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GEOTECHNICAL STUDY
RESIDENTIAL SUBDIVISION
100 WEST 1900 SOUTH
LEHI, UTAH

Prepared By:

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Job No. 050582

Prepared for:

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April 7, 2005

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FIGURES

TABLES

1.0 INTRODUCTION

This report presents the results of a geotechnical study for a proposed residential development to be located at approximately 1900 South 100 West in Lehi, Utah. The general location of the site is shown on Figure No. 1, *Vicinity Map*, at the end of this report.

The purposes of this study were to 1) evaluate the subsurface soil conditions at the site, 2) assess the engineering characteristics of the subsurface soils, and 3) to provide geotechnical recommendations for general site grading and the design and construction of foundations, concrete floor slabs, miscellaneous concrete flatwork, and asphalt pavement sections. The scope of work completed for this study included field reconnaissance, subsurface investigation, field and laboratory soil testing, engineering analysis, and the preparation of this report.

2.0 CONCLUSIONS

The following is a brief summary of our findings and conclusions:

1. Below approximately 12 inches of topsoil are layers of Clay (CL), Silt (ML), and Sand (SP, SM) extending to the maximum depths explored of about 16½ to 31½ feet below the existing grade.

2. Groundwater was encountered in the test holes at depths of approximately ½ to 4 feet below the existing surface. These depths may not reflect the static groundwater levels at the site. Groundwater levels will limit the feasability of basements within this development.

3. Another potential problem associated with high groundwater is liquefaction. Loose, saturated sands, and soft sensitive silts have a potential to liquefy during an earthquake. We encountered both of these types of soil conditions within the depths explored. The potential for liquefaction to occur at this site is high.

4. Foundations may be constructed entirely on undisturbed native soils, or entirely on a minimum of 18 inches of properly placed and compacted structural fill placed on undisturbed native soil. A maximum bearing capacity of 1,500 psf may be used for design of the footings on the native soils. More details regarding foundation design can be found in Section 10.0 of this report.

3.0 PROPOSED CONSTRUCTION

It is our understanding that the site will be developed as a single family residential subdivision consisting of 18 lots. We estimate that foundation loads for the proposed structures will not exceed 3 kips per linear foot for bearing walls and 150 pounds per square foot for floor slabs. If structural loads will be greater our office should be notified so that we may review our recommendations and, if necessary, make modifications.

In addition to the structures described above, we anticipate that utilities will be installed to service the proposed residences, that exterior concrete flatwork will be placed in the form of curb, gutter, sidewalks, and driveways, and that asphalt concrete paved residential streets will be constructed.

4.0 GENERAL SITE DESCRIPTION

At the time of our subsurface investigation the site was a horse pasture. Vegetation was composed of grasses and weeds. Site grade was fairly flat with a slight slope downward to the south. The area is bounded on the north by a field, on the south by 1900 South street, and on the east and west by residences.

5.0 SUBSURFACE INVESTIGATION

Under the direction of a qualified member of our geotechnical staff, a subsurface investigation was conducted at the site on March 23, 2005, by drilling four exploratory test holes to approximate depths of 16½ to 31½ feet below the existing ground surface using an all-terrain hydraulic drill rig. The approximate locations of the test holes are shown on Figure No. 2 at the end of this report.

Hollow stem augers were used during drilling which allowed the collection of both disturbed and relatively undisturbed samples of native soils below the augers at intervals of 2½ to 5 feet in each of the test holes. Disturbed samples were collected with a 2 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 blow count, or "N-value", and is recorded on the attached test hole logs at the respective sample depths. Relatively undisturbed samples were collected using thin walled "Shelby"tubes hydraulically pushed into the soil below the augers. The soil samples collected were classified by visual examination in the field using the guidelines of the Unified Soil Classification System (USCS). Samples will be retained in our laboratory for 30 days following the date of this report and then discarded unless a written request for additional holding time is received prior to the disposal date.

6.0 LABORATORY TESTING

Selected soil samples were tested in the laboratory to assess pertinent engineering properties and to aid in refining field classifications, if needed. Laboratory testing consisted of natural moisture content and dry density tests, Atterberg limits determinations, one dimensional consolidation tests, and mechanical gradation analyses. The following table summarizes the results of the laboratory testing. Test results are also given on the enclosed test hole logs at the respective sample depths, and on Figure No. 7, *Consolidation-Swell Test*, at the end of this report. California Bearing Ratio (CBR) tests were also conducted to aid in pavement design, with the results of the CBR tests are presented in Section 14.0.

Table No. 1: Laboratory Test Results

TEST HOLE 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	
TH-1	2½	14	115	31	14	---	---	---	CL
TH-1	7½	20	---	---	---	2	67	31	SM
TH-2	5	30	92	28	11	---	---	---	CL
TH-2	10	28	---	---	---	0	31	69	ML
TH-3	7½	26	100	27	3	---	---	---	ML

7.0 SUBSURFACE CONDITIONS

7.1 Soil Types

The surface of the site was covered with clay topsoil, which we estimated to extend approximately 12 inches in depth at the test hole locations. Underlying the topsoil, layers of Lean Clay (CL) predominate, with a few interbedded layers of Silt (ML), Silty Sand (SM), and Poorly Graded Sand (SP) extending to the maximum depths explored of about 16½ to 31½ feet below the existing surface.

Graphical representations and detailed descriptions of the soils encountered are shown on Figure Nos. 3 through 6, *Drill Hole Log* at the end of this report. The stratification lines shown on the logs represent the approximate boundary between soil units, the actual transition may be gradual. Due to potential natural variations inherent in soil deposits, care should be taken in interpolating between and extrapolating beyond exploration points. A key to the symbols and terms on the logs is presented on Figure No. 7, *Key to Symbols.*

7.2 Groundwater Conditions

Groundwater was encountered at depths as shallow as approximately 6 inches to about 4 feet below the surface. The native clay soils transmit water much more slowly than more granular soils such as sand and gravel, and groundwater levels may have risen if the drill holes were allowed to remain open for several hours. Additionally, the state has experienced several years of below normal precipitation and current groundwater levels at the site may not reflect normal levels. Groundwater levels will fluctuate in response to the season, precipitation and snow melt, irrigation, and other on and off-site influences. Precisely quantifying these fluctuations would require long term monitoring.

