GEOTECHNICAL ENGINEERING REPORT

PHASE I RESIDENTIAL DEVELOPMENT
AT THE PINES GOLF COURSE
NORTH OF CORTARO ROAD AND WEST OF INTERSTATE 10
MARANA, ARIZONA

TERRACON PROJECT NO. 63045225
DECEMBER 8, 2004

Prepared for:

STANDARD PACIFIC OF TUCSON
4578 NORTH FIRST AVENUE
SUITE 160
TUCSON, ARIZONA 85718-5748

ATTN: MR. BOB STORIE

Prepared by:

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SUBMITTAL NO. 1

Terracon

PRV-050666

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December 8, 2004

Standard Pacific of Tucson
4578 North First Avenue
Suite 160
Tucson, Arizona 85718-5748

Attn: Mr. Bob Storie

RE: Geotechnical Engineering Report
Phase I Residential Development at the Pines Golf Course
North of Cortaro Road and West of Interstate 10
Marana, Arizona
Terracon Project No. 63045225

Terracon has completed geotechnical engineering exploration for the follow-up geotechnical report for Phase I of the Residential Development to be located at the Pines Golf Course in Marana, Arizona. This study was performed in general accordance with our proposal number D6304245 dated October 27, 2004. The results of our engineering study, including the site plan, laboratory test results, logs of borings, and the geotechnical recommendations needed to aid in the design and construction of foundations and other earth connected phases of this project are attached.

The subsurface soils at the site consisted of sandy clay, to sandy silt, fill material between 2 and 27 feet below existing grade. The results of field exploration and laboratory testing indicate the soils at the site exhibit low to moderate compressibility at in-situ moisture content. The soils generally show slight tendency for hydro-compaction when elevated in moisture content. When water is added to compacted near surface soils, the materials exhibit low expansive potential under light loading conditions such as those imposed by floor slabs. However, one isolated sample at Boring Location B-19 showed moderate expansive potential.

Based on the geotechnical engineering analyses, subsurface exploration and laboratory test results, we recommend the proposed building structures be supported on a spread footing foundation systems. We recommend that all existing fill on site be entirely removed and replaced in a controlled manner. Due to the relatively loose nature of the native soils we recommend spread footings bear on engineered fill to support of the proposed foundations. Slab-on-grade may be utilized for the interior floor system provided that care is taken in the placement and compaction of the subgrade soil. On-site soils should be suitable for use as engineered fill beneath the foundation systems and floor slabs.

Other design and construction recommendations, based upon geotechnical conditions, are presented in the report.

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

Sincerely,
Terracon

Bryan W. Reed, E.I.T.
Project Manager

Oleg B. Lysyj, P.E.
Geotechnical Services Manager

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Copies to: Addressee (3)

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PHASE I RESIDENTIAL DEVELOPMENT
AT THE PINES GOLF COURSE
NORTH OF CORTARO ROAD AND WEST OF INTERSTATION 10
MARANA, ARIZONA

TERRACON PROJECT NO. 63045225

INTRODUCTION

This report contains the results of our geotechnical engineering exploration for the proposed residential development to be located at The Pines Golf Course. The site is located in the northeast ¼ of Section 27, Township 12 South, Range 12 East of the Gila and Salt River Base and Meridian.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- foundation design and construction
- lateral earth pressures
- floor slab design and construction
- pavement design and construction
- earthwork
- drainage

The recommendations contained in this report are 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

We understand the proposed project consists of Phase I of the area presently known as the Pines Golf Course. Phase I covers about 34 acres and is planned for single-family houses. Portions of this phase are over an area that was formerly a gravel pit. We have also been provided with a preliminary site exhibit for Phase I (prepared by WLB). We understand that geotechnical issues such as existing fills and steep slopes will likely affect development plans.

Terracon reviewed the information provided to us, performed a site visit, and prepared a letter providing preliminary geotechnical recommendations. Our preliminary letter was dated September 29, 2004.

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 analyses.

Field Exploration: A total of 20 test borings were drilled on November 15th and 16th . The borings were drilled to approximate depths of 10 to 40 feet at the locations shown on the Site Plan, Figure 1. Borings were evenly spaced across the site. Borings were advanced with a truck-mounted drilling rig, utilizing 7-½ inch diameter hollow-stem auger.

The borings were located in the field by measurements from property lines and existing site features. The accuracy of boring locations should only be assumed to the level implied by the methods used to determine each.

Continuous lithologic logs of each boring were recorded by the geotechnical engineer during the drilling operations. At selected intervals, samples of the subsurface materials were taken by driving split-spoon or ring-barrel samplers. Bulk samples of subsurface materials were obtained from borings in pavement areas.

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

Groundwater conditions were evaluated in each boring at the time of site exploration.

Laboratory Testing: Samples retrieved during the field exploration were taken to the laboratory for observation by the project geotechnical engineer and were classified in accordance with the Unified Soil Classification System described in Appendix C. At that time, the field descriptions were confirmed or modified as necessary and an applicable laboratory testing program was formulated to determine engineering properties of the subsurface materials. Boring logs were prepared and are presented in Appendix A.

Laboratory tests were conducted on selected soil samples and are presented in Appendix B and on the Logs of Borings. The test results were used for the geotechnical engineering analyses, and the development of foundation and earthwork recommendations.

Selected soil samples were tested for the following engineering properties:

- Water Content
- Dry Density
- Consolidation
- Percent Fines
- Plasticity Index
- Expansion

SITE CONDITIONS

This site had been previously used as a gravel pit and materials supply yard. Remains of concrete slabs and foundations from previous structures are scattered throughout the site. This portion of the site is relatively flat and level, however there are a few mounds and depressions across the site. One depression, near boring B-5, was bounded with one to two inch wide tangential cracks (at this area we encountered fills up to 27 feet deep). The top of the previous gravel pit is at the south and west margins of this site. The pit slopes are terraced and appear to have an overall inclination of about 3 to 1 (horizontal to vertical) with portions that may be as steep as 1 to 1 (horizontal to vertical). Based on aerial photos taken between 1979 and 2000, it appears that pit was mined to near its present location, and the relatively level area on top of the pit had not been extensively mined. Currently the former gravel pit is a golf course, the course extends to the north and east of the site, with the clubhouse to the northeast of the site.

SUBSURFACE CONDITIONS

Soil Conditions: As presented on the Logs of Boring, surface soils to depths of 5 to 27 feet consisted of fill, containing silty sand to clayey sand . The materials underlying the surface soils and extending to the maximum depth of exploration consisted of silty sand with gravel.

Field and Laboratory Test Results: Field penetration test results indicate the sand soils vary from very loose to medium dense, in relative density.

Laboratory test results indicate that the subsoils at shallow depth exhibit low to moderate compression at in-situ moisture contents. The soils generally show slight tendency for hydro-compaction when elevated in moisture content, however one sample showed significant hydro-compactive tendencies. When water is added to samples of laboratory compacted near-surface soils, the materials exhibit no to low expansion potential under light loading

conditions such as those imposed by floor slabs. However, one isolated sample near Boring Location B-19 showed moderately high expansive potential.

Groundwater Conditions: Groundwater was not observed in any test boring 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 RECOMMENDATIONS

Geotechnical Considerations: Based on the geotechnical engineering analyses, subsurface exploration and laboratory test results, we recommend that all existing fill be removed from the proposed building areas. We also recommend structures be supported on a spread footing foundation system. Due to the relatively loose nature of the native soils and potential for hydro-compaction, spread footings bearing on engineered fill are recommended for support of the proposed foundations. Slab on grade may be utilized for the interior floor system provided that care is taken in the placement and compaction of the subgrade soil. On-site soils should be suitable for use as engineered fill beneath the foundation systems and floor slabs.

Design and construction recommendations for foundation systems and other earth connected phases of the project are outlined below.

Foundation Systems: Spread footing foundations are recommended for the support of the proposed building on the site. Due to the relatively loose density of native soils and potential for hydro-compaction, spread footings bearing on engineered fill are recommended for support of the proposed foundations. Engineered fill which will support footings should be placed and constructed as recommended in the Earthwork section of this report.

The footings may be designed for a maximum bearing pressure of 2000 psf. The design bearing pressure applies to dead loads plus design live load conditions. The design bearing pressure may be increased by one-third when considering total loads that include wind or seismic conditions. Recommended minimum widths of column and wall footings are 16--inches and 24-inches, respectively.

Exterior footings should be placed a minimum of 18-inches below finished grade to provide confinement for the bearing soils. Interior footings should bear a minimum of 12-inches below finished grade. Finished grade is the lowest adjacent grade for perimeter footings and floor level for interior footings.

Total settlement resulting from the assumed structural loads is estimated to be on the order of 1-inch. Differential settlement should be on the order of ½ to ¾ of the estimated total settlement. Additional foundation movements could occur if water from any source infiltrates the foundation soils; therefore, proper drainage should be provided in the final design and during construction.

For foundations adjacent to slopes, a minimum horizontal setback of five (5) feet should be maintained between the foundation base and slope face. In addition, the setback should be at a location where an imaginary line extending downward at 45 degrees from the nearest edge of the foundation does not intersect the slope face.

Thickened slab sections can be used to support interior load-bearing partitions, provided that:

- slabs are supported on engineered fill,
- loads do not exceed 900 plf,
- thickened sections have a minimum width of 12-inches, and
- thickness and reinforcement are consistent with structural requirements.

