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GEOTECHNICAL STUDY
WOLFCREEK PARCEL 7
EDEN, UTAH

Prepared By:

Earthtec Engineering Inc.

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Job No. 081261

Prepared for:
Wolfcreek Properties
2595 N Hwy 162
PO Box 658
Eden, Utah 84310

September 12, 2008

Table of Contents
Wolfcreek Parcel 7
EEI Job 08-1261

1.0 INTRODUCTION

We understand that a new residential development is planned for a parcel of land located at Parcel 7, within the Wolf Creek resort, in Eden, Utah as shown on the Vicinity Map, Figure 1.

This study was made to assist in evaluating the subsurface conditions and engineering characteristics of the foundation soils and in developing our opinions and recommendations concerning appropriate foundation types, floor slabs and pavement sections. This report presents the results of our geotechnical investigation including field exploration, laboratory testing, engineering analysis, and our opinions and recommendations. Data from the study is summarized on Figures 3 through 13 and in Table 1.

2.0 CONCLUSIONS

1. Based upon the seven test pits excavated for this study, the site is generally free of topsoil. Soils at the site consist of dense to very dense clayey gravel with sand (GC), very dense clayey gravel with sand and cobbles (GC), very dense silty gravel with sand (GM), stiff to hard elastic silt (MH) and soft elastic silt with sand (MH). Groundwater was not encountered in the test pits at the time of our investigation.

2. Expansive soils were encountered at the site. Spread footings founded on at least 2 feet of structural fill should provide adequate support for the proposed structures. A maximum allowable bearing capacity of 2000 psf should be used.

3. Foundation drains should be installed around any basements which extend below existing grades to prevent seepage from perched water and to prevent accumulation of water below structures on the potentially expansive soils.

4. Pavements should consist of 3 inches of asphaltic concrete over 8 inches of untreated aggregate base.

3.0 PROPOSED CONSTRUCTION

It is our understanding that this project will consist of a 35.75 acre residential subdivision. The homes will be one to two story wood frame structures possibly with basements. Miscellaneous concrete flatwork and asphalt access roads are also planned. For design purposes it was assumed that structural loads would be 1 to 3 kips per lineal foot for wall loads and less than 100 pounds per square foot for floor loads. For pavement design we assumed a daily traffic number of 5 which is common for residential access roads. If structural or traffic loads are different than those assumed, we should be notified and allowed to reevaluate our recommendations.

4.0 SITE CONDITIONS

The subject site is undeveloped land covered by sparse weeds, grasses and brush. The property slopes down to the south-southwest at grades estimated at 10 to 15 percent. The site is bound by a residential subdivision to the south and open land on all other sides.

5.0 FIELD INVESTIGATION

The field investigation consisted of excavating seven test pits to depths of 5 ½ to 11 feet below current site grades. Boulders prevented advancing all pits to the desired 10-foot depth. The approximate test pit locations are shown on Figure 2. The soils encountered at the site were logged by personnel from our office. Samples were obtained and returned to our laboratory for testing.

6.0 LABORATORY TESTING

The samples obtained during the field investigation were sealed and returned to our laboratory where representative samples were selected for laboratory testing. Laboratory tests included natural moisture and density determinations, mechanical gradations tests, Atterberg Limits tests and swell/consolidation tests. The results of these tests are shown on Figures 3 through 12 and in Table 1, attached.

Samples will be retained in our laboratory for 30 days following the date of this report at which time they will be disposed of unless a written request for additional holding time is received prior to the disposal date.

7.0 SUBSURFACE CONDITIONS

Based upon the seven test pits excavated for this study, the site is generally free of topsoil. Soils at the site consist of dense to very dense clayey gravel with sand (GC), very dense clayey gravel with sand and cobbles

(GC), very dense silty gravel with sand (GM), stiff to hard elastic silt (MH) and soft elastic silt with sand (MH). Groundwater was not encountered in the test pits at the time of our investigation.

8.0 SITE GRADING

8.1 General Site Grading

Topsoil, man-made fill (if encountered) and soils loosened by construction activities should be removed (stripped) from the building pads and below concrete flatwork and pavements prior to foundation excavation and placement of site grading fills. Following stripping and excavation to design grades, the subgrade should be proof rolled to a firm, non-yielding surface with an approved non-vibratory roller. Soft areas detected during the proof rolling operation should be removed and replaced with structural fill. If the soft soils extend more than 18 inches deep, stabilization may be considered. The use of stabilization should be approved by the geotechnical engineer and would likely consist of over-excavating the area by 18 inches, a geotextile, such as Mirafi 600X, is placed at the bottom of the excavation over which a stabilizing fill consisting of angular coarse gravel with cobbles is placed up to the design subgrade.

Test pits were used at this site to identify the subsurface soils and the pits were backfilled with uncompacted native soils. The contractor should identify the pit areas. If any portion of the homes or roadways extend over a test pit then the backfill soils should be removed and replaced with structural fill.

Expansive soils were encountered in the test pits excavated for this project. Excavation for footings should extend at least 2 feet below intended grades and 2 feet of structural fill placed to bring the excavations to footing grade.