8.0 SITE GRADING

8.1 General Site Grading

Unsuitable soils and vegetation should be removed from below areas which will ultimately support structural loads. These areas include those below foundations, floor slabs, exterior concrete flatwork, and pavements. Unsuitable soils consist of topsoil, organic soils, undocumented fill, soft, loose, or disturbed native soils, and any other inapt materials. Topsoil was estimated to extend up to approximately 12 inches in depth. The topsoil, even if found to extend deeper than 12 inches, along with any other unsuitable soils, should be completely removed.

On-site soils will not meet our recommendations for structural fill, and should not be used as structural fill. Excavated soils may be stockpiled for use as fill in landscape areas.

8.2 Temporary Excavations

For temporary excavations less than 5 feet in depth into the native soils or into structural fill, slopes should not be made steeper than 0.5:1.0 (horizontal:vertical). Temporary excavations extending up to 10 feet in depth should not be made steeper than 1:1. Unstable conditions or groundwater seepage may be encountered and flatter slopes or shoring or bracing may be required. Utility excavations will likely encounter groundwater.

8.3 Fill Material

Regular structural fill, if needed, should consist of imported material meeting the following requirements:

Maximum particle size:	4 inches
Percent retained on the 3/4 inch sieve (coarse gravel):	30 maximum
Percent passing the No. 200 sieve (fines):	15 maximum
Liquid Limit of fines:	35 maximum
Plasticity Index of fines:	15 maximum

In some situations, particles larger than 4 inches and/or more than 30 percent coarse gravel may be acceptable, however, compaction and compaction testing may be more difficult. As a result more strict quality controls measures than normally used may be required. Such measures may include using thinner lifts, and increased or full time observation of fill placement.

Utility trenches may be backfilled with the native soil or structural fill. If native soil that is predominantly fine grained (clay or silt) is used, it may be difficult and time consuming to adjust the moisture content and obtain the required compaction. All backfill soil should meet the following requirements:

Maximum particle size:	4 inches
Liquid Limit of fines:	35 maximum
Plasticity Index of fines:	15 maximum

Fill in submerged areas, such as may be encountered in utility trenches, should consist of free draining granular material (sand and/or gravel) meeting the following requirements:

Maximum particle size:	3 inches
Percent passing the No. 10 sieve:	25 maximum

Percent passing the No. 40 sieve:	15 maximum
Percent passing the No. 200 sieve (fines):	5 maximum

Three inch minus washed rock (sometimes called river rock or drain rock) and pea gravel typically 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, precautions should be taken to prevent the migration of fine soil into the free draining fill. Such precautions may include placing a filter fabric between the free draining fill and the adjacent material, or to use a well graded, free draining fill material approved by the geotechnical engineer.

8.4 Fill Placement and Compaction

The thickness of each lift should be appropriate for the compaction equipment that is used. We recommend a maximum lift thickness 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 areas not supporting structural loads:	90%
Less than 5 feet of fill below foundations, flatwork and pavements:	95%
Five or more feet of fill below foundations, flatwork and pavements:	98%

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

We recommend that fill be tested frequently during placement. Early testing is recommended to demonstrate that placement and compaction methods are achieving the required compaction.

It is the contractor's responsibility to ensure that fill materials and compaction efforts are consistent so that tested areas are representative of the entire fill.

8.5 Stabilization

The clay and silt soils at the site are susceptible to rutting and pumping. 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 and/or partial loads, by working in dry times of the year, or by providing a working surface for equipment.

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 18 inches. Removal and replacement to a greater depth may be required.

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. The more angular and coarse the material, the thinner the lift that will be required. 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 less than 15.

Using a geosynthetic fabric 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 18 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 CONSIDERATIONS

9.1 Faulting

No surficial evidence of faulting was observed during our field investigation and no faults are mapped in the immediate vicinity. The nearest mapped[1] fault trace is part of a group of faults located beneath the northern tip of Utah Lake and is approximately 1¼ miles southeast of the site. The Wasatch fault is located approximately 6½ miles east-northeast of the site.

9.2 Liquefaction Potential

The site is located within an area which has been mapped by the Utah Geological Survey[2] as having high liquefaction potential. Liquefaction is a phenomenon where a soil loses intergranular strength due to an increase in soil pore water pressures during a dynamic event such as an earthquake. The potential for liquefaction is based on several factors, including 1) the grain size distribution of the soil, 2) the plasticity of the fine fraction of the soil (material passing the No. 200 sieve), 3) relative density of the soil, 4) earthquake strength (magnitude) and duration, and 5) overburden pressures. In addition, the soils must be saturated for liquefaction to occur. As a part of this investigation, the potential for liquefaction to occur in the soils we observed was assessed

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[1]Hecker, S., 1993, Quaternary Faults and Folds, Utah, Utah Geologic Survey, Bulletin 127.

[2]Liquefaction Potential Map, Utah Geological Survey, Public Information Series 28. 1994.

Loose, saturated sands are most susceptible to liquefaction, but soft, sensitive silt soils also have the potential to experience failure and movement during a seismic event. Sensitive silt layers typically exhibit moisture contents much higher than the liquid limit. Loose sand layers and potentially sensitive silt layers were encountered in the drill holes. We estimate these layers to have high liquefaction potential at horizontal ground accelerations of 0.13 to 0.16 g. A peak horizontal ground acceleration of 0.17 g has a 10% probability of being exceeded in 50 years according to the U.S. Geological Survey. We estimate that as much as 2 inches of additional settlement could occur as a result of liquefaction.