Footings, foundations, and masonry walls should be reinforced as necessary to reduce the potential for distress caused by differential foundation movement. The use of joints at openings or other discontinuities in masonry walls is recommended.

Foundation excavations should be observed by the geotechnical engineer. If the soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

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

- Active ..... 40 psf/ft
- Passive ..... 300 psf/ft
- Coefficient of base friction 0.45*

  *The coefficient of base friction should be reduced to 0.30 when used in conjunction with passive pressure.

Where the design includes restrained elements, the following equivalent fluid pressures are recommended:

- At rest ..... 60 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.

Retaining Wall Drainage: To reduce hydrostatic loading on retaining walls, a subsurface drain system should be placed behind the wall. The drain system should consist of free-draining granular soils containing less than five percent fines (by weight) passing a No. 200 sieve placed adjacent to the wall. The free-draining granular material should be graded to prevent the intrusion of fines or encapsulated in a suitable filter fabric. A drainage system consisting of either weep holes or perforated drain lines (placed near the base of the wall) should be used to intercept and discharge water which would tend to saturate the backfill. Where used, drain lines should be embedded in a uniformly graded filter material and provided with adequate clean-outs for periodic maintenance. An impervious soil should be used in the upper layer of backfill to reduce the potential for water infiltration. As an alternative, a prefabricated drainage structure, such as geocomposite, may be used as a substitute for the granular backfill adjacent to the wall.

Seismic Considerations: Based upon the nature of the subsurface materials, a Site Class D should be used for the design of structures for the proposed project (***2000 International Building Code***, Table 1615.1.1).

Floor Slab Design and Construction: The on-site soils exhibit non to low expansive potential under light loading conditions such as those imposed by floor slabs. There may be isolated areas (such as Boring B-19) where the soil is moderately expansive and should not be used beneath floor slabs. Construction of floor slabs directly on undisturbed soils or compacted fills composed of on-site soils are considered acceptable for the project. Some differential movement of a slab-on-grade floor system is possible should the subgrade soils become elevated in moisture content. Such movements are anticipated to be within general

tolerance for normal slab-on-grade construction. To reduce potential slab movements, the subgrade soils should be prepared as outlined in the Earthwork section of this report.

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 recommendations outlined below.
- For the anticipated design loading, a minimum 4-inch layer of clean-graded gravel, sand or aggregate base course should be placed beneath interior slabs. For heavy loading, vehicular traffic or concentrated loads on floor slabs, reevaluation of slab and/or base course thickness may be required.
- Other design and construction considerations, as outlined in the ACI Design Manual, Section 302.1R are recommended.

Pavement Design and Construction: The site soils have a correlated R-value of 49 which equates to a resilient modulus value M_r of 20,536 psi using a seasonal variation factor of 1.7 for Marana. The plans provided to us indicated 160 residential lots. Assuming 10 movements per lot per day, we estimate 150,000 design ESAL's. Using this data and ADOT/AASHTO design procedures a required structural number of 1.66 is calculated. A minimum pavement section consisting of 2.5-inches of asphalt (PAG Mix No. 2) over 4-inches of aggregate base course has a structural number of 1.66 and is recommended for design.

Materials and construction of pavements for the project should be in accordance with the requirements and specifications of the Pima County/City of Tucson[1].

Preventative maintenance should be planned and provided for through an on-going pavement management program in order to enhance future pavement performance. Preventative maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment.

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[1] Pima County/City of Tucson, 1994, ***Standard Specifications for Public Improvements,*** Arizona.

Preventative maintenance consists of both localized maintenance (e.g. crack sealing and patching) and global maintenance (e.g. surface sealing). Preventative maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements.

Earthwork:

- **General Considerations:** The following presents recommendations for site preparation, excavation, subgrade preparation and placement of engineered fills on the project. The recommendations presented for design and construction of earth supported elements including foundations, slabs and pavements are contingent upon following the recommendations outlined in this section.

  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.

- **Site Preparation**: Strip and remove all concrete slabs and footings. All exposed surfaces should be free of mounds and depressions which could prevent uniform compaction. Stripped materials consisting of vegetation and organic materials should be wasted from the site, or used to revegetate landscaped areas or exposed slopes after completion of grading operations. If it is necessary to dispose of organic materials on-site they should be placed in non-structure or non-pavement areas and in fill sections not exceeding 5 feet in height.

  All existing fills should be removed in the location of the proposed buildings, generally fills on the site extended to depths of approximately 15 feet, however near boring B-5 the fills extended to depths of 27 feet. Although evidence of underground facilities such as septic tanks, cesspools, basements, and utilities were not observed during the site reconnaissance, such features could be encountered during construction. If such features are encountered, they should be removed and the excavation thoroughly cleaned prior to backfill placement and/or construction.

  Based upon the subsurface conditions encountered during the geotechnical exploration, subgrade soils exposed during construction are anticipated to be relatively stable at in-situ moisture contents. However, unstable subgrade conditions may develop if the soils are wetted by precipitation or other sources and/or subjected to

repetitive construction traffic. If unstable conditions develop, subgrade workability may be improved by scarifying, drying, and recompaction or by overexcavation of wet zones and replacement with granular materials.

The individual contractor(s) are responsible for the design and construction of stable, temporary excavations as required to maintain stability of both the excavation sides and bottom. All excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench safety standards.

- **Subgrade Preparation:** After existing fills are removed, engineered fill should extend below proposed footings a depth equal to the width of wall footings, and a depth equal to one-half the width of column footings; however, a minimum of two feet of engineered fill is recommended below, and adjacent to the edges of all footings. The engineered fill should extend laterally an additional distance of 8-inches for each additional foot of excavation beyond the 24-inch minimum depth. If engineered fill is placed beneath the entire building, it should extend horizontally a minimum distance of 5 feet beyond the outside edge of perimeter footings.

  Exposed areas which will receive fill, once properly cleared and benched where necessary, should be scarified to a minimum depth of ten-inches, conditioned to near optimum moisture content, and compacted.

  Subgrade soils beneath interior and exterior slabs, and beneath pavements should be scarified, moisture conditioned and compacted to a minimum depth of ten-inches. The moisture content and compaction of subgrade soils should be maintained until slab or pavement construction.

- **Fill Materials and Placement:** Clean on-site soils or approved imported materials may be used as fill material for the following:

  - general site grading
  - foundation areas
  - interior floor slab areas
  - exterior slab areas
  - pavement areas
  - foundation backfill

  On-site soils appear suitable for use as compacted fill beneath interior or exterior floor slabs. Although some areas where moderately expansive soils may be encountered near the surface, these soils should not be used as engineered fill below conventional unreinforced floor slabs.

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

Gradation	Percent finer by weight (ASTM C136)
6"	100
3"	70-100
No. 4 Sieve	50-100
No. 200 Sieve	50 (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. Fill lifts should not exceed ten-inches loose thickness. Recommended compaction criteria for engineered fill materials are as follows:

Material	Minimum Percent (ASTM D698)
Scarified subgrade soils	95
On-site and imported fill soils:	
Beneath foundations	95
Beneath slabs	95
Beneath pavements	95
Greater than 5 feet deep	98
Aggregate base (beneath slabs)	95
Aggregate base (beneath pavements)	100

Miscellaneous backfill (non-structural areas).....90

On-site sand soils should be compacted within a moisture content range of 3 percent below, to 3 percent above optimum. Imported soils should be compacted within a moisture range of 3 percent below to 3 percent above optimum.

- **Slopes:** For permanent slopes in compacted fill and cut native areas, recommended maximum configurations for on-site materials are 2 to 1 (horizontal to vertical). Slopes steeper than 3 to 1 (horizontal to vertical) should be revegetated to help reduce surface erosion.

  The face of all slopes should be compacted to the minimum specification for fill embankments. Alternately, fill slopes can be over-built and trimmed to compacted material. If any slope in cut or fill will exceed 25 feet in height, the grading design should include mid-height benches to intercept surface drainage and divert flow from the face of the embankment.

- **Excavation and Trench Construction:** The individual contractor(s) should be made responsible for designing and constructing stable, temporary excavations as required to maintain stability of both the excavation sides and bottom. All excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench safety standards.

  The soils to be penetrated by the proposed excavations may vary significantly across the site. The preliminary soil classifications are based solely on the materials encountered in widely spaced exploratory test borings. The contractor should verify that similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are encountered at the time of construction, the actual conditions should be evaluated to determine any excavation modifications necessary to maintain safe conditions.

  As a safety measure, it is recommended that all vehicles and soil piles be kept to a minimum lateral distance from the crest of the slope equal to no less than the slope height. The exposed slope face should be protected against the elements.

Additional Design and Construction Considerations:

- **Exterior Slab Design and Construction:** Exterior slabs-on-grade, exterior architectural features, and utilities founded on, or in backfill may experience some

movement due to the volume change of the backfill. To reduce the potential for damage caused by movement, we recommend:

- minimizing moisture increases in the backfill
- controlling moisture-density during placement of backfill
- using designs which allow vertical movement between the exterior features and adjoining structural elements
- placing effective control joints on relatively close centers

- **Underground Utility Systems:** Underground piping within or near the proposed structure should be designed with flexible couplings, so minor deviations in alignment do not result in breakage or distress. Utility knockouts in foundation walls should be oversized to accommodate differential movements.

