

GEOTECHNICAL SUBSURFACE EXPLORATION FOR

ROSE GARDEN LANE DRAINAGE CHANNEL

NORTH SIDE OF ROSE GARDEN LANE FROM THE AGUA FRIA RIVER TO
LAKE PLEASANT ROAD, PHOENIX, ARIZONA



Prepared for:
Wood, Patel & Associates
2051 West Northern Avenue, Suite 100
Phoenix, Arizona 85021

Prepared by:
Alpha Geotechnical & Materials, Inc.
5216 South 40th Street
Phoenix, Arizona 85040

Job # 04-G-00074



August 5, 2004
Alpha Project #04-G-00074

Wood, Patel & Associates, Inc.
2051 West Northern Avenue, Suite 100
Phoenix, Arizona 85021

Attn: Mr. David Violette, P.E.

RE: **GEOTECHNICAL SUBSURFACE EXPLORATION**
Rose Garden Lane Drainage Channel
Phoenix, Arizona

In accordance with your request and authorization, Alpha Geotechnical & Materials, Inc. (Alpha) has performed a geotechnical subsurface exploration for the proposed drainage channel improvement located on the north side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road in Phoenix, Arizona.

INTRODUCTION

The purpose of this geotechnical exploration was to evaluate the general surface and subsurface conditions at the referenced site, and to assess any areas that may be difficult to excavate. Our scope of services was in general accordance with our proposal 04P685B, dated June 17, 2004. This geotechnical report is based on available project information, the site plans provided by the client and our experience with similar construction and soil conditions.



SITE AND PROJECT DESCRIPTION

Geotechnical Site Reconnaissance

The westernmost portion of the site (from the Agua Fria River to 109th Avenue) consists of native desert with moderate amounts of vegetation. A depressed landscaped area exists between 109th Avenue and 107th Avenue. A masonry fence was located adjacent to the sidewalk from 107th Avenue to a point 600' east. The remainder of the site extending east to Lake Pleasant Road was dry and flat with little vegetation.

Project Description

It is understood that Phase I of the project consists of a drainage channel approximately 8,000 lineal feet in length along the north side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road. Generally, the depth of the proposed channel varies from 7'-10' below existing grade.

FIELD EXPLORATION AND TESTING

Field Exploration

Ten test borings were drilled to depths ranging from one and a half (1.5) to four (4) feet below existing ground level where auger refusal occurred with a CME-45 power drill rig using hollow-stem augers. The borings were drilled at the approximate locations shown on the site plan included in the Appendix of this report. Bulk soil samples were collected from the test borings. Driving a sampler in general accordance with ASTM D-1586 specifications collected Split spoon samples. Penetration resistance values, or blow counts, were obtained for each sample. These values represent the number of blows required to drive the samplers 6-inch increments into the soil, using a 140-pound hammer falling 30 inches. The blow counts are shown on the boring logs, and are relative indicators of the soil strength and density.

Five test pits were advanced to depths ranging from two (2) to four (4) feet below existing ground level where the backhoe refusal was obtained at the subject site with a John Deere 510 with a eighteen inch bucket. The test pits were excavated at the same locations shown for the soil borings in the Appendix of this report. Bulk soil samples were collected for the test pits.

Samples were collected at various depths for each location. Representative portions of the soil samples were sealed in plastic containers and returned to our



laboratory. The soil samples were then classified in general accordance with the Unified Soil Classification System (USCS). Field boring/test pit logs were prepared and are presented in the Appendix.

Laboratory Testing

Laboratory testing was performed to evaluate the percent silt and clay in the soil (% passing the #200 sieve), and the Plasticity Index of soils. Results of the plasticity and gradation tests are presented in the following table:

Test Boring	Sample Depth (ft)	% Passing #200 Sieve	Plasticity Index
B-1	0'-2'	30	3
B-2	0'-2'	58	7
B-2	2'-3'	41	Not tested
B-3	0'-2'	56	6
B-4	0'-2'	25	12
B-5	0'-2'	20	6
B-6	0'-2'	50	11
B-8	2'	12	Not tested
B-9	2'-4'	28	Not tested
B-10	0'-2'	28	3
B-10	2'-3'	21	Not tested

Most of the native site soils have low to medium percentages of fines and low to medium plasticities. A full sieve analysis was performed on samples from borings B-2, B-4, B-8, B-9 and B-10. Details of the laboratory tests are presented in the Appendix.