9.3 IRC Seismic Design Category

The Seismic Design Categories in the International Residential Code (IRC) are based upon the short period design accelerations determined using the seismic provisions of the International Building Code (IBC) and the soil properties in the upper 100 feet of the soil profile. These properties are determined from SPT blow counts and undrained shear strength measurements. The IBC code also states that "Where site specific data are not available to a depth of 100 feet, appropriate soil properties may be estimated by the registered design professional preparing the soils report...." The code requires that sites where potentially liquefiable soils exist be designated as Site Class F. A Site Class F designation requires a site specific seismic evaluation to determine appropriate seismic design values of Fa and Fv. A site specific evaluation is typically conducted with a seismic cone penetration test. We can arrange for this test to be conducted, however it would require additional time and significant additional expense.

The site is located at approximately 40.37 degrees latitude and -111.85 degrees longitude, with $S_S = 1.21$ g. Without a site specific evaluation, we estimate Fa to be 0.9 and $S_{DS} = 0.73$. The Seismic Design Category is D_1.

10.0 FOUNDATIONS

10.1 General

The foundation recommendations presented in this report are based on the soil conditions encountered at the site, the results of laboratory testing 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 are significantly different, we should be notified in order to re-evaluate our design parameters and estimates, and to provide additional recommendations if necessary.

Foundations should not be installed on topsoil, undocumented fill, debris, combination soils, frozen soil, or in ponded water. Foundations may be constructed entirely on undisturbed, uniform native soils, or entirely on a minimum of 18 inches of properly placed and compacted structural fill placed on undisturbed native soils. If foundation soils become disturbed during construction they should be recompacted to the requirements for structural fill presented in this report. For design of conventional strip and spread footings, the following parameters are recommended:

Minimum embedment for frost protection:	30 inches
Minimum strip footing width:	20 inches
Minimum spot footing width:	30 inches
Maximum allowable net bearing pressure:	1,500 psf
Bearing pressure increase for transient loading:	33 percent

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.

10.2 Estimated Settlement

If the proposed foundations are properly designed and constructed using the parameters provided above, total settlement is estimated not to exceed one inch. Differential settlement is anticipated to be one-half of the total settlement over a 25-foot length of foundation. Additional settlement could occur during a seismic event as discussed in Section 9.2.

Note that if grading fill is placed to raise the site grade, settlement may occur due to the weight of the fill. If more than 2 feet of grading fill will be placed, our office should be notified so that proper evaluation and recommendations can be provided.

11.0 FLOOR SLABS

Groundwater was encountered at depths of about 6 inches to 4 feet below the existing surface. Floor slabs should be kept a minimum of 36 inches above the groundwater which, in some instances, may require the site to be built up. We recommend that floor slabs not extend below the existing surface.

To facilitate construction, act as a capillary break, and aid in distributing floor loads we recommend that all at-grade slabs and exterior flatwork be underlain by four inches of free-draining granular material such as "pea" gravel or three-quarters to one-inch minus clean gravel supported on re-compacted native soils or structural fill.

To help control normal shrinkage and stress cracking the floor slabs should have the following features:

1. Adequate reinforcement for the anticipated floor loads with the reinforcement continuous through interior floor joints;
2. Frequent crack control joints; and
3. 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 SUBSURFACE DRAINAGE

According to Section R405 of the 2003 International Residential Code "Drains shall be provided around all concrete or masonry foundations that retain earth and enclose habitable or usable spaces located below grade." An exception is allowed when the foundation is installed on well drained ground consisting of Group 1 soils. These soils include those defined by the Unified Soil Classification System as GW, GP, SW, SP, GM, and SM. The majority of subsurface soils encountered (clay and silts) in the drill holes are not Group 1 soils. If floor slabs will be placed at any depth below the existing surface, foundation drains should be installed.

13.0 MOISTURE CONTROL AND SURFACE DRAINAGE

Precautions should be taken during and after construction to reduce the potential for saturation of foundation soils which could lead to additional settlement. We recommend that the following precautions be taken at this site:

1. 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.**

2. The ground surface should be graded to drain away from the residences in all directions. We recommend a minimum fall of 6 inches in the first 10 feet.

3. 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 structures, whichever is greater.

4. Sprinklers should be aimed away from foundation walls. Sprinkler systems should be well maintained, checked for leaks frequently, and repaired promptly.

5. Any additional precautions which may become evident during construction.

14.0 PAVEMENT DESIGN

We anticipate that residential streets within the development will consist of asphalt pavement. Based on the results of our field exploration, the pavement section will be supported on clay soils. Pavement section design in Lehi City is based upon a tested California Bearing Ratio (CBR) value for the subgrade soils. For this purpose we collected two samples of the subgrade soils below the topsoil. The CBR value obtained from the two tests was approximately 7.

The CBR value may be applied directly to the Lehi City pavement design chart to determine the pavement section. All base material and asphalt should conform to local requirements regarding thickness, gradation, oil content, and any other requirements pertaining to the project. We recommend that all roadbase and subbase be properly processed, moisture conditioned, and compacted to a minimum of 95% of the maximum dry density as determined by ASTM-D 1557. All asphalt should be compacted to a minimum of 95% of the laboratory Marshal mix design density.

Any soft or pumping areas encountered during grading for pavements should be stabilized as recommended in Section 8.5.

15.0 GENERAL CONDITIONS

The exploratory data presented in this report was collected to provide geotechnical design recommendations for this project. The test holes 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 test holes may occur and which may be sufficient to require modifications in the design. If during construction, conditions are different than presented in this report, please advise us so that the appropriate modifications can be made.

The geotechnical study as presented in this report was conducted within the limits prescribed by our client, with the usual thoroughness and competence of the engineering profession in the area. No other warranty or representation, either expressed or implied, is intended in our proposals, contracts or reports.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;

EARTHTEC TESTING AND ENGINEERING, P.C.