- **Surface Drainage:** Positive drainage should be provided during construction and maintained throughout the life of the proposed project. Infiltration of water into utility or foundation excavations must be prevented during construction. Planters and other surface features which could retain water in areas adjacent to the building or pavements should be sealed or eliminated. In areas where sidewalks or paving do not immediately adjoin the structure, we recommend that protective slopes be provided with a minimum grade of approximately 5 percent for at least 10 feet from perimeter walls. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to reduce the possibility of moisture infiltration.

  Downspouts, roof drains or scuppers should discharge into splash blocks or extensions when the ground surface beneath such features is not protected by exterior slabs or paving. Sprinkler systems should not be installed within 5 feet of foundation walls. Landscaped irrigation adjacent to the foundation system should be minimized or eliminated.

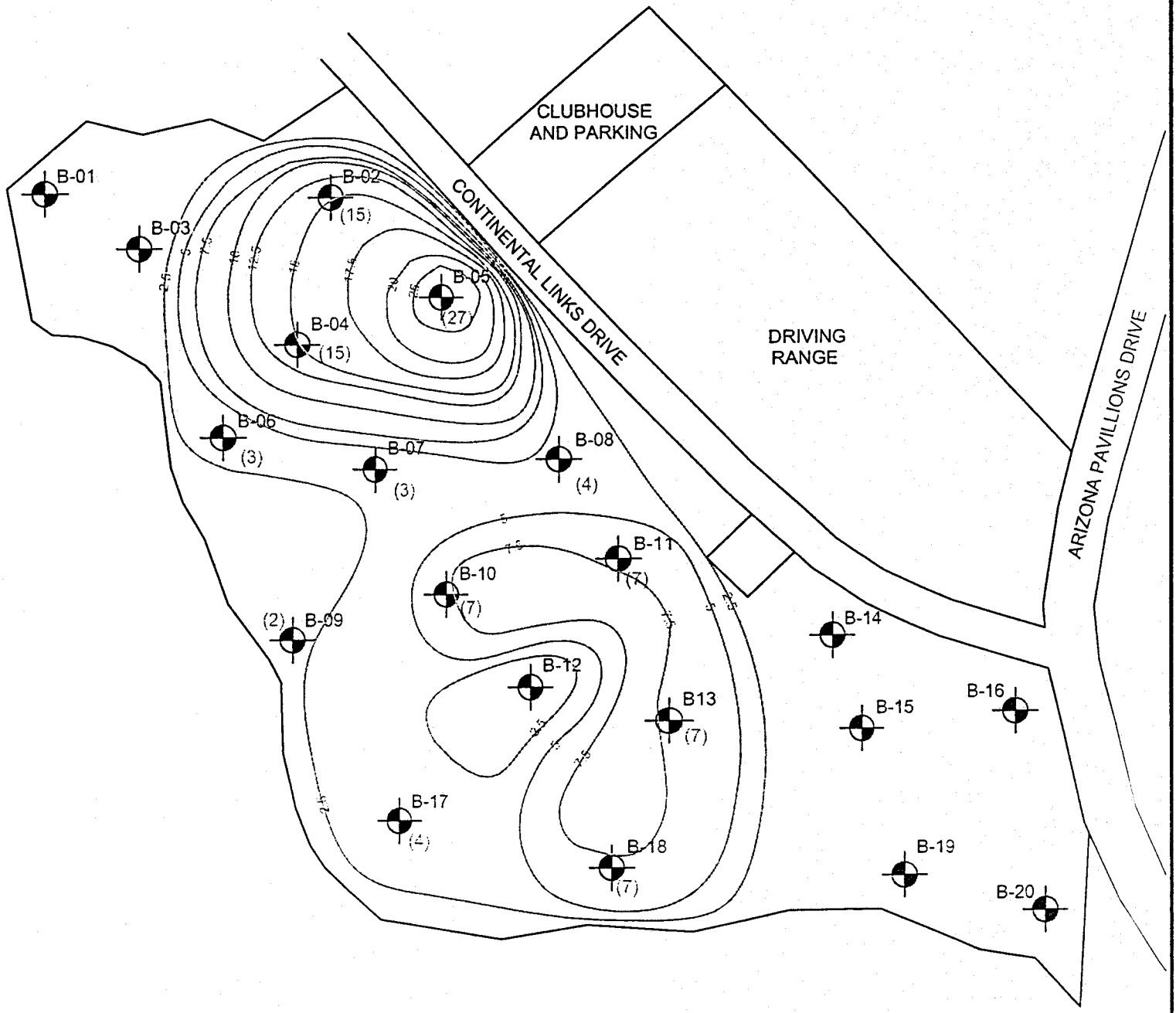
GENERAL COMMENTS

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 which may occur between borings or 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 assessment of the site or identification of contaminated or hazardous materials or conditions. If the owner is concerned about the potential for such contamination, 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. 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.



LEGEND

APPROXIMATE BORING

(5) APPROXIMATE DEPTH OF FILL

N

SITE PLAN AND BORING LOCATIONS
PROPOSED PHASE I RESIDENTIAL DEVELOPMENT AT THE PINES
NORTH OF CORTARO ROAD AND WEST OF INTERSTATE 10
MARANA, ARIZONA
STANDARD PACIFIC OF TUCSON

Project Mngr: OBL	Terracon	Project No.	63045225
Designed By:	355 South Euclid, Suite 107 Tucson, Arizona 85719	Scale:	None
Checked By:		Date:	11-23-04
Approved By: OBL		Drawn By:	B.A.R. 63
File Name: n:\public\04georept\63045225\6304225.dwg L(Layout1)		Figure No.	1

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

LOG OF BORING NO. B-01

CLIENT: Standard Pacific of Tucson

SITE: The Pines Golf Course, Marana, Arizona

PROJECT: Phase I Residential Development

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	SANDY CLAY TRACE GRAVEL; brown, stiff, low plasticity fines, moist		CL	1	BS							
			CL	2	RS	12	28	7	100			
		5										
	SILTY SAND TRACE GRAVEL; brown, dense, non-plastic fines, moist		SM	3	SS	6	35					
	7.5											
	CLAYEY SAND WITH GRAVEL; brown, dense to medium dense, low plasticity fines, moist		SC	4	SS	14	31					
		10										
			SC	5	SS	12	19					
	11.5											
	Bottom of Boring											

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 AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-15-04		
BORING COMPLETED	11-15-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/7/04

LOG OF BORING NO. B-02

CLIENT: **Standard Pacific of Tucson**

SITE: **The Pines Golf Course, Marana, Arizona**

PROJECT: **Phase I Residential Development**

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	FILL: SANDY CLAY TRACE GRAVEL; brown, very stiff to medium stiff, low plasticity fines, moist		CL	1	BS							
			CL	2	RS	8	28					
		5	CL	3	SS	12	4					
			CL	4	RS	12	6					
	with gravel, glass at 10' in sample	10	CL	5	SS	8	4					
			CL	6	RS	12	7					
	15	15										
	SILTY SAND TRACE GRAVEL; brown, very loose to medium dense, non-plastic fines, moist		SM	7	SS	8	4					
			SM	8	SS	17	14					
	less silty with gravel	20	SM	9	SS	13	20					
	21.5											
	Bottom of Boring											

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 AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-15-04		
BORING COMPLETED	11-15-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/7/04

LOG OF BORING NO. B-03

CLIENT: Standard Pacific of Tucson

SITE: The Pines Golf Course, Marana, Arizona

PROJECT: Phase I Residential Development

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	SANDY SILT TRACE GRAVEL; dark brown, very dense to medium dense, non-plastic fines, moist		ML	1	BS							
			ML	2	RS	6	50/6"					
		5	ML	3	RS	12	51					
	some clay seams		ML	4	SS	18	33					
		10	ML	5	SS	12	27					
	11.5 Bottom of Boring											

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 AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-15-04		
BORING COMPLETED	11-15-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/7/04

LOG OF BORING NO. B-04

CLIENT: Standard Pacific of Tucson

SITE: The Pines Golf Course, Marana, Arizona

PROJECT: Phase I Residential Development

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	FILL: SANDY CLAY TRACE GRAVEL; brown, stiff to medium stiff, medium plasticity fines, moist		CL	1	BS					32	14	61
			CL	2	RS	12	18					
		5	CL	3	RS	12	8					
			CL	4	SS	4	5					
		10	CL	5	SS	10	5					
			CL	6	RS	12	15					
	15	15										
	CLAYEY SAND WITH GRAVEL; dark brown, loose to medium dense, low plasticity fines, moist		SC	7	SS	18	8					
			SC	8	SS	14	18					
	20	20										
	SILTY SAND WITH GRAVEL; dark brown, loose, non-plastic fines, moist		SM	9	SS	16	7					
		25										

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	▽ None WD	▼ None AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-15-04		
BORING COMPLETED	11-15-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/8/04

LOG OF BORING NO. B-04

CLIENT: Standard Pacific of Tucson

SITE: The Pines Golf Course, Marana, Arizona

PROJECT: Phase I Residential Development

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	SILTY SAND WITH GRAVEL; dark brown, loose, non-plastic fines, moist		SM	10	SS	16	8					
	26.5 Bottom of Boring											

