



June 17, 2020

Hammers Construction  
1411 Woolsey Heights  
Colorado Springs, Colorado 80915

Attn: Mr. Bob Green  
P: (719) 570-1599  
E: [RGreen@hammersconstruction.com](mailto:RGreen@hammersconstruction.com)

Re: Geotechnical Engineering Update Letter  
Claremont Business Park Filing Nos. 1 and 2  
State Highway 24 and Marksheffel Road  
Colorado Springs, Colorado  
Terracon Project No. 23055071

Terracon completed geotechnical engineering exploration and Geotechnical Engineering Reports, dated October 5, 2005 and May 30, 2006 for Claremont Business Park Filing Nos. 1 and 2, respectively. We have been requested to provide an update letter for proposed construction within the development with respect to our geotechnical reports.

It is our understanding that site grading remains similar to the condition at the time of our geotechnical exploration or during materials testing services. It is our opinion that the conclusions and recommendations contained in our reports remain applicable to the site. We recommend Terracon review soils subgrade conditions for foundations, slabs, and, pavements at the time of construction.

If you have any questions concerning this report or any of our testing, inspection, design and consulting services, please do not hesitate to contact us.

Sincerely,  
**Terracon Consultants, Inc.**

Tyler A. Compton, P.E.  
Project Engineer



Robert M. Hernandez, P.E.  
Geotechnical Services Manager

**GEOTECHNICAL ENGINEERING REPORT**

**CLAREMONT BUSINESS PARK FILING NO. 2  
STATE HIGHWAY 24 AND MARKSHEFFEL ROAD  
COLORADO SPRINGS, COLORADO**

**TERRACON PROJECT NO. 23055071  
May 30, 2006**

*Prepared for:*

**Hammers Construction  
3460 Capital Drive  
Colorado Springs, Colorado 80915**

**Attn: Mr. Jerry Edmonds**

*Prepared by:*

**Terracon  
4172 Center Park Drive  
Colorado Springs, Colorado 80916  
Phone: 719-597-2116  
Fax: 719-597-2117**

**Terracon**

May 30, 2006

Hammers Construction  
3460 Capital Drive  
Colorado Springs, Colorado 80915

Attn: Mr. Jerry Edmonds

**Re: Geotechnical Engineering Report  
Claremont Business Park Filing No. 2  
State Highway 24 and Marksheffel Road  
Colorado Springs, Colorado  
Terracon Project No. 23055071**

**Terracon**  
Consulting Engineers & Scientists

Terracon Consultants, Inc.  
4172 Center Park Drive  
Colorado Springs, Colorado 80916  
Phone 719.597.2116  
Fax 719.597.2117  
www.terracon.com

Terracon has completed geotechnical engineering exploration for the proposed Claremont Business Park Filing No. 2 to be located at State Highway 24 and Marksheffel Road in Colorado Springs, Colorado. Terracon previously issued a preliminary report for this project dated August 25, 2005. This report presents final geotechnical recommendations for development of the subject lots. It should be noted that the recommendations contained in this report must be verified in writing at the time of construction by a qualified geotechnical engineer.

We appreciate being of service to you in the geotechnical engineering phase of this project, and are prepared to assist you during the construction phases as well. If you have any questions please do not hesitate to contact us.

Sincerely,  
**TERRACON CONSULTANTS, INC.**

*Andrei Bedoya/gh*  
Andrei Bedoya, P.E.  
Project Engineer

*David D. Harwood*  
David D. Harwood, P.E.  
Geotechnical Department Manager



N:\PROJECTS\2005\23055071\Final Report.doc

Copies to: Addressee (3)

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## **BORING LOCATION DIAGRAM**

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## **APPENDIX B: LABORATORY TEST RESULTS**

## **APPENDIX C: GENERAL NOTES**

# GEOTECHNICAL ENGINEERING REPORT

CLAREMONT BUSINESS PARK FILING NO. 2  
STATE HIGHWAY 24 AND MARKSHEFFEL ROAD  
COLORADO SPRINGS, COLORADO

TERRACON PROJECT NO. 23055071  
May 30, 2006

## INTRODUCTION

This report contains results of our geotechnical engineering exploration for the proposed project to be located at State Highway 24 and Marksheffel Road.

The purpose of this report is to provide information and geotechnical engineering considerations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Foundation design and construction
- Floor slab design and construction
- Earthwork
- Drainage

The information contained in this report is based upon the results of field and laboratory testing, engineering analyses, and experience with similar soil conditions, structures and our understanding of the proposed project.

## PROPOSED CONSTRUCTION

Based on information provided by Mr. Jerry Edmonds of Hammers Construction, the proposed project will include the development of an approximate 30 acre parcel. Development will include the construction of 37 single-story, slab-on-grade commercial structures using metal frame construction. Building footprints are anticipated to be on the order of 5,000 to greater than 20,000 square feet. Wall and column loads are assumed to be on the order of 1 to 4 kips per lineal foot and 40 to 80 kips, respectively.

Mass grading of the site was complete at the time of our field exploration. A Terracon representative was present on-site during mass grading operations and provided field density observation and testing during placement of fill materials.

## SITE CONDITIONS

At the time of our field explorations site grading operations appeared to be complete. The site consisted of a large graded pad with drainage generally to the north to northeast. Paving of roadways within Phase I was complete with construction of several buildings underway. Based on our observations during grading operations, about 7 to 20 feet of compacted fill was placed along the east to northeast portions of the site.

## SITE EXPLORATION

The scope of the services performed for this project included site reconnaissance by a geotechnical engineer, a subsurface exploration program, laboratory testing and engineering analysis.

**Field Exploration:** A total of eight test borings were drilled on May 11, 2006, to depths of about 20½ feet below existing site grade. The borings were drilled along lot lines and within the anticipated footprint of proposed building pads. The borings were advanced with a truck-mounted drilling rig, utilizing 4-inch diameter solid-stem auger.

The borings were located in the field by utilizing a handheld GPS unit referencing existing site features. Elevations were taken at each boring location by interpolation from contours indicated on the provided Site Layout. The accuracy of boring locations and elevations should only be assumed to the level implied by the methods used.

A lithologic log of each boring was recorded by a staff engineer during the drilling operations. At selected intervals, samples of the subsurface materials were taken by driving split-spoon and ring barrel samplers.

Penetration resistance measurements were obtained by driving the split-spoon and ring barrel samplers into the subsurface materials with a 140-pound hammer falling 30 inches. The penetration resistance value is a useful index to the consistency, relative density or hardness of the materials encountered.

Groundwater measurements were made in each boring at the time of site exploration. Due to the sandy soil profile and active grading operations, the borings were backfilled with auger cuttings after completion of drilling.

**Laboratory Testing:** Samples retrieved during the field exploration were returned to the laboratory for observation by the project geotechnical engineer, and were classified in general accordance with the Unified Soil Classification System described in Appendix C. At that time, an applicable laboratory testing program was formulated to determine engineering properties of

the subsurface materials and the field descriptions were confirmed or modified as necessary. Logs of Borings were prepared and are presented in Appendix A.

Laboratory test results are presented on the Logs of Borings and in Appendix B, and were used for the geotechnical engineering analyses, and the development of preliminary foundation and earthwork considerations. Laboratory tests were performed in general accordance with Terracon test methods.

Selected soil samples were tested for the following engineering properties:

- Water content
- Dry density
- Consolidation
- Expansion
- Grain size
- Plasticity index
- pH
- Resistivity
- Water soluble sulfate content
- Water soluble chloride content

## SUBSURFACE CONDITIONS

**Soil Conditions:** Based on our field logs, surface soils to a maximum depth of drilling of 20½ feet consisted of sand with varying amounts of silt and clay.

**Field and Laboratory Test Results:** Field test results indicate that the sand soils vary from loose to dense in relative density.

Laboratory test results indicate that subsoils at shallow depth are non-expansive and exhibit low to moderate compression at in-situ and elevated water contents.

**Groundwater Conditions:** Groundwater was not observed in the test borings at the time of field exploration. These observations represent groundwater conditions at the time of the field exploration, and may not be indicative of other times, or at other locations. Groundwater conditions can change with varying seasonal and weather conditions, and other factors.

## ENGINEERING ANALYSES AND CONSIDERATIONS

**Geotechnical Considerations:** Based on the results of our field investigation, laboratory testing program and geotechnical analyses, development of the site is considered feasible from a geotechnical viewpoint provided that the conclusions and considerations provided herein are incorporated into the design and construction of the project. Design and construction considerations for foundation systems and other earth connected phases of the project are outlined below.

**Spread Footings:** Due to the presence of non-swelling soils on the site, spread footing foundations bearing upon undisturbed sands are considered suitable for support for the proposed structures. The footings may be designed for a maximum allowable bearing pressure of 2,000 psf. The design bearing pressure applies to dead loads plus design live load conditions. The design bearing pressure may be increased as allowed by the local building code when considering total loads that include wind or seismic conditions.

For purposes of design, a minimum footing width of 16 inches for continuous footings and 24 inches for isolated footings should be considered. As the design bearing capacity of footings on sands is dependent in part on footing dimensions, it is suggested that Terracon review preliminary foundation plans to evaluate if bearing capacities presented above are applicable for the proposed footings.

