Terracon

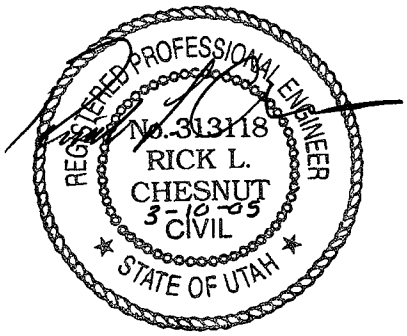
GEOTECHNICAL ENGINEERING REPORT

PROPOSED RIVERTON DEVELOPMENT
3200 WEST 12600 SOUTH
RIVERTON, UTAH

Terracon Project No. 61055012
March 8, 2005

Prepared for:

Richmond American Homes
Salt Lake City, Utah



Prepared by:

TERRACON CONSULTANTS, INC.
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March 8, 2005

Terracon
Consulting Engineers & Scientists

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Richmond American Homes
849 West LeVoy Drive, Suite 100
Salt Lake City, Utah 84123

Attn: Mr. Benson Whitney

Re: Geotechnical Engineering Report
Proposed Riverton Development
Riverton, Utah
Terracon Project No. 61055012

Gentlemen:

At your request, Terracon has performed a geotechnical exploration at the site of the proposed Riverton development to be located at approximately 3200 West 12600 South in Riverton, Utah. This exploration was authorized by you on February 10, 2005 and performed in general conformance with our Proposal for Geotechnical Engineering Services, dated February 10, 2005. The accompanying report describes the exploration, summarizes our findings and presents recommendations for site grading and design of foundations for the proposed structures.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
TERRACON

Bradley C. Conder, E.I.T
Geotechnical Staff Engineer

Rick L. Chesnut, P.E.
Utah Operations Manager

Copies To: Addressee (3)

N:\2005 Project Files\61055012\61055012 rpt

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GEOTECHNICAL ENGINEERING REPORT
PROPOSED RIVERTON DEVELOPMENT
RIVERTON, UTAH

Terracon Project No. 61055012
March 8, 2005

INTRODUCTION

This report presents the results of a geotechnical exploration for the site of the proposed Riverton development to be located at approximately 3200 West 12600 South in Riverton, Utah. The general location of the site with respect to existing roads is presented on the Project Vicinity Map, included in Appendix A.

The purpose of this exploration was to evaluate subsurface conditions at the site, and provide geotechnical recommendations regarding design of foundations and pavement sections and associated earthwork for the proposed structures and roadways. The scope of work included subsurface exploration, field and laboratory testing, engineering analysis, and the preparation of this report.

PROJECT DESCRIPTION

We understand that the project consists of constructing a residential subdivision on approximately 30 acres. The site will be divided into 88 lots, each approximately 14,000 to 20,000 square feet in size. The proposed buildings will be two-story single-family homes of wood frame construction. Basements are planned below the residences. We anticipate that structural loads will not exceed 3 kips per lineal foot of wall. Floor slab loads are anticipated to not exceed about 125 psf.

Grading plans and finished elevation of the lots were not available at the time this report was prepared. However, we understand that homes will be constructed near the existing lot grades.

Pavement loading design criteria was not provided at the time of the preparation of this report. It is anticipated that design traffic loads will not exceed 50,000 18-kip Equivalent Single Axle Loads (ESALs) for interior, low-volume roads.

If structural loads are determined to be greater than those assumed above or if site grading activities vary significantly from that described above, we should be notified immediately so the necessary modifications can be made to our recommendations.

SITE EXPLORATION PROCEDURES

Field Exploration

The subsurface exploration included drilling 16 borings throughout the development to depths of approximately 16.5 to 31.5 feet below the existing site grades. The approximate location of the boring in relation to the proposed construction is shown on the Boring Location Plan, included in Appendix A. The borings were located by reference to existing on-site features. The locations are approximate and should be considered accurate only to the degree implied by the means and methods used to determine them.

The borings were drilled with a truck-mounted rotary drill rig with continuous flight hollow-stem augers. Disturbed soil samples were collected at various depths utilizing a 2-inch outside-diameter split spoon sampler driven in general accordance with the standard penetration test (SPT). This test consists of driving the sampler into the ground with a 140-pound hammer free-falling through a distance of 30 inches. The number of blows required to advance the sampler the last 12 inches, or the interval indicated, of a typical 18-inch penetration is recorded as the standard penetration resistance value (N-value). These values will be indicated on the final boring logs at the respective sample depths.

The standard penetration test provides a reasonable indication of the in-place density of sandy type materials, but only provides an indication of the relative stiffness of cohesive materials since the blow count in these soils may be affected by the moisture content. In addition, considerable care should be exercised in interpreting the N-values in gravelly soils, particularly where the size of the gravel particle exceeds the inside diameter of the sampler.

A larger 3.5-inch diameter split spoon sampler with brass insert sleeves was used to collect ring samples in fine-grained soil.

A log of each boring was prepared by Terracon personnel during drilling. Approximate locations of the borings are indicated on the attached Boring Location Plan. The soil samples were packaged and transported to our Draper, Utah laboratory for further observation and testing.

Laboratory Testing

Samples obtained during the field exploration were visually classified in the laboratory in general accordance with the Unified Soil Classification System (USCS). The USCS is described in Appendix C.

Representative soil samples were selected for testing to determine physical and engineering properties and to aid in classification. Following are the laboratory tests performed and a brief description of each test:

Natural Water Content: The percentage of water in the soil at the sample location.

Percent Passing the No. 200 Sieve: Amount of combined clay and silt-sized particles in the soil sample.

Natural Dry Unit Weight: Dry unit weight of soil at the sample location.

Atterberg Limits: Consistency and range of moisture content within which the material is workable.

One-Dimensional Consolidation: Measurement of soil compressibility upon loading and soil behavior upon wetting at given loads.

Results of the laboratory tests are summarized on the boring logs in Appendix A, on the summary sheets in Appendix B and in the following sections of this report.

SITE CONDITIONS

The site consists of open fields. A canal was observed along the eastern property boundary. The site is bordered to the south and west by commercial properties and to the north by residential properties. Vegetation consisting of grasses and weeds was observed throughout the site. Numerous fill piles were observed at the northern end of the site.

SUBSURFACE CONDITIONS

Soil Conditions

Soil conditions encountered in the borings consisted of about 1 to 2 feet of sandy clay overlaying natural interbedded layers of silty and clayey sand, silty and clayey gravel and sandy clay extending to the maximum depths explored of about 31.5 feet.

The sand was generally loose to very dense with N-values ranging between 7 and 61 blows per foot of penetration. Laboratory tests results indicate that the moisture content of these soils ranged between 6 and 14 percent and the percent fines (material passing the No. 200 sieve) was about 41 percent.

The gravel was observed to be medium dense to very dense with standard penetration blow counts ranging between 22 blows per foot of penetration and refusal (greater than 50 blows per 6 inches of sampler penetration). Laboratory test results indicate that the fines in these soils have liquid limits of about 31 percent and plasticity indexes of about 11 percent, respectively. Moisture contents ranged between 2 and 15 percent. Test results indicate a dry unit weight of about 126 pcf and a fines content (material passing the No. 200 sieve) of about 32 percent in a sample of the gravel.

The clay was generally stiff to hard with N-values ranging between 7 blows per foot of penetration and refusal (greater than 50 blows per 6 inches of sampler penetration). Laboratory test results indicate that these soils have liquid limits and plasticity indexes ranging between 29 and 50 percent and 13 and 28 percent, respectively. Moisture contents ranged between 10 and 42 percent. Dry unit weights varied between 84 and 109 pcf and percent fines (material passing the No. 200 sieve) ranged between 60 and 80 percent. Laboratory tests indicate the clay has the potential to collapse 0.1 to 1.3 percent when wetted at the test locations.

Groundwater Conditions

The borings were monitored during drilling for the presence and level of groundwater. At the time of our field exploration, groundwater was not observed within the depths explored. It should be recognized that fluctuations of the groundwater table may occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Evaluation of these factors is beyond the scope of this exploration.

