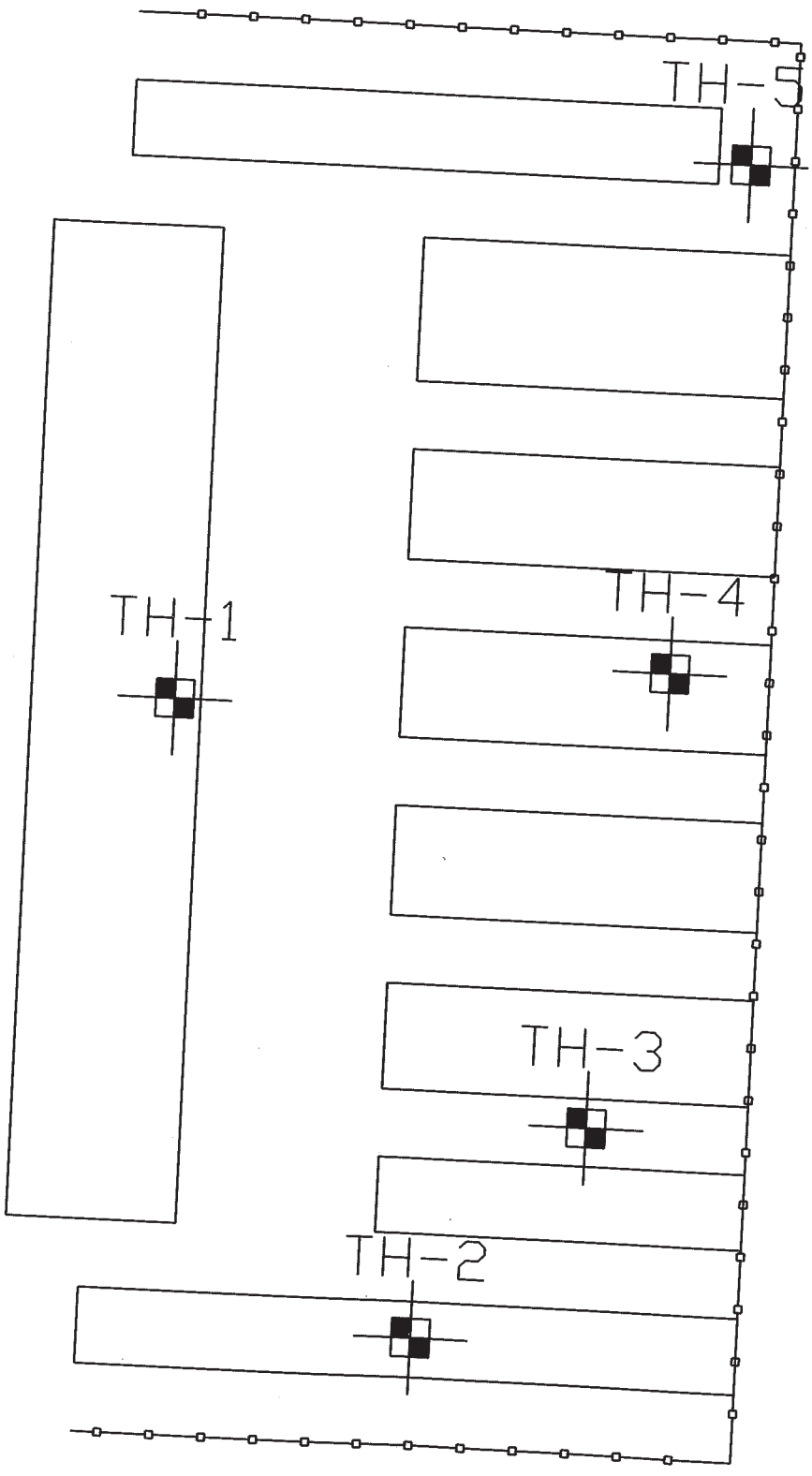


NO SCALE

SES
Summit Engineering Services, Inc.

SITE VICINITY MAP
EMPIRE STORAGE
4000 WEST 12311 SOUTH
WEST JORDAN, UTAH

G-1661	FIGURE A-1



NO SCALE

SES
Summit Engineering Services, Inc.