Exterior footings should be placed a minimum of 30 inches below finished grade for frost protection and to provide confinement for the bearing soils. Finished grade is the lowest adjacent grade within 5 feet of the structure for exterior footings.

Total movement resulting from the assumed structural loads is estimated to be on the order of 1 inch. Differential movement should be on the order of 1/2 to 3/4 of the estimated total movement. Movement values are based on maintaining a relatively uniform soil water content below the foundations. Fluctuations due to poor drainage, irrigation, climatic conditions and groundwater levels can result in additional movement than estimated above.

**Lateral Earth Pressures:** For level soil conditions above any free water surface, equivalent fluid pressures for unrestrained foundation elements when using on-site soils as backfill are:

- Active.....35 psf/ft
- Passive.....250 psf/ft
- Coefficient of base friction.....0.40\*

\*The coefficient of base friction may be combined with passive pressure as allowed by the local building code.

Where the design includes restrained elements, the following equivalent fluid pressures may be considered:

- At rest.....55 psf/ft

The lateral earth pressures herein do not include any factor of safety and are not applicable for submerged soils/hydrostatic loading. Additional recommendations may be necessary if such conditions are to be included in the design.

Fill against foundation and retaining walls should be compacted to densities specified in Earthwork. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors. Overcompaction may cause excessive lateral earth pressures which could result in wall movement.

The values provided below are based on our May 11, 2006 subsurface exploration, our experience in the area, and the 2005 Pikes Peak Regional Building Code.

Site Class .....	D
$S_s$ .....	0.185g
$S_1$ .....	0.050g
$F_a$ .....	1.6
$F_v$ .....	2.4

**Floor Slab Design and Construction:** We anticipate that non-expansive soils or engineered fill will support floor slabs. Some differential movement of a slab-on-grade floor system is possible should the subgrade soils become elevated in moisture content. To reduce potential slab movements, the subgrade soils should be scarified to a minimum depth of 12 inches, adjusted to near optimum water content and compacted to a minimum of 90 percent of the maximum laboratory density determined in accordance with ASTM Test Method D-1557-02.

For structural design of concrete slabs-on-grade, a modulus of subgrade reaction of 200 pounds per cubic inch (pci) may be used for floors supported on existing or engineered fill consisting of on-site soils.

Additional floor slab design and construction recommendations are as follows:

- Positive separations and/or isolation joints should be provided between slabs and all foundations, columns or utility lines to allow independent movement.
- Control joints should be provided in slabs to control the location and extent of cracking.
- Interior trench backfill placed beneath slabs should be compacted in accordance with recommended specifications outlined below.
- In areas subjected to heavy loading, reevaluation of slab and/or base course thickness may be required.

- If moisture sensitive floor coverings are used on interior slabs, consideration should be given to the use of barriers to minimize potential vapor rise through the slab.
- Floor slabs should not be constructed on frozen subgrade.

Other design and construction considerations, as outlined in the ACI Design Manual, Section 302.1R are recommended.

**Earthwork:**

**General Considerations:** The following presents recommendations for site preparation, excavation, subgrade preparation and placement of engineered fills on the project.

Earthwork on the project should be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

**Subgrade Preparation:** Due to the granular nature of the on-site materials, areas of soft or loose soils will likely be encountered at foundation bearing depth after excavation is completed for footings. When such conditions exist beneath planned footing areas, the subgrade soils should be recompacted prior to placement of the foundation system.

Subgrade soils beneath interior and exterior slabs should be scarified, adjusted to near optimum water content and compacted to a minimum depth of 12 inches. The water content and compaction of subgrade soils should be maintained until slab construction.

**Fill Materials and Placement:** On-site soils or approved imported materials free of deleterious materials and gravel larger than 3 inches may be used as fill material.

Imported soils (if required) should conform to the following:

<u>Gradation</u>	<u>Percent finer by weight (ASTM C136)</u>
3".....	70-100
No. 4 Sieve.....	50-100
No. 200 Sieve.....	35 (max)
• Liquid Limit.....	30 (max)
• Plasticity Index.....	15 (max)
• Maximum expansive potential (%)* .....	1.5

\*Measured on a sample compacted to approximately 95 percent of the ASTM D698 maximum dry density at about 3 percent below optimum water content. The sample is confined under a 100 psf surcharge and submerged.

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Engineered fill materials should be compacted to a minimum of 90 percent of the maximum laboratory density determined in accordance with ASTM D-1557-01.

On-site sands and/or imported soils should be compacted at above optimum water content unless modified by the project geotechnical engineer.

#### **Additional Design and Construction Considerations:**

**Corrosion Protection:** Results of soluble sulfate testing indicate that the on-site soils possess negligible (<0.001 percent) sulfate concentration when classified in accordance with Table 4.3.1 of the ACI Design Manual. Foundation concrete should be designed in accordance with the provisions of the ACI Design Manual, Section 318, Chapter 4.

Laboratory test results also yielded resistivities ranging from 3,676 to 7,199 ohm-centimeters, pH values ranging from 6.8 to 6.9, and soluble chloride concentrations of <0.0001 percent. These values should be used to determine potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

#### **GENERAL COMMENTS**

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide testing and observation during excavation, grading, foundation and construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the field investigation and from other information discussed in this report. This report does not reflect variations, which may occur across the site. The nature and extent of such variations may not become evident until construction. If variations appear, it will be necessary to reevaluate the recommendations of this report.

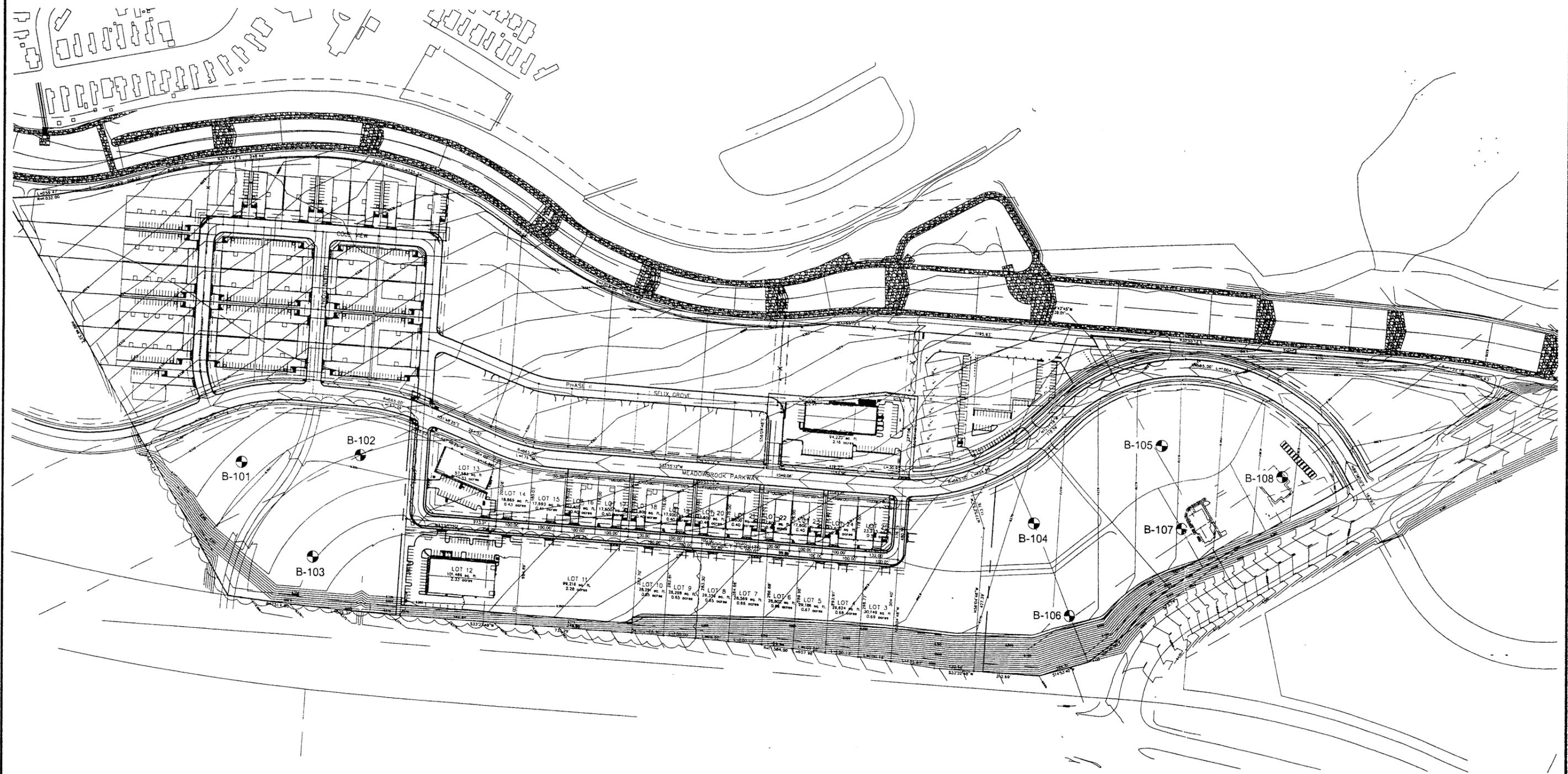
The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or

prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

Appendix

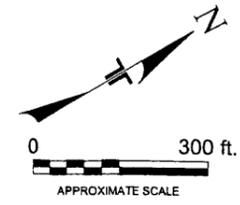
A



**LEGEND**  
 ○ APPROXIMATE LOCATION OF SOIL BORING

**NOTE:** GENERAL SITE PLAN AND PROPOSED CONSTRUCTION DRAWING PREPARED BY HAMMER'S CONSTRUCTION USED AS A BASE DRAWING.

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES.