ENGINEERING ANALYSIS AND RECOMMENDATIONS

Geotechnical Considerations

Based on the results of our exploration, it is our opinion that the site is suitable for the proposed construction. The proposed structures may be supported on lightly loaded continuous footings established directly on undisturbed native non-collapsible soils or on properly placed and compacted structural fill as described below.

Laboratory test results indicate that portions of the on-site clays have a potential to collapse when wetted. Collapse of soils supporting foundations or floor slabs may result in cracking, offset of concrete foundation and floor slab elements and structural distress. The alternate providing the least risk of settlement would be complete removal of collapsible soils from below the footprint of the building, and replacement with properly placed and compacted structural fill. If portions of the collapsible soils are left in place below the building or structural fill, the risk of settlement and distress to floor slabs or building elements would increase. The potential for soil collapse may be reduced by implementing measures that reduce the potential for surface or piped water penetrating the subsurface soils. Moisture control measures include maintaining positive drainage away from the structures, extending roof drainage to discharge far away from the structures and using low permeability soil to backfill perimeter foundation excavations and trenches beneath or around the structures.

Foundation Systems

Lightly loaded conventional strip footings supported directly on the undisturbed native non-collapsible soil, or on properly placed and compacted structural fill may be proportioned for a

maximum net allowable bearing pressure of 2,000 pounds per square foot (psf). The maximum allowable bearing pressure value applies to the total of dead load plus permanently and/or frequently applied live loads, and can be increased by 1/3 for short duration cyclic loads, such as wind or seismic.

If used, structural fill placed beneath foundations should extend laterally beyond the edges of the footings a distance equal to or greater than two-thirds of the structural fill thickness. Continuous footings should have minimum dimensions of 16 inches. Exterior footing bottoms should be established a minimum of 30 inches below the lowest adjacent exterior grade for frost protection. Footings not subjected to frost should bear at least 12 inches below finished grade (proposed floor level).

Total settlements of footings are expected to be less than 1 inch for the recommended allowable bearing pressure. Differential settlement between similarly loaded footings is typically about 1/2 to 3/4 of the total settlement.

Lateral foundation loads may be resisted using the friction between the footing bottoms and underlying soil. Friction between the footing bottoms and underlying soil may be calculated using an ultimate friction coefficient of 0.4. An appropriate factor of safety should be used against sliding.

If areas of loose or soft soil (unsuitable for bearing) are encountered in foundation excavations, the excavations should be extended deeper to suitable soils. The footings may then be extended to bear directly on these soils at the lower level or on properly compacted structural fill extending down to the suitable soils.

Lateral Earth Pressures

Foundation walls and footings should be backfilled with compacted granular fill conforming to the requirements presented below in the **earthwork** section of this report. All debris and loose soil should be removed before placing the backfill. Backfill around foundations should be placed uniformly on both sides to prevent uneven lateral pressures. Care should be taken to avoid over-compaction of the backfill to reduce the potential for displacement or damaging walls. Only light hand-operated compaction equipment should be operated within 5 feet of walls.

The following equivalent fluid pressures may be used for estimating lateral earth pressures. The recommended equivalent fluid pressures assume the top of the backfill will be horizontal and the backfill is granular and completely drained. Additional lateral pressures due to surcharge loading or water in the backfill area are not included.

Condition	Equivalent Fluid Pressure Level Backfill (pcf)
Active	35
At-rest	54
Passive	350

Floor Slab Design and Construction

To provide uniform support for slabs placed on grade, we recommend that all slabs be placed on a minimum of 6 inches of crushed gravel underlain by undisturbed native non-collapsible soils or properly placed and compacted structural fill extending down to undisturbed native soil.

If moisture sensitive floor coverings or treatments are to be used in the structures, or if there are other concerns about moisture vapor transmission through concrete slabs, a vapor retarder should be considered. The building designer is usually in the best position to make final decisions regarding the use of a vapor retarder, its method of placement, and its position relative to the base of the slab. We will be available at your request to discuss the advantages and disadvantages of various methods of vapor retarder placement and related slab design and construction recommendations.

Seismic Considerations

Based on the results of our exploration, the shallow subsurface soil profile is best represented by Site Class D according to the 2000 International Building Code (IBC). A search of the National Seismic Hazard Map database indicates the following peak ground acceleration (PGA) and spectral accelerations for 0.2 second (S_s) and 1.0 second (S_1) periods for a 2% probability of exceedance (PE) in 50 years at the project site:

Period	Acceleration
PGA	0.46g
0.2 sec SA	1.12g
1.0 sec SA	0.45g

The soil conditions encountered in the borings generally consisted of stiff to hard clay and dense to very dense sand and gravel. These types of soil are generally not susceptible to liquefaction. The site is located in an area designated on published liquefaction maps as very low potential for liquefaction.

Pavements

The pavement section presented below was determined in general accordance with the 1993 AASHTO "Guide for the Design of Pavement Structures". Design traffic consisting of 50,000 ESALs was used for low-volume interior subdivision roads. A California Bearing Ratio (CBR) of 5 percent was assumed to represent the clay subgrade. The following pavement section, or an approved equivalent, should be placed on the properly prepared subgrade soils as described below.

Recommended Pavement Sections (Inches)			
Asphalt Concrete Surfacing	**Aggregate Base Course**	**Granular Subbase**	**Total**
3.0	6.0	8.0	17.0
4.0	7.0	---	11.0

The asphaltic concrete should be placed and compacted to at least 97 percent of the maximum density as determined by ASTM D 1559 (50 blows each end). Aggregates and asphaltic concrete should conform to local city or Utah Department of Transportation (UDOT) specifications.

Earthwork

Topsoil, existing fill and other deleterious materials should be removed from beneath building areas. Excavations resulting from the removal of these materials should be backfilled with structural fill. Following removal of these materials, the exposed native soils should be proof-rolled to aid in assessing subgrade condition. Soft areas encountered during compaction should be excavated and replaced with structural fill properly placed and compacted as described below.

Portions of the near-surface native soils encountered at the site are fine-grained and may be susceptible to disturbance or rutting under the weight of construction equipment if they become wet. In order to reduce the potential for disturbance or rutting, excessive water should not be applied to the surface during earthwork operations and construction should occur during dryer weather. Soils that become excessively rutted, pumped or otherwise disturbed are not suitable for support of foundations or floor slabs and should be removed and replaced with structural fill.

Positive drainage away from the structures should be provided during construction and maintained throughout the life of the proposed project. Infiltration of water into excavations

should be prevented during construction. It is important that foundation soils are not allowed to become wetted. Surface drainage should be collected and discharged far away from the structures to prevent wetting of the foundation soils.

Structural fill beneath foundations or slabs should consist of well graded, granular soil with a maximum particle size of 3 inches, 25 to 60 percent passing the No. 4 sieve and having 10 to 30 percent fines. The recommended 6-inch thick layer of gravel beneath concrete slabs should be 3/4-inch minus crushed aggregate.

All fill should be approved by the geotechnical engineer, should be moisture conditioned to near optimum water content, placed in uniform lifts not exceeding 8 inches in loose thickness, and be compacted to the following minimum percentages of the maximum dry density as determined by ASTM D 1557 (Modified Proctor):

Location	Percent of Maximum Dry Density ASTM D 1557
Building areas	95
Other areas of fill and backfill	92

It is the responsibility of the contractor to provide safe working conditions in connection with underground excavations. Temporary construction excavations should be properly sloped or shored. All excavations should be accomplished in accordance with applicable federal, state, and local standards.