EMPIRE STORAGE
4000 WEST 12311 SOUTH
WEST JORDAN, UTAH

G-1661

FIGURE A-2

Summit Engineering Services, Inc.
3640 South 500 West
Salt Lake City, Utah 84115
Telephone: 801 261 2800
Fax: 801 261 2801

TEST PIT NUMBER TP-1

CLIENT Richard Gallagher
PROJECT NAME Empire Storage
PROJECT NUMBER G-1661
PROJECT LOCATION Riverton, Utah
DATE STARTED 3/26/07 **COMPLETED** 3/26/07
GROUND ELEVATION _____ **TEST PIT SIZE** 2 ft by 8 ft
EXCAVATION CONTRACTOR Client supplied backhoe
GROUND WATER LEVELS:
EXCAVATION METHOD Excavation
AT TIME OF EXCAVATION ---
LOGGED BY JU **CHECKED BY** CS
AT END OF EXCAVATION ---
NOTES _____
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
						TOPSOIL: silt, sand and gravel with organics
0.5						SILT (ML), loose, moist, tan
2	S-1	100	MC=30% DD=88pcf	ML		
4			MC=32%			
5.0						
				SW		SAND (SM), fine grained, silty, slightly cemented, porous structure, moist, tan
6	S-2	100	MC=16%			
6.0						SILT (ML), medium dense, moist, brown to reddish brown
8				ML		
10	S-3	100				
12						
12.0						Bottom of test pit at 12.0 feet.

JOB NO. G-1661

FIGURE A-3

Summit Engineering Services, Inc.
3640 South 500 West
Salt Lake City, Utah 84115
Telephone: 801 261 2800
Fax: 801 261 2801

TEST PIT NUMBER TP-2

CLIENT Richard Gallagher
PROJECT NAME Empire Storage
PROJECT NUMBER G-1661
PROJECT LOCATION Riverton, Utah
DATE STARTED 3/26/07 **COMPLETED** 3/26/07
GROUND ELEVATION _____ **TEST PIT SIZE** 2 ft by 8 ft
EXCAVATION CONTRACTOR Client supplied backhoe
GROUND WATER LEVELS:
EXCAVATION METHOD Excavation
AT TIME OF EXCAVATION ---
LOGGED BY JU **CHECKED BY** CS
AT END OF EXCAVATION ---
NOTES _____
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
						0.3 TOPSOIL: silt, sand and gravel with organics
2				ML		SILT (ML), loose, moist, tan
	S-1	100	MC=9%			
4						
	S-2	100	MC=13%			
						5.0
6						SILT (ML), sandy, occasional gravels, medium dense, moist to dry, reddish tan
	S-3	100				
8				ML		
10						10.0
	S-4	100	MC=16%			
12						Bottom of test pit at 12.0 feet.

GENERAL BH / TP / WELL G-1661.GPJ GINT US.GDT 4/27/07

JOB NO. G-1661

FIGURE A-4

Summit Engineering Services, Inc.
3640 South 500 West
Salt Lake City, Utah 84115
Telephone: 801 261 2800
Fax: 801 261 2801

TEST PIT NUMBER TP-3

CLIENT Richard Gallagher
PROJECT NAME Empire Storage
PROJECT NUMBER G-1661
PROJECT LOCATION Riverton, Utah
DATE STARTED 3/26/07 **COMPLETED** 3/26/07
GROUND ELEVATION _____ **TEST PIT SIZE** 2 ft by 8 ft
EXCAVATION CONTRACTOR Client supplied backhoe
GROUND WATER LEVELS:
EXCAVATION METHOD Excavation
AT TIME OF EXCAVATION ---
LOGGED BY JU **CHECKED BY** CS
AT END OF EXCAVATION ---
NOTES _____
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
2						FILL: silt, over poorly graded, well rounded, pea gravel and some 3/4 inch, gravel
4	S-1	100	MC=19%			
6	S-2	100	MC=2%			6.0
8	S-3	100	MC=4%	ML		SILT (ML), medium dense, moist, brown to reddish brown
10						
12	S-4	100	MC=19%			12.0
						Bottom of test pit at 12.0 feet.