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 AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-15-04		
BORING COMPLETED	11-15-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/8/04

LOG OF BORING NO. B-05

CLIENT: Standard Pacific of Tucson

SITE: The Pines Golf Course, Marana, Arizona

PROJECT: Phase I Residential Development

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	FILL: SANDY CLAY TRACE GRAVEL; brown, stiff to medium stiff, low plasticity fines, moist		CL	1	BS							
			CL	2	RS	12	13					
		5	CL	3	SS	14	5					
			CL	4	RS	12	7					
		10	CL	5	SS	14	2					
			CL	6	SS	8	5					
		15	CL	7	RS	12	6					
			CL	8	SS	18	4					
		20	CL	9	SS	16	5					
		25										

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	▽ None WD	▼ None AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-15-04		
BORING COMPLETED	11-15-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/7/04

LOG OF BORING NO. B-05

CLIENT: Standard Pacific of Tucson

SITE: The Pines Golf Course, Marana, Arizona

PROJECT: Phase I Residential Development

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	FILL: SANDY CLAY TRACE GRAVEL; brown, stiff to medium stiff, low plasticity fines, moist		CL	10	SS	18	5					
	27 **SANDY CLAY TRACE GRAVEL**; brown, stiff to medium stiff, low plasticity fines, moist	30	CL	11	SS	18	7					
		35	CL	12	SS	0	11					
	40	40	SP	13	SS	18	46					
	41.5 Bottom of Boring											

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 AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-15-04		
BORING COMPLETED	11-15-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/7/04

LOG OF BORING NO. B-06

CLIENT: Standard Pacific of Tucson

SITE: The Pines Golf Course, Marana, Arizona

PROJECT: Phase I Residential Development

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	FILL: SILTY SAND WITH GRAVEL; brown, very dense, low plasticity fines, moist		SM	1	BS					0	0	32
	3		SM	2	RS	12	78					
	SANDY CLAY; brown, medium stiff to stiff, low plasticity fines, moist	5	CL	3	SS	15	6					
			CL	4	SS	15	8					
		10	CL	5	SS	15	8					
	15											
	SAND WITH GRAVEL TRACE SILT; brown, loose, non-plastic fines, moist	15	SP	6	SS	14	17					
	16.5											
	Bottom of Boring											

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 AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-15-04		
BORING COMPLETED	11-15-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/7/04

LOG OF BORING NO. B-07

CLIENT: Standard Pacific of Tucson

SITE: The Pines Golf Course, Marana, Arizona

PROJECT: Phase I Residential Development

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	FILL: CLAYEY SAND WITH GRAVEL; brown, very dense, low plasticity fines, moist		SC	1	BS							
		3	SC	2	RS	6	50/6"					
	SANDY CLAY; brown, stiff, low plasticity fines, moist											
		5	CL	3	SS	14	10					
		7.5										
	SAND TRACE SILT AND GRAVEL; brown, loose, non-plastic fines, moist		SP	4	SS	13	9					
		10	SP	5	SS	14	11					
		11.5										
	Bottom of Boring											

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 AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-15-04		
BORING COMPLETED	11-15-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/7/04

LOG OF BORING NO. B-08

CLIENT: **Standard Pacific of Tucson**

SITE: **The Pines Golf Course, Marana, Arizona**

PROJECT: **Phase I Residential Development**

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	FILL: CLAYEY SAND WITH GRAVEL; brown, very dense, low plasticity fines, moist		SC	1	BS							
			SC	2	RS	6	50/6"					
	4											
	SANDY CLAY TRACE GRAVEL; brown, very stiff to hard, low plasticity fines, moist	5	CL	3	SS	13	23					
			CL	4	SS	17	19					
		10	CL	5	SS	14	30					
	11.5											
	Bottom of Boring											

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 AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-15-04		
BORING COMPLETED	11-15-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/7/04

LOG OF BORING NO. B-09

CLIENT: **Standard Pacific of Tucson**

SITE: **The Pines Golf Course**
Marana, Arizona

PROJECT: **Phase I Residential Development**

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	SILTY SAND TRACE GRAVEL; brown, low plasticity fines, moist		SM	1	BS					0	0	46
	2											
	SILTY SAND TRACE GRAVEL; brown, medium dense, non-plastic fines, moist		SM	2	RS	12	17					
	5	5										
	SANDY SILT; dark brown, loose, non-plastic fines, moist		ML	3	SS	14	7					
			ML	4	RS	0	11					
	10	10										
	SAND WITH GRAVEL TRACE SILT; light brown, loose to medium dense, non-plastic fines, moist		SP	5	SS	12	14					
		15	SP	6	SS	8	27					
		20	SP	7	SS	3	47					
	21.5											
	Bottom of Boring											

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 AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-15-04		
BORING COMPLETED	11-15-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/7/04

LOG OF BORING NO. B-10

CLIENT: Standard Pacific of Tucson

SITE: The Pines Golf Course, Marana, Arizona

PROJECT: Phase I Residential Development

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	FILL: SANDY CLAY TRACE GRAVEL; very dense to dense, low plasticity fines, moist		SC	1	BS							
			SC	2	RS	4	50/4"					
		5	SC	3	SS	14	36					
	7											
	SANDY SILT; loose, low plasticity fines, moist		ML	4	SS	16	5					
	10	10										
	SAND TRACE SILT AND GRAVEL; medium dense, non-plastic fines, moist		SP	5	SS	13	14					
	11.5											
	Bottom of Boring											

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 AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-15-04		
BORING COMPLETED	11-15-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/7/04

LOG OF BORING NO. B-11

CLIENT: **Standard Pacific of Tucson**

SITE: **The Pines Golf Course, Marana, Arizona**

PROJECT: **Phase I Residential Development**

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	POSSIBLE FILL: CLAYEY SAND WITH GRAVEL; medium dense to loose, low plasticity fines, moist		SC	1	BS							
			SC	2	RS	12	23					
		5	SC	3	SS	6	8					
	7.5											
	SILTY SAND TRACE GRAVEL; loose, non-plastic fines, moist		SM	4	SS	8	12					
		10	SM	5	SS	12	14					
	11.5											
	Bottom of Boring											

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 AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-16-04		
BORING COMPLETED	11-16-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/8/04

LOG OF BORING NO. B-12

CLIENT: Standard Pacific of Tucson

SITE: The Pines Golf Course, Marana, Arizona

PROJECT: Phase I Residential Development

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	CLAYEY SAND WITH GRAVEL; medium dense to loose, low plasticity fines, moist		SC	1	BS							
	2.5											
	SILTY SAND TRACE GRAVEL; loose, non-plastic fines, moist		SM	2	RS	12	25	12	100			
		5	SM	3	SS	8	8					
			SM	4	SS	12	8					
		10	SM	5	SS	14	9					
		15	SM	6	SS	13	16					
	16.5											
	Bottom of Boring											

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 AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-16-04		
BORING COMPLETED	11-16-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/7/04

LOG OF BORING NO. B-13

CLIENT **Standard Pacific of Tucson**

SITE **The Pines Golf Course**
Marana, Arizona

PROJECT
Phase I Residential Development

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	FILL: CLAYEY SAND WITH GRAVEL; very dense to very loose, low plasticity fines, moist		SC	1	BS							
			SC	2	RS	4	50/4"					
		5	SC	3	SS	6	50/4"					
			SC	4	SS	0	4					
	9 Bottom of Boring											

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 AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-16-04		
BORING COMPLETED	11-16-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/1/04

LOG OF BORING NO. B-14

CLIENT **Standard Pacific of Tucson**

SITE **The Pines Golf Course**
Marana, Arizona

PROJECT
Phase I Residential Development

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	CLAYEY SAND WITH GRAVEL; low plasticity fines, moist		SC	1	BS							
2												
	SANDY CLAY; medium dense, very stiff to hard, low plasticity fines, moist		CL	2	RS	12	21	10	99			
		5	CL	3	SS	13	19					
			CL	4	SS	8	28					
		10	CL	5	SS	8	72/12"					
11												
	Bottom of Boring											

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 AB
WL	▼	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-16-04		
BORING COMPLETED	11-16-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/7/04

LOG OF BORING NO. B-15

CLIENT **Standard Pacific of Tucson**

SITE **The Pines Golf Course**
Marana, Arizona

PROJECT
Phase I Residential Development

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	AC = 2"											
	SILTY SAND WITH GRAVEL; loose, non-plastic fines, moist		SM	1	BS							
			SM	2	RS	4	15					
4												
	SANDY SILT; loose to medium dense, non-plastic fines, moist	5	ML	3	SS	15	12					
			ML	4	SS	14	18					
		10	ML	5	SS	15	21					
11.5												
	Bottom of Boring											

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 AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-16-04		
BORING COMPLETED	11-16-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

LOG OF BORING NO. B-16

CLIENT: **Standard Pacific of Tucson**

SITE: **The Pines Golf Course, Marana, Arizona**

PROJECT: **Phase I Residential Development**

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	CLAYEY SAND WITH GRAVEL; low plasticity fines, moist		SC	1	BS							
1	**SANDY CLAY TRACE GRAVEL**; loose, non-plastic fines, moist		CL	2	RS	12	12	20	96			
5	**SANDY SILT WITH GRAVEL**; loose to medium dense, low plasticity fines, moist	5	ML	3	SS	14	12					
			ML	4	SS	12	18					
		10	ML	5	SS	16	24					
11.5	Bottom of Boring											