BORING LOCATION DIAGRAM CLAREMONT BUSINESS PARK, FILING NO. 2 NW OF HIGHWAY 24 AND MARKSHEFFEL ROAD COLORADO SPRINGS, COLORADO				
Project Mngr:	DDH	 4172 Center Park Drive Colorado Springs, Colorado 80916	Project No.	23055071
Designed By:			Scale:	AS SHOWN
Checked By:	RWF		Date:	05-25-06
Approved By:			Drawn By:	MLA
File Name:	23055108 / Fig1-BLD	R0 MLA 05-26-06	Figure No.	1

# LOG OF BORING NO. B-101

CLIENT <b>Hammers Construction</b>									
SITE <b>NW of Hwy 24 and Marksheffel Rd. Colorado Springs, Colorado</b>		PROJECT <b>Claremont Business Park, Filing No.2</b>							
GRAPHIC LOG	DESCRIPTION  Approx. Surface Elev.: 6345.0 ft	DEPTH, ft.	USCS SYMBOL	SAMPLES				TESTS	
				NUMBER	TYPE	RECOVERY, in.	BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf
	<u>SILTY SAND</u> ; yellowish-brown, medium dense.	5	SM	1	RS	12	30	9	100
		SM	2	RS	12	26	7	99	
		SM	3	RS	12	32	4	111	
		SM	4	RS	12	33	4	107	
		SM	5	RS	12	27	6	102	
		18	6327						
	<u>SILTY TO CLAYEY SAND</u> ; light brown, medium dense.	20	SC SM	6	SS	20	8		
		20.5	6324.5						
	Boring terminated at 20 ½ feet.								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	None	WD	None
			AD
WL	None		
WL			



BORING STARTED		5-11-06	
BORING COMPLETED		5-11-06	
RIG	D-50T	FOREMAN	RDR
REVIEWED	DDH	JOB #	23055071

BOREHOLE PI 23055071.GPJ TERRACON.GDT 5/26/06

# LOG OF BORING NO. B-102

CLIENT <p style="text-align: center;"><b>Hammers Construction</b></p>	
SITE <p style="text-align: center;"><b>NW of Hwy 24 and Marksheffel Rd. Colorado Springs, Colorado</b></p>	PROJECT <p style="text-align: center;"><b>Claremont Business Park, Filing No.2</b></p>

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES				TESTS		
				NUMBER	TYPE	RECOVERY, in.	BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED COMPRESSION, psi
	Approx. Surface Elev.: 6348.0 ft									
	<b>SILTY SAND</b> ; brown, loose to medium dense.								Non-Plastic %<#200 = 7	
			SM	5	GRAB					
			SM	1	RS	12	51	7		111
	color change to yellowish-brown below 3 feet.		SM	2	RS	12	37	5		105
		5								
			SM	3	RS	12	16	5		101
			SM	4	RS	12	13	5		101
		10								
			SM	6	RS	12	23	5	117	
		15								
			SM	7	SS	13	23	4		
		20								
	Boring terminated at 20 ½ feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	None	WD	None
AD			
WL			
WL			



BORING STARTED	5-11-06
BORING COMPLETED	5-11-06
RIG	D-50T
FOREMAN	RDR
REVIEWED	DDH
JOB #	23055071

BOREHOLE PI 23055071.GPJ TERRACON.GDT 5/26/06

# LOG OF BORING NO. B-103

CLIENT <b>Hammers Construction</b>											
SITE <b>NW of Hwy 24 and Marksheffel Rd. Colorado Springs, Colorado</b>		PROJECT <b>Claremont Business Park, Filing No.2</b>									
GRAPHIC LOG	DESCRIPTION  Approx. Surface Elev.: 6352.0 ft	DEPTH, ft.	USCS SYMBOL	SAMPLES				TESTS			
				NUMBER	TYPE	RECOVERY, in.	BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED COMPRESSION, psi	
	<u>SILTY SAND</u> ; yellowish-brown, medium dense to dense.	5		SM	1	RS	12	68	8	112	
		5		SM	2	RS	12	60	7	108	
		10		SM	3	RS	12	32	10	107	
		10		SM	4	RS	12	22	7	100	
	<u>SILTY TO CLAYEY SAND</u> ; yellowish-brown, medium dense.	15		SC SM	5	RS	12	31	17	105	
		20		SC SM	6	SS	14	18	10		
	Boring terminated at 20 ½ feet.										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

BOREHOLE: PI 23055071.GPJ TERRACON.GDT 5/26/06

WATER LEVEL OBSERVATIONS, ft			
WL	None	WD	None
			AD
WL			
WL			



BORING STARTED		5-11-06	
BORING COMPLETED		5-11-06	
RIG	D-50T	FOREMAN	RDR
REVIEWED	DDH	JOB #	23055071

# LOG OF BORING NO. B-104

CLIENT  
**Hammers Construction**  
 SITE **NW of Hwy 24 and Marksheffel Rd.**  
**Colorado Springs, Colorado**

PROJECT  
**Claremont Business Park, Filing No.2**

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	SAMPLES				TESTS		
			USCS SYMBOL	NUMBER	TYPE	RECOVERY, in.	BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf
	Approx. Surface Elev.: 6371.0 ft								
	<b>SILTY SAND</b> ; yellowish-brown, loose to medium dense.								
			SM	5	GRAB				
			SM	1	RS	12	31	7	102
			SM	2	RS	12	11	8	99
		5							
			SM	3	RS	12	45	7	101
			SM	4	RS	12	42	2	108
		10							
			SM	6	RS	12	53	8	111
		15							
			SM	7	SS	13	28	8	
		20							
	Boring terminated at 20 ½ feet.								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	∇ None	WD	∇ None AD
WL	∇		∇
WL			



BORING STARTED		5-11-06	
BORING COMPLETED		5-11-06	
RIG	D-50T	FOREMAN	RDR
REVIEWED	DDH	JOB #	23055071

BOREHOLE PI 23055071.GPJ TERRACON GDT 5/26/06

# LOG OF BORING NO. B-105

CLIENT  
**Hammers Construction**

SITE **NW of Hwy 24 and Marksheffel Rd.  
Colorado Springs, Colorado**

PROJECT  
**Claremont Business Park, Filing No.2**

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	SAMPLES				TESTS			
			USCS SYMBOL	NUMBER	TYPE	RECOVERY, in.	BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED COMPRESSION, psi
			Approx. Surface Elev.: 6377.0 ft							
	<b>SILTY SAND</b> ; yellowish-brown, medium dense to dense.		SM	1	RS	12	36	9	109	
		5	SM	2	RS	10	72/11"	10	110	
			SM	3	RS	9	76/11"	10	114	
		10	SM	4	RS	9	80/11"	10	112	
	color change to brown to yellowish-brown, with roots at 13 feet.		SM	5	RS	11	73	7	118	
		15								
			SM	6	SS	13	18	4		
		20								
	Boring terminated at 20 ½ feet.									
	20.5	6356.5								

BOREHOLE PI 23055071.GPJ TERRACON.GDT 5/26/06

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	∇ None	WD	∇ None AD
WL	∇		∇
WL			



BORING STARTED		5-11-06	
BORING COMPLETED		5-11-06	
RIG	D-50T	FOREMAN	RDR
REVIEWED	DDH	JOB #	23055071

# LOG OF BORING NO. B-106

CLIENT <b>Hammers Construction</b>									
SITE <b>NW of Hwy 24 and Marksheffel Rd. Colorado Springs, Colorado</b>		PROJECT <b>Claremont Business Park, Filing No.2</b>							
GRAPHIC LOG	DESCRIPTION  Approx. Surface Elev.: 6373.0 ft	DEPTH, ft.	SAMPLES				TESTS		
			USCS SYMBOL	NUMBER	TYPE	RECOVERY, in.	BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf
	<u>SILTY SAND</u> ; yellowish-brown, medium dense.	5	SM	5	GRAB				
			SM	1	RS	12	21	11	102
			SM	2	RS	12	23	10	106
			SM	3	RS	12	41	4	116
			SM	4	RS	12	30	6	109
			SM	6	RS	12	28	13	105
			SM	7	SS	13	25	9	
	Boring terminated at 20 ½ feet.	20							