GENERAL SITE CONDITIONS

Soil Stratigraphy

The naturally occurring site surface and subsurface soils extending to the depth tests consisted mostly of sandy clay (CL) to clayey sand (SC) with gravel. Clayey/silty gravels (GM/GC) and sandy silty clays (CL-ML) were also found. The site soils were found to be medium dense to very dense and/or very stiff to hard. Carbonate cementation was more evident (and stronger) at the western end of the channel. The cobble/gravel layer caused refusal on the easternmost boring locations.

Groundwater

Soil moisture contents were dry to moist throughout the depth of the test borings. No free groundwater was encountered in the test borings for this project. This condition could change with time and would be influenced by factors such as the amount of precipitation and/or watering and ground water pumping.

Ease of Excavation and Workability

Based on the material types and the blowcounts in the test borings, we anticipate that shallow (less than ten feet) excavations for this site will require a moderate sized (e.g. Caterpillar 345B) track hoe equipped with a rock bucket in order to reach the desired depths. Deeper excavations will be more difficult due to the density and cementation of some of the site soils. Since refusal seemed to be caused by cobbles and cemented soils, as opposed to fragmented rock, blasting would not likely be required to reach the proposed channel depth. Further evaluation of the excavation conditions could be made using a track-hoe with a rock bucket or the same type and capacity equipment as will be used during construction of the project.

Sloped embankments up to, and including the design slope of 4:1 are likely to remain stable under their own weight. This is especially true where chemical cementation is not disturbed during the excavation process.

Wetting of the native soils could result in some soil pumping under dynamic loadings, such as heavy construction equipment driving over the areas. In areas where pumping occurs, the area should be allowed to dry until the soils are workable without pumping, or the wetted areas should be removed and replaced with drier more suitable soils.

Lateral Soil Pressures

Any proposed walls/structures that will retain soil must be designed to withstand lateral soil pressures. Any cantilevered retaining walls, or unrestrained walls subject to lateral earth pressures, should be designed for an equivalent fluid pressure (EFP) of 35 PCF. Restrained walls should be designed to withstand a residual or long-term at-rest (K_0) earth pressure condition of 55 pounds per cubic foot (PCF).

Passive EFP of 300 PCF may be used for shallow spread footings, along with a coefficient of friction of 0.40. Any vehicular surcharge loads and/or hydrostatic pressures will increase the recommended equivalent fluid pressures.

Only cohesionless, free-draining granular materials should be used as backfill, adjacent to earth-retaining structures. We recommend that backfill directly behind the walls be compacted with light, hand-held compactors. Heavy compactors and grading equipment should not be allowed to operate within 3 feet of the walls during backfilling, to avoid developing excessive temporary or long-term lateral soil pressures. Positive gravity drainage of the backfill should be provided. We recommend that a one-foot thick layer of clay be used to cap the backfill, and slope away from the structure, to reduce the quantity of surface water that might seep into the backfill soils.



Allowable Bearing Capacity

Structures bearing on undisturbed native soils could be designed using the following allowable bearing capacities.

Bearing Depth Below Finished Grade (ft.)	Allowable Bearing Pressure (psf)
1.5 (min.)	2,000
4.0 or greater	2,500

***Note:** Bearing depth is defined as the depth below the lowest adjacent finished grade elevation within 5 feet of the edge of the foundation.

A one-third increase may be applied to the design bearing pressures when considering short duration loads, such as wind and seismic.

Individual footings or bearing areas should have minimum widths of 24 inches by 24 inches. The minimum width is recommended for ease of construction, and to provide a margin of safety against a local or punching shear failure of the foundation soils. Joints in continuous concrete or masonry structures should be reinforced to reduce potential distress caused by differential foundation movement.

All bearing areas should be observed by the Geotechnical Engineer prior to placement of reinforcing steel and/or concrete. If soil conditions are encountered that are different than indicated by the test borings, revised recommendations may be required.

Settlements for foundations designed in accordance with the above recommendations should not exceed 3/4 inch, and differential settlements should not exceed 1/2 inch. Additional foundation movements could occur if water from any source infiltrates the foundation soils. As discussed earlier, positive drainage is critical during and after construction.

CLOSURE

Limitations

Our professional services have been performed using that degree and skill ordinarily exercised, under similar circumstances, by reputable Geotechnical Engineers practicing in this or similar localities. No other warranty, express or implied, is made.