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 AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-16-04		
BORING COMPLETED	11-16-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/7/04

LOG OF BORING NO. B-17

CLIENT: **Standard Pacific of Tucson**

SITE: **The Pines Golf Course**
Marana, Arizona

PROJECT: **Phase I Residential Development**

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	POSSIBLE FILL: SANDY SILT TRACE GRAVEL; brown, non-plastic fines, moist		ML	1	BS					0	0	55
	2											
	POSSIBLE FILL: SANDY SILT; brown, loose, non-plastic fines, moist		ML	2	RS	9	15					
	4											
	SILTY SAND; light brown, medium dense, non-plastic fines, moist	5	SM	3	SS	10	14					
			SM	4	SS	14	9					
	trace gravel	10	SM	5	SS	6	9					
	with gravel	15	SM	6	SS	8	19					
	16.5											
	Bottom of Boring											

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 AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-16-04		
BORING COMPLETED	11-16-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/8/04

LOG OF BORING NO. B-18

CLIENT **Standard Pacific of Tucson**

SITE **The Pines Golf Course**
Marana, Arizona

PROJECT
Phase I Residential Development

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	FILL: SILTY GRAVELLY SAND; brown, very dense, non-plastic fines, moist		SM	1	BS							
			SM	2	RS	6	50/6"					
		5	SM	3	SS	6	62/10"					
	7											
	SILTY SAND WITH GRAVEL; light brown, medium dense, non-plastic fines, moist		SM	4	SS	8	17					
		10	SM	5	SS	2	57					
		15	SM	6	SS	12	13					
	16.5											
	Bottom of Boring											

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 AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-16-04		
BORING COMPLETED	11-16-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/7/04

LOG OF BORING NO. B-19

CLIENT **Standard Pacific of Tucson**

SITE **The Pines Golf Course**
Marana, Arizona

PROJECT
Phase I Residential Development

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	SANDY SILTY CLAY; brown, medium dense, non-plastic fines, moist		CL-ML	1	BS							
			CL-ML	2	RS	12	21	21	105			
	5	5										
	SANDY SILT; brown, medium dense, non-plastic fines, moist		ML	3	SS	14	14					
	trace gravel		ML	4	SS	16	10					
	with gravel	10	ML	5	SS	16	12					
		15	ML	6	SS	14	19					
	16.5											
	Bottom of Boring											

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 AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-16-04		
BORING COMPLETED	11-16-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERRACON.GDT 12/7/04

LOG OF BORING NO. B-20

CLIENT: Standard Pacific of Tucson

SITE: The Pines Golf Course, Marana, Arizona

PROJECT: Phase I Residential Development

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (in)	SAMPLES BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS Liquid Limit	TESTS PLASTICITY INDEX	TESTS -200
	SILTY SAND TRACE GRAVEL; medium dense to loose, non-plastic fines, moist		SM	1	BS					0	0	42
			SM	2	RS	12	31	8	112			
		5	SM	3	SS	8	7					
			SM	4	RS	12	13					
		10	SM	5	SS	12	6					
		15	SM	6	SS	4	27					
	16.5 Bottom of Boring											

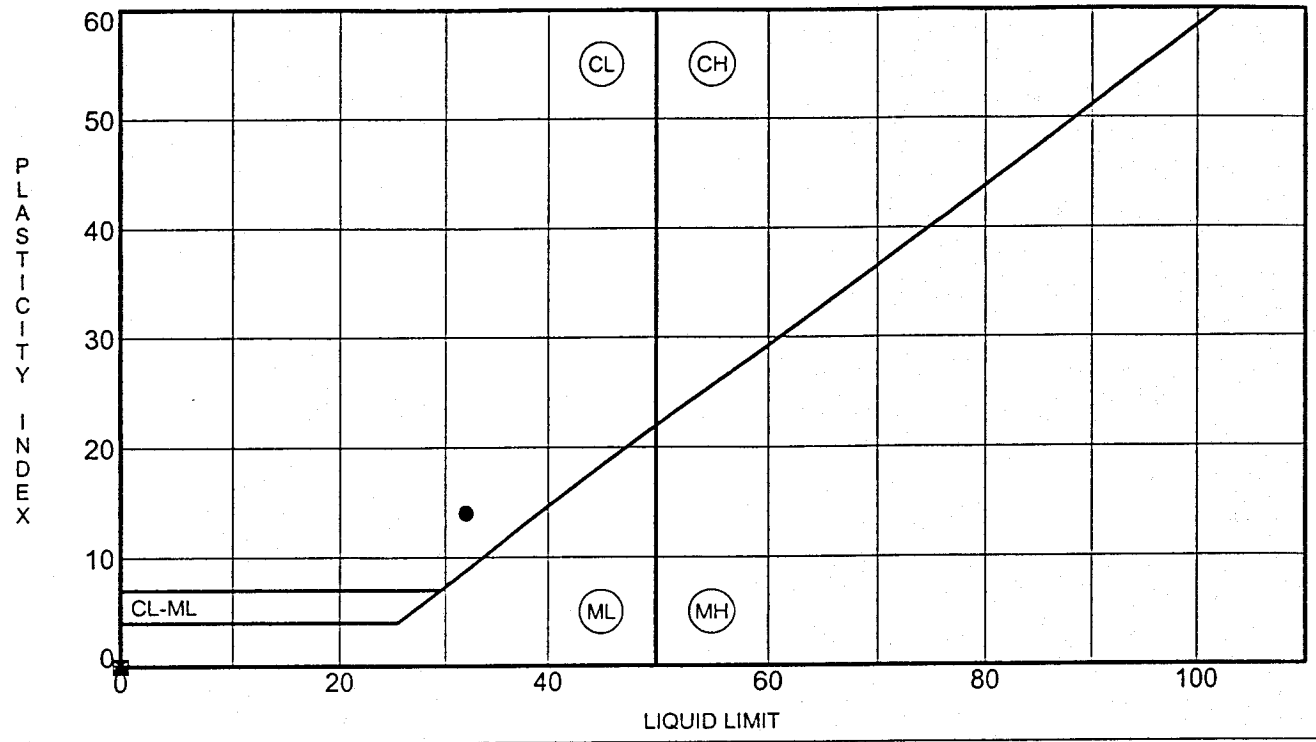
The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼ None AB
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	11-16-04		
BORING COMPLETED	11-16-04		
RIG	CME 75	FOREMAN	BWR
Approved	OBL	JOB #	63045225

BOREHOLE 2000 63045225.GPJ TERR2000.GDT 12/8/04



Specimen Identification		LL	PL	PI	%Fines	Classification
● B-04	0.0ft	32	18	14	61	FILL: SANDY CLAY TRACE GRAVEL (CL)
⊠ B-06	0.0ft	NP	NP	NP	32	FILL: SILTY SAND WITH GRAVEL (SM)
▲ B-09	0.0ft	NP	NP	NP	46	SILTY SAND TRACE GRAVEL (SM)
★ B-17	0.0ft	NP	NP	NP	55	SANDY SILT TRACE GRAVEL (ML)
⊙ B-20	0.0ft	NP	NP	NP	42	SILTY SAND TRACE GRAVEL (SM)

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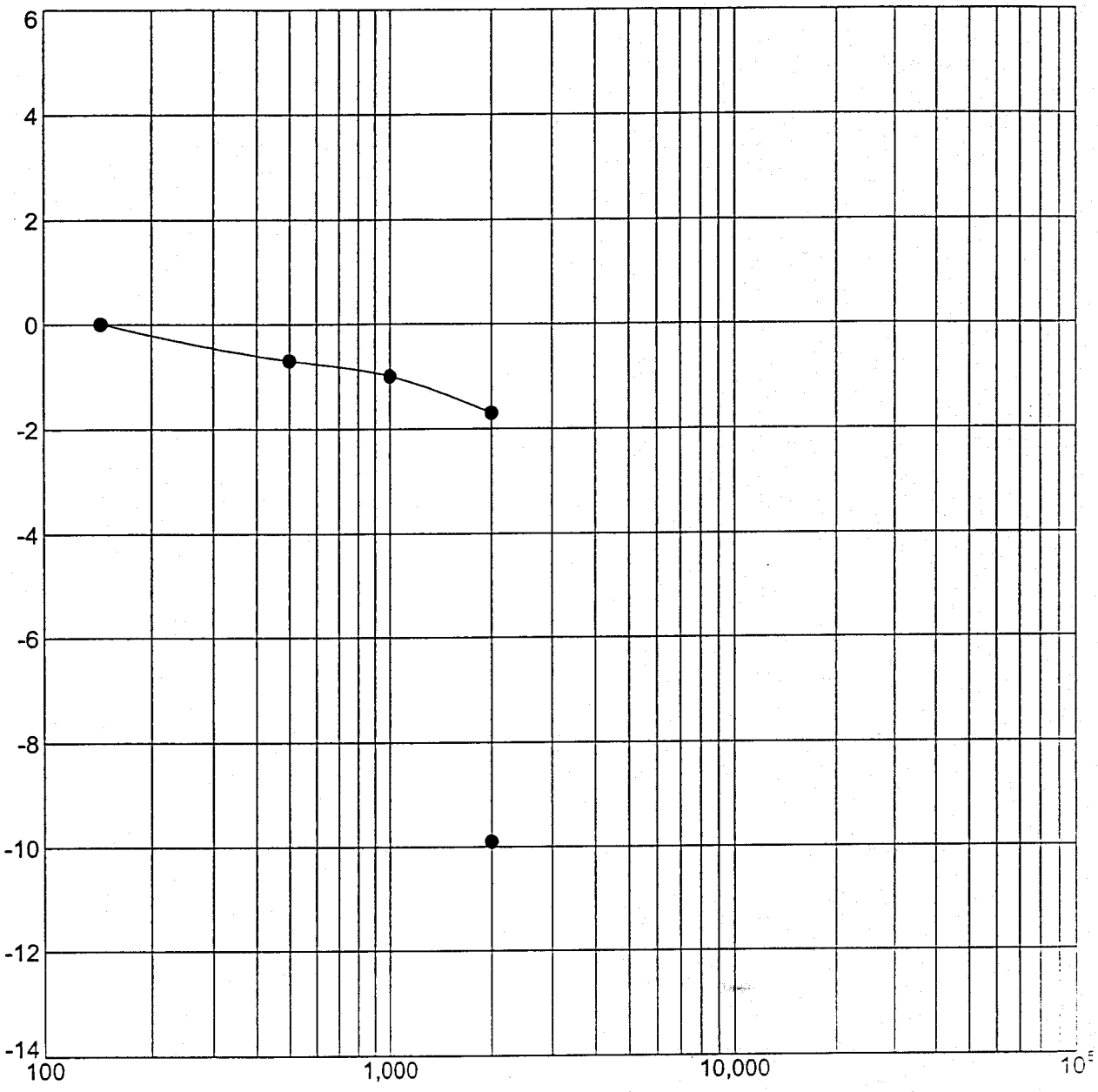
ATTERBERG LIMITS RESULTS