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

BOREHOLE PI 23055071.GPJ TERRACON.GDT 5/26/06

WATER LEVEL OBSERVATIONS, ft			
WL	None	WD	None
			AD
WL			
WL			



BORING STARTED		5-11-06	
BORING COMPLETED		5-11-06	
RIG	D-50T	FOREMAN	RDR
REVIEWED	DDH	JOB #	23055071

# LOG OF BORING NO. B-107

CLIENT  
**Hammers Construction**

SITE **NW of Hwy 24 and Marksheffel Rd.  
Colorado Springs, Colorado**

PROJECT  
**Claremont Business Park, Filing No.2**

GRAPHIC LOG	DESCRIPTION  Approx. Surface Elev.: 6378.0 ft	DEPTH, ft.	SAMPLES					TESTS		
			USCS SYMBOL	NUMBER	TYPE	RECOVERY, in.	BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED COMPRESSION, psi
			SM	1	RS	12	56	6	104	
	color change to light brown below 3 feet.									
SM	2	RS	12	42	15	108				
	color change to brown below 6 feet.									
SM	3	RS	12	18	20	95				
	color change to yellowish-brown below 8 feet.									
SM	4	RS	12	24	4	98				
	color change to brown below 13 feet.									
SM	5	RS	12	32	11	109				
	color change to brown below 13 feet.									
SM	6	SS	14	22	10					
	Boring terminated at 20 1/2 feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	None	WD	None
AD			
WL	None		
WL			



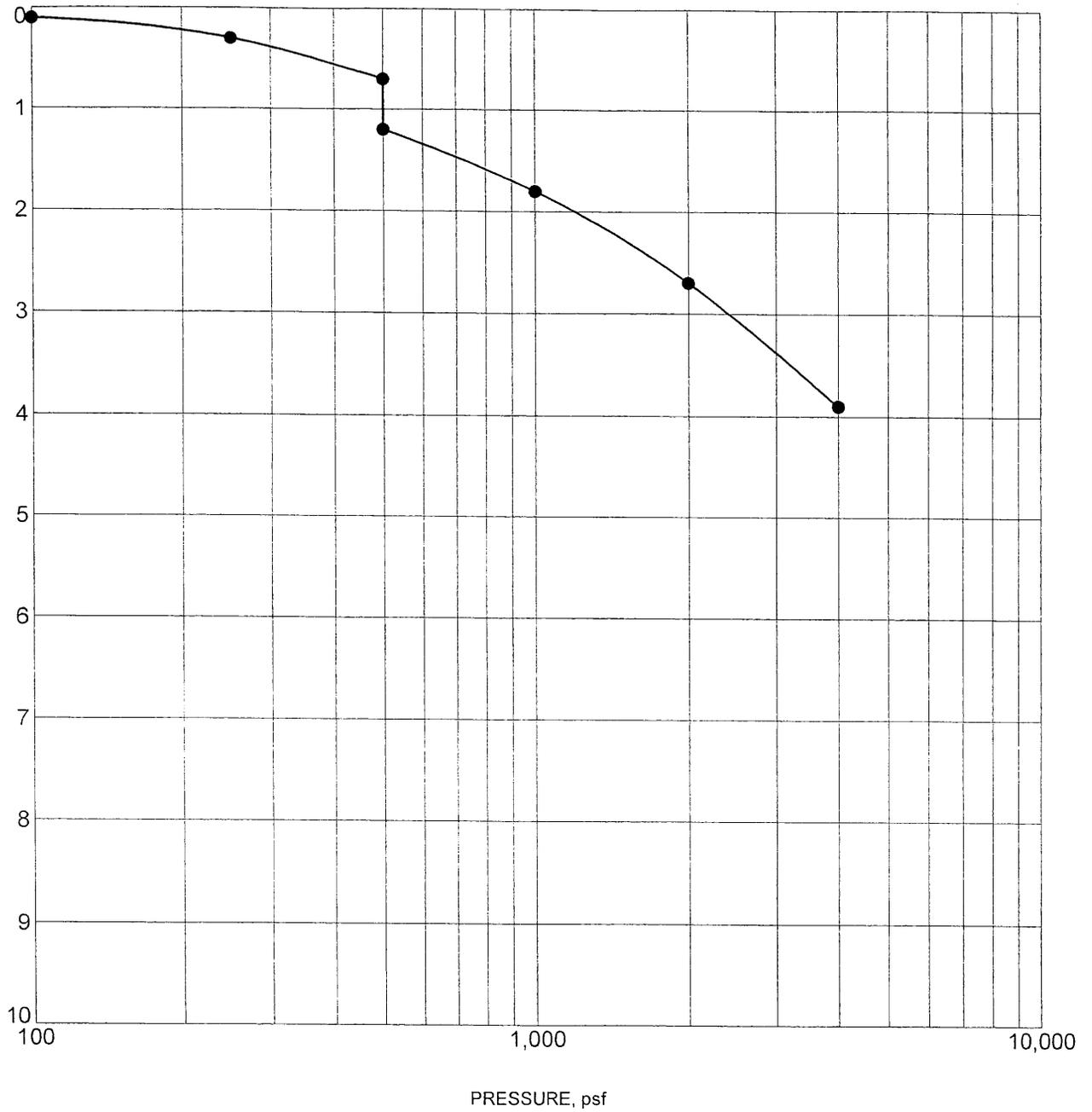
BORING STARTED	5-11-06
BORING COMPLETED	5-11-06
RIG	D-50T
FOREMAN	RDR
REVIEWED	DDH
JOB #	23055071

BOREHOLE PI 23055071.GPJ TERRACON.GDT 5/26/06



# Appendix B

AXIAL STRAIN, %



Specimen Identification		Classification	$\gamma_d$ , pcf	WC, %
● B-101	2.0ft	SILTY SAND(SM)	100	9

Notes: Sample inundated with water at 500 pounds per square foot (psf).

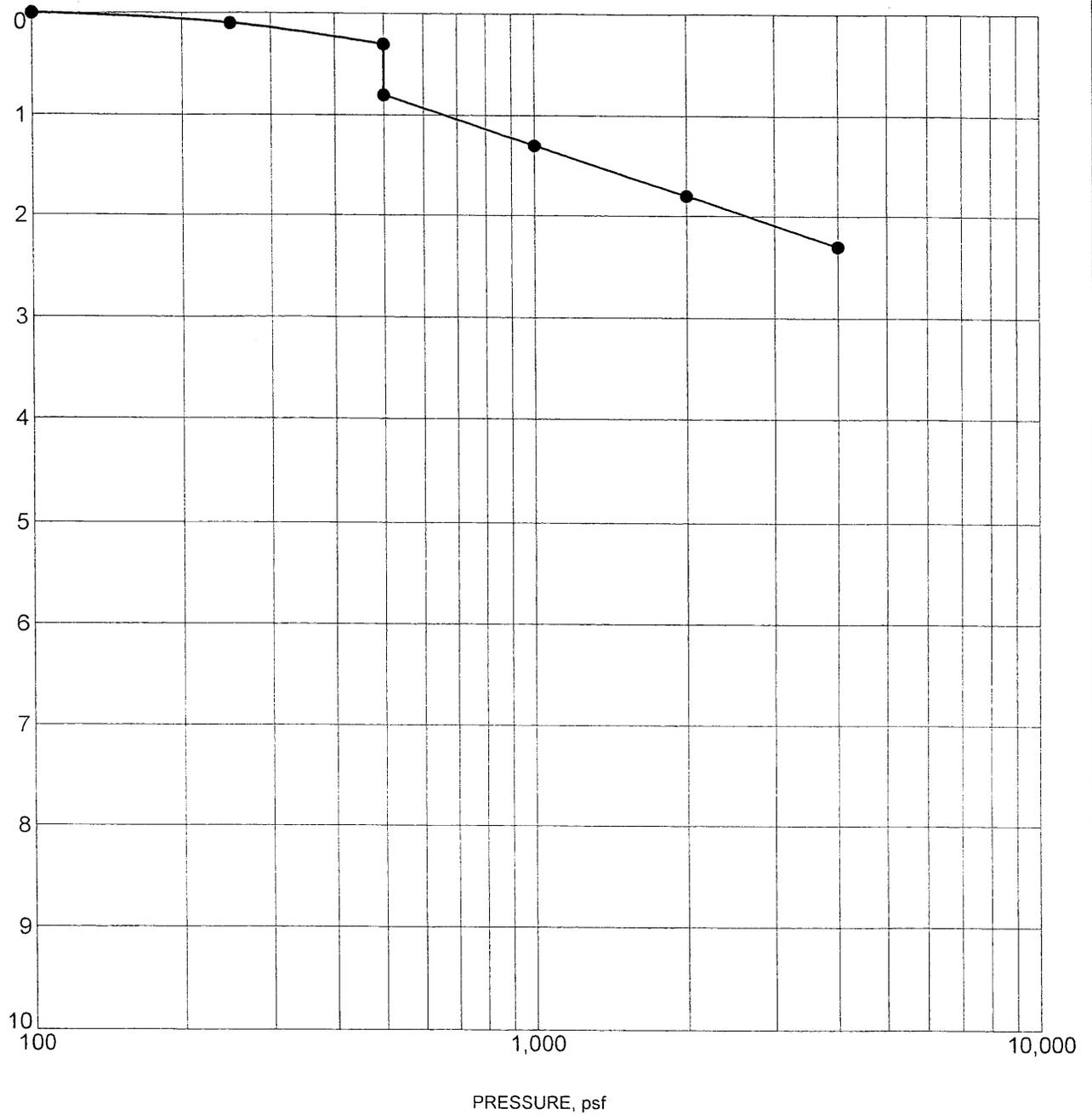
TC CONSOL STRAIN 23055071.GPJ TERRACON.GDT 5/26/06



### CONSOLIDATION TEST

Project: Claremont Business Park, Filing No.2  
 Site: NW of Hwy 24 and Marksheffel Rd. Colorado Springs, Colorado  
 Job #: 23055071  
 Date: 5-26-06

AXIAL STRAIN, %



Specimen Identification		Classification	$\gamma_d$ , pcf	WC, %
● B-102	4.0ft	SILTY SAND(SM)	105	5

Notes: Sample inundated with water at 500 pounds per square foot (psf).