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

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 borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations

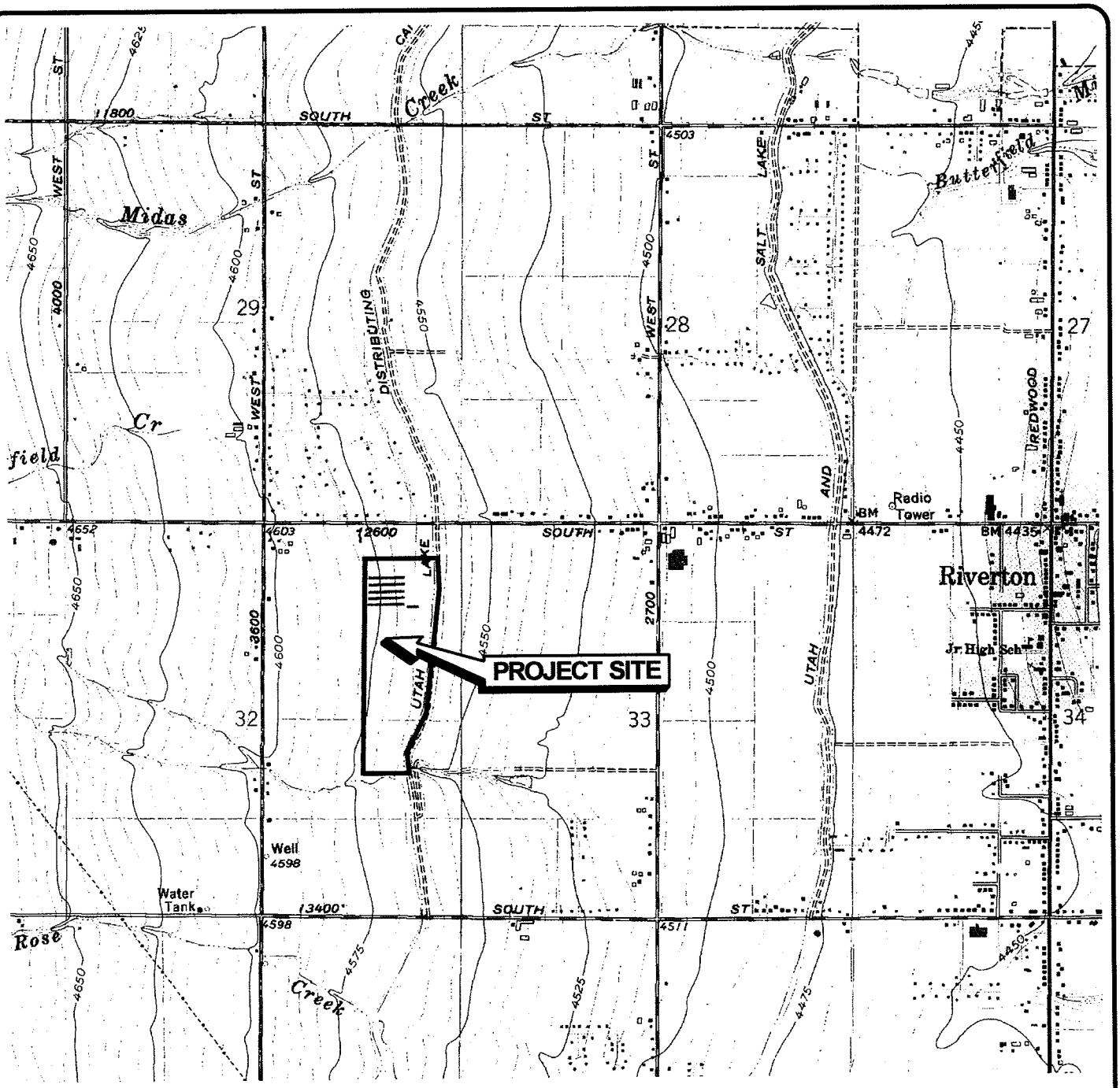
appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