The recommendations contained in this report are based on our field exploration, laboratory test results, and our understanding of the proposed construction. The subsurface data used in the preparation of this report was obtained from the test borings excavated during the field subsurface exploration. It is anticipated that some variations in the soil conditions will exist on-

site. The nature and extent of variations may not be evident until construction occurs. If any conditions are encountered at this site that are different from those described in this report, we should be immediately notified so that we may make any necessary revisions to the recommendations contained in this report. In addition, if the scope of the proposed construction changes from that described in this report, our firm should also be notified.

It is the Client's responsibility to see that all parties to the project including the designer, contractor, subcontractor, etc. are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the contractor's option and risk.

This report may be used only by the Client and only for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both on and off-site), or other factors may change over time, and additional work may be required with the passage of time. Any party, other than the Client, who wishes to use this report, shall notify Alpha of such intended use. Based on the intended use of this report, Alpha may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements, by the Client or anyone else, will release Alpha from any liability.

Recommended Additional Services

The recommendations provided in this report are based on the assumption that an adequate program of tests and observations will be performed during the construction. These tests and observations should be performed by the Geotechnical Engineer's representative and should include, but are not necessarily be limited to the following:

- Observe and document that any existing surficial vegetation and other deleterious materials have been removed from the site as required in site preparation section.
- Approve any material used as engineered fill in building and pavement areas to document it's suitability before placement.
- Perform field density tests, as needed, to verify compaction compliance. The representative should monitor the progress of compaction and filling operations.
- Keep detailed records of on-site activity and progress.

Construction testing, including field and laboratory evaluation of fill and backfill materials, concrete and steel should be performed to determine whether applicable project requirements have been met.

This report is for the exclusive purpose of providing Geotechnical Engineering and/or testing information and recommendations. 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



Geotechnical Subsurface Exploration
Rose Garden Drainage Channel
Phoenix, Arizona

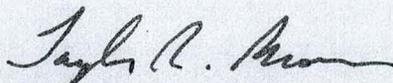
Alpha Project 04-G-00074

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potential for such contamination, other studies should be undertaken.

Should you have any questions concerning the contents of this report, please contact the undersigned at (602) 453-3265.

Respectfully submitted,
Alpha Geotechnical & Materials, Inc.


Taylor R. Brown, E.I.T

James E. Weaver, P.E.
President



Dist: Addressee (3)



Engineering • Testing • Solutions

UNIFIED SOIL CLASSIFICATION SYSTEM					CONSISTENCY OR RELATIVE DENSITY		
Major Divisions			Group Symbols	Typical Names	CRITERIA		
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels 50% or more of coarse fraction retained on No. 4 sieve	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	<u>Standard Penetration Test</u> Density of Granular Soils Penetration Resistance N (blows/ft) Relative Density		
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines			
		Gravels With Fines	GM	Silty gravels, gravel-sand-silt mixtures			
			GC	Clayey gravels, gravel-sand-clay mixtures			
	Sands More than 50% of coarse fraction passes No. 4 sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines	0-4	Very Loose	
			SP	Poorly graded sands and gravelly sands, little or no fines	5-10	Loose	
		Sands With Fines	SM	Silty sands, sand-silt mixtures	11-30	Medium Dense	
			SC	Clayey sands, sand-clay mixtures	31-50	Dense	
Fine-Grained Soils 50% or more passes No. 200 sieve	Sils and Clays Liquid Limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	<u>Standard Penetration Test</u> Consistency of Cohesive Soils Penetration Resistance N (blows/ft) Consistency Unconfined Compressive Strength (Tons/ft ²)		
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL	Organic silts and organic silty clays of low plasticity			<2
	Sils and Clays Liquid Limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	2-4	Soft	0.25-0.50
			CH	Inorganic clays of high plasticity, fat clays	4-8	Firm	0.50-1.00
			OH	Organic clays of medium to high plasticity	8-15	Stiff	1.00-2.00
					15-30	Very Stiff	2.00-4.00
Highly Organic Soils		PT	Peat, mucic, and other highly organic soils	>30	Hard	>4.0	

3" 3/4" #4 #10 #40 #200 U.S. Standard Sieve

Unified Soil Classification	Cobbles	Gravel		Sand			Silt or Clay
		coarse	fine	coarse	medium	fine	