8.2 Structural Fill and Compaction

All fill placed below the buildings, pavements and concrete flatwork should be structural fill. All other fills should be considered as backfill. The native clays and silts may not be used as structural fill. Imported structural fill materials should consist of well-graded gravels with a maximum particle size of 3 inches and

15 to 25 percent fines (materials passing the No. 200 sieve). The liquid limit of the fines should not exceed 35 and the plasticity index should be below 15. All fill soils should be free from topsoils, frosted or frozen soils, highly organic soils, debris, and other deleterious materials. Structural fill should be placed in lifts appropriate to the compaction equipment used. We recommend a maximum loose lift thickness of 4 inches for hand operated equipment, 6 inches for most "trench compactors", and 8 inches for larger rollers. The soils should be placed at a moisture content within 2 percent of optimum and compacted to at least 95 percent of maximum density (ASTM D 1557). Frequent soil compaction testing should be performed during structural fill placement to ensure proper compaction. If fill depths exceed 5 feet we recommend required compaction be increased to 98 percent (ASTM D 1557) and that full time inspection be provided.

8.3 Backfill

The native soils may be used as backfill in utility trenches and against the outside of foundation walls. Backfill should be placed in lifts heights suitable to the compaction equipment used and compacted to at least 90 percent of the maximum dry density (ASTM D 1557). Where backfill will support concrete flatwork, pavements, or other structures, the fill should meet structural fill requirements.

8.4 Excavations

Excavations can be made with standard excavation equipment. Temporary construction excavations at the site which are above the water table and less than four feet deep should stand with ½ :1 (horizontal:vertical) slopes. All excavations which are advanced deeper than four feet below site grades or where water is encountered should be sloped or braced in accordance with OSHA[1] requirements for type C soil.

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[1] OSHA Health and Safety Standards, final rule, CFR 29, Part 1926.

9.0 SEISMIC CONSIDERATIONS

9.1 Faulting

Based on published data, no active faults are known to traverse the area and no faulting was indicated on the property during our field investigation. The Ogden Valley Northeast Margin Fault is located approximately 1 mile north of the site[2].

9.2 Seismic Design Criteria

The residential structures should be designed in accordance with the International Residential Code (IRC). The IRC designates this area as a seismic design class D.

The site is located at approximately 41.33 degrees latitude and -111.82 degrees longitude. The IRC site value for this property is 0.74g as shown in the table below.

Table No. 2: Design Acceleration for Short Period

S_S	F_a	Site Value
		$2/3(S_S*F_a)$
1.02g	1.09	0.74 g

9.3 Liquefaction

Liquefaction is a phenomenon where soils lose their intergranular strength due to an increase of pore 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 near saturation for liquefaction to occur. According to the Utah Geologic Survey Weber County hazards map[2], this site is in an area classified as having a very low potential for liquefaction.

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[2] Utah Geological Survey, Selected Critical Facilities and Geologic Hazards, Weber County, Utah

10.0 FOUNDATIONS

10.1 Footing Design

Spread footings founded on 2 feet of structural fill should provide adequate support for the proposed buildings. The recommendations presented below should be utilized during design and construction of this project:

1. Spread footings founded on at least 2 feet of structural fill should be designed for a maximum allowable bearing capacity of 2000 psf. A one-third increase is allowed for short term transient loads such as wind and seismic events.
2. Footings should be uniformly loaded.
3. Continuous footings should have a minimum width of 18 inches.
4. Exterior footings should be placed below frost depth which is determined by local building codes. Generally 30 inches is adequate in the area. Interior footing should extend at least 18 inches below the lowest adjacent final grade.
5. Foundation walls on continuous footings should be well reinforced. We suggest a minimum amount of steel equivalent to that required for a simply supported span of 12 feet.
6. The bottom of footing excavations should be cleaned of all soils loosened during excavation and should be proof rolled to identify soft spots prior to placement of structural fill. If soft areas are encountered during the proof rolling operation they should be removed and replaced with structural fill or stabilized as recommended in Section 8.1.
7. Footing excavations should be observed by the geotechnical engineer prior to construction of footings to evaluate whether suitable bearing soils have been exposed and free of fill or disturbed soils.
8. Basements which extend below existing grades should be provided with a foundation drain to intercept perched ground water to aid in keeping moisture from penetrating to the expansive soils below. In addition an outlet should be provided for the fill placed under the footings to prevent ponding of water on the fill.

10.2 Estimated Settlement

If footings are designed and constructed in accordance with the recommendations presented above, the risk of total settlement exceeding 1 inch and differential settlement exceeding 0.5 inch for a 25-foot span will be low. Additional settlement should be expected during a strong seismic event.

11.0 FLOOR SLABS

A minimum 4 inch thick layer of free-draining gravel should be placed immediately below the floor slab to help distribute floor loads, break the rise of capillary water, and aid in the concrete curing process. Floor slabs may be designed using a modulus of subgrade reaction of 180 psi/in. To help control normal shrinkage and stress cracking the floor slabs should have adequate reinforcement for the anticipated floor loads with the reinforcement continuous through interior floor joints and we recommend using adequate crack control joints.

Special precautions should be taken during placement and curing of the concrete slabs. Excessive slump (high water-cement ratios) of the concrete and/or improper finishing and curing procedures may lead to excessive shrinkage, cracking, spalling or curling of the slabs. We recommend all concrete placement and curing operations be performed in compliance with ACI[3] standards.