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

PROJECT VICINITY MAP
BORING LOCATION PLAN
LOG OF BORING



Reference: USGS 7.5-Minute Quadrangles for Midvale, Utah

SCALE 1:24,000

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

N

CONTOUR INTERVAL 5 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

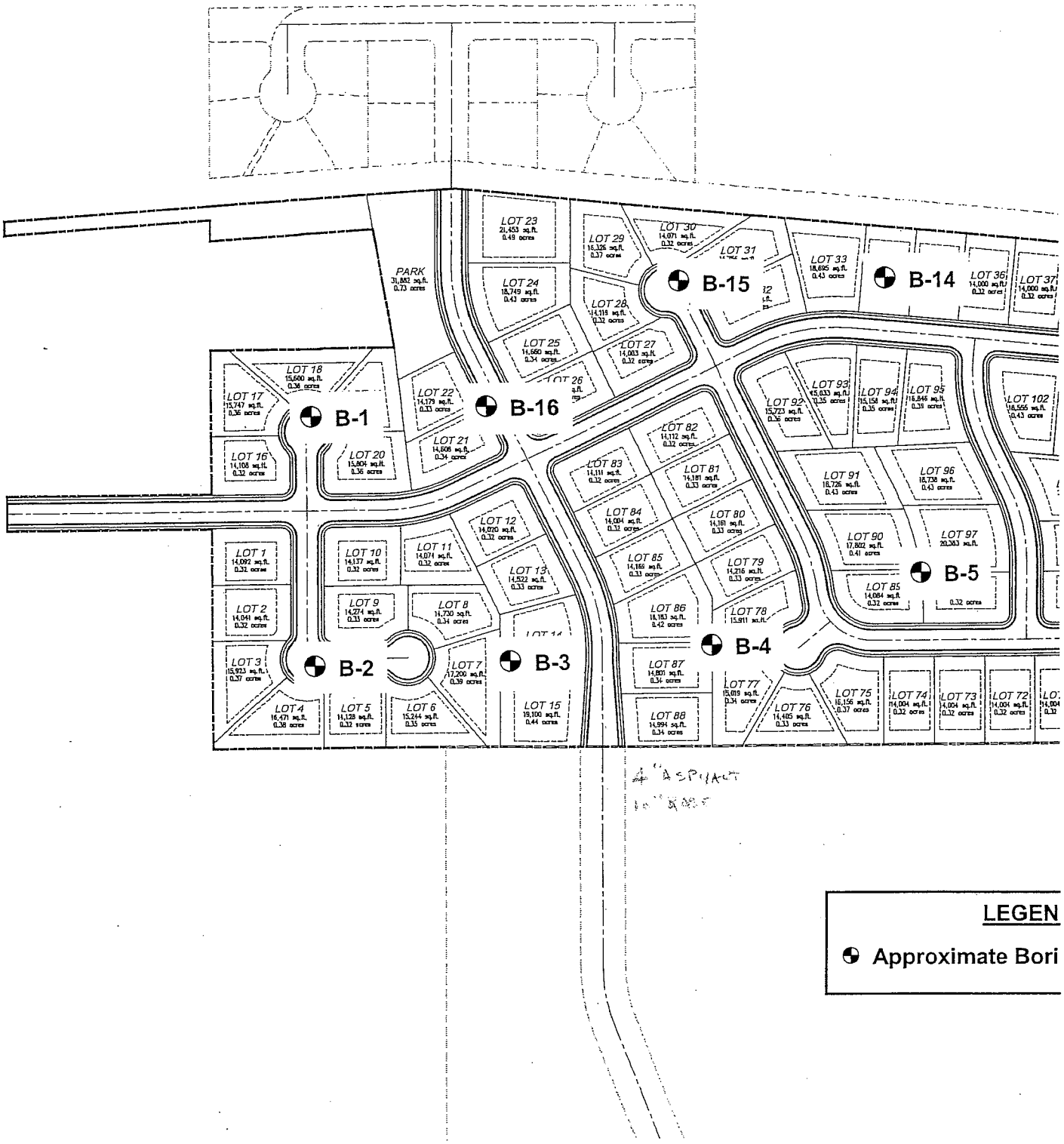
PROJECT VICINITY MAP

RIVERTON DEVELOPMENT

RIVERTON, UT

Job No: 61055012	Date: February, 2005	Drawn By: BCC

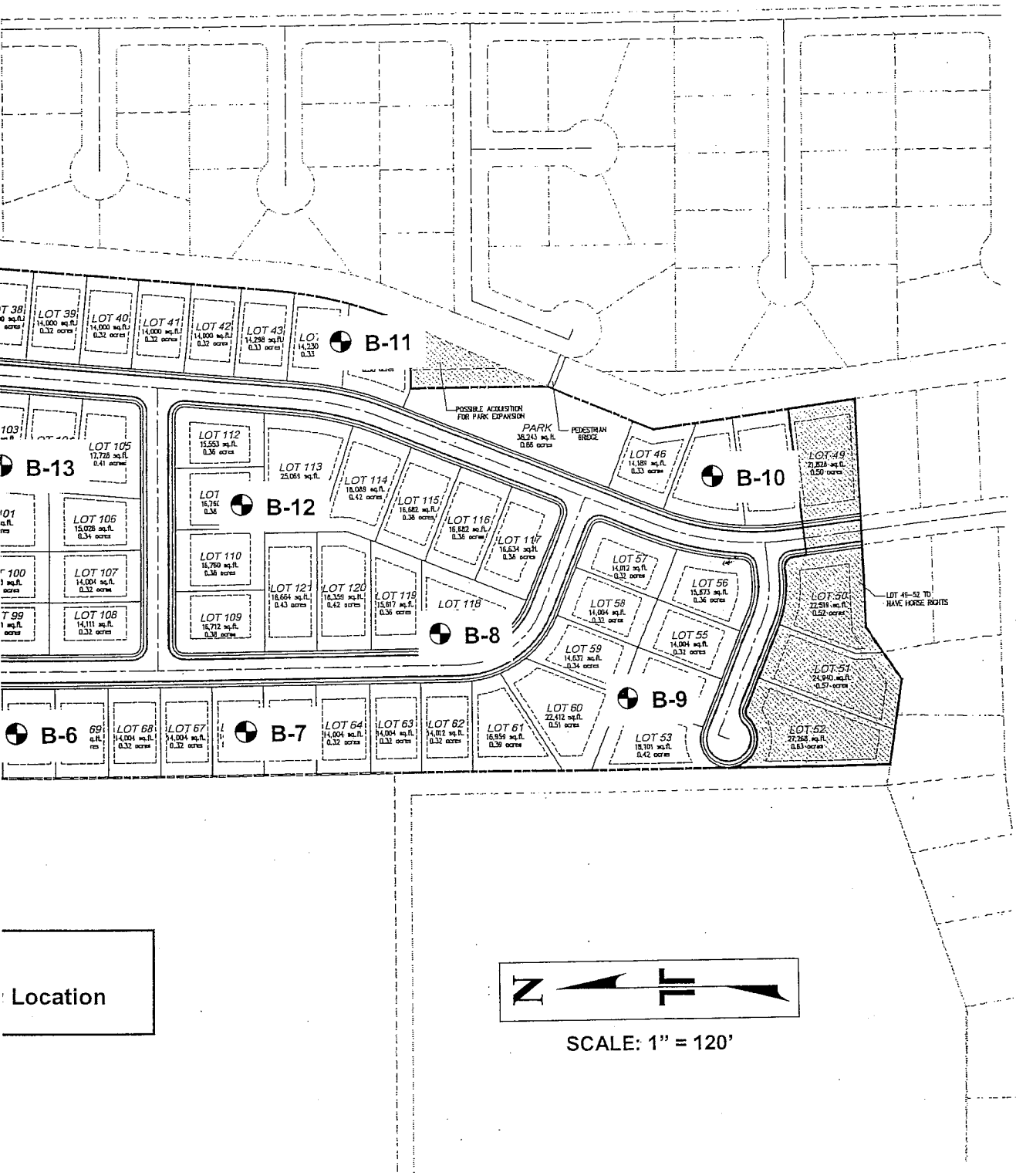
Terracon



LEGEN

Approximate Bori

Reference: Site plan dated 10-13-04, p



Location

SCALE: 1" = 120'

vided by Stanley Consultants, Inc.

BORING LOCATION PLAN

RIVERTON DEVELOPMENT

RIVERTON, UTAH

Job# 61055012 | Date: February 2005 | Drawn: BCC

Terracon

LOG OF BORING NO. B-1

CLIENT: **Richmond American Homes**

SITE: **Riverton, Utah**

PROJECT: **Riverton Development**

DEPTH, ft.	GRAPHIC LOG	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: PENETRATION RESISTANCE BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: DRY UNIT WEIGHT, PCF	TESTS: LIQUID LIMIT	TESTS: PLASTICITY INDEX	TESTS: % PASSING NO. 200 SIEVE	OTHER
1			1	SS	5	7						
2												
3		CL	2	SS	11	29	10				80	
4												
5												
6			3	SS	9	51						
7												
8			4	SS	10	56						
9												
10												
11			5	SS	12	29						
12												
13												
14												
15												
16			6	SS	16	25						

SANDY CLAY:
stiff, dark brown, with roots near surface

1.5

SANDY CLAY:
hard, light brown

5

SILTY GRAVEL:
with sand, very dense, light brown

- with sand lenses

10

SANDY CLAY:
very stiff to hard, brown with orange mottling

- with white mottling

16.5

BOTTOM OF BORING AT APPROXIMATELY 16.5 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	▽ N/E	WD	▼
WL	▽		▼
WL			

Terracon

BORING STARTED	2-10-05		
BORING COMPLETED	2-10-05		
RIG	Mobile B-80	FOREMAN	BCC
LOGGED	BCC	JOB #	61055012

GEO LOG 61055012.GPJ TERRACON.GDT 3/8/05

LOG OF BORING NO. B-2

CLIENT
Richmond American Homes

SITE
Riverton, Utah

PROJECT
Riverton Development

DEPTH, ft.	GRAPHIC LOG	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES PENETRATION RESISTANCE BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WEIGHT, PCF	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS % PASSING NO. 200 SIEVE	OTHER
1												
2												
3			1	SS	8	50/5"						
4												
5												
6			2	SS	7	70						
7												
8			3	SS	12	54						
9												
10												
11			4	SS	4	50/5"						
12												
13												
14												
15												
16			5	SS	7	20						

FILL:
silty gravel with sand, brown
1.5

SILTY GRAVEL:
with sand, very dense, light brown
14

SANDY CLAY:
with gravel, very stiff, brown
16.5

BOTTOM OF BORING AT
APPROXIMATELY 16.5 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	▽ N/E	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	2-10-05		
BORING COMPLETED	2-10-05		
RIG	Mobile B-80	FOREMAN	BCC
LOGGED	BCC	JOB #	61055012

GEO LOG 61055012.GPJ TERRACON.GDT 3/8/05

LOG OF BORING NO. B-3

CLIENT: **Richmond American Homes**

SITE: **Riverton, Utah**

PROJECT: **Riverton Development**

DEPTH, ft.	GRAPHIC LOG	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: PENETRATION RESISTANCE BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: DRY UNIT WEIGHT, PCF	TESTS: LIQUID LIMIT	TESTS: PLASTICITY INDEX	TESTS: % PASSING NO. 200 SIEVE	TESTS: OTHER
0												
1												
2												
3			1	SS	9	7						
4												
5												
6			2	SS	10	22						
7												
8			3	SS	7	50/5"						
9												
10												
11			4	SS	9	48						
12												
13												
14												
15												
16		CL	5	SS	17	13	22		32	17		

FILL:
clayey gravel with sand, brown

2

SANDY CLAY:
with gravel, stiff, brown

5.5

SILTY GRAVEL:
with sand, medium dense to very dense, light brown

15

SANDY CLAY:
very stiff, light brown

16.5

BOTTOM OF BORING AT APPROXIMATELY 16.5 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	▽ N/E	WD	▼
WL	▽		▼
WL			

Terracon

BORING STARTED	2-10-05		
BORING COMPLETED	2-10-05		
RIG	Mobile B-80	FOREMAN	BCC
LOGGED	BCC	JOB #	61055012

GEO LOG 61055012.GPJ TERRACON.GDT 3/8/05

LOG OF BORING NO. B-4

CLIENT: **Richmond American Homes**

SITE: **Riverton, Utah**

PROJECT: **Riverton Development**

GRAPHIC LOG		DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES PENETRATION RESISTANCE BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WEIGHT, PCF	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS % PASSING NO. 200 SIEVE	OTHER
	SANDY CLAY: medium stiff, dark brown, with roots near surface	1		1	SS	12	4	18					
		2											
	SILTY SAND: medium dense, light brown, fine to medium grained	3		2	SS	9	23	9					
		4											
		5											
	SILTY GRAVEL: with sand, dense, light brown	6		3	SS	7	33						
		7											
	SANDY CLAY: hard, olive brown with orange mottling	8		4	SS	16	33						
		9											
		10											
	SANDY CLAY: very stiff, brown	11	CL	5	SS	18	18	15				64	
		12											
	SILTY GRAVEL: with sand, very dense, light brown	13											
		14											
		15											
		16		6	SS	3	50/6"	2					
	BOTTOM OF BORING AT APPROXIMATELY 16 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	▽ N/E	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	2-10-05		
BORING COMPLETED	2-10-05		
RIG	Mobile B-80	FOREMAN	BCC
LOGGED	BCC	JOB #	61055012