Project: Phase I Residential Development
Site: The Pines Golf Course Marana, Arizona
Job #: 63045225
Date: 12-8-04

TC ATTERBERG LIMITS 63045225.GPJ TERRACON.GDT 12/8/04



Specimen Identification		Classification	γ_d, pcf	WC,%
● B-01	2.5ft	SANDY CLAY TRACE GRAVEL (CL)	100	7

Notes:

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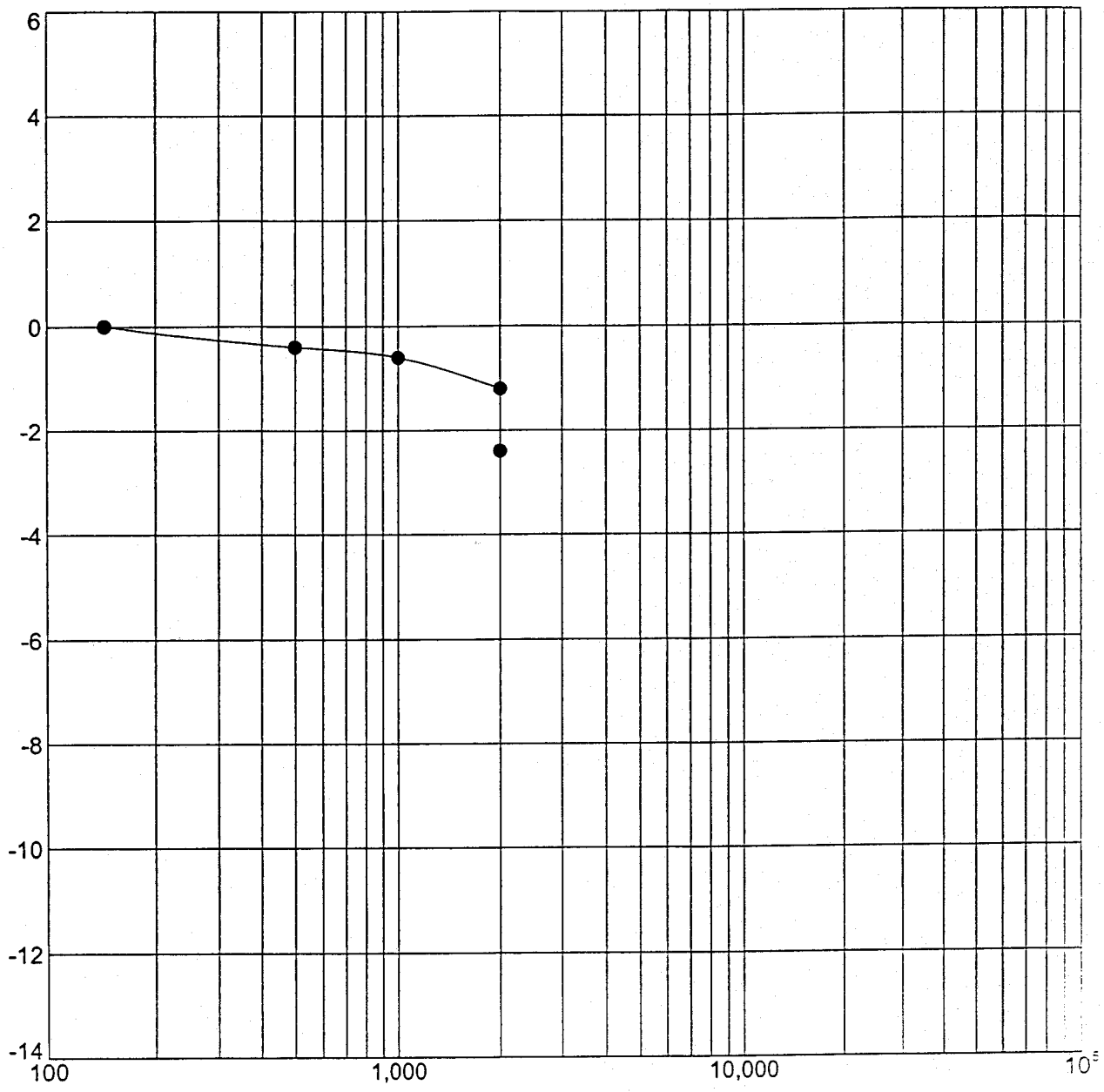
CONSOLIDATION TEST

Project: Phase I Residential Development
Site: The Pines Golf Course Marana, Arizona
Job #: 63045225
Date: 12-7-04

TC CONSOL STRAIN 63045225.GPJ TERRACON.GDT 12/7/04



Specimen Identification		Classification	γ_d, pcf	WC,%
● B-12	2.5ft	SILTY SAND TRACE GRAVEL (SM)	100	12

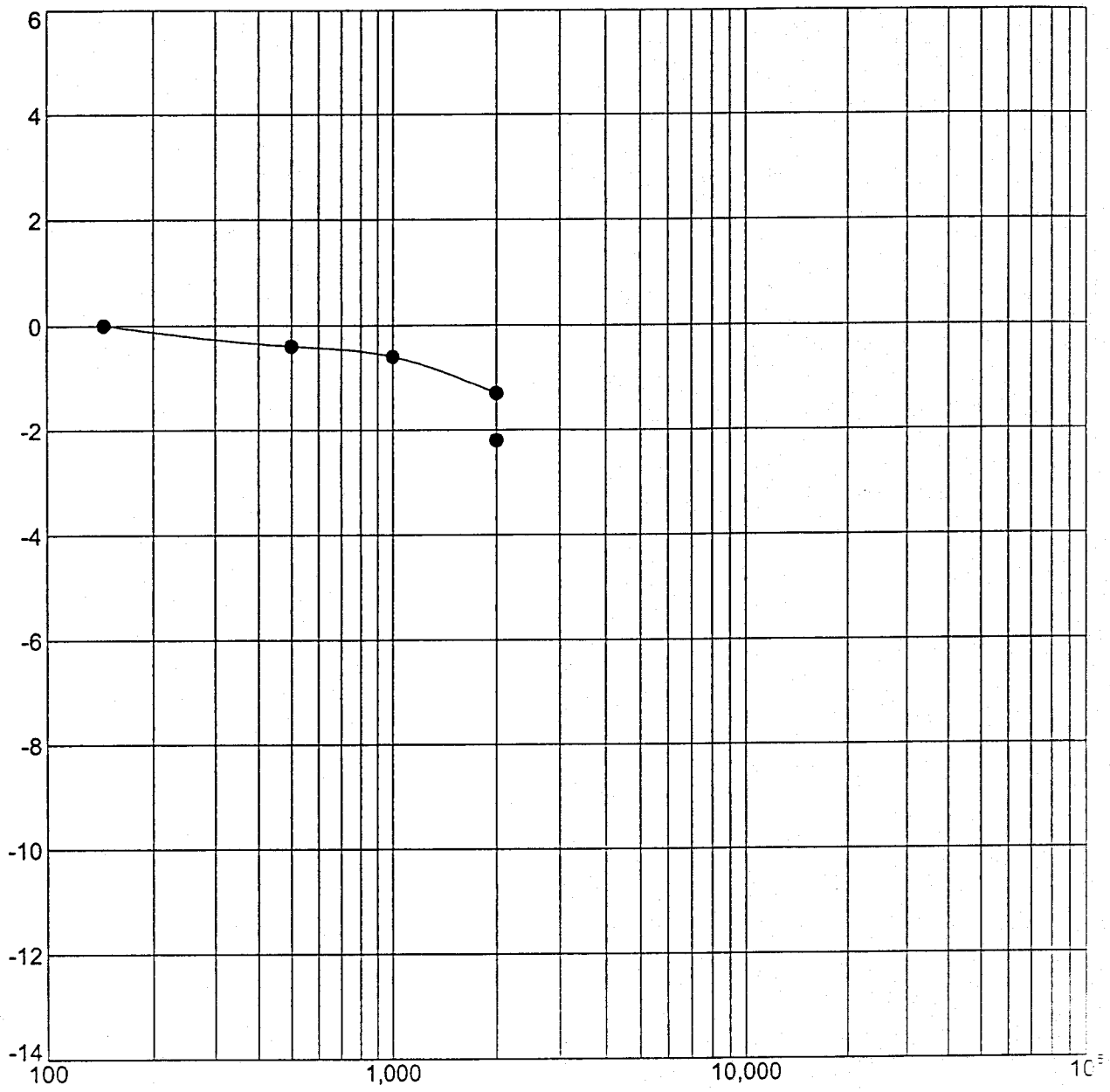
Notes:

Terracon

CONSOLIDATION TEST

Project: Phase I Residential Development
Site: The Pines Golf Course Marana, Arizona
Job #: 63045225
Date: 12-7-04

TC CONSOL STRAIN 63045225.GPJ TERRACON.GDT 12/7/04



Specimen Identification		Classification	γ_d, pcf	WC,%
● B-14	2.5ft	SANDY CLAY (CL)	99	10

Notes:

TC_CONSOL_STRAIN 63045225.GPJ TERRACON.GDT 12/7/04

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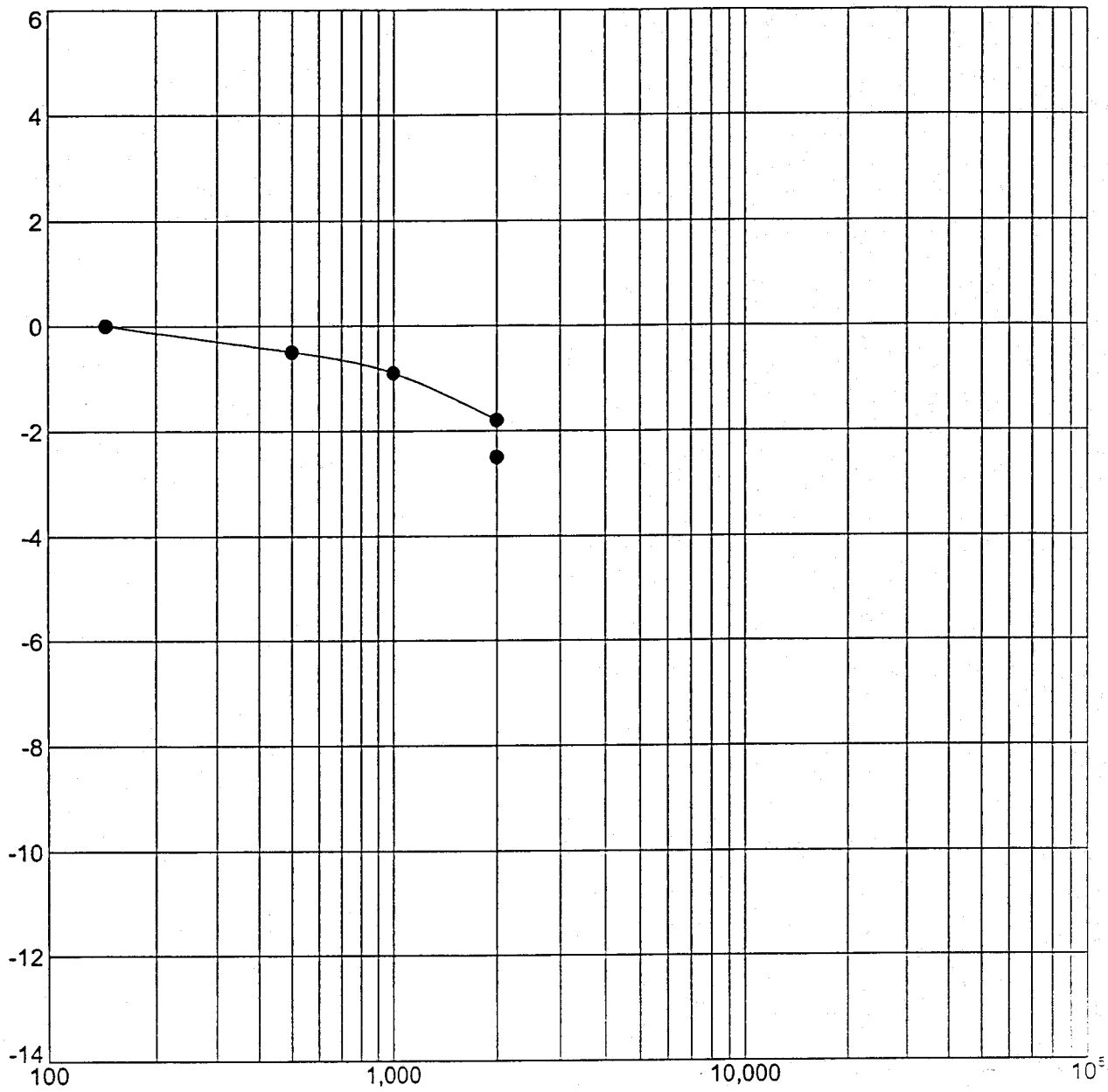
CONSOLIDATION TEST

Project: Phase I Residential Development
Site: The Pines Golf Course Marana, Arizona
Job #: 63045225
Date: 12-7-04



Specimen Identification		Classification	γ_d, pcf	WC,%
● B-16 2.5ft		SANDY CLAY TRACE GRAVEL (CL)	96	20

Notes:

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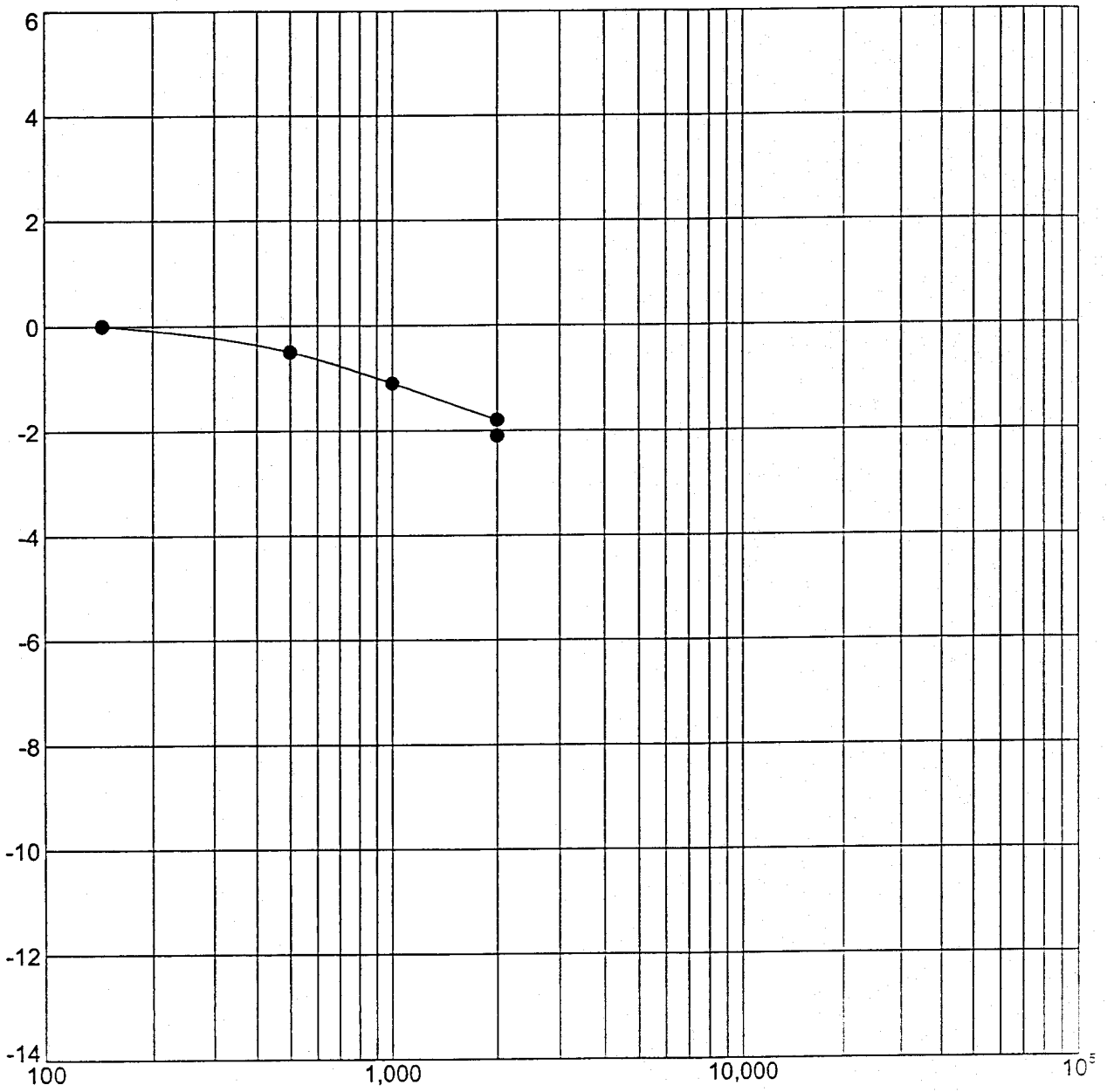
CONSOLIDATION TEST