GENERAL BH / TP / WELL G-1661.GPJ GINT US.GDT 4/27/07

JOB NO. G-1661

FIGURE A-5

Summit Engineering Services, Inc.
3640 South 500 West
Salt Lake City, Utah 84115
Telephone: 801 261 2800
Fax: 801 261 2801

TEST PIT NUMBER TP-4

CLIENT Richard Gallagher
PROJECT NAME Empire Storage
PROJECT NUMBER G-1661
PROJECT LOCATION Riverton, Utah
DATE STARTED 3/26/07 **COMPLETED** 3/26/07
GROUND ELEVATION _____ **TEST PIT SIZE** 2 ft by 8 ft
EXCAVATION CONTRACTOR Client supplied backhoe
GROUND WATER LEVELS:
EXCAVATION METHOD Excavation
AT TIME OF EXCAVATION ---
LOGGED BY JU **CHECKED BY** CS
AT END OF EXCAVATION ---
NOTES
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
2						FILL: silt, over sand and gravel
	S-1	100				
4						
	S-2	100	MC=3%			
						4.5
6						SILT (ML), medium dense, moist, brown to reddish brown
8						
	S-3	100	MC=30%	ML		
	S-4	100				
10						
	S-5	100	MC=18%			
12						12.0
						Bottom of test pit at 12.0 feet.

JOB NO. G-1661

FIGURE A-6

Summit Engineering Services, Inc.
3640 South 500 West
Salt Lake City, Utah 84115
Telephone: 801 261 2800
Fax: 801 261 2801

TEST PIT NUMBER TP-5

ENT Richard Gallagher
OJECT NUMBER G-1661
TE STARTED 3/26/07 COMPLETED 3/26/07
CAVATION CONTRACTOR Client supplied backhoe
CAVATION METHOD Excavation
GGED BY JU CHECKED BY CS
TES

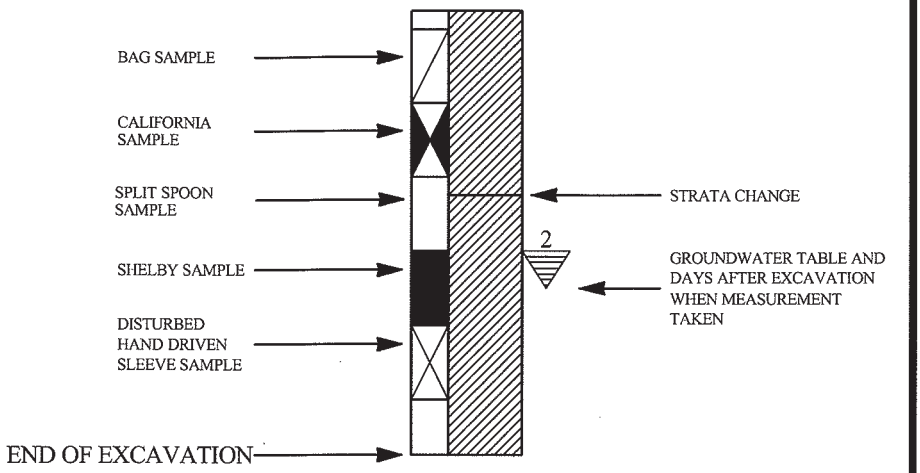
PROJECT NAME Empire Storage
PROJECT LOCATION Riverton, Utah
GROUND ELEVATION ____ TEST PIT SIZE 2 ft by 8 ft
GROUND WATER LEVELS:
AT TIME OF EXCAVATION ---
AT END OF EXCAVATION ---
AFTER EXCAVATION ---