GEO LOG 61055012.GPJ TERRACON.GDT 3/8/05

LOG OF BORING NO. B-5

CLIENT
Richmond American Homes

SITE
Riverton, Utah

PROJECT
Riverton Development

GRAPHIC LOG		DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES PENETRATION RESISTANCE BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WEIGHT, PCF	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS % PASSING NO. 200 SIEVE	OTHER
	SANDY CLAY: dark brown, with roots near surface												
	1.5												
	CLAYEY SAND: loose to dense, brown, fine to medium grained			1	SS	12	7						
				2	SS	11	36						
	7.5 - with gravel lense												
	SANDY CLAY: very stiff to hard, brown with orange mottling			3	SS	14	15						
	11		CL	4	RS	14	62	16	109	29	13		CONSOL
	CLAYEY SAND: dense to very dense, brown with orange mottling, fine to medium grained												
	15												
	SANDY CLAY: with gravel, hard, brown			5	SS	12	53						
	16.5												
	BOTTOM OF BORING AT APPROXIMATELY 16.5 FEET												
	CONSOL = Consolidation Test												

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	▽ N/E	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	2-11-05		
BORING COMPLETED	2-11-05		
RIG	Mobile B-80	FOREMAN	BCC
LOGGED	BCC	JOB #	61055012

GEO LOG 61055012.GPJ TERRACON.GDT 3/8/05

LOG OF BORING NO. B-6

CLIENT: **Richmond American Homes**

SITE: **Riverton, Utah**

PROJECT: **Riverton Development**

GRAPHIC LOG		DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES PENETRATION RESISTANCE BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WEIGHT, PCF	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS % PASSING NO. 200 SIEVE	OTHER
	SANDY CLAY: with gravel, stiff, dark brown, with roots near surface	1		1	SS	8	7	16					
		2											
	CLAYEY GRAVEL: with sand, medium dense, brown	3		2	SS	4	24						
		4											
		5											
	CLAYEY SAND: dense, brown, fine to medium grained	6		3	SS	6	32	14					
		7											
	CLAYEY GRAVEL: with sand, very dense, light brown	8	GC	4	RS	16	63	11	126	31	11		
		9											
		10											
	SANDY CLAY: hard, olive brown with light brown mottling	11		5	SS	14	57	20					
		12											
		13											
	SILTY GRAVEL: with sand, very dense, light gray brown	14											
		15											
		16		6	SS	7	50/5"						
	BOTTOM OF BORING AT APPROXIMATELY 16.5 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	▽ N/E	WD	▼
WL	▽		▼
WL			

Terracon

BORING STARTED	2-11-05		
BORING COMPLETED	2-11-05		
RIG	Mobile B-80	FOREMAN	BCC
LOGGED	BCC	JOB #	61055012

GEO LOG 61055012.GPJ TERRACON.GDT 3/8/05

LOG OF BORING NO. B-7

CLIENT: **Richmond American Homes**

SITE: **Riverton, Utah**

PROJECT: **Riverton Development**

GRAPHIC LOG	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES PENETRATION RESISTANCE BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WEIGHT, PCF	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS % PASSING NO. 200 SIEVE	OTHER
SANDY CLAY: dark brown, with roots near surface	2											
SILTY GRAVEL: with sand, very dense, brown			1	SS	10	52						
- becomes light brown			2	SS	11	81						
			3	SS	6	50/4"						
			4	SS	6	50/5"						
SANDY CLAY: with gravel, very stiff, olive brown	13											
			5	SS	14	18						
BOTTOM OF BORING AT APPROXIMATELY 16.5 FEET	16.5											

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	▽ N/E	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	2-11-05		
BORING COMPLETED	2-11-05		
RIG	Mobile B-80	FOREMAN	BCC
LOGGED	BCC	JOB #	61055012

GEO LOG 61055012.GPJ TERRACON.GDT 3/8/05

LOG OF BORING NO. B-8

CLIENT: **Richmond American Homes**

SITE: **Riverton, Utah**

PROJECT: **Riverton Development**

GRAPHIC LOG		DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES PENETRATION RESISTANCE BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WEIGHT, PCF	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS % PASSING NO. 200 SIEVE	OTHER
	SANDY CLAY: very stiff, dark brown, with roots near surface	1		1	SS	14	13						
1.5													
	CLAYEY GRAVEL: with sand, very dense, brown	2											
		3		2	SS	8	72						
		4											
5		5											
	SILTY GRAVEL: with sand, very dense, light brown	6		3	SS	11	61						
		7											
		8		4	SS	7	50/5"						
		9											
		10		5	SS	8	50/5"						
		11											
		12											
		13											
		14											
15		15											
	CLAYEY GRAVEL: with sand, very dense, brown	16		6	SS	9	80						
16.5													
	BOTTOM OF BORING AT APPROXIMATELY 16.5 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	▽ N/E	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	2-11-05		
BORING COMPLETED	2-11-05		
RIG	Mobile B-80	FOREMAN	BCC
LOGGED	BCC	JOB #	61055012

GEO LOG 61055012.GPJ TERRACON.GDT 3/8/05

LOG OF BORING NO. B-9

CLIENT: **Richmond American Homes**

SITE: **Riverton, Utah**

PROJECT: **Riverton Development**

DEPTH, ft.	GRAPHIC LOG	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: PENETRATION RESISTANCE BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: DRY UNIT WEIGHT, PCF	TESTS: LIQUID LIMIT	TESTS: PLASTICITY INDEX	TESTS: % PASSING NO. 200 SIEVE	TESTS: OTHER	DESCRIPTION
0													**SANDY CLAY:** dark brown, with roots near surface
2													**CLAYEY SAND:** with gravel, medium dense to dense, brown, fine to medium grained
3			1	SS	10	12							
5													
5.5													**SILTY GRAVEL:** with sand, dense, brown
6		GM	2	SS	12	42	7				32		
7													- becomes light brown
8			3	SS	5	50/6"							
10													**SANDY CLAY:** with gravel, very stiff, brown
11			4	SS	12	22							
12													**CLAYEY GRAVEL:** with sand, very dense, brown
15													
16			5	SS	16	63							
16.5													BOTTOM OF BORING AT APPROXIMATELY 16.5 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	▽ N/E	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	2-11-05		
BORING COMPLETED	2-11-05		
RIG	Mobile B-80	FOREMAN	BCC
LOGGED	BCC	JOB #	61055012

GEO LOG 61055012.GPJ TERRACON.GDT 3/8/05

LOG OF BORING NO. B-10

CLIENT: **Richmond American Homes**

SITE: **Riverton, Utah**

PROJECT: **Riverton Development**

GRAPHIC LOG	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES PENETRATION RESISTANCE BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WEIGHT, PCF	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS % PASSING NO. 200 SIEVE	OTHER
	1		1	SS	7	14						
	2											
	3		2	RS	15	50/4"						
	4											
	5		3	SS	14	75						
	6											
	7											
	8		4	SS	12	27						
	9											
	10											
	11		5	SS	18	16						
	12											
	13											
	14											
	15											
	16		6	SS	15	27						