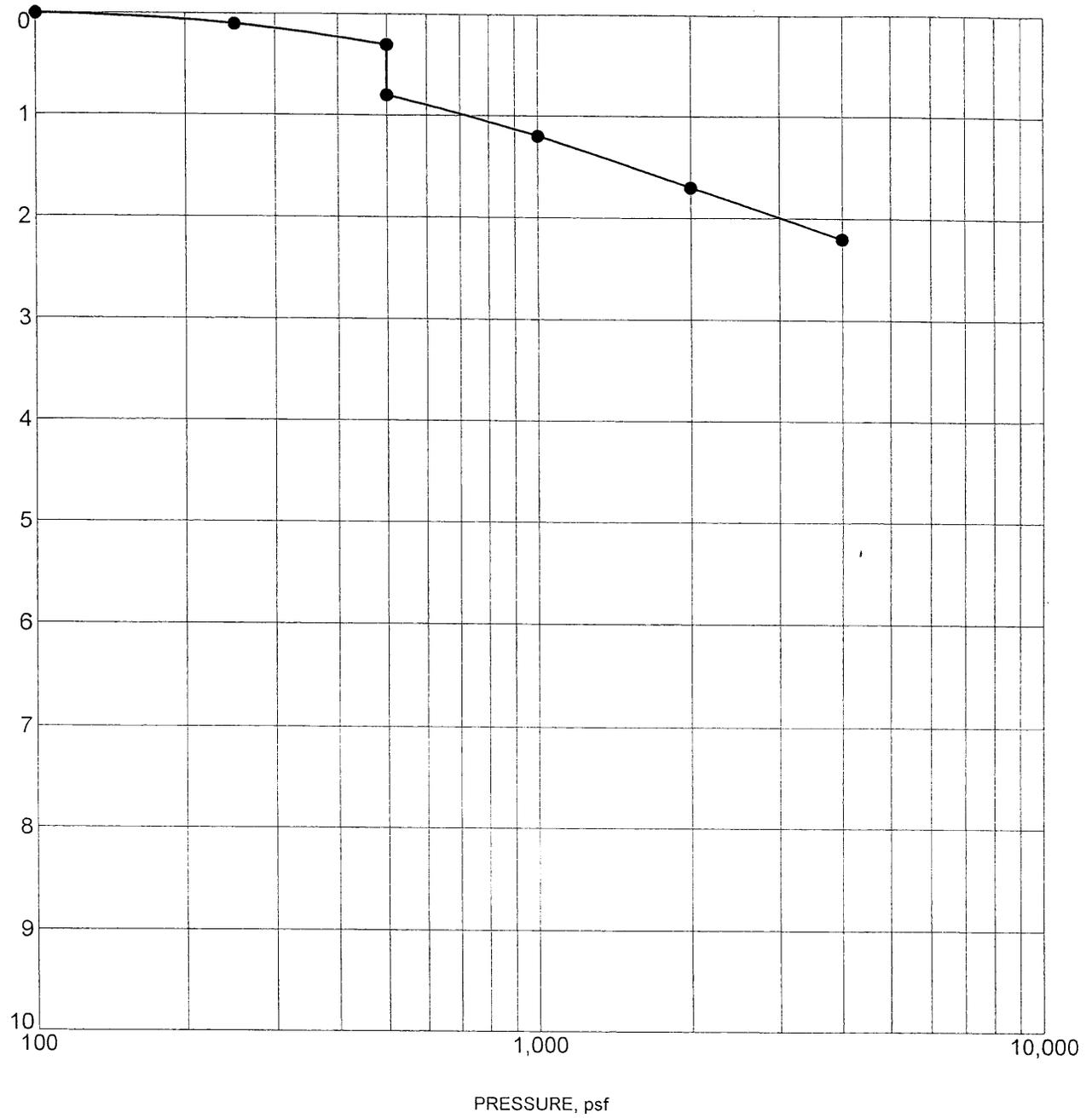
TC CONSOL STRAIN 23055071.GPJ TERRACON.GDT 5/26/06



### CONSOLIDATION TEST

Project: Claremont Business Park, Filing No.2  
 Site: NW of Hwy 24 and Marksheffel Rd. Colorado Springs, Colorado  
 Job #: 23055071  
 Date: 5-26-06

AXIAL STRAIN, %



Specimen Identification	Classification	$\gamma_d$ , pcf	WC, %
● B-103      4.0ft	SILTY SAND(SM)	108	7

Notes: Sample inundated with water at 500 pounds per square foot (psf).

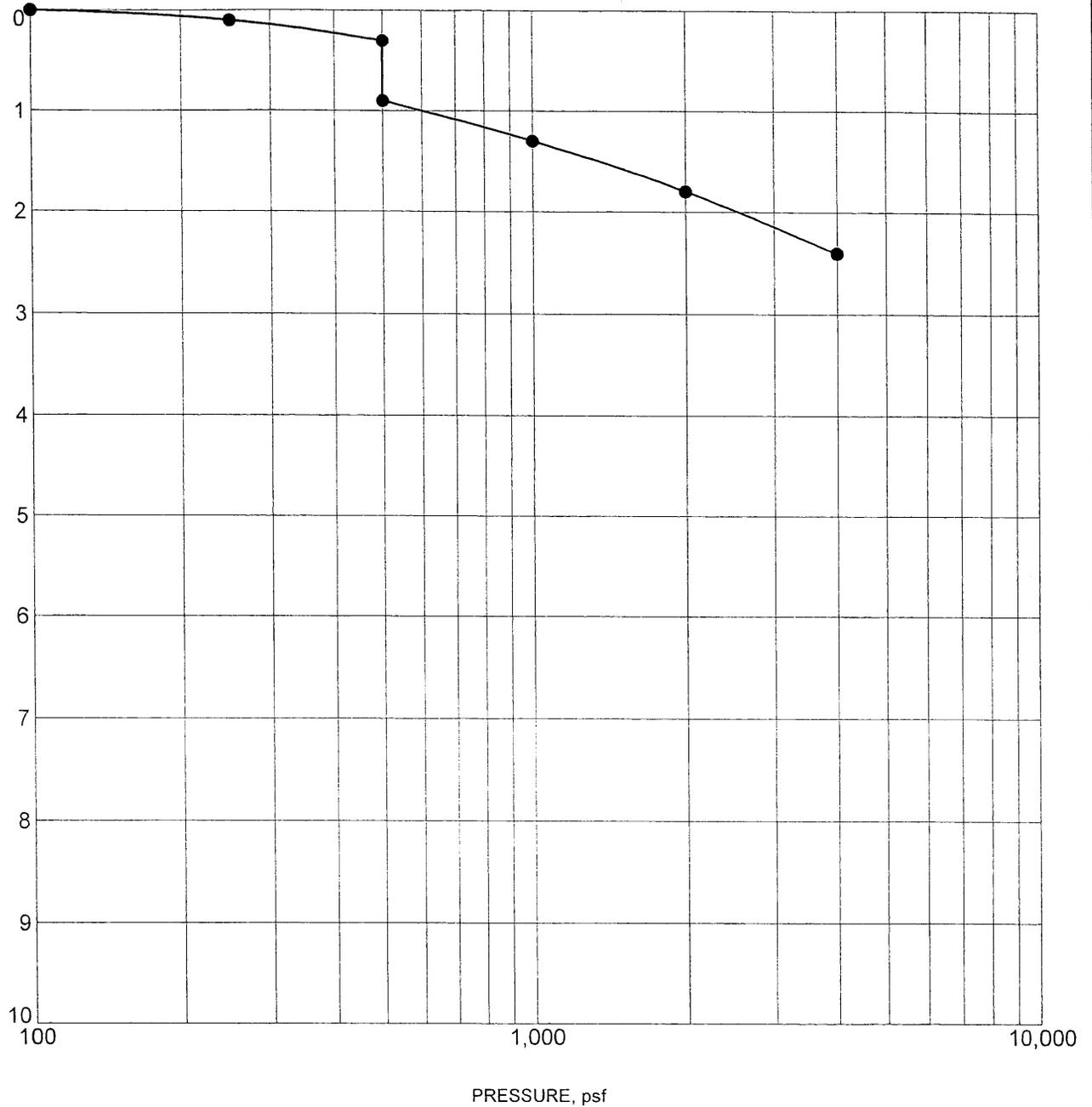
TC CONSOL STRAIN 23055071.GPJ TERRACON.GDT 5/26/06



**CONSOLIDATION TEST**

Project: Claremont Business Park, Filing No.2  
 Site: NW of Hwy 24 and Marksheffel Rd. Colorado Springs, Colorado  
 Job #: 23055071  
 Date: 5-26-06

AXIAL STRAIN, %



Specimen Identification	Classification	$\gamma_d$ , pcf	WC, %
● B-104      2.0ft	SILTY SAND(SM)	102	7

Notes: Sample inundated with water at 500 pounds per square foot (psf).