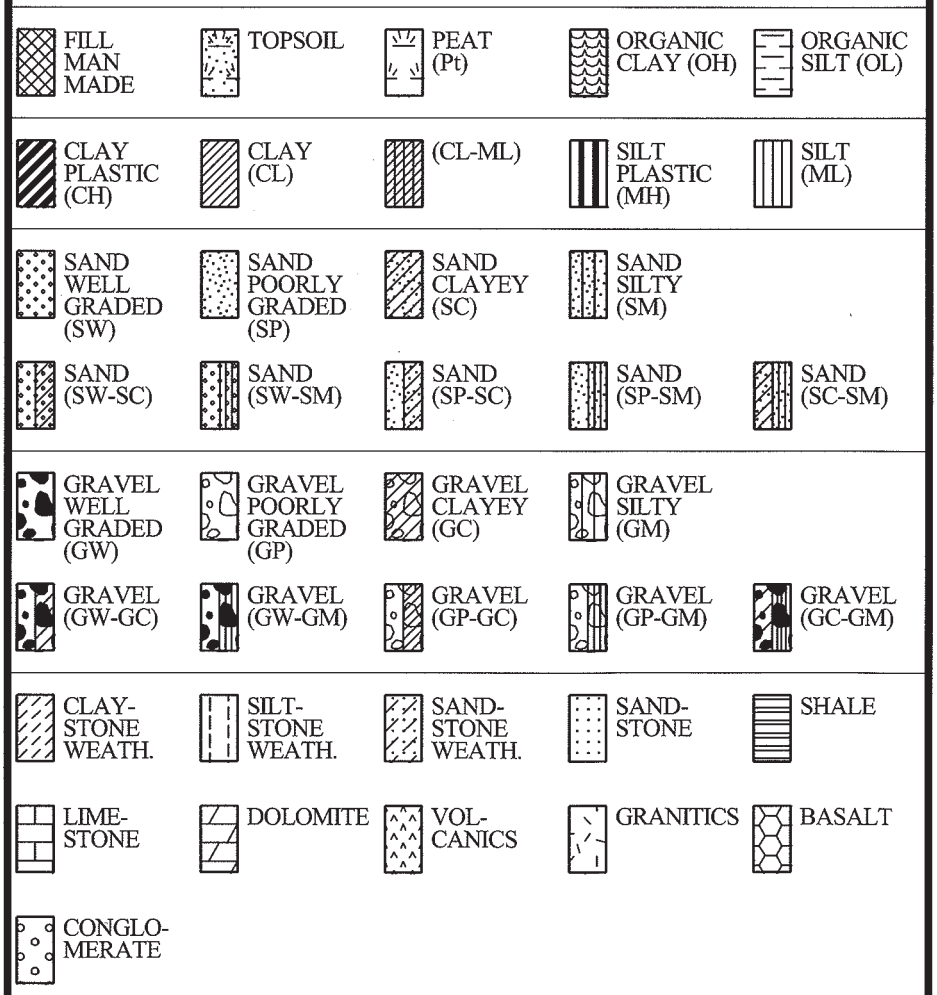
(ft)	SAMPLE TYPE NUMBER	RECOVERY %	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
						FILL: silt, over sand and gravel
					1.5	
	S-1	100	MC=22% DD=79pcf	ML		SILT (ML), medium dense, moist, brown to reddish brown
					6.0	
	S-3	100	MC=17%	SM		SAND (SM), fine grained, silty, medium dense, moist,
					6.5	
				ML		SILT (ML), medium dense, moist, brown to reddish brown
					10.0	
	S-4	100		SP		SAND (SP), some gravel, medium dense, moist, reddish tan
					12.0	
						Bottom of test pit at 12.0 feet.

JOB NO. G-1661

FIGURE A-7

KEY TO TEST HOLE/TEST PIT





CONSISTENCY (CLAY)

	SHEAR STRENGTH (psf)	BLOWS /FOOT
VERY SOFT	<250	<2
SOFT	250 - 500	2 - 4
MED. STIFF	500 - 1000	4 - 8
STIFF	1000 - 2000	9 - 15
VERY STIFF	2000 - 4000	16 - 30
HARD	>4000	>30

RELATIVE DENSITY (SAND & SILT)

	BLOWS/FOOT
VERY LOOSE	<4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	>50

ABBREVIATIONS

LL - LIQUID LIMIT (%)
PI - PLASTIC INDEX (%)
W - MOISTURE CONTENT (%)
DD - DRY DENSITY (PCF)
NP - NONPLASTIC
-200 - PERCENT PASSING NO. 200 SIEVE

phi - ANGLE OF INTERNAL FRICTION
C - COHESION (PSF)
p - HAND PENETROMETER (TSF)

NOTES:
1. The soils have been classified in accordance with the Unified Soil Classification System.
2. The test pits were excavated on 3/26/07 by a backhoe supplied by Skyline C
3. Free water was not encountered in any of the test pits.