SANDY CLAY: very stiff, dark brown, with roots near surface

1

SANDY CLAY: very stiff to hard, light olive brown with orange mottling

4.5

SILTY GRAVEL: with sand, very dense, light brown

7.5

CLAYEY GRAVEL: with sand, medium dense, brown

8.5

SANDY CLAY: very stiff to hard, brown with light brown mottling

- with gravel lenses

- with gravel lenses

16.5

BOTTOM OF BORING AT APPROXIMATELY 16.5 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	▽ N/E	WD	▼
WL	▽		▼
WL			

Terracon

BORING STARTED	2-11-05		
BORING COMPLETED	2-11-05		
RIG	Mobile B-80	FOREMAN	BCC
LOGGED	BCC	JOB #	61055012

GEO LOG 61055012.GPJ TERRACON.GDT 3/8/05

LOG OF BORING NO. B-11

CLIENT: **Richmond American Homes**

SITE: **Riverton, Utah**

PROJECT: **Riverton Development**

GRAPHIC LOG	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES PENETRATION RESISTANCE BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WEIGHT, PCF	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS % PASSING NO. 200 SIEVE	OTHER
SANDY CLAY: dark brown, with roots near surface	2											
SANDY CLAY: stiff, light olive brown	5		1	SS	14	10	42					
SANDY CLAY: very stiff to hard, brown with orange mottling	9	CL	2	SS	15	23	15				60	
			3	SS	7	41						
SILTY GRAVEL: with sand, medium dense, brown	15		4	SS	7	20						
CLAYEY GRAVEL: with sand, very dense, olive brown	16		5	RS	14	50/5"	7					
BOTTOM OF BORING AT APPROXIMATELY 16 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	▽ N/E	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	2-11-05		
BORING COMPLETED	2-11-05		
RIG	Mobile B-80	FOREMAN	BCC
LOGGED	BCC	JOB #	61055012

GEO LOG 61055012.GPJ TERRACON.GDT 3/8/05

LOG OF BORING NO. B-12

CLIENT: **Richmond American Homes**

SITE: **Riverton, Utah**

PROJECT: **Riverton Development**

GRAPHIC LOG	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: PENETRATION RESISTANCE BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: DRY UNIT WEIGHT, PCF	TESTS: LIQUID LIMIT	TESTS: PLASTICITY INDEX	TESTS: % PASSING NO. 200 SIEVE	OTHER
	1											
	2		1	RS	16	21						
	3											
	4											
	5											
	6		2	SS	9	61						
	7											
	8		3	SS	14	26						
	9											
	10											
	11		4	SS	2	17						
	12											
	13											
	14											
	15											
	16		5	SS	9	83						
	17											
	18											
	19											
	20											

SANDY CLAY:
dark brown, with roots near surface

1.5

CLAYEY SAND:
medium dense to very dense, brown, fine to medium grained

- with gravel

6.5

SILTY GRAVEL:
with sand, medium dense, brown, with clay seams

8.5 - with sand lenses

SANDY CLAY:
very stiff, brown

- becomes olive brown

12

SILTY GRAVEL:
with sand, very dense, brown

Continued Next Page

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	▽ N/E	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	2-11-05		
BORING COMPLETED	2-11-05		
RIG	Mobile B-80	FOREMAN	BCC
LOGGED	BCC	JOB #	61055012

GEO LOG 61055012.GPJ TERRACON.GDT 3/8/05

LOG OF BORING NO. B-12

CLIENT
Richmond American Homes

SITE
Riverton, Utah

PROJECT
Riverton Development

GRAPHIC LOG		DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES PENETRATION RESISTANCE BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WEIGHT, PCF	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS % PASSING NO. 200 SIEVE	OTHER
	SILTY GRAVEL: with sand, very dense, brown	21		6	SS	10	94						
		22											
		23											
		24											
		25		7	SS	7	50/6"						
		26											
		27											
		28											
	29	29											
	CLAYEY GRAVEL: with sand, very dense, brown	30		8	SS	15	80						
	30.5												
	BOTTOM OF BORING AT APPROXIMATELY 30.5 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	▽ N/E	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	2-11-05		
BORING COMPLETED	2-11-05		
RIG	Mobile B-80	FOREMAN	BCC
LOGGED	BCC	JOB #	61055012

GEO LOG 61055012.GPJ TERRACON.GDT 3/8/05

LOG OF BORING NO. B-13

CLIENT: **Richmond American Homes**

SITE: **Riverton, Utah**

PROJECT: **Riverton Development**

GRAPHIC LOG		DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES PENETRATION RESISTANCE BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WEIGHT, PCF	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS % PASSING NO. 200 SIEVE	OTHER
	SANDY CLAY: dark brown, with roots near surface	1											
	SANDY CLAY: hard, olive brown with orange mottling	3	CH	1	RS	12	38	34	86	50	28		CONSOL
		6		2	SS	11	10						
	CLAYEY SAND: medium dense, brown with orange mottling, fine grained	7.5											
	SILTY GRAVEL: with sand, dense, brown	10		3	SS	10	36						
	SANDY CLAY: very stiff, brown with orange mottling	16		4	SS	12	14						
	CLAYEY SAND: with gravel, medium dense, brown, fine to medium grained	16.5		5	SS	14	14						

BOTTOM OF BORING AT APPROXIMATELY 16.5 FEET

CONSOL = Consolidation Test

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	▽ N/E	WD	▼
WL	▽		▼
WL			

Terracon

BORING STARTED	2-11-05		
BORING COMPLETED	2-11-05		
RIG	Mobile B-80	FOREMAN	BCC
LOGGED	BCC	JOB #	61055012

GEO LOG 61055012.GPJ TERRACON.GDT 3/8/05

LOG OF BORING NO. B-14

CLIENT: **Richmond American Homes**

SITE: **Riverton, Utah**

PROJECT: **Riverton Development**

DEPTH, ft.	GRAPHIC LOG	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: PENETRATION RESISTANCE BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: DRY UNIT WEIGHT, PCF	TESTS: LIQUID LIMIT	TESTS: PLASTICITY INDEX	TESTS: % PASSING NO. 200 SIEVE	OTHER
0												
1			1	SS	11	12						
2												
3		CL	2	RS	9	17	29	84	49	28		CONSOL
4												
5												
6			3	SS	14	33						
7												
8			4	SS	10	86	15					
9												
10												
11			5	SS	11	70						
12												
13												
14												
15												
16			6	SS	6	50/5"	3					

SANDY CLAY:
stiff, dark brown, with roots near surface

2

SANDY CLAY:
stiff, light olive brown with orange mottling

5.5

CLAYEY SAND:
dense, brown, fine to coarse grained

8 - with clay seams

SILTY GRAVEL:
with sand, very dense, light brown

16

BOTTOM OF BORING AT
APPROXIMATELY 16 FEET

CONSOL = Consolidation Test

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	▽ N/E	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	2-11-05		
BORING COMPLETED	2-11-05		
RIG	Mobile B-80	FOREMAN	BCC
LOGGED	BCC	JOB #	61055012

GEO LOG 61055012.GPJ TERRACON.GDT 3/8/05

LOG OF BORING NO. B-15

CLIENT: **Richmond American Homes**

SITE: **Riverton, Utah**

PROJECT: **Riverton Development**

GRAPHIC LOG		DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES PENETRATION RESISTANCE BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WEIGHT, PCF	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS % PASSING NO. 200 SIEVE	OTHER
	SANDY CLAY: dark brown, with roots near surface	1											
	2	2											
	SANDY CLAY: very stiff to hard, brown with light brown mottling	3		1	SS	9	55						
		4											
	- becomes light brown	5											
		6		2	SS	11	25						
	7.5	7											
	CLAYEY SAND: with gravel, dense, brown, fine to coarse grained	8		3	SS	10	43						
	10	9											
	SILTY GRAVEL: with sand, very dense, brown	10											
		11		4	SS	9	65						
		12											
		13											
		14											
		15											
		16		5	SS	7	61						
	16.5 BOTTOM OF BORING AT APPROXIMATELY 16.5 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	▽ N/E	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	2-11-05		
BORING COMPLETED	2-11-05		
RIG	Mobile B-80	FOREMAN	BCC
LOGGED	BCC	JOB #	61055012