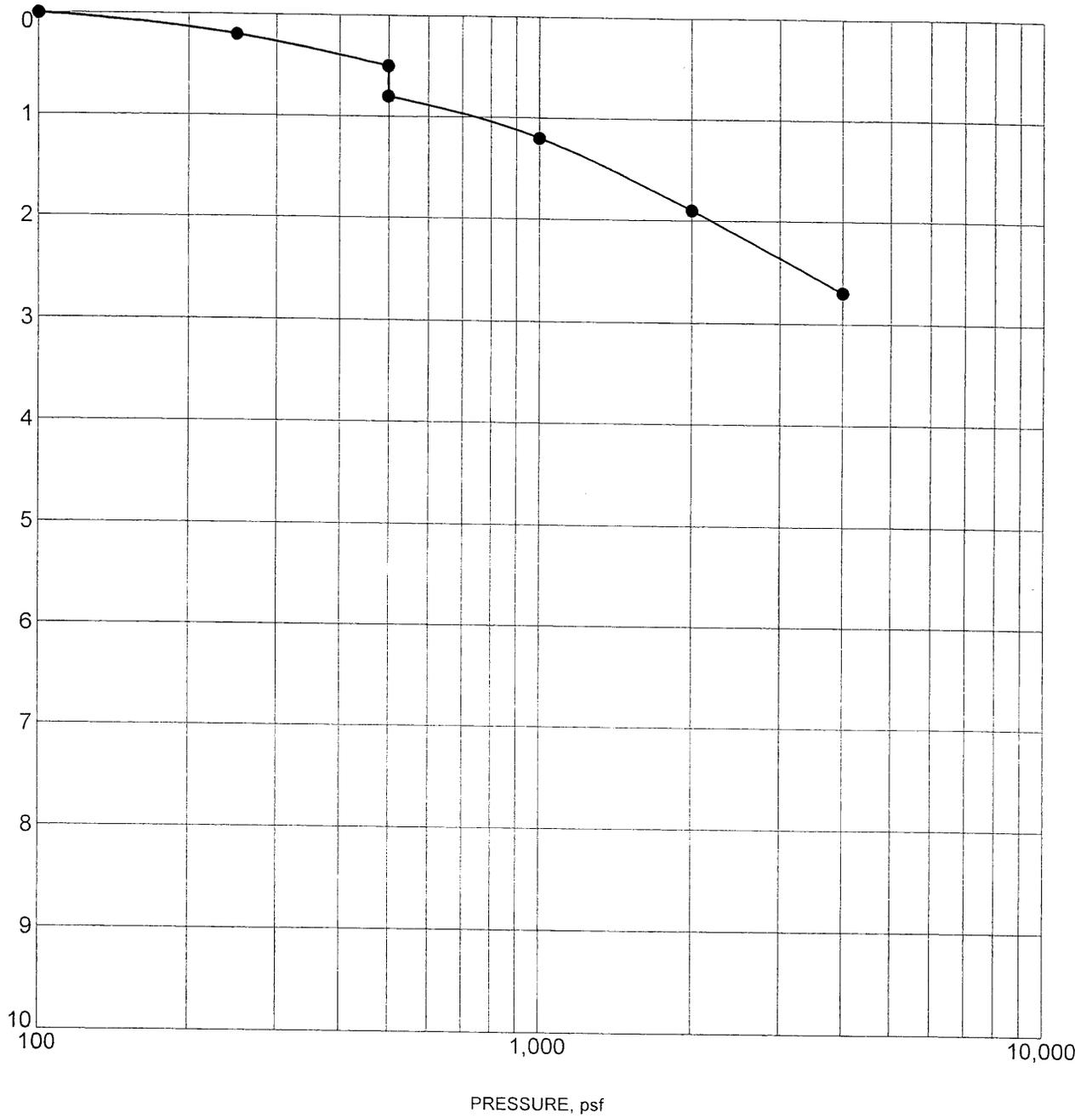
TC CONSOL STRAIN 23055071.GPJ TERRACON.GDT 5/26/06

**Terracon**

**CONSOLIDATION TEST**

Project: Claremont Business Park, Filing No.2  
 Site: NW of Hwy 24 and Marksheffel Rd. Colorado Springs, Colorado  
 Job #: 23055071  
 Date: 5-26-06

AXIAL STRAIN, %



Specimen Identification		Classification	$\gamma_d$ , pcf	WC, %
● B-105	2.0ft	SILTY SAND(SM)	109	9

Notes: Sample inundated with water at 500 pounds per square foot (psf).

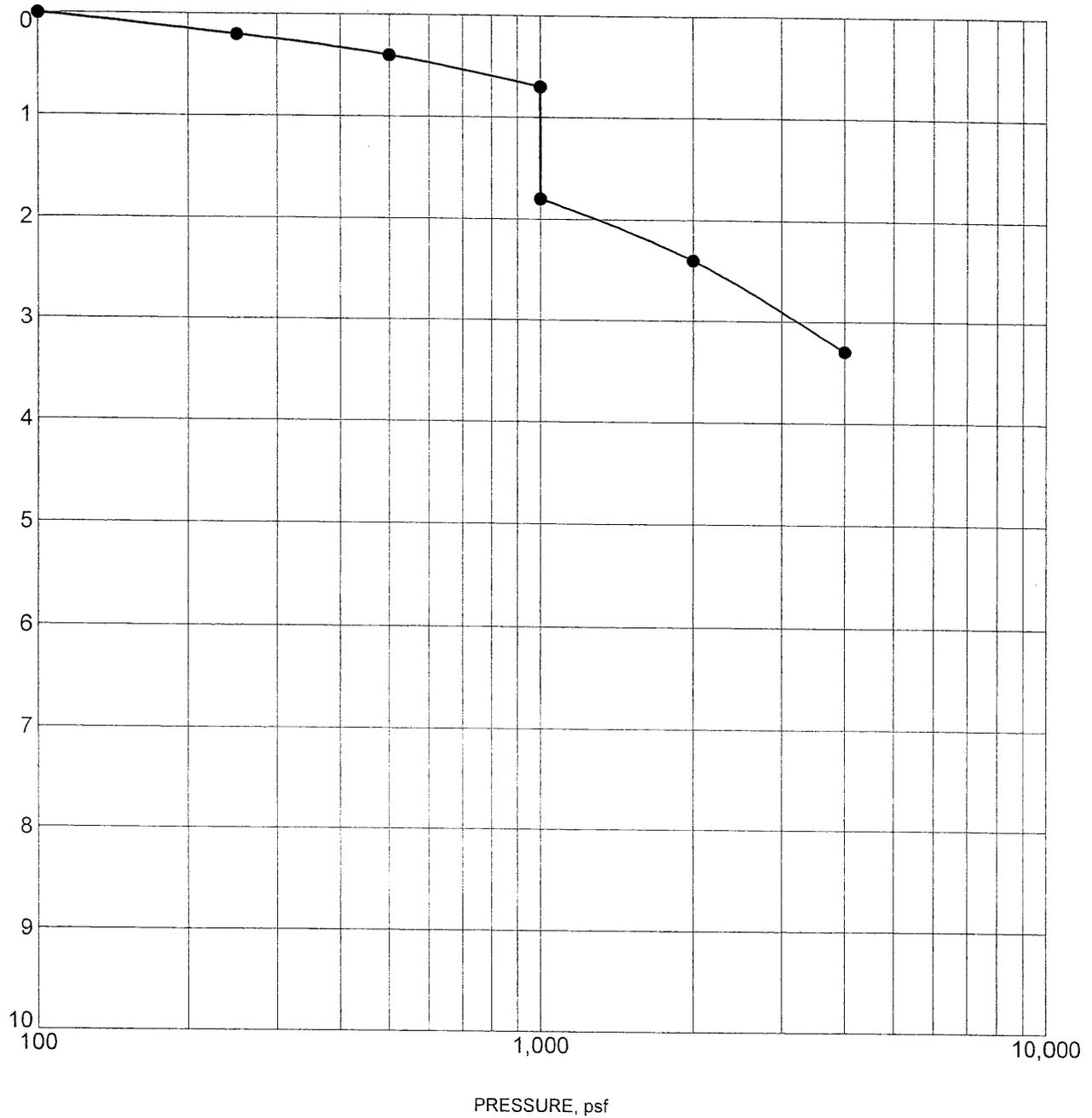
TC CONSOL STRAIN 23055071.GPJ TERRACON.GDT 5/26/06



### CONSOLIDATION TEST

Project: Claremont Business Park, Filing No.2  
 Site: NW of Hwy 24 and Marksheffel Rd. Colorado Springs, Colorado  
 Job #: 23055071  
 Date: 5-26-06

AXIAL STRAIN, %



Specimen Identification	Classification	$\gamma_d$ , pcf	WC, %
● B-106      7.0ft	SILTY SAND(SM)	116	4

Notes: Sample inundated with water at 1,000 pounds per square foot (psf).