Jeffrey J. Egbert, P.E.I.
Project Engineer

REGISTERED PROFESSIONAL ENGINEER
No. 10999
WILLIAM G. TURNER
4/7/05
State of Utah

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

VICINITY MAP

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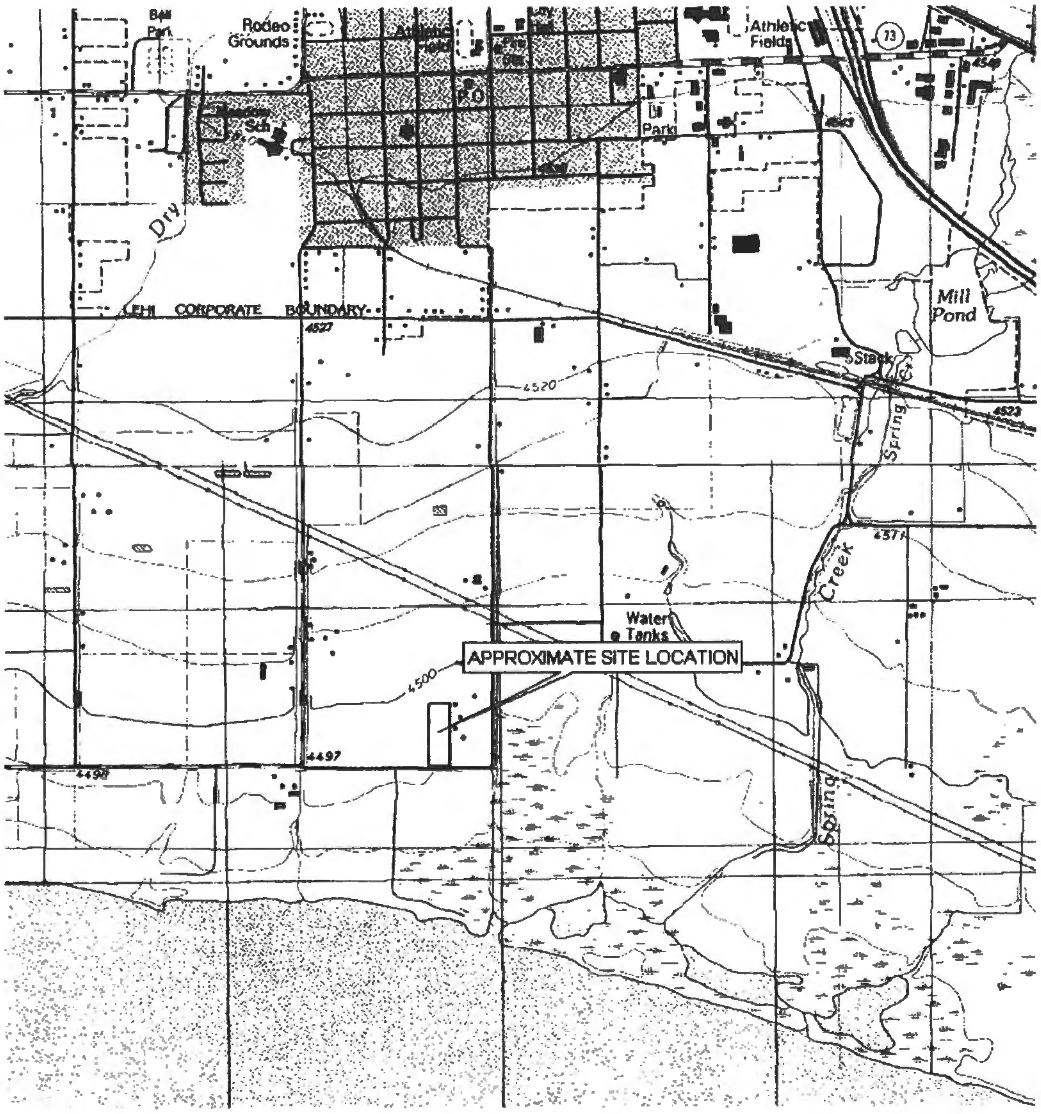

Job No. 050582

Figure No. 1

SITE PLAN AND APPROXIMATE LOCATIONS OF TEST HOLES

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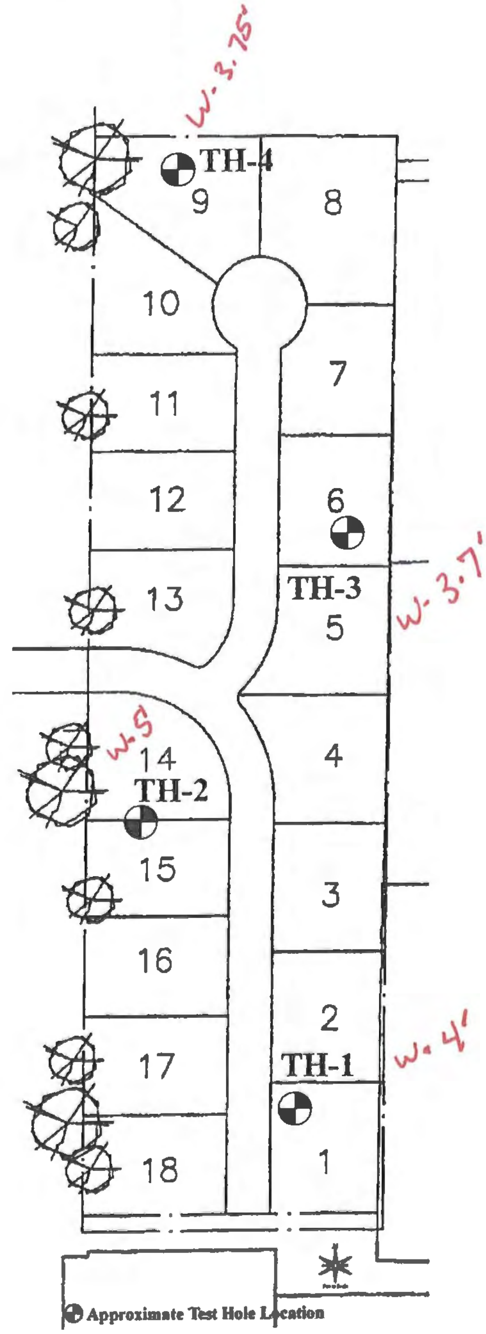


Job No. 050582

Figure No. 2

DRILL HOLE LOG

BORING NO.: TH-1

PROJECT: Lehi Subdivision
CLIENT: Atlas Engineering
LOCATION: Refer to Figure 2.
DRILLER: Earthtech Drilling
DRILL RIG: CME 750 A.T.
DEPTH TO WATER> INITIAL ▽ : 4 ft.