GEO LOG 61055012.GPJ TERRACON.GDT 3/8/05

LOG OF BORING NO. B-16

CLIENT: Richmond American Homes

SITE: Riverton, Utah

PROJECT: Riverton Development

GRAPHIC LOG		DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES PENETRATION RESISTANCE BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WEIGHT, PCF	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS % PASSING NO. 200 SIEVE	OTHER
	0.5 **SANDY CLAY:** very stiff, dark brown, with roots near surface	1		1	SS	7	26						
	CLAYEY SAND: with gravel, medium dense, olive brown with orange mottling, fine to coarse grained	2											
	2.5 **SANDY CLAY:** hard, brown to dark brown	3		2	SS	14	31	27					
		4											
	5 **SANDY CLAY:** hard, light olive brown with orange and white mottling	5											
		6		3	SS	12	46						
	7.5 **SILTY SAND:** dense, light brown with orange mottling, fine to medium grained	7											
		8	SM	4	SS	11	45	6				41	
	10 **SANDY CLAY:** hard, light brown with orange mottling	9											
		10											
		11		5	SS	6	35						
	14 **SILTY GRAVEL:** with sand, very dense, light brown	12											
		13											
		14											
		15											
		16		6	SS	12	50	4					
		17											
		18											
		19											
	20	20											

Continued Next Page

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	▽ N/E	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	2-14-05		
BORING COMPLETED	2-14-05		
RIG	Mobile B-80	FOREMAN	BCC
LOGGED	BCC	JOB #	61055012

GEO LOG 61055012.GPJ TERRACON.GDT 3/8/05

LOG OF BORING NO. B-16

CLIENT: **Richmond American Homes**

SITE: **Riverton, Utah**

PROJECT: **Riverton Development**

GRAPHIC LOG		DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES PENETRATION RESISTANCE BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WEIGHT, PCF	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS % PASSING NO. 200 SIEVE	OTHER
	SANDY CLAY: hard, dark brown with orange mottling	21		7	SS	10	29						
	22	22											
	CLAYEY GRAVEL: with sand, very dense, brown	23											
		24											
		25											
		26		8	SS	9	50/5"						
		27											
		28											
		29											
	30	30											
	SANDY CLAY: with gravel, very stiff, brown with orange mottling	31		9	SS	18	14	20					
	31.5												
	BOTTOM OF BORING AT APPROXIMATELY 31.5 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	▽ N/E	WD	▼
WL	▼		▼
WL			