Project: Phase I Residential Development
Site: The Pines Golf Course Marana, Arizona
Job #: 63045225
Date: 12-7-04

TC CONSOL STRAIN 63045225.GPJ TERRACON.GDT 12/7/04



Specimen Identification		Classification	γ_d, pcf	WC,%
● B-19	2.5ft	SANDY SILTY CLAY (CL-ML)	105	21

Notes:

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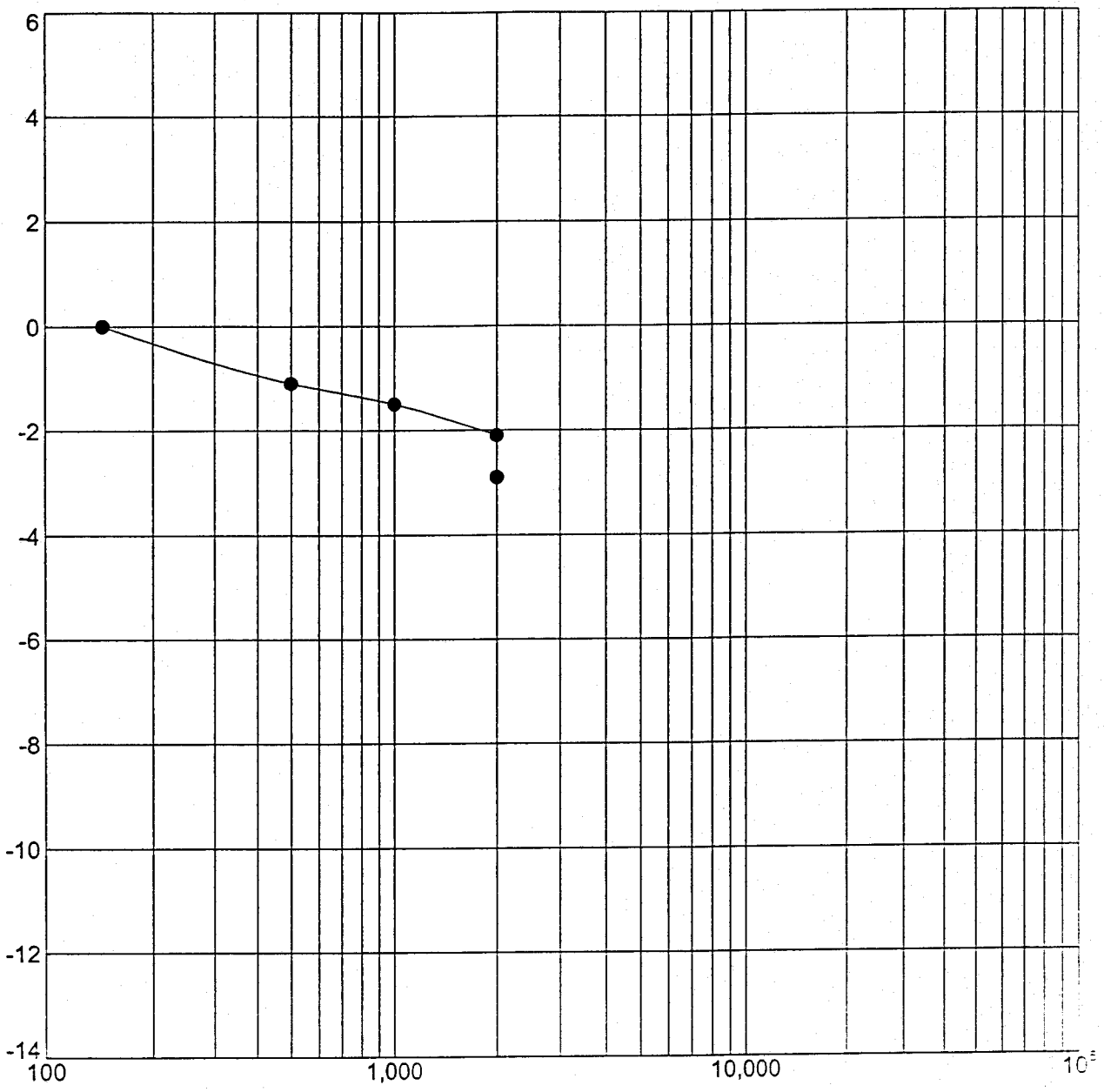
CONSOLIDATION TEST

Project: Phase I Residential Development
Site: The Pines Golf Course Marana, Arizona
Job #: 63045225
Date: 12-7-04

TC_CONSOL_STRAIN 63045225.GPJ TERRACON.GDT 12/7/04



Specimen Identification			Classification	γ_d, pcf	WC,%
●	B-20	2.5ft	SILTY SAND TRACE GRAVEL (SM)	112	8

Notes:

TC CONSOL STRAIN 63045225.GPJ TERRACON.GDT 12/7/04

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CONSOLIDATION TEST

Project: Phase I Residential Development
Site: The Pines Golf Course Marana, Arizona
Job #: 63045225
Date: 12-7-04

Borehole No.	Depth (ft.)	USCS Soil Class.	In-Situ Properties		Classification				Remolded Expansion				Corrosivity				Remarks
			Dry Density (pcf)	Water Content (%)	Passing #200 Sieve (%)	Atterberg Limits			Dry Density (pcf)	Water Content (%)	Surcharge (psf)	Expansion (%)	pH	Resistivity (ohm-cm)	Water Soluble Salts (ppm)	Sulfates (ppm)	
						LL	PL	PI									
B-01	2.5	CL	100	7													1, 2
B-02	0.0	CL							102.4	13.7	144	1.2					2, 3, 4
B-03	0.0	ML							117.6	5.8	144	0					2, 3, 4
B-04	0.0	CL			61	32	18	14									
B-05	0.0	CL							115.1	10.5	144	0.4					2, 3, 4
B-06	0.0	SM			32	NP	NP	NP									
B-09	0.0	SM			46	NP	NP	NP									
B-12	0.0	SC							109	10.4	144	0.6					2, 3, 4
B-12	2.5	SM	100	12													1, 2
B-14	2.5	CL	99	10													1, 2
B-16	2.5	CL	96	20													1, 2
B-17	0.0	ML			55	NP	NP	NP									
B-19	0.0	CL-ML							103.6	12.8	144	2.8					2, 3, 4
B-19	2.5	CL-ML	105	21													1, 2
B-20	0.0	SM			42	NP	NP	NP									
B-20	2.5	SM	112	8													1, 2

REMARKS

1. Dry density and/or moisture determined from one or more rings of a multi-ring sample.
2. Visual Classification.
3. Submerged to approximate saturation.
4. Compacted density (approximately 95% of ASTM D698 maximum density at moisture content slightly below optimum).

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SUMMARY OF LABORATORY RESULTS

Project: Phase I Residential Development
Site: The Pines Golf Course Marana, Arizona
Job #: 63045225
Date: 12-7-04

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 - 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

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 / Liquid limit - not dried	< 0.75	OL	Organic clay[K,L,M,N] / 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 / Liquid limit - not dried	< 0.75	OH	Organic clay[K,L,M,P] / 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.

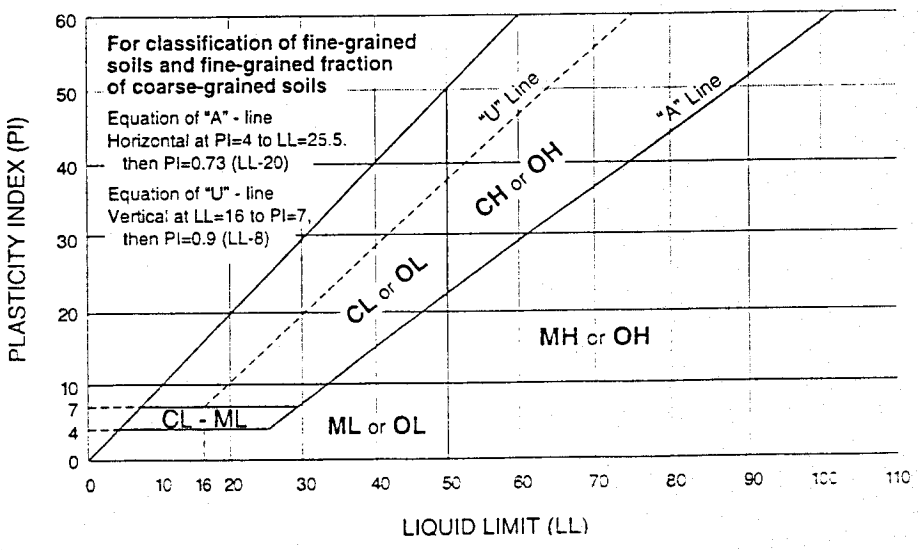
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[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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