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GEOTECHNICAL AND SITE ENGINEERS

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REPORT ON SOIL EXPLORATION



DESIGNATION: M.C.F.C.D. Roadway Bridges
Arizona Canal Diversion Channel

LOCATION: Thunderbird Road & 59th Avenue
Phoenix, Arizona

CLIENT: Sverdrup & Parcel and Associates

PROJECT NO: 88910SS

DATE: July 20, 1982

A118.924

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INTRODUCTION

This report presents the results of a subsoil exploration carried out at the site of the proposed bridges for Thunderbird Road as it passes over the Arizona Canal Diversion Channel and the relocated Arizona Canal. These bridges will begin 630 feet west of 59th Avenue and extend approximately 780 feet to the west.

Present plans call for the construction of a 550-foot seven-span (maximum) bridge over the Diversion Channel at a 30+ degree skew. The trapezoidal channel excavation will eliminate the existing canal and have a flow line elevation of 1192.6 with six (h) to one (v) side slopes. The bridge deck will slope up to the west with the eastern deck elevation at 1218.4 feet. The channel design flow rate is 29,000 cfs with a velocity of approximately 5.5 fps.

The relocated Arizona Canal Bridge will be a 70 foot long, two-span bridge at the same 30 degree skew. The trapezoidal channel will be concrete lined with 3/4 (h) to 1 (v) side slopes. The flow line elevation will be at approximately 1210.9 feet and the bridge deck will be on a vertical curve with a surface elevation of approximately 1219.6+.

GENERAL SITE AND SOIL CONDITIONS

Site Conditions - At the time of this investigation, Thunderbird Road was a two-lane paved roadway approximately 24 feet wide. There were wide graded but unpaved shoulders. The existing 2-span bridge is two-lane concrete with narrow sidewalks. The canal is unlined. Overhead electric lines, buried telephone cable and a sanitary sewer are located on the north side of the roadway. The south side of the roadway contains water and sanitary sewer lines and an abandoned telephone cable.

On the west side of the Canal, the land to the north is open cultivated fields and the land to the south is fenced horse pasture.

Subsoil Conditions - The site is located approximately 3 miles east of the Skunk Creek and New River intersection. The native soils in this area are deposited on old alluvial fans and valley plains. The borings were drilled along the roadway and indicate the presence of surface

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fills that are the result of ramping Thunderbird Road over the Arizona Canal and the canal banks. These fills are a maximum of 5.0+ feet and consist of silty sands and clayey sand and gravel.

The native surface soils consists of silty and sandy clay with varying amounts of sand and gravel. This deposit is generally 3 to 10 feet thick. In the vicinity of the Relocated Canal Bridge, this clay was encountered in Borings 9 and 10 to a depth of 3.0 to 3.5 feet. In Boring B-11, a clayey silty sand was found to a depth of 6.5 feet. This material had a standard penetration resistance (SPT) of 27 bpf.

The material underlying this deposit is a layered alluvial system. In general, this material is granular in nature but contains varying amounts of silt and clay. Thin gravel and clean sand lenses were encountered. This material is very stable, exhibiting a SPT of 19 to 29 bpf at the 6.5 foot depth (Borings B-9 and B-10), to 50 bpf and above at greater depths.

Underlying these granular materials is a relatively thin layer of brown sandy clay and clayey sandy silt. This layer, from 3 to 14 feet thick, extends to elevation 1185, approximately 7.5 feet below the proposed channel bottom. This finer material is very stable, exhibiting a SPT of 40 bpf to an average of 75 bpf. Although it was noted to contain some fine root holes, density data and consolidation testing indicated collapse upon inundation was not a problem. This material has a dry density on the order of 95 to 110 pcf at moisture contents of 15 to 20 percent. Its liquid limit is 46 percent with a plasticity index of 12. Triaxial shear testing indicated that this material has a cohesion of 3800 psf and an angle of interval friction of 22 degrees.

Below this layer and extending to the depth of the deepest boring, 50.6 feet, a deposit of relatively clean sand with varying amounts of gravel was encountered. Traces of silt and clay were noted in some samples. This material is very dense with a SPT of 50 bpf to greater than 100 bpf.

Although subsoils were moist, all borings were dry upon completion. Since the water table is believed to be hundreds of feet deep, and no perched water was encountered, groundwater should not be a factor during construction.