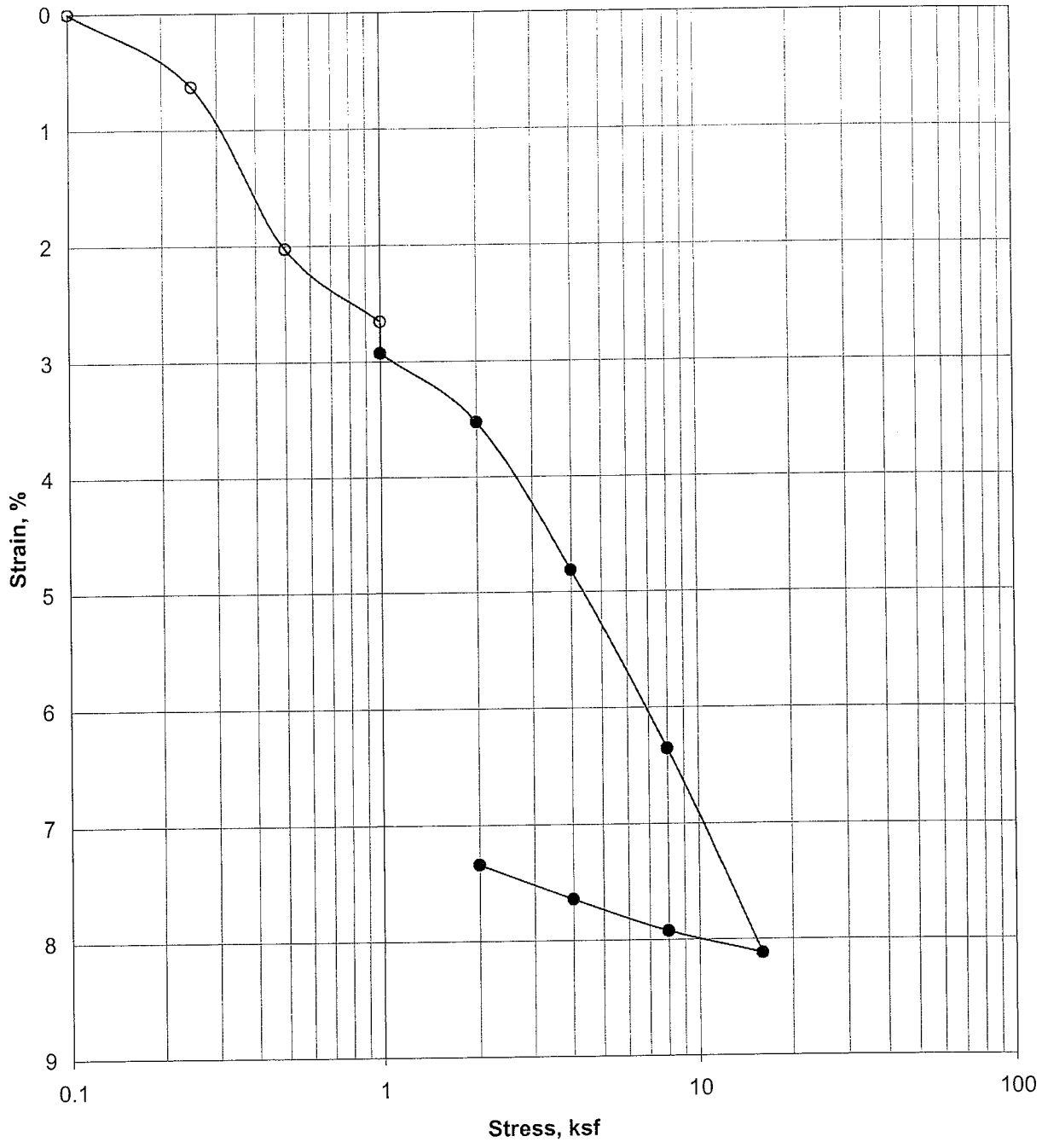
Terracon

BORING STARTED			2-14-05
BORING COMPLETED			2-14-05
RIG	Mobile B-80	FOREMAN	BCC
LOGGED	BCC	JOB #	61055012

GEO LOG 61055012.GPJ TERRACON.GDT 3/8/05

APPENDIX B

LABORATORY TEST RESULTS

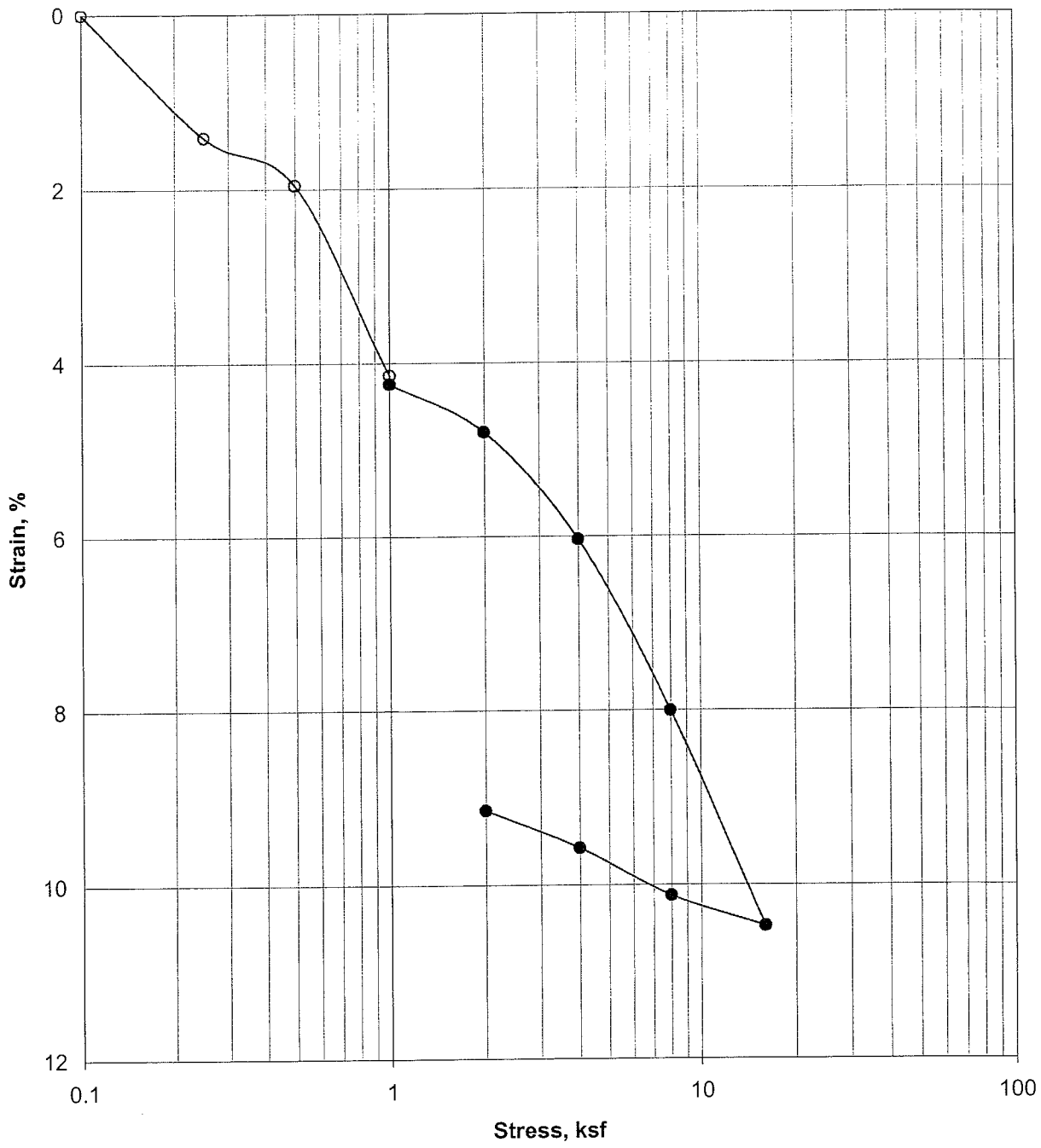


Specimen Identification		Classification	DD	MC%
○	B-5 at 10 ft	Sandy Clay (CL)	109	16
●	(Same sample, after water added at 1 ksf)			

Terracon

CONSOLIDATION TEST RESULTS

Project Name: Riverton Development
Location: Riverton, Utah
Project No.: 61055012
Date: 3/2/05

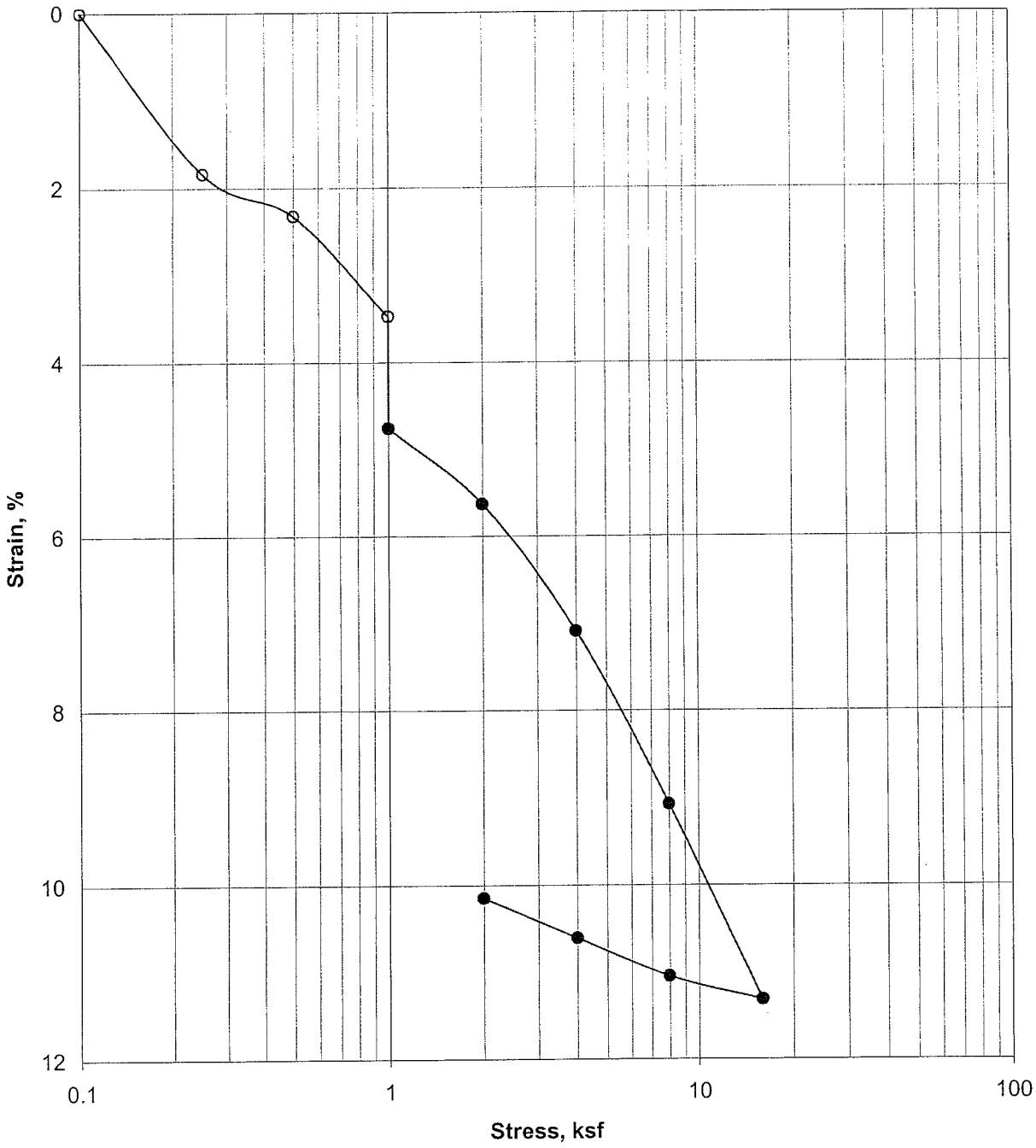


Specimen Identification		Classification	DD	MC%
○	B-13 at 2.5 ft	Sandy Clay (CH)	86	34
●	(Same sample, after water added at 1 ksf)			

Terracon

CONSOLIDATION TEST RESULTS

Project Name: Riverton Development
Location: Riverton, Utah
Project No.: 61055012
Date: 3/2/05



Specimen Identification		Classification	DD	MC%
○	B-14 at 2.5 ft	Sandy Clay (CL)	84	29
●	(Same sample, after water added at 1 ksf)			

Terracon

CONSOLIDATION TEST RESULTS

Project Name: Riverton Development
Location: Riverton, Utah
Project No.: 61055012
Date: 3/2/05

APPENDIX C

GENERAL NOTES
UNIFIED CLASSIFICATION SYSTEM

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1-3/8" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube - 3" 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

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 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

Standard Penetration or N-value (SS) Blows/Ft.	Ring Sampler (RS) Blows/Ft.	Relative Density
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

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

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
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

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

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1-10
Medium	11-30
High	30+

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UNIFIED SOIL CLASSIFICATION SYSTEM

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

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] 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.

[D] 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] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

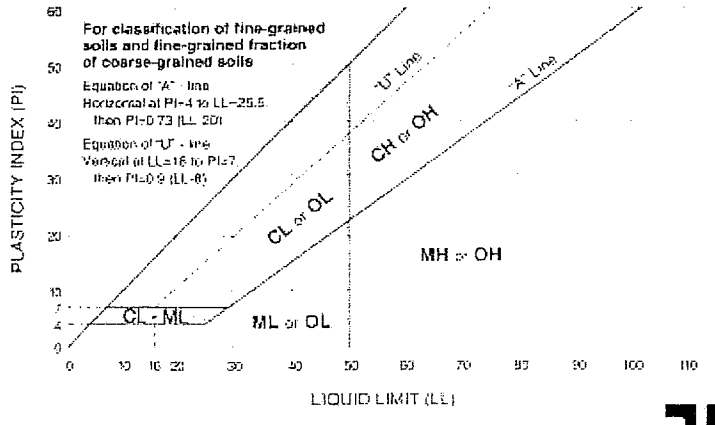
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



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