MOISTURE CONDITIONS

MATERIAL QUANTITY

OTHER SYMBOLS

Dry	Absence of moist, dusty, dry to the touch
Slightly Damp	Below optimum moisture content for compaction
Moist	Near optimum moisture content, will moisten the hand
Very Moist	Above optimum moisture content
Wet	Visible free water; below water table

trace	0 - 5%
few	5 - 10%
little	10 - 25%
some	25 - 45%
mostly	50 - 100%

C	Core Sample
S	SPT Sample
B	Bulk Sample
▼	Groundwater
Qp	Pocket Penetrometer

BASIC LOG FORMAT:

Group name, Group symbol, (grain size), color, moisture, consistency or relative density. Additional comments: odor, presence of roots, mica, gypsum, coarse grained particles, etc.

EXAMPLE:

Brown, loose fine to medium Sand (SP), trace silt, little fine gravel, damp

UNIFIED SOIL CLASSIFICATION SYSTEM

APPENDIX

AGUA FRIA RIVER

109th AVE.

LAKE PLEASANT ROAD

ROSE GARDEN LANE



LEGEND

⊕ SOIL TEST BORING



ALPHA
 Geotechnical & Materials, Inc.
 5216 S. 40th Street
 Phoenix, Arizona 85040

Boring Location Plan

Project: Rose Garden Lane Drainage Channel 04-G-00074

Location: Rose Garden Lane, Phoenix, AZ

Date: 8-5-04

Drawn By: T. Brown

Alpha Project Number: 04-G-00074

LOG OF BORING NO. B-1

Project: Rose Garden Lane Drainage Channel

Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona

Location: See attached site plan

Longitude: 112° 17.980'

Latitude: 33° 40.472'

Remarks:

DESCRIPTION OF SUBSURFACE CONDITIONS

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	DESCRIPTION OF SUBSURFACE CONDITIONS
H			1.6	1	GM	SILTY GRAVEL with SAND Medium brown, poor gradation, sub angular particles, low plasticity, dry, strong cementation. Auger refusal @ 1' no groundwater encountered.
				2		
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				10		
				11		
				12		
				13		
				14		

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

Sample Type Key: S = Split Spoon H = Hand Sample
 NR = No Recovery R = Ring Sampler RF = Refusal

Alpha Geotechnical & Materials, Inc.
 5216 S. 40TH Street
 Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

Alpha Project Number: 04-G-00074

LOG OF BORING NO. B-2

Project: Rose Garden Lane Drainage Channel

Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona

Location: See attached site plan

Longitude: 112° 17.907' Latitude: 33° 40.476'

Remarks: Depth to proposed channel is approximately eight feet at this location. Hand samples were collected from 0'-2' and 2'-3' depth. Deere 510 backhoe with 18" bucket also experienced refusal at 3' depth.

DESCRIPTION OF SUBSURFACE CONDITIONS

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE
H	29-50/6"			1	CL-ML
S		2			
H		3			
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
		14			

SANDY SILTY CLAY
 Medium brown, poor gradation, sub angular particles, hard, low plasticity, dry, moderate cementation.
 Some gravel and strong cementation.
Auger Refusal @ 3' no groundwater encountered.

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

Sample Type Key: S = Split Spoon H = Hand Sample
 NR = No Recovery R = Ring Sampler RF = Refusal

Alpha Geotechnical & Materials, Inc.
 5216 S. 40TH Street
 Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

Alpha Project Number: 04-G-00074

LOG OF BORING NO. B-3

Project: Rose Garden Lane Drainage Channel

Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona

Boring Location: See attached site plan

Longitude: 112° 17.963' Latitude: 33° 40.472'

Remarks: Depth to proposed channel is approximately nine and a half feet at this location. Hand sample was collected from 0'-2' depth.

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	DESCRIPTION OF SUBSURFACE CONDITIONS
H			2.0	1	CL-ML	SANDY SILTY CLAY with GRAVEL Medium brown, poor gradation, sub angular particles, low plasticity, dry, moderate cementation.
				2		
				3		Auger Refusal @ 2' no groundwater encountered.
				4		
				5		
				6		
				7		
				8		
				9		
				10		
				11		
				12		
				13		
				14		

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

Sample Type Key: S = Split Spoon H = Hand Sample
NR = No Recovery R = Ring Sampler RF = Refusal

Alpha Geotechnical & Materials, Inc.
5216 S. 40TH Street
Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

Alpha Project Number: 04-G-00074

LOG OF BORING NO. B-4

Project: Rose Garden Lane Drainage Channel

Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona

Location: See attached site plan

Longitude: 112° 17.784' Latitude: 33° 40.473'

Remarks: Depth to proposed channel is approximately eight feet at this location. Hand samples were collected from 0'-2' and 2' depth. Deere 510 backhoe with 18" bucket also experienced refusal at 2' depth.