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Foundation Design - Project documents provided by Sverdrup & Parcel indicate proposed footing levels for the small canal bridge to be at Elevation 1208.4 (2.5 feet below flow line) and for the main structure to be at Elevation 1186 (6.5 feet below flow line). It is our opinion that the proposed structures can be properly supported at these levels utilizing conventional spread footings or drilled belled caissons. Net allowable bearing capacity values for design have been determined for these and other levels and are presented, together with settlement estimates, as follows:

<u>Footing Elevation (Ft.)</u>	<u>Design Bearing Capacity (psf)</u>	<u>Estimated Settlements (In.)</u>	
		<u>Total</u>	<u>Differential</u>
1208	4000	1.0	0.5
	5000	1.5	0.7
1202	8000	1.0	0.7
1186	8000	1.8	0.9
	10000	2.1	1.2
	12000	2.3	1.4
1180	12000	1.5	0.7
	15000	2.0	1.5

These values apply to both spread footings and hand-cleaned belled caissons. Cementation, particularly at Elevation 1180 is light and variable, which may cause sloughing problems for belled caissons. Accordingly, if caissons are selected, we recommend that a full-size test hole be drilled to confirm that bells will stay open; we recommend the vicinity of Test Boring No. 4 for this determination.

Lateral Pressures - Native soils are quite stable and would exert relatively small active pressures; accordingly active lateral pressures for retaining wall design will be governed by compaction of backfill. For compaction in thin lifts using light equipment, an equivalent fluid pressure of 35 pcf may be utilized for unrestrained walls; for rigid or restrained walls, use 60 pcf.

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For resistance of lateral loads, passive pressures for shallow footings may be simulated by an equivalent fluid pressure of 250 pcf for continuous footings and 350 pcf for spread footings, together with a sliding friction coefficient of 0.4. For deep footings under the main bridge, 300 pcf, 400 pcf, and 0.5 may be used.

All backfill must be compacted to not less than 95 percent of maximum dry density (ASTM D-698) to mobilize these passive values at low strain.

Pavement Design - Grading operations should be conducted so that the upper 3.0 feet of the roadway approach embankments be constructed of the more granular subsoils such as silty and clayey sands to take advantage of their structural stability. This pavement design is based on the City of Phoenix Standard Detail P-1104, Depth of Base Course for Major Streets; a supplement to the M.A.G. Uniform Standard Details. For design purposes, a value of 50 percent passing the 200 sieve and a plasticity index of 14 percent results in the following minimum design:

<u>Asphaltic Concrete</u>	<u>ABC</u>	<u>Select</u>
4 inches	4 inches	8 inches

All materials should meet the applicable requirements of M.A.G. Uniform Standard Specifications. The asphalt mix design should meet the requirements of M.A.G. designated C-3/4 mix.

All embankment subgrade materials, abutment and wing wall backfill should be compacted to 95 percent maximum dry density as determined by ASTM D-698 (Standard Proctor). Pavement base course materials should be compacted to 100 percent.

Utilities Installation - Trench excavations for utilities may be accomplished by conventional trenching equipment. Excavations deeper than approximately 3.0 to 5.0 feet below existing grade may encounter sands and gravels subject to minor sloughing. It is believed, however, that this material contains enough fines to enable trench walls to stand near-vertically for the short periods of time required to install utilities. If trenches are greater than shoulder-height, precaution must be taken to protect workmen.

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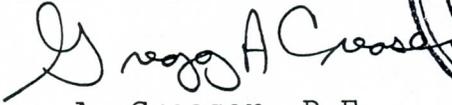
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Backfill of trenches may be carried out with native excavated material. This material should be moisture conditioned, placed in 8-inch lifts and mechanically compacted. Water settling is not recommended. Compaction should meet the requirements of M.A.G. Uniform Standard Specifications.