PROJECT NO.: 050582
DATE: 23 Mar 2005
ELEVATION: NM
LOGGED BY: S.G.

AT COMPLETION ▼ :

Depth (ft.)	USCS	DESCRIPTION	Blows/Foot	Dry Dens. pcf	Gravel %	Sand %	Fines %	Other Tests
	TOP	TOPSOIL: Clay, roots and organics, moist, dark brown.						
4	CL	LEAN CLAY, some sand, stiff, moist, gray-brown.		115				C
	CL	LEAN CLAY with sand, stiff, moist, gray.	9					
8	SM	SILTY SAND, trace gravel, medium dense, wet, gray.	11		1	67	32	
12	SP	POORLY GRADED SAND with gravel, medium dense, wet, gray.	17					
16	CL	LEAN CLAY, trace sand, hard, moist, gray-brown.	55					
20, 24		Bottom at approximately 16.5 feet.						

TEST RESULTS: P.L. ├──┤ L.L.; Water Content % – ●; Blow Count – ▨; 10 20 30 40 50

Notes:

Tests Key:
T = Torvane
C = Consolidation
CBR = California Bearing Ratio
DS = Direct Shear
P = Percolation
UC = Unconf. Compress. Strength

Job No.: 050582	EARTHTEC TESTING & ENGINEERING, P.C.	Figure No.: 3

DRILL HOLE LOG

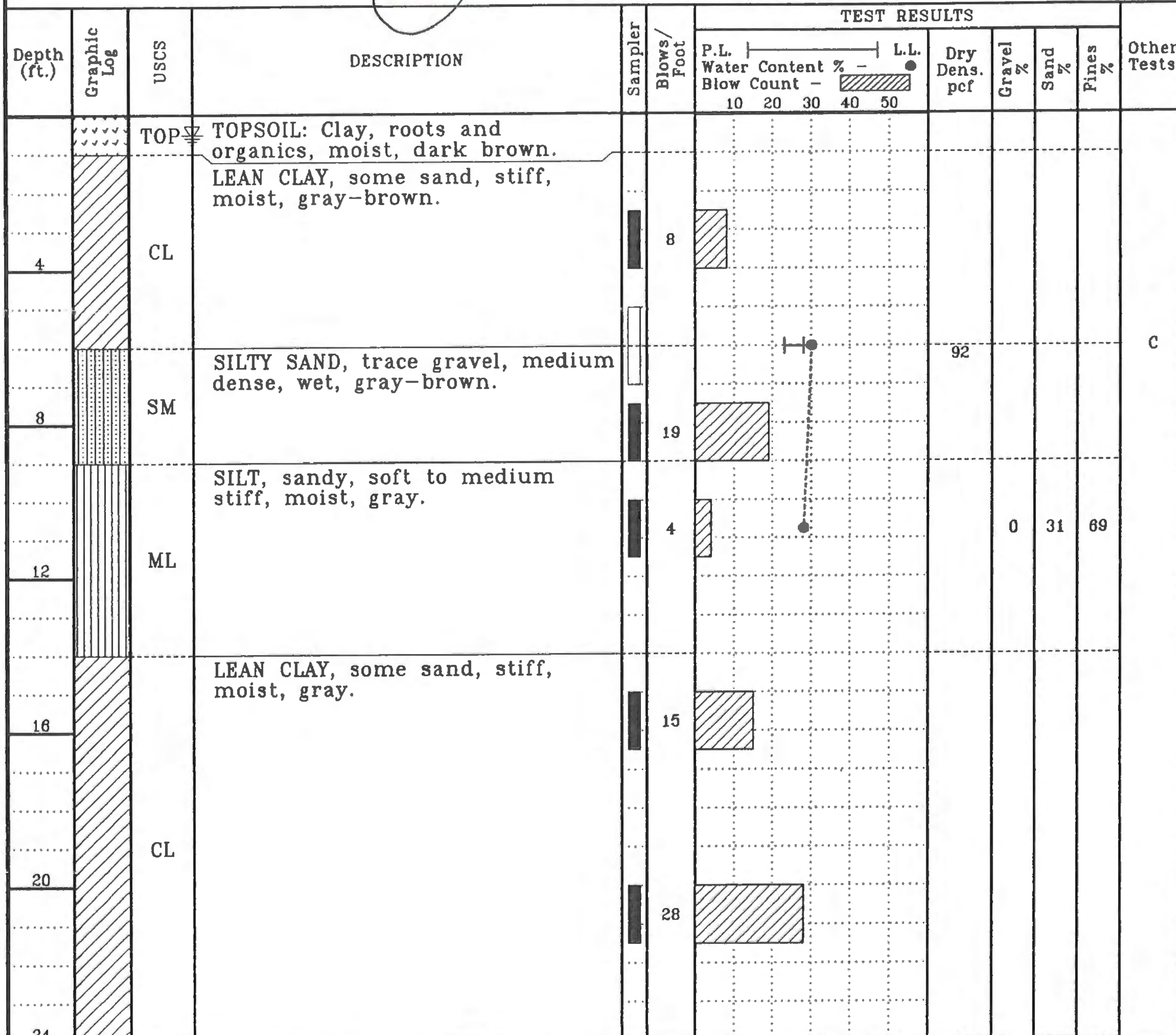
BORING NO.: TH-2

PROJECT: Lehi Subdivision
CLIENT: Atlas Engineering
LOCATION: Refer to Figure 2.
DRILLER: Earthtech Drilling
DRILL RIG: CME 750 A.T.
DEPTH TO WATER> INITIAL ∇ : .5 ft.