12.0 BASEMENT WALLS

Basement walls should be designed to resist the lateral loads imposed by the soils retained. The lateral earth pressures on the below grade walls and the distribution of those pressures depends upon the type of structure, hydrostatic pressures, in-situ soils, backfill, and tolerable movements. Basement and retaining walls are usually designed with triangular stress distributions known as equivalent fluid pressure based on lateral earth pressure coefficients. If soils similar to the native soils are used to backfill basement walls then the walls may be designed using the following ultimate values:

---

[3] American Concrete Institute (ACI) Standards

Condition	Lateral Pressure Coefficient	Equivalent Fluid Weight (PCF)
At Rest	0.55	64
Active	0.35	41
Passive	2.88	337

We recommend that the lateral earth pressures for walls which allow little or no wall movement be based on "at rest" conditions. Walls allowed to rotate 0.4 percent of the wall height may be designed with "active pressures". These values assume level backfill extending horizontally for a distance at least as far as the wall height and that water will not accumulate behind walls. Any surcharge load in excess of the soil weight applied to the backfill should be multiplied by the appropriate lateral pressure coefficient and added to the soil pressure. Backfill should be placed in accordance with the requirements discussed in Section 8.3. Lateral pressures approximately 30 percent higher may occur during backfill placement, and bracing may be called for until the backfilling operation is completed.

Lateral building loads will be resisted by frictional resistance between the footings and the foundation soils and by passive pressure developed by backfill against the wall. For footings on native soils we recommend a friction coefficient of 0.28 be used. The lateral earth coefficients presented above are ultimate values; therefore, an appropriate factor of safety should be applied in resistance calculations.

13.0 SURFACE DRAINAGE

Wetting of the foundation soils will likely cause some degree of volume change within the soil and should be prevented both during and after construction. We recommend that the following precautions be taken at this site:

1. The ground surface should be graded to drain away from the structures in all directions. We recommend a minimum fall of 8 inches in the first 10 feet.

2. Roof runoff should be collected in rain gutters with down spouts designed to discharge well outside of the backfill limits.

3. Sprinkler heads should be aimed away and kept at least 12 inches from foundation walls.

4. Provide adequate compaction of backfill with a minimum 90% density (ASTM D 1557). Water consolidation methods should not be used.

5. Other precautions which may become evident during design and construction should be taken.

14.0 FOUNDATION DRAIN

Although no groundwater was encountered during the investigation, it has been our experience that perched groundwater can develop in this area during wet spring seasons. Additionally, expansive soils were encountered in the test pits. The International Residential Code (IRC) which govern development in Utah, requires a foundation drain when buildings are founded in low permeability soils, such as the clays and silts encountered at this site. Therefore, we recommend that any basement which extends below existing grade incorporate a foundation drain. The recommendations presented below should be followed during design and construction of the foundation drain:

1. The foundation drains should consist of a 4 inch diameter, slotted pipe encased in at least 12 inches of free draining gravel. A filter fabric such as Mirafi 140N should separate the gravel from the native soils. The pipe should be graded to drain to a storm drain or other free gravity outfall unless provisions for a pumped sump are made. The gravel should extend up the foundation wall to within 18 inches of final grade. The gravel extending up the wall may be replaced with a composite drain such as miradrain or equivalent.

2. The highest point of the 4 inch perforated pipe within the foundation drain should be placed at least 10 inches below the floor slab. The pipe should be graded to drain to a free gravity outlet.

3. To facilitate basement drainage, clean gravel placed below the basement floor slab should be increased to at least 6 inches thick.

4. Connections through the foundation should be made between the subfloor gravel and the foundation drain. The connections should be made in such a way to allow any water collected below the floor slabs to gravity flow to the foundation drains.

5. Appropriately spaced clean outs should be installed so that the foundation drains may be cleaned as necessary.

15.0 PAVEMENTS

We understand that a flexible pavement is desired for the access roads in this development. Unless a more stringent local code is required, we recommend a pavement section consisting of 3 inches of asphaltic concrete over 8 inches of untreated aggregate base. The design recommendations utilized an assumed CBR value of 10 (see Figure 8), AASHTO design methods, and the following assumptions:

1. The subgrade is prepared by proof rolling to a firm, non-yielding surface and soft areas are stabilized as discussed in Section 8.1;
2. Site grading fills below the pavements meet structural fill material and placement requirements as defined in Section 8.2;
3. Asphaltic concrete should meet Weber County requirements for secondary roads and aggregate base should meet UDOT specification requirements;
4. Aggregate base is compacted to at least 95 percent of maximum dry density (ASTM D 1557);
5. Asphaltic concrete is compacted to at least 96 percent of the laboratory Marshal mix design density (ASTM D 1559);
6. Traffic loading, estimated based on the type of use, as discussed in Section 3.0 of this report; and
7. Pavement design life of 20 years.

16.0 GENERAL CONDITIONS

The exploratory data presented in this report were collected to provide geotechnical design recommendations for this project. Test pits were widely spaced and may not be indicative of subsurface conditions between the test pits or outside the study area and thus have limited value in depicting subsurface conditions for contractor bidding. If it is necessary to define subsurface conditions in sufficient detail to allow accurate bidding we recommend an additional study be conducted which is designed for that purpose.