JOB NO. G-1661

FIGURE A-8

APPENDIX B

Table B-1 Laboratory Test Results

Figure B-1 through B-2 Swell-Consolidation Test Results

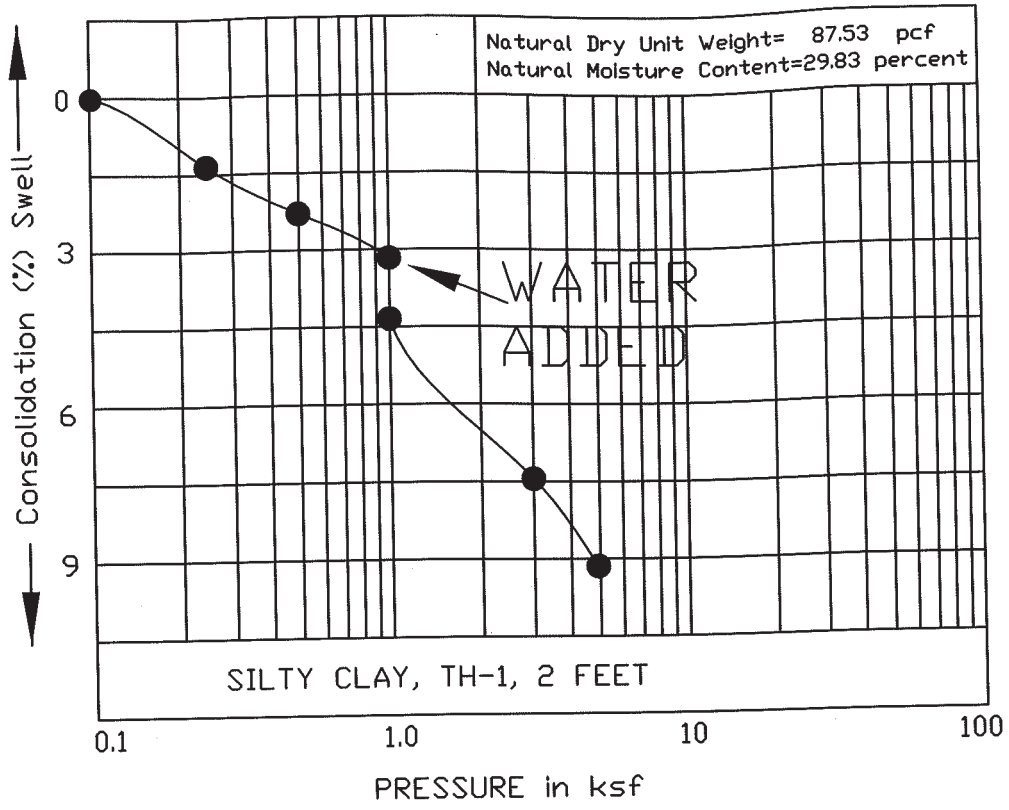
LABORATORY TESTING PROCEDURES

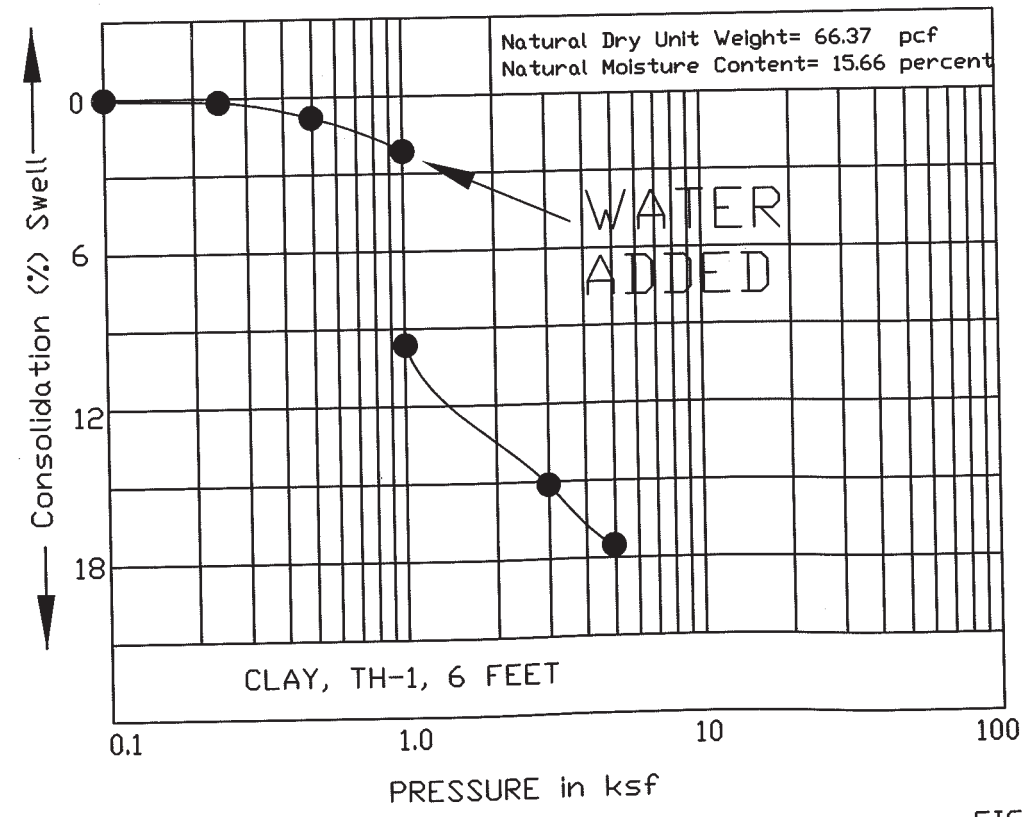
The soil samples obtained from our exploration test pits were identified in the laboratory to confirm field classification. Laboratory tests conducted included natural moisture and density and swell-consolidation tests. All tests were conducted in accordance with ASTM standards.