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	DESCRIPTION OF SUBSURFACE CONDITIONS
H			2.7	1	GC	CLAYEY GRAVEL with SAND and trace COBBLES Medium brown, poor gradation, sub angular particles, medium plasticity, dry, moderate cementation.
H				2		
				3		Auger Refusal @ 2' no groundwater encountered.
				4		
				5		
				6		
				7		
				8		
				9		
				10		
				11		
				12		
				13		
				14		

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

Sample Type Key: S = Split Spoon H = Hand Sample
NR = No Recovery R = Ring Sampler RF = Refusal

Alpha Geotechnical & Materials, Inc.
5216 S. 40TH Street
Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

Alpha Project Number: 04-G-00074

LOG OF BORING NO. B-5

Project: Rose Garden Lane Drainage Channel

Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona

Location: See attached site plan

Longitude: 112° 17.639' Latitude: 33° 40.478'

Remarks: Depth to proposed channel is approximately nine feet at this location. Hand sample was collected from 0'-1.5' depth.

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	DESCRIPTION OF SUBSURFACE CONDITIONS
H				1	SC-SM	SILTY CLAYEY SAND with GRAVEL Medium brown, poor gradation, sub angular particles, low plasticity, dry, moderate cementation.
				2		Auger Refusal @ 1.5' no groundwater encountered.
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				10		
				11		
				12		
				13		
				14		

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

Sample Type Key: S = Split Spoon H = Hand Sample
NR = No Recovery R = Ring Sampler RF = Refusal

Alpha Geotechnical & Materials, Inc.
5216 S. 40TH Street
Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

Alpha Project Number: 04-G-00074

LOG OF BORING NO. B-6

Project: Rose Garden Lane Drainage Channel

Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona

Location: See attached site plan

Longitude: 112° 17.492' Latitude: 33° 40.482'

Remarks: Depth to proposed channel is approximately seven feet at this location. Hand sample was collected from 0'-2' depth.

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	DESCRIPTION OF SUBSURFACE CONDITIONS
H			3.2	1 2 3 4 5 6 7 8 9 10 11 12 13 14	CL/SC	<p>SANDY CLAY to CLAYEY SAND with trace COBBLES Medium brown, poor gradation, sub angular particles, medium plasticity, dry, weak cementation.</p> <p>Auger Refusal @ 2' no groundwater encountered.</p>

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

Sample Type Key: S = Split Spoon H = Hand Sample
NR = No Recovery R = Ring Sampler RF = Refusal

Alpha Geotechnical & Materials, Inc.
5216 S. 40TH Street
Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

Alpha Project Number: 04-G-00074

LOG OF BORING NO. B-7

Project: Rose Garden Lane Drainage Channel

Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona

Location: See attached site plan

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	Longitude: 112° 17.260'	Latitude: 33° 40.473'
						Remarks: Depth to proposed channel is approximately seven feet at this location. Hand sample was collected from 0'-2' depth.	
DESCRIPTION OF SUBSURFACE CONDITIONS							
H				1	CL/SC	SANDY CLAY to CLAYEY SAND with trace COBBLES Medium brown, poor gradation, sub angular particles, low plasticity, dry, weak cementation.	
				2			
				3	Auger Refusal @ 3' no groundwater encountered.		
				4			
				5			
				6			
				7			
				8			
				9			
				10			
				11			
				12			
				13			
				14			

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

Sample Type Key: S = Split Spoon H = Hand Sample
NR = No Recovery R = Ring Sampler RF = Refusal

Alpha Geotechnical & Materials, Inc.
5216 S. 40TH Street
Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

Alpha Project Number: 04-G-00074

LOG OF BORING NO. B-8

Project: Rose Garden Lane Drainage Channel

Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona

Location: See attached site plan

Longitude: 112° 17.141' Latitude: 33° 40.476'

Remarks: Depth to proposed channel is approximately seven feet at this location. Hand samples were collected from 0'-2' and 2' depth. Deere 510 backhoe with 18" bucket also experienced refusal at 2' depth.