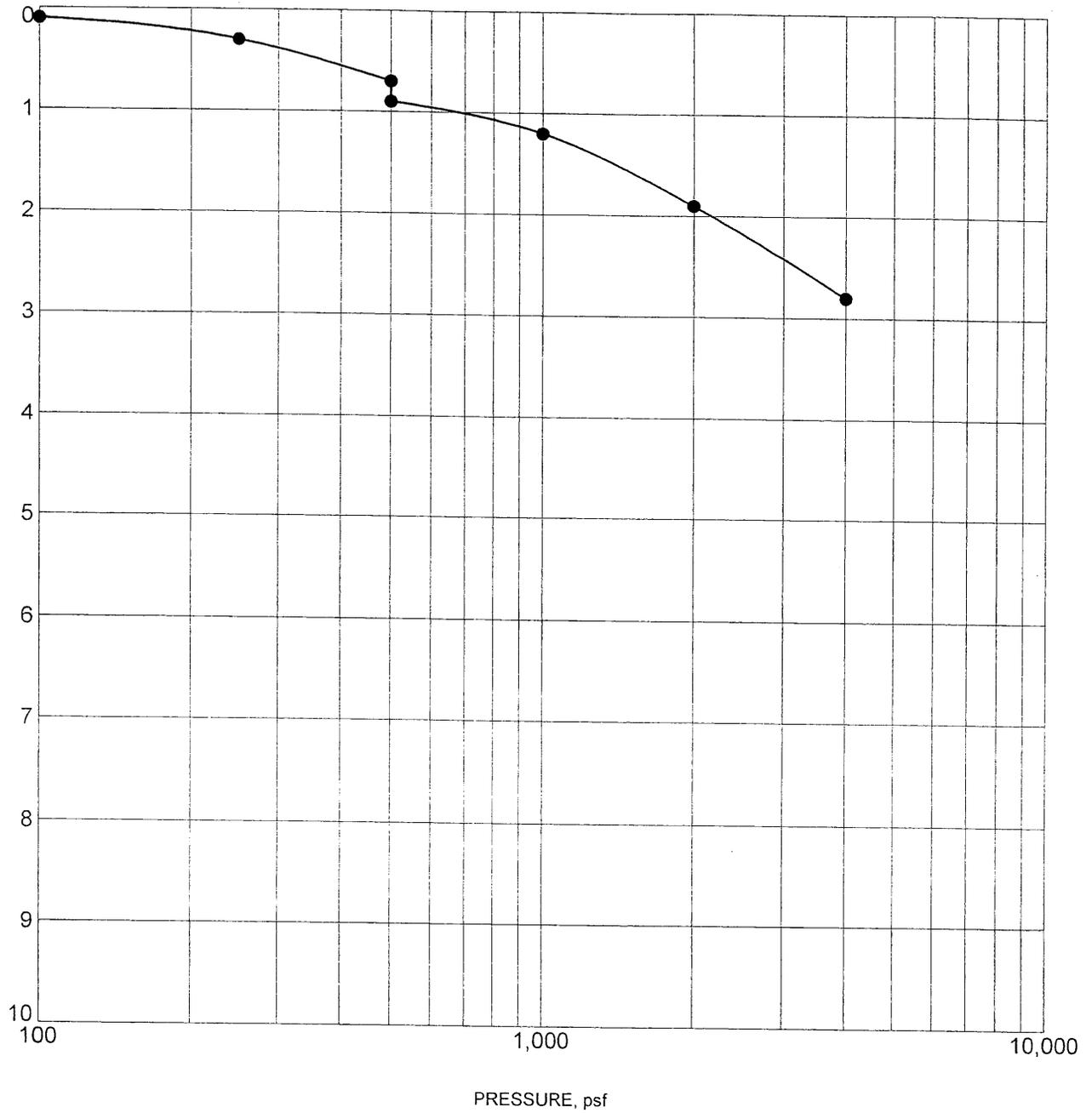
TC CONSOL. STRAIN 23055071.GPJ TERRACON.GDT 5/26/06



### CONSOLIDATION TEST

Project: Claremont Business Park, Filing No.2  
 Site: NW of Hwy 24 and Marksheffel Rd. Colorado Springs, Colorado  
 Job #: 23055071  
 Date: 5-26-06

AXIAL STRAIN, %



Specimen Identification	Classification	$\gamma_d$ , pcf	WC, %
● B-107      4.0ft	SILTY SAND(SM)	108	15

Notes: Sample inundated with water at 500 pounds per square foot (psf).

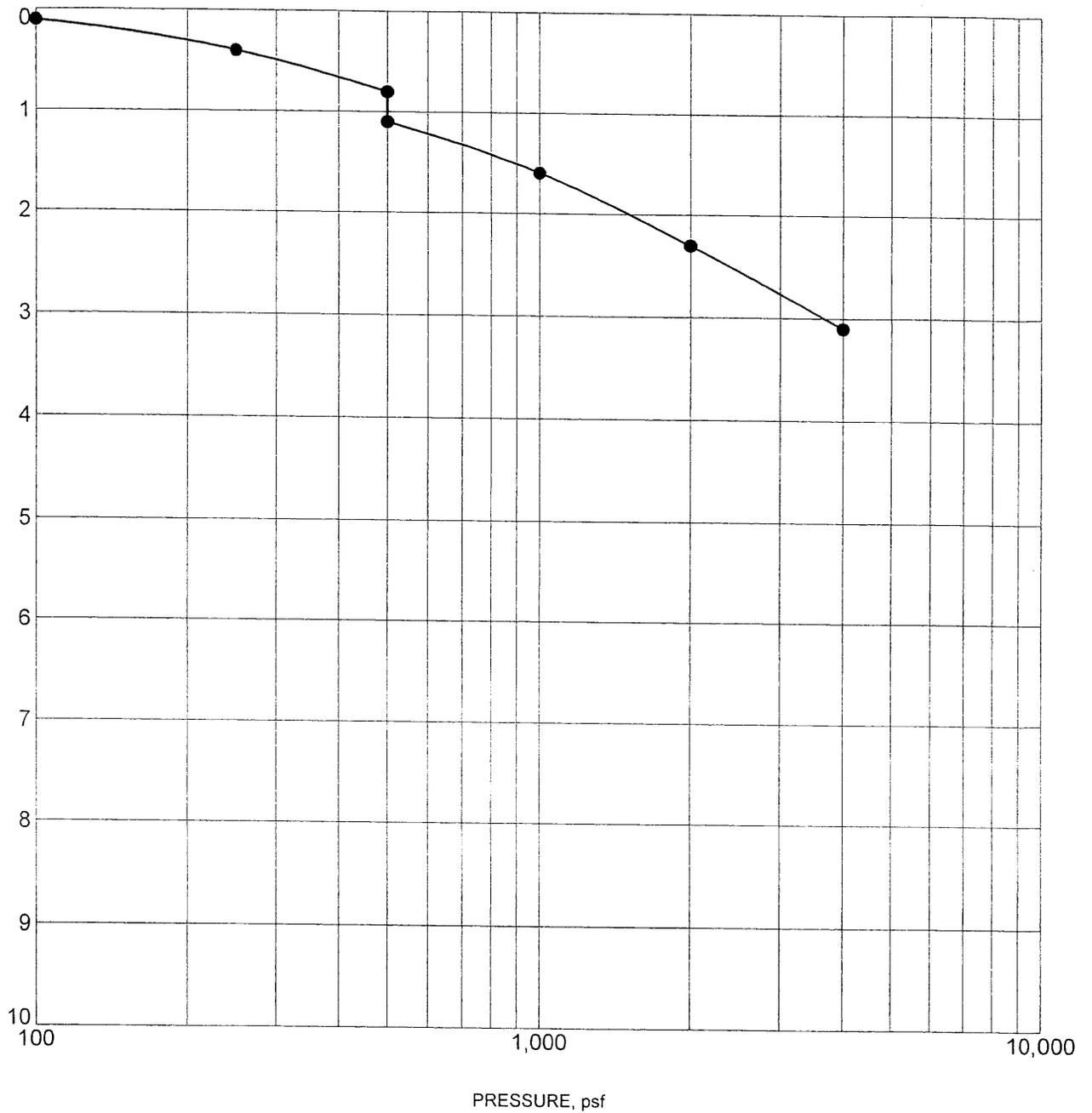
TC\_CONSOL\_STRAIN\_23055071.GPJ TERRACON.GDT 5/26/06

**Terracon**

**CONSOLIDATION TEST**

Project: Claremont Business Park, Filing No.2  
 Site: NW of Hwy 24 and Marksheffel Rd. Colorado Springs, Colorado  
 Job #: 23055071  
 Date: 5-26-06

AXIAL STRAIN, %



Specimen Identification	Classification	$\gamma_d$ , pcf	WC, %
● B-108      2.0ft	SILTY SAND(SM)	105	11

Notes: Sample inundated with water at 500 pounds per square foot (psf).