TABLE B – 1

SUMMARY OF LABORATORY TEST RESULTS

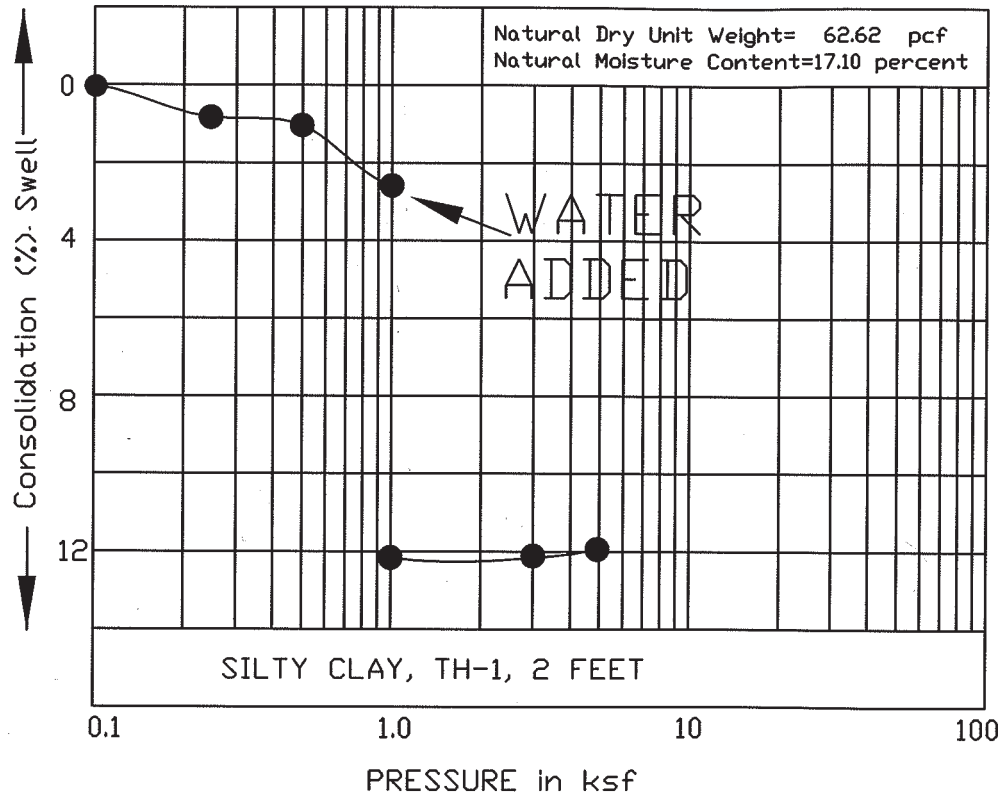
TEST HOLE NO.	DEPTH (FT.)	NATURAL MOISTURE (%)	NATURAL DRY DENSITY (PCF)	GRAIN SIZE DISTRIBUTION (%)			ATTERBERG LIMITS		UNCONFINED COMPRESSION STRESS (KSF)	SWELL-CONSOLIDATION			SOIL TYPE
				GRAVEL > #4	SAND	SILT/ CLAY < #200	LIQUID LIMIT	PLASTIC INDEX		SWELL (%)	COLLAPSE (%)	PRESS (KSF)	
TH-1	2	30	88								1.5	1.0	ML
TH-1	6	16	66								6.0	1.0	ML
TH-2	2	9											ML
TH-2	4	13											ML
TH-2	10	16											ML
TH-3	2	19											
TH-3	4	2											
TH-3	6	4											ML
TH-3	10	19											ML
TH-4	4	3											
TH-4	8	30											ML
TH-4	12	18											ML
TH-5	2	22	79										ML
TH-5	6	17	67										SM





JOB NO. G-1661

FIGURE B-1



JOB NO. G-1661

FIGURE B-2