PROJECT NO.: 050582
DATE: 23 Mar 2005
ELEVATION: NM
LOGGED BY: S.G.

AT COMPLETION ▼ :

Depth (ft.)	USCS	DESCRIPTION	Blows/Foot	Dry Dens. pcf	Gravel %	Sand %	Fines %	Other Tests
0	TOP ∇	TOPSOIL: Clay, roots and organics, moist, dark brown.						
1–6	CL	LEAN CLAY, some sand, stiff, moist, gray-brown.	8	92				C
6–9	SM	SILTY SAND, trace gravel, medium dense, wet, gray-brown.	19					
9–14	ML	SILT, sandy, soft to medium stiff, moist, gray.	4		0	31	69	
14–24	CL	LEAN CLAY, some sand, stiff, moist, gray.	15, 28					



Notes:

Tests Key:
T = Torvane
C = Consolidation
CBR = California Bearing Ratio
DS = Direct Shear
P = Percolation
UC = Unconf. Compress. Strength

Job No.: 050582 | EARTHTEC TESTING & ENGINEERING, P.C. | Figure No.: 4

DRILL HOLE LOG

BORING NO.: TH-2
(continued)

Depth (ft.)	Graphic Log	USCS	DESCRIPTION	Sampler	Blows/Foot	TEST RESULTS: P.L. — L.L., Water Content % ●, Blow Count (10 20 30 40 50)	Dry Dens. pcf	Gravel %	Sand %	Fines %	Other Tests
28		ML	SILT, sandy, very stiff, moist, olive-gray.		27						
		CL	LEAN CLAY, hard, moist, gray.		36						
32			Bottom at approximately 31.5 feet.								
36											
40											
44											
48											
52											
56											

Job No.: 050582 | EARTHTEC TESTING & ENGINEERING, P.C. | Figure No.: 4

DRILL HOLE LOG

BORING NO.: TH-3

PROJECT: Lehi Subdivision
CLIENT: Atlas Engineering
LOCATION: Refer to Figure 2.
DRILLER: Earthtech Drilling
DRILL RIG: CME 750 A.T.
DEPTH TO WATER> INITIAL ▽: 3.7 ft.

PROJECT NO.: 050582
DATE: 23 Mar 2005
ELEVATION: NM
LOGGED BY: S.G.
AT COMPLETION ▼:

Depth (ft.)	Graphic Log	USCS	DESCRIPTION	Sampler	Blows/Foot	TEST RESULTS: P.L. – L.L.; Water Content % ●; Blow Count (10 20 30 40 50)	Dry Dens. pcf	Gravel %	Sand %	Fines %	Other Tests
		TOP	TOPSOIL: Clay, roots and organics, moist, dark brown.								
4		CL	LEAN CLAY, medium stiff, moist, light brown.		6						
		SM	SILTY SAND, loose, wet, gray-brown.		7						
8		ML	SILT, soft, moist, light brown.				100				C
12					3						
			-Silt becomes more stiff.								
16			-Hard at 15 feet.		48						
			Bottom at approximately 16.5 feet.								
20											
24											

Notes:

Tests Key:
T = Torvane
C = Consolidation
CBR = California Bearing Ratio
DS = Direct Shear
P = Percolation
UC = Unconf. Compress. Strength

DRILL HOLE LOG

BORING NO.: TH-4

PROJECT: Lehi Subdivision
CLIENT: Atlas Engineering
LOCATION: Refer to Figure 2.
DRILLER: Earthtech Drilling
DRILL RIG: CME 750 A.T.
DEPTH TO WATER> INITIAL ▽: 3.75 ft.

PROJECT NO.: 050582
DATE: 23 Mar 2005
ELEVATION: NM
LOGGED BY: S.G.
AT COMPLETION ▼ :

Depth (ft.)	Graphic Log	USCS	DESCRIPTION	Sampler	Blows/Foot	TEST RESULTS: P.L. ├─┤ L.L. / Water Content % – ● / Blow Count – ▨ (10 20 30 40 50)	Dry Dens. pcf	Gravel %	Sand %	Fines %	Other Tests
		TOP	TOPSOIL: Clay, roots and organics, moist, dark brown.								
		CL	LEAN CLAY, medium stiff to soft, moist brown.								
				■	2						
4											
				■	7						
8				■	3						
12											
16				◫							
			Bottom at approximately 17 feet.								
20											
24											

Notes:

Tests Key:
T = Torvane
C = Consolidation
CBR = California Bearing Ratio
DS = Direct Shear
P = Percolation
UC = Unconf. Compress. Strength

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KEY TO SYMBOLS

Symbol Description

Strata symbols

Topsoil

Low plasticity clay

Silty sand

Poorly graded sand

Silt

Misc. Symbols

Water table during drilling

Water table at boring completion

Soil Samplers

Undisturbed thin wall Shelby tube

California sampler

No recovery

Notes:

1. The logs are subject to the limitations, conclusions, and recommendations in this report.

2. Results of test conducted on samples recovered are reported on the logs.

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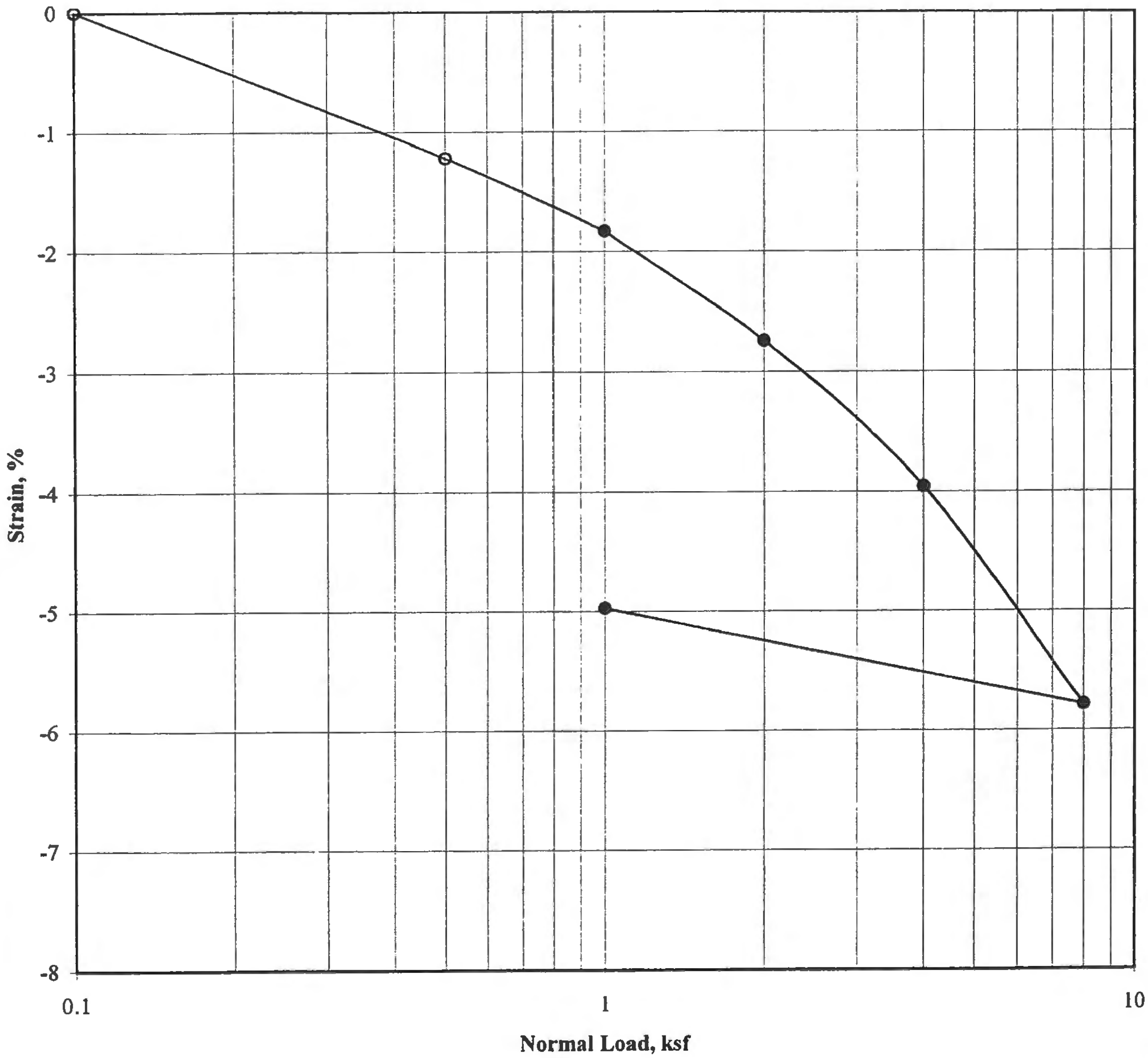
Figure No.: 7

Consolidation - Swell Test



Project:	Lehi Subdivision
Location:	TH-1
Sample Depth:	2½
Description:	Shelby Tube
Soil Type:	Lean CLAY (CL)
Dry Density, pcf:	115
Natural Moisture, %:	14
Liquid Limit:	31
Plasticity Index:	14
Water Added at:	1 ksf