Variations from the conditions portrayed in the test pits often occur which are sometimes sufficient to require modifications in the design. If during construction, conditions are found to be different than those presented in this report, please advise us so that the appropriate modifications can be made. An experienced geotechnical engineer or technician should observe fill placement and conduct testing as required to confirm the use of proper structural fill materials and placement procedures.

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.

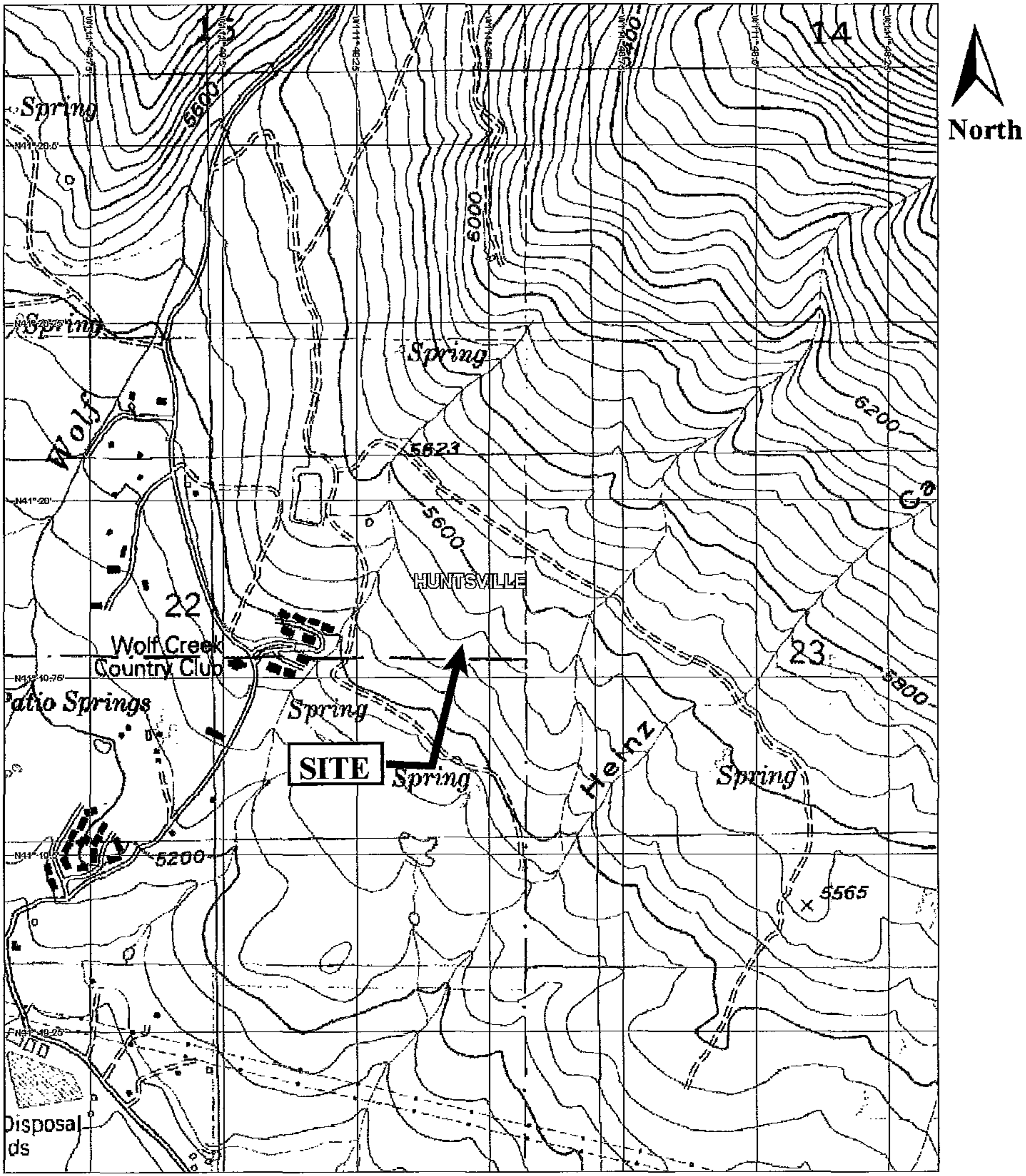
Respectfully;
EARTHTEC ENGINEERING, INC.

RUSSELL JOHN TOPHAM
No. 319204
9-15-08

Russell J. Topham, P.E.
Project Geotechnical Engineer

REV:REB

EARTHTEC ENGINEERING, INC.