TC CONSOL. STRAIN 23055071.GPJ TERRACON.GDT 5/26/06



**CONSOLIDATION TEST**

Project: Claremont Business Park, Filing No.2  
 Site: NW of Hwy 24 and Marksheffel Rd. Colorado Springs, Colorado  
 Job #: 23055071  
 Date: 5-26-06





# Analytical Results

TASK NO: 06051507

Report To: Ryan Feist  
Company: Terracon, Inc.  
4172 Center Park Drive  
Colo. Springs CO 80916

Bill To: Ryan Feist  
Company: Terracon, Inc.  
4172 Center Park Drive  
Colo. Springs CO 80916

Task No.: 06051507  
Client PO:  
Client Project: Claremont Park 2305-5071

Date Received: 5/15/06  
Date Reported: 5/24/06  
Matrix: Soil - Geotech

Customer Sample ID B102 (1-10)

Sample Date/Time:

Lab Number: 06051507-01

Test	Result	Method
Chloride - Water Soluble	< 0.0001 %	AASHTO T291-91
pH	6.9 units	AASHTO T289-91
Resistivity	7199 ohm.cm	AASHTO T288-91
Sulfate - Water Soluble	< 0.001 %	AASHTO T290-91

Customer Sample ID B108 (1-10)

Sample Date/Time:

Lab Number: 06051507-02

Test	Result	Method
Chloride - Water Soluble	< 0.0001 %	AASHTO T291-91
pH	6.8 units	AASHTO T289-91
Resistivity	3676 ohm.cm	AASHTO T288-91
Sulfate - Water Soluble	< 0.001 %	AASHTO T290-91

DATA APPROVED FOR RELEASE BY

Appendix

C

## GENERAL NOTES

### DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1- <sup>3</sup> / <sub>8</sub> " I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube - 2" O.D., unless otherwise noted	PA:	Power Auger
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB:	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split- spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value". For 3" O.D. ring samplers (RS) the penetration value is reported as the number of blows required to advance the sampler 12 inches using a 140-pound hammer falling 30 inches, reported as "blows per foot," and is not considered equivalent to the "Standard Penetration" or "N-value".

### WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling	N/E:	Not Encountered
WCI:	Wet Cave in	WD:	While Drilling		
DCI:	Dry Cave in	BCR:	Before Casing Removal		
AB:	After Boring	ACR:	After Casing Removal		

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

**DESCRIPTIVE SOIL CLASSIFICATION:** Soil classification is based on the Unified Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

#### CONSISTENCY OF FINE-GRAINED SOILS

<u>Unconfined Compressive Strength, Qu, psf</u>	<u>Standard Penetration or N-value (SS) Blows/Ft.</u>	<u>Consistency</u>
< 500	<2	Very Soft
500 - 1,000	2-3	Soft
1,001 - 2,000	4-6	Medium Stiff
2,001 - 4,000	7-12	Stiff
4,001 - 8,000	13-26	Very Stiff
8,000+	26+	Hard

#### RELATIVE DENSITY OF COARSE-GRAINED SOILS

<u>Standard Penetration or N-value (SS) Blows/Ft.</u>	<u>Ring Sampler (RS) Blows/Ft.</u>	<u>Relative Density</u>
0 - 3	0-6	Very Loose
4 - 9	7-18	Loose
10 - 29	19-58	Medium Dense
30 - 49	59-98	Dense
50+	99+	Very Dense

#### RELATIVE PROPORTIONS OF SAND AND GRAVEL

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 15
With	15 - 29
Modifier	> 30

#### GRAIN SIZE TERMINOLOGY

<u>Major Component of Sample</u>	<u>Particle Size</u>
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

#### RELATIVE PROPORTIONS OF FINES

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 5
With	5 - 12
Modifiers	> 12

#### PLASTICITY DESCRIPTION

<u>Term</u>	<u>Plasticity Index</u>
Non-plastic	0
Low	1-10
Medium	11-30
High	30+

# Terracon

## GENERAL NOTES

### Description of Rock Properties

#### WEATHERING

Fresh	Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer if crystalline.
Very slight	Rock generally fresh, joints stained, some joints may show thin clay coatings, crystals in broken face show bright. Rock rings under hammer if crystalline.
Slight	Rock generally fresh, joints stained, and discoloration extends into rock up to 1 in. Joints may contain clay. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.
Moderate	Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some show clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.
Moderately severe	All rock except quartz discolored or stained. In granitoid rocks, all feldspars dull and discolored and majority show kaolinization. Rock shows severe loss of strength and can be excavated with geologist's pick.
Severe	All rock except quartz discolored or stained. Rock "fabric" clear and evident, but reduced in strength to strong soil. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of strong rock usually left.
Very severe	All rock except quartz discolored or stained. Rock "fabric" discernible, but mass effectively reduced to "soil" with only fragments of strong rock remaining.
Complete	Rock reduced to "soil". Rock "fabric" not discernible or discernible only in small, scattered locations. Quartz may be present as dikes or stringers.

#### HARDNESS (for engineering description of rock – not to be confused with Moh's scale for minerals)

Very hard	Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of geologist's pick.
Hard	Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately hard	Can be scratched with knife or pick. Gouges or grooves to 1/4 in. deep can be excavated by hard blow of point of a geologist's pick. Hand specimens can be detached by moderate blow.
Medium	Can be grooved or gouged 1/16 in. deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1-in. maximum size by hard blows of the point of a geologist's pick.
Soft	Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.
Very soft	Can be carved with knife. Can be excavated readily with point of pick. Pieces 1-in. or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

#### Joint, Bedding and Foliation Spacing in Rock<sup>a</sup>

Spacing	Joints	Bedding/Foliation
Less than 2 in.	Very close	Very thin
2 in. – 1 ft.	Close	Thin
1 ft. – 3 ft.	Moderately close	Medium
3 ft. – 10 ft.	Wide	Thick
More than 10 ft.	Very wide	Very thick

Rock Quality Designator (RQD) <sup>b</sup>		Joint Openness Descriptors	
RQD, as a percentage	Diagnostic description	Openness	Descriptor
Exceeding 90	Excellent	No Visible Separation	Tight
90 – 75	Good	Less than 1/32 in.	Slightly Open
75 – 50	Fair	1/32 to 1/8 in.	Moderately Open
50 – 25	Poor	1/8 to 3/8 in.	Open
Less than 25	Very poor	3/8 in. to 0.1 ft.	Moderately Wide
		Greater than 0.1 ft.	Wide

- a. Spacing refers to the distance normal to the planes, of the described feature, which are parallel to each other or nearly so.  
 b. RQD (given as a percentage) = length of core in pieces 4 in. and longer/length of run.

References: American Society of Civil Engineers, Manuals and Reports on Engineering Practice - No. 56, Subsurface Investigation for Design and Construction of Foundations of Buildings, New York: American Society of Civil Engineers, 1976.  
 U.S. Department of the Interior, Bureau of Reclamation, Engineering Geology Field Manual.

# UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests<sup>A</sup>

				Soil Classification		
				Group Symbol	Group Name <sup>B</sup>	
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines <sup>C</sup>	$Cu \geq 4$ and $1 \leq Cc \leq 3^E$	GW	Well-graded gravel <sup>F</sup>	
		Gravels with Fines More than 12% fines <sup>C</sup>	$Cu < 4$ and/or $1 > Cc > 3^E$	GP	Poorly graded gravel <sup>F</sup>	
			Fines classify as ML or MH	GM	Silty gravel <sup>F,G,H</sup>	
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines <sup>D</sup>	$Cu \geq 6$ and $1 \leq Cc \leq 3^E$	SW	Well-graded sand <sup>I</sup>	
		Sands with Fines More than 12% fines <sup>D</sup>	$Cu < 6$ and/or $1 > Cc > 3^E$	SP	Poorly graded sand <sup>I</sup>	
			Fines classify as ML or MH	SM	Silty sand <sup>G,H,I</sup>	
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silt and Clays Liquid limit less than 50	inorganic	$PI > 7$ and plots on or above "A" line <sup>J</sup>	CL	Lean clay <sup>K,L,M</sup>	
			$PI < 4$ or plots below "A" line <sup>J</sup>	ML	Silt <sup>K,L,M</sup>	
		organic	Liquid limit - oven dried < 0.75	OL	Organic clay <sup>K,L,M,N</sup>	
			Liquid limit - not dried	OL	Organic silt <sup>K,L,M,O</sup>	
		Silt and Clays Liquid limit 50 or more	inorganic	$PI$ plots on or above "A" line	CH	Fat clay <sup>K,L,M</sup>
				$PI$ plots below "A" line	MH	Elastic Silt <sup>K,L,M</sup>
	organic		Liquid limit - oven dried < 0.75	OH	Organic clay <sup>K,L,M,P</sup>	
			Liquid limit - not dried	OH	Organic silt <sup>K,L,M,Q</sup>	
	Highly organic soils		Primarily organic matter, dark in color, and organic odor		PT	Peat

<sup>A</sup>Based on the material passing the 3-in. (75-mm) sieve

<sup>B</sup>If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

<sup>C</sup>Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

<sup>D</sup>Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

$$^E Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

<sup>F</sup>If soil contains  $\geq 15\%$  sand, add "with sand" to group name.

<sup>G</sup>If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

<sup>H</sup>If fines are organic, add "with organic fines" to group name.

<sup>I</sup>If soil contains  $\geq 15\%$  gravel, add "with gravel" to group name.

<sup>J</sup>If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

<sup>K</sup>If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

<sup>L</sup>If soil contains  $\geq 30\%$  plus No. 200 predominantly sand, add "sandy" to group name.

<sup>M</sup>If soil contains  $\geq 30\%$  plus No. 200, predominantly gravel, add "gravelly" to group name.

<sup>N</sup> $PI \geq 4$  and plots on or above "A" line.

<sup>O</sup> $PI < 4$  or plots below "A" line.

<sup>P</sup> $PI$  plots on or above "A" line.

<sup>Q</sup> $PI$  plots below "A" line.