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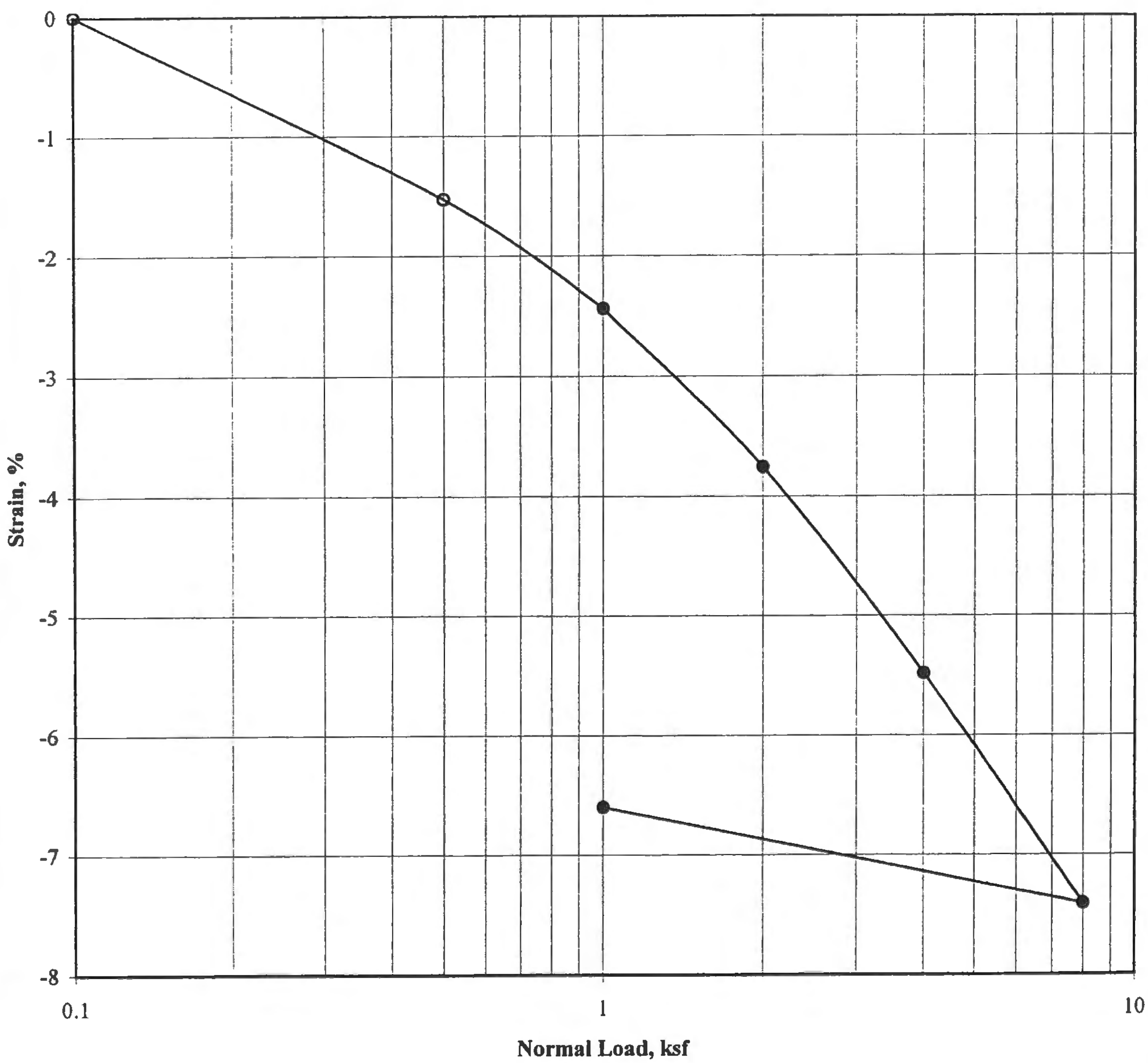
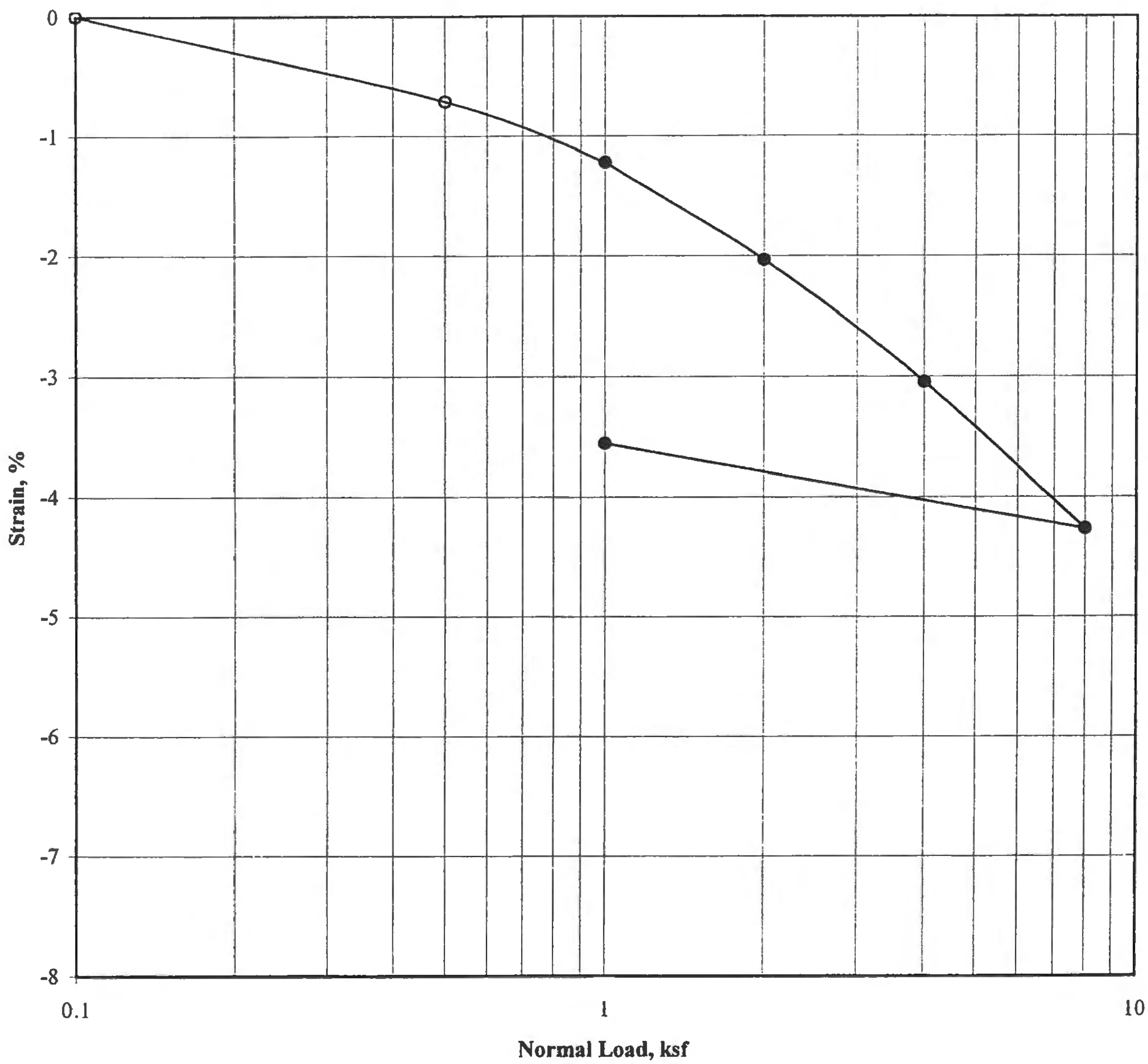
Figure 8

Consolidation - Swell Test



Project:	Lehi Subdivision
Location:	TH-2
Sample Depth:	5
Description:	Shelby Tube
Soil Type:	Lean CLAY (CL)
Dry Density, pcf:	92
Natural Moisture, %:	30
Liquid Limit:	28
Plasticity Index:	11
Water Added at:	1 ksf

Consolidation - Swell Test



Project:	Lehi Subdivision
Location:	TH-3
Sample Depth:	7½
Description:	Shelby Tube
Soil Type:	SILT (ML)
Dry Density, pcf:	99
Natural Moisture, %:	26
Liquid Limit:	27
Plasticity Index:	3
Water Added at:	1 ksf

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Figure 10