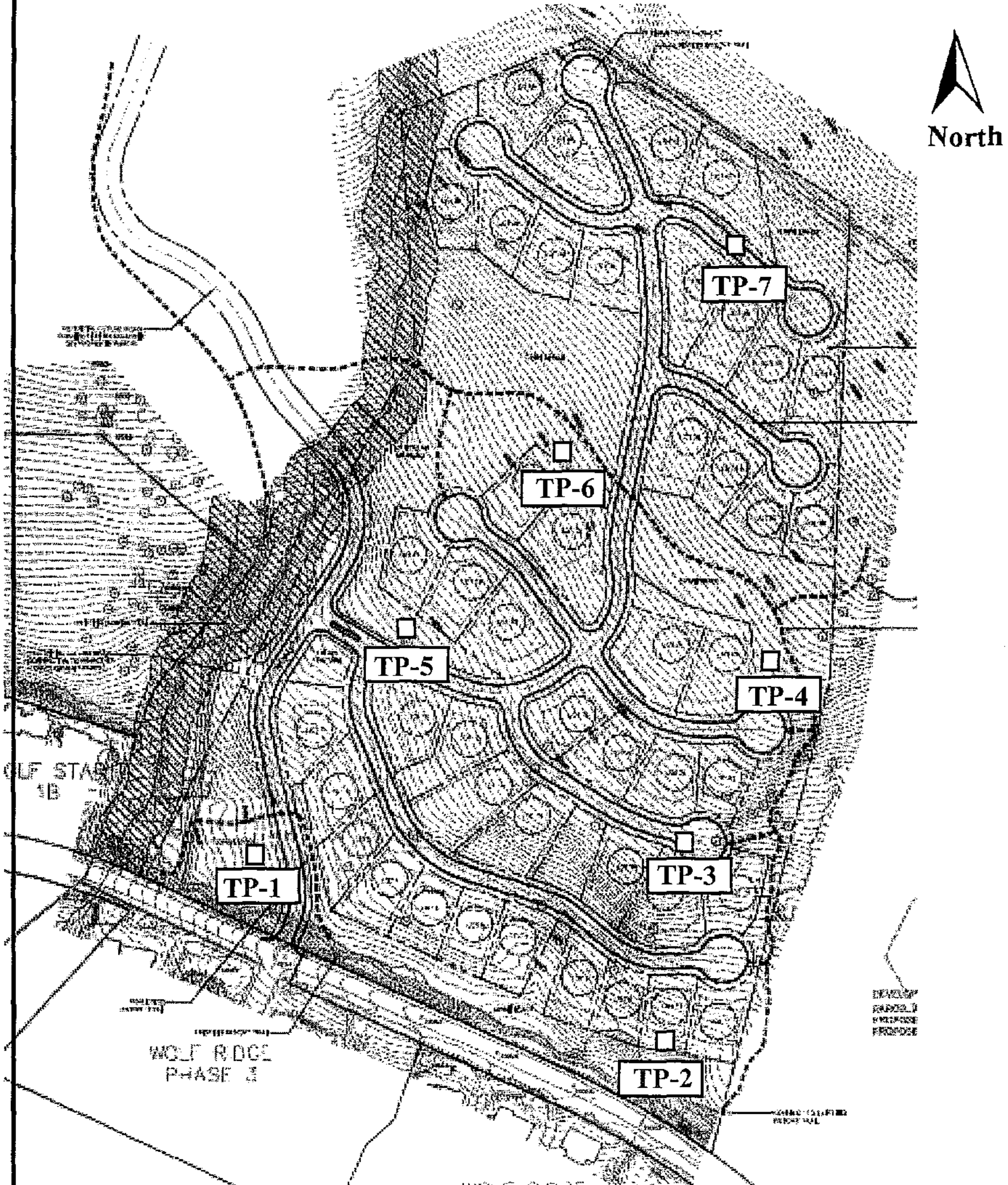
3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS

350 ft Scale: 1 : 12,800 Detail: 14-0 Datum: WGS84

**BASE MAP TAKEN FROM DELORME DOCS
"HUNTSVILLE" QUAD**

EEI Job No. 08-1261 **VICINITY MAP** **Figure 1**

EARTHTEC ENGINEERING, INC



BASE MAP PROVIDED BY
CLIENT

SITE PLAN SHOWING LOCATION OF TEST PITS

EEI Job No. 08-1261

Figure 2

TEST PIT LOG

NO.: TP-1

PROJECT: Wolf Creek Parcel 7

CLIENT: Wolfcreek Properties

LOCATION: See Figure 2

OPERATOR: Client Provided

EQUIPMENT: Bobcat 337 Mini Excavator

DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 08-1261

DATE: 08/27/08

ELEVATION: Not Measured

LOGGED BY: CAP

AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS							
					Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0 1	▨	GC	Clayey gravel with sand, dense, dry, brown									
2	▥	MH	Elastic silt with occasional gravels, hard, moist, brown to yellow brown	☒								
3	▥											
4	▥			☒	88	33	37	72	2	16	82	C
5	▨	GC	Clayey gravel, cobble bed ranging from 1-3 inches, angular to sub rounded in clay matrix, very dense, dry, brown									
6	▥	MH	Elastic silt (weathered tuffaceous siltstone) with sand and gravel, soft, moist, yellow									
7	▥											
8	▥			☒		47	23	72	0	30	70	
9	▥											
10			PRACTICAL REFUSAL DUE TO BOULDERS									
11												
12												
13												
14												
15												

Notes: No groundwater encountered.

Tests Key

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

PROJECT NO.: 08-1261

Earthtec Engineering Inc.