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	DESCRIPTION OF SUBSURFACE CONDITIONS
H				1	CL/SC	SANDY CLAY to CLAYEY SAND with trace GRAVEL Medium brown, poor gradation, sub angular particles, moist, weak cementation.
H				2		
				3		Auger Refusal @ 2' no groundwater encountered.
				4		
				5		
				6		
				7		
				8		
				9		
				10		
				11		
				12		
				13		
				14		

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

Sample Type Key: S = Split Spoon H = Hand Sample
NR = No Recovery R = Ring Sampler RF = Refusal

Alpha Geotechnical & Materials, Inc.
5216 S. 40TH Street
Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

Alpha Project Number: 04-G-00074

LOG OF BORING NO. B-9

Project: Rose Garden Lane Drainage Channel

Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona

Location: See attached site plan

Longitude: 112° 17.036' Latitude: 33° 40.481'

Remarks: Depth to proposed channel depth is approximately six feet at this location. Hand samples were collected from 0'-2' and 2'-4' depth. Deere 510 backhoe with 18" bucket also experienced refusal at 4' depth.

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	DESCRIPTION OF SUBSURFACE CONDITIONS
H				1	CL/SC	SANDY CLAY to CLAYEY SAND Medium brown, poor gradation, sub angular particles, low plasticity, dry, weak cementation.
H				2		
				3		Gravel and cobbles with strong cementation.
				4		Auger Refusal @ 4' no groundwater encountered.
				5		
				6		
				7		
				8		
				9		
				10		
				11		
				12		
				13		
				14		

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

Sample Type Key: S = Split Spoon H = Hand Sample
NR = No Recovery R = Ring Sampler RF = Refusal

Alpha Geotechnical & Materials, Inc.
5216 S. 40TH Street
Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

Alpha Project Number: 04-G-00074

LOG OF BORING NO. B-10

Project: Rose Garden Lane Drainage Channel

Project Location: North Side of Rose Garden Lane from the Agua Fria River to Lake Pleasant Road, Phoenix, Arizona

Location: See attached site plan

Longitude: 112° 16.872' Latitude: 33° 40.478'

Remarks: Depth to proposed channel is approximately two feet at this location. Hand samples were collected from 0'-2' and 2'-3' depth. Deere 510 backhoe with 18" bucket also experienced refusal at 3' depth.

SAMPLE TYPE	BLOWS PER 6"	DRY DENSITY (PCF)	MOISTURE (%)	DEPTH (FEET)	USCS CODE	DESCRIPTION OF SUBSURFACE CONDITIONS
H	10-21-21		0.9	1	GM	SILTY GRAVEL with SAND Medium brown, poor gradation, sub angular particles, dense, low plasticity, dry, weak cementation.
S				2		
H				3	Auger Refusal @ 3' no groundwater encountered.	
				4		
				5		
				6		
				7		
				8		
				9		
				10		
				11		
				12		
				13		
				14		

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

Sample Type Key: S = Split Spoon H = Hand Sample
NR = No Recovery R = Ring Sampler RF = Refusal

Alpha Geotechnical & Materials, Inc.
5216 S. 40TH Street
Phoenix, Arizona 85040

Sampling Date: 07/07/04

Drill Rig: CME 45

PROJECT: ROSE GARDEN LANE
LOCATION: SUN CITY, AZ
MATERIAL: NATIVE
SAMPLE SOURCE: B-2 (@2'-3')

JOB NO: 04-G-00074
WORK ORDER NO: 2
LAB NO: 8
DATE SAMPLED: 7/22/2004

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (AZ 201)
Select Method

MECHANICAL ANALYSIS

SIEVE SIZE	% PASSING
6 in / 152mm	100
4 in / 100mm	100
3 in / 75mm	100
2 in / 50mm	100
1 1/2 in / 37.5mm	100
1 1/4 in / 32 mm	100
1 in / 25 mm	99
3/4 in / 19 mm	97
1/2 in / 12.5 mm	95
3/8 in / 9.5 mm	94
1/4 in / 6.4 mm	92
#4, 4.75mm	90
#8, 2.36mm	86
#10, 2.00mm	85
#16, 1.18mm	81
#30, 0.60mm	75
#40, .425mm	70
#50, .300mm	66
#100, .150mm	54
#200, .075mm	40.8

NOTES:

Reviewed by: _____

TRB

PROJECT: ROSE GARDEN LANE
LOCATION: SUN CITY, AZ
MATERIAL: NATIVE
SAMPLE SOURCE: B-4 (@2')

JOB NO: 04-G-00074
WORK ORDER NO: 2
LAB NO: 9
DATE SAMPLED: 7/22/2004

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (AZ 201)
Select Method

MECHANICAL ANALYSIS

SIEVE SIZE	% PASSING
6 in / 152mm	100
4 in / 100mm	100
3 in / 75mm	91
2 in / 50mm	87
1 1/2 in / 37.5mm	81
1 1/4 in / 32 mm	80
1 in / 25 mm	79
3/4 in / 19 mm	77
1/2 in / 12.5 mm	74
3/8 in / 9.5 mm	72
1/4 in / 6.4 mm	69
#4, 4.75mm	67
#8, 2.36mm	65
#10, 2.00mm	65
#16, 1.18mm	63
#30, 0.60mm	59
#40, .425mm	56
#50, .300mm	53
#100, .150mm	46
#200, .075mm	37

NOTES:

Reviewed by: _____

TRB

PROJECT: ROSE GARDEN LANE
LOCATION: SUN CITY, AZ
MATERIAL: NATIVE
SAMPLE SOURCE: B-8 (@2')

JOB NO: 04-G-00074
WORK ORDER NO: 2
LAB NO: 10
DATE SAMPLED: 7/22/2004

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (AZ 201)
Select Method

MECHANICAL ANALYSIS

SIEVE SIZE	% PASSING
6 in / 152mm	100
4 in / 100mm	100
3 in / 75mm	96
2 in / 50mm	86
1 1/2 in / 37.5mm	80
1 1/4 in / 32 mm	75
1 in / 25 mm	72
3/4 in / 19 mm	67
1/2 in / 12.5 mm	58
3/8 in / 9.5 mm	53
1/4 in / 6.4 mm	46
#4, 4.75mm	42
#8, 2.36mm	35
#10, 2.00mm	34
#16, 1.18mm	30
#30, 0.60mm	25
#40, .425mm	23
#50, .300mm	21
#100, .150mm	16
#200, .075mm	12

NOTES:

Reviewed by: TRB

PROJECT: ROSE GARDEN LANE
LOCATION: SUN CITY, AZ
MATERIAL: NATIVE
SAMPLE SOURCE: B-9 (2'-4')

JOB NO: 04-G-00074
WORK ORDER NO: 2
LAB NO: 11
DATE SAMPLED: 7/22/2004

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (AZ 201)
Select Method

MECHANICAL ANALYSIS

SIEVE SIZE	% PASSING
6 in / 152mm	100
4 in / 100mm	100
3 in / 75mm	100
2 in / 50mm	87
1 1/2 in / 37.5mm	83
1 1/4 in / 32 mm	82
1 in / 25 mm	80
3/4 in / 19 mm	78
1/2 in / 12.5 mm	75
3/8 in / 9.5 mm	73
1/4 in / 6.4 mm	70
#4, 4.75mm	68
#8, 2.36mm	63
#10, 2.00mm	62
#16, 1.18mm	59
#30, 0.60mm	53
#40, .425mm	50
#50, .300mm	46
#100, .150mm	38
#200, .075mm	28

NOTES:

Reviewed by: _____

TRB

PROJECT: ROSE GARDEN LANE
LOCATION: SUN CITY, AZ
MATERIAL: NATIVE
SAMPLE SOURCE: B-10 (2'-3')

JOB NO: 04-G-00074
WORK ORDER NO: 2
LAB NO: 12
DATE SAMPLED: 7/22/2004

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (AZ 201)
Select Method

MECHANICAL ANALYSIS

SIEVE SIZE	% PASSING
6 in / 152mm	100
4 in / 100mm	100
3 in / 75mm	100
2 in / 50mm	83
1 1/2 in / 37.5mm	75
1 1/4 in / 32 mm	73
1 in / 25 mm	70
3/4 in / 19 mm	67
1/2 in / 12.5 mm	61
3/8 in / 9.5 mm	58
1/4 in / 6.4 mm	52
#4, 4.75mm	49
#8, 2.36mm	46
#10, 2.00mm	45
#16, 1.18mm	43
#30, 0.60mm	40
#40, .425mm	39
#50, .300mm	36
#100, .150mm	29
#200, .075mm	21

NOTES:

Reviewed by: TPB