FIGURE NO.: 3

TEST PIT LOG
NO.: TP-2

PROJECT: Wolf Creek Parcel 7
PROJECT NO.: 08-1261
CLIENT: Wolfcreek Properties
DATE: 08/27/08
LOCATION: See Figure 2
ELEVATION: Not Measured
OPERATOR: Client Provided
LOGGED BY: CAP
EQUIPMENT: Bobcat 337 Mini excavator
DEPTH TO WATER; INITIAL ∇ :
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0		GM	Silty gravel with sand, very dense, dry, brown									
1												
2												
3												
4												
5												
6												
7												
8		MH	Elastic silt (highly weathered tuffaceous siltstone), stiff to hard, moist, green									
9				☒		10			50	24	26	
10												
11												
12												
13												
14												
15												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
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LOG OF TESTPIT 08-1261.GPJ EARTHTEC.GDT 9/15/08

PROJECT NO.: 08-1261

FIGURE NO.: 4

TEST PIT LOG
NO.: TP-3

PROJECT: Wolf Creek Parcel 7
PROJECT NO.: 08-1261
CLIENT: Wolfcreek Properties
DATE: 08/27/08
LOCATION: See Figure 2
ELEVATION: Not Measured
OPERATOR: Client Provided
LOGGED BY: CAP
EQUIPMENT: CAT 330D
DEPTH TO WATER; INITIAL ▽ :
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS							
					Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0	▨	GC	Clayey gravel with sand, very dense, dry, brown									
1	▨											
2	▨			☒								
3	▨											
4	▨											
5			PRACTICAL REFUSAL DUE TO BOULDERS									
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
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PROJECT NO.: 08-1261

Earthtec Engineering Inc.

FIGURE NO.: 5

TEST PIT LOG
NO.: TP-4

PROJECT: Wolf Creek Parcel 7
CLIENT: Wolfcreek Properties
LOCATION: See Figure 2
OPERATOR: Client Provided
EQUIPMENT: CAT 330D
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 08-1261
DATE: 08/27/08
ELEVATION: Not Measured
LOGGED BY: CAP
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS							
					Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0	▨		Clayey gravel with sand, very dense, dry, brown									
1	▨											
2	▨			☒								
3	▨	GC										
4	▨											
5	▨											
6			PRACTICAL REFUSAL DUE TO BOULDERS									
7												
8												
9												
10												
11												
12												
13												
14												
15												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
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UC = Unconfined Compressive Strength

PROJECT NO.: 08-1261

Earthtec Engineering Inc.

FIGURE NO.: 6

TEST PIT LOG

NO.: TP-5

PROJECT:	Wolf Creek Parcel 7	**PROJECT NO.:**	08-1261
CLIENT:	Wolfcreek Properties	**DATE:**	08/27/08
LOCATION:	See Figure 2	**ELEVATION:**	Not Measured
OPERATOR:	Client Provided	**LOGGED BY:**	CAP
EQUIPMENT:	CAT 330D		

DEPTH TO WATER; INITIAL ∇ : **AT COMPLETION ▼ :**

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS							
					Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0	▨		Clayey gravel with sand containing cobbles 3 to 5 inches in size, high plastic clay, very dense, dry, brown with iron oxide staining at 3 feet									
1	▨											
2	▨											
3	▨	GC		☒	99	29	27	54	2	29	69	
4	▨											
5	▨											
6			PRACTICAL REFUSAL DUE TO BOULDERS									
7												
8												
9												
10												
11												
12												
13												
14												
15												

Notes: No groundwater encountered.

Tests Key

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C = Consolidation
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UC = Unconfined Compressive Strength

PROJECT NO.: 08-1261

Earthtec Engineering Inc.

FIGURE NO.: 7

TEST PIT LOG

NO.: TP-6

PROJECT: Wolf Creek Parcel 7
PROJECT NO.: 08-1261
CLIENT: Wolfcreek Properties
DATE: 08/27/08
LOCATION: See Figure 2
ELEVATION: Not Measured
OPERATOR: Client Provided
LOGGED BY: CAP
EQUIPMENT: Bobcat 337 Mini excavator
DEPTH TO WATER; INITIAL ▽ :
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS							
					Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0	▨	GC	Clayey gravel with sand containing cobbles 3 to 5 inches in size, very dense, dry, brown									
1	▨											
2	▨			☒								
3	▨											
4	▨											
5	▨											
6			PRACTICAL REFUSAL DUE TO BOULDERS									
7												
8												
9												
10												
11												
12												
13												
14												
15												

Notes: No groundwater encountered.

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

PROJECT NO.: 08-1261

Earthtec Engineering Inc.

FIGURE NO.: 8

TEST PIT LOG

NO.: TP-7

PROJECT:	Wolf Creek Parcel 7	**PROJECT NO.:**	08-1261
CLIENT:	Wolfcreek Properties	**DATE:**	08/27/08
LOCATION:	See Figure 2	**ELEVATION:**	Not Measured
OPERATOR:	Client Provided	**LOGGED BY:**	CAP
EQUIPMENT:	Bobcat 337 Mini excavator		

DEPTH TO WATER; INITIAL ∇ : **AT COMPLETION ▼ :**

Depth (Ft.) 0	Graphic Log	USCS	Description	Samples	TEST RESULTS							
					Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
1	▨		Clayey gravel with sand containing cobbles 3 to 5 inches in size, very dense, dry, brown									
2	▨											
3	▨			☒		3			48	28	24	
4	▨	GC										
5	▨											
6	▨											
7			PRACTICAL REFUSAL DUE TO BOULDERS									
8												
9												
10												
11												
12												
13												
14												
15												

Notes: No groundwater encountered.

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

PROJECT NO.: 08-1261

Earthtec Engineering Inc.

FIGURE NO.: 9

LEGEND

PROJECT: Wolf Creek Parcel 7
CLIENT: Wolfcreek Properties
DATE: 08/27/08
LOGGED BY: CAP

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 (2½ 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.

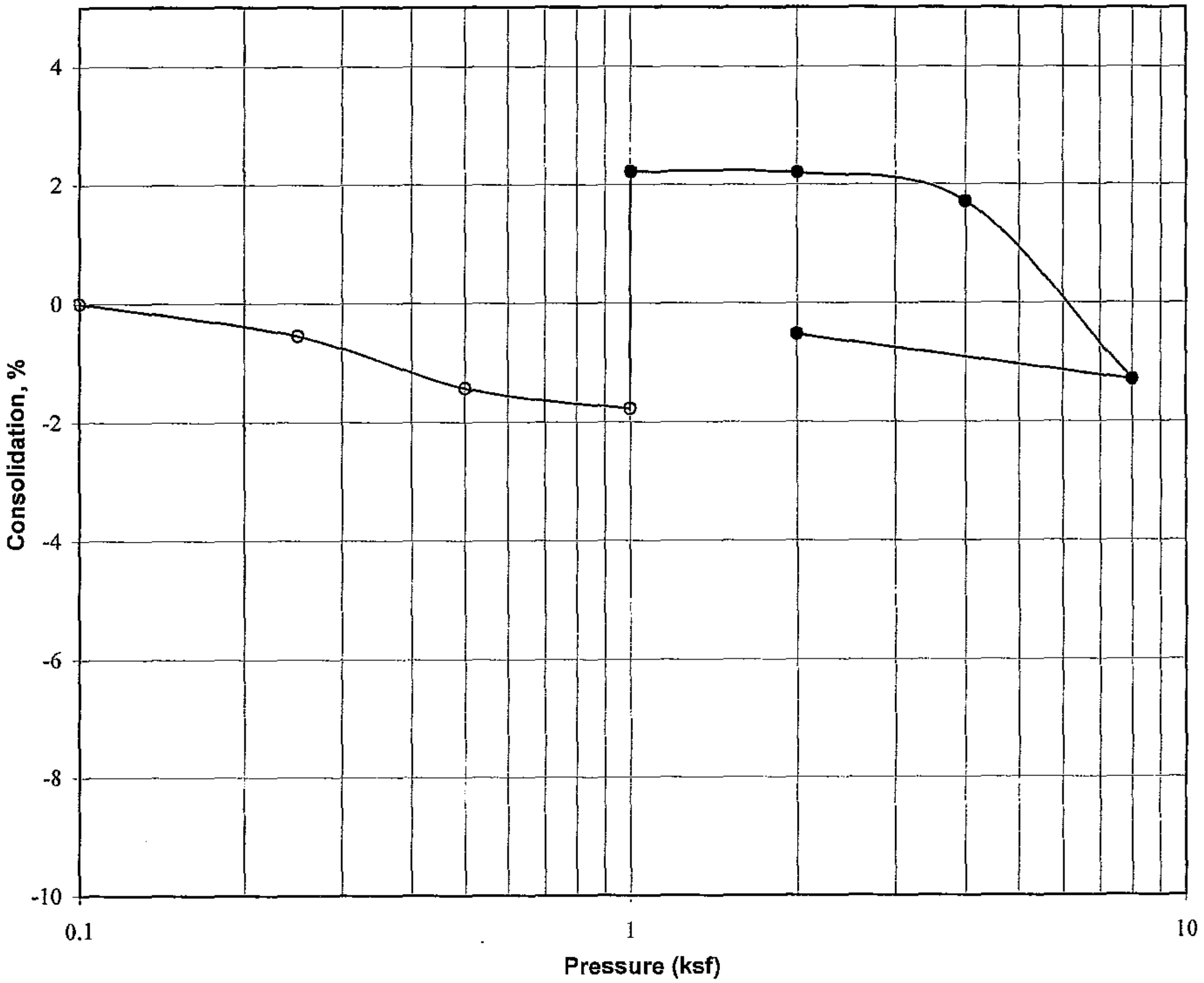
PROJECT NO.: 08-1261

Earthtec Engineering Inc.

FIGURE NO.: 10

LEGEND 08-1261.GPJ EARTHTEC.GDT 9/11/08

CONSOLIDATION - SWELL TEST



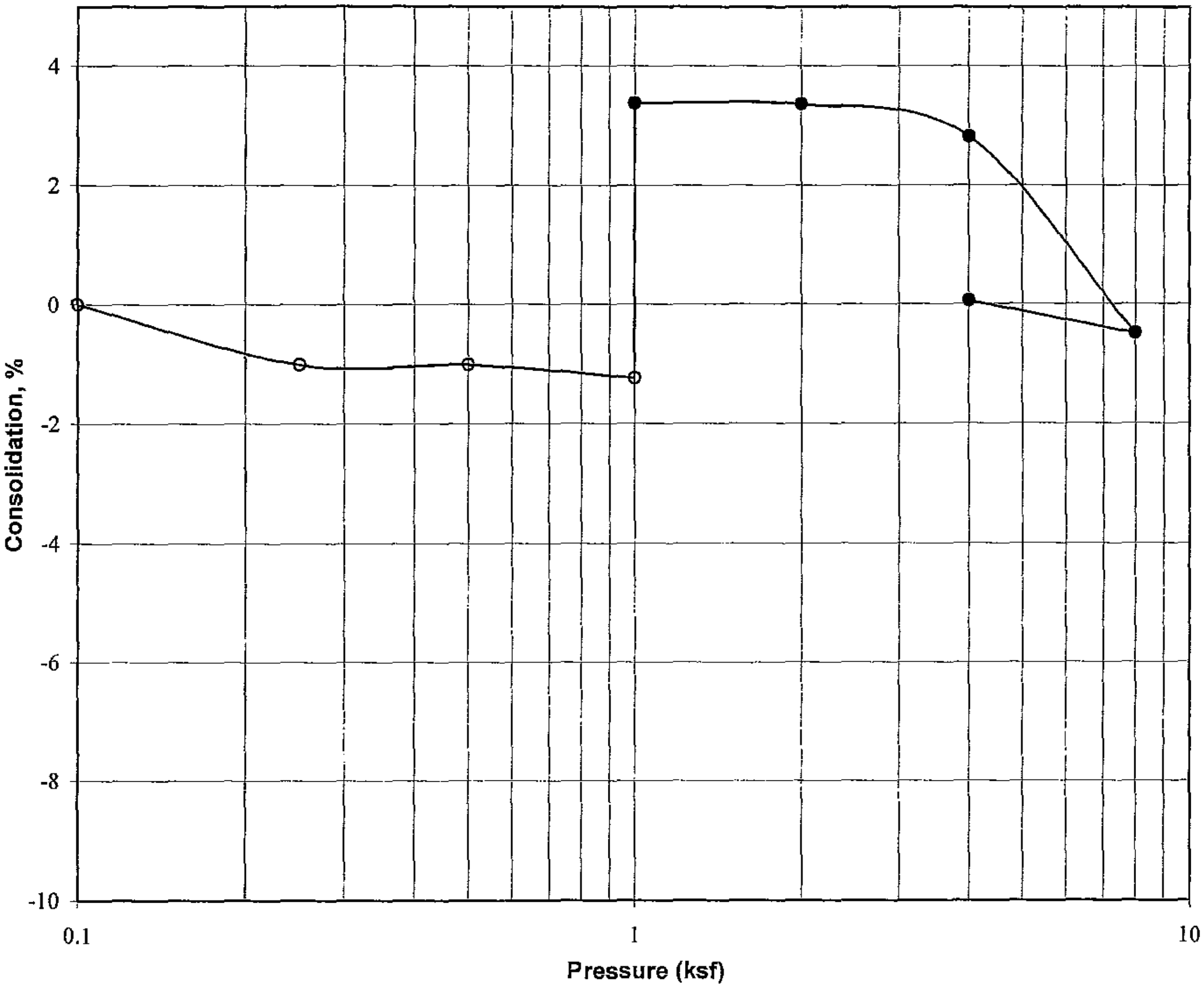
Project:	Wolf Creek Parcel 7
Location:	1
Sample Depth:	3
Description:	bag
Soil Type:	MH
Natural Moisture, %:	33
Dry Density, pcf:	88
Liquid Limit:	72
Plasticity Index:	37
Water Added at:	1 ksf
Percent Swell:	4.0

PROJECT NO.: 08-1261

Earthtec Engineering Inc.

FIGURE NO.: 11

CONSOLIDATION - SWELL TEST



Project:	Wolf Creek Parcel 7
Location:	5
Sample Depth:	3
Description:	bag
Soil Type:	CH
Natural Moisture, %:	29
Dry Density, pcf:	99
Liquid Limit:	54
Plasticity Index:	27
Water Added at:	1 ksf
Percent Swell:	4.6

PROJECT NO.: 08-1261	Earthtec Engineering Inc.	**FIGURE NO.:** 12

TABLE 1
SUMMARY OF LABORATORY DATA

TEST PIT/HOLE	DEPTH (FT)	DRY DENSITY (PCF)	MOISTURE (%)	(%) GRADATION			ATTERBERG LIMITS		SOIL TYPE
				GRAVEL	SAND	SILT/CLAY	LIQUID LIMIT	PI	
TP-1	3	88.2	32.7	2	16	82	72	37	Elastic SILT (MH)
TP-1	7		47.2	0	30	70	72	23	Elastic SILT (MH)
TP-2	9		10.0	50	24	26			Elastic SILT (MH)
TP-5	3	98.7	29.0	2	29	69	54	27	CLAYEY Gravel with sand (GC)
TP-7	2		3.3	48	28	24			CLAYEY Gravel with sand (GC)

BRENDY ACRES SUBDIVISION **ETE JOB NO. 08-1261**