Respectfully submitted,

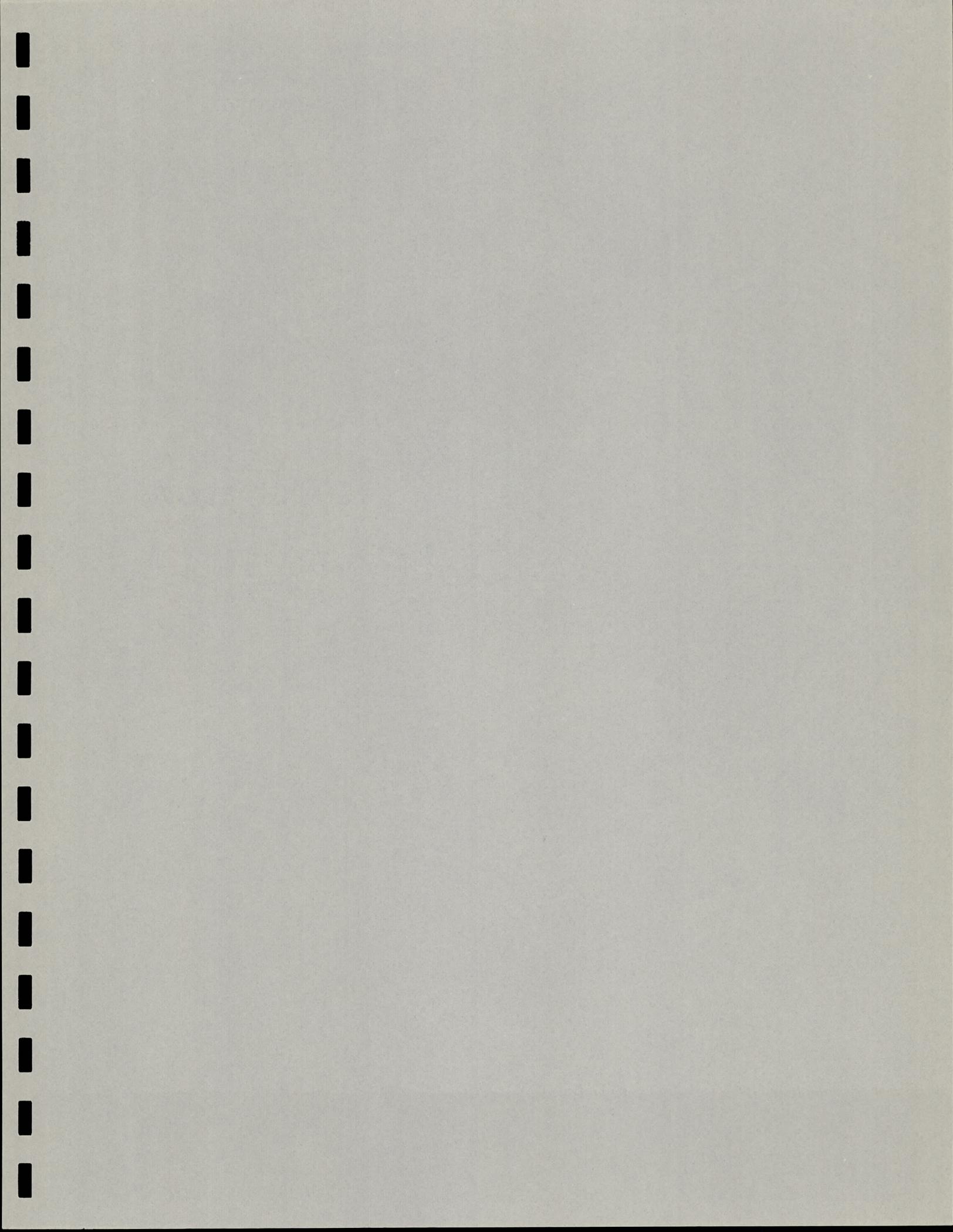


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APPENDIX

FIELD AND LABORATORY INVESTIGATION Page 1 of 1

SOIL BORING LOCATION PLAN Plate 1

SOIL LOG LEGEND Plate 2

LOG OF SOIL BORINGS: Soil Boring No. B-1 Figures 1a & 1b
 Soil Boring No. B-2 Figures 2a & 2b
 Soil Boring No. B-3 Figures 3a & 3b
 Soil Boring No. B-4 Figures 4a & 4b
 Soil Boring No. B-5 Figures 5a & 5b
 Soil Boring No. B-6 Figures 6a & 6b
 Soil Boring No. B-7 Figures 7a & 7b
 Soil Boring No. B-8 Figures 8a & 8b
 Soil Boring No. B-9 Figure 9
 Soil Boring No. B-10 Figure 10
 Soil Boring No. B-11 Figure 11

TABULATION OF TEST DATA Figure 12

CONSOLIDATION TEST Figures 13 & 14

TRIAXIAL SHEAR TESTING Figure 15

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FIELD AND LABORATORY INVESTIGATION

On July 6 and July 7, 1982, eleven soil borings were drilled in the locations shown on Plate 1. For the purposes of this report, ground surface elevations were interpolated from the plan and profile drawing by IECO. All exploratory work was carried out under the full-time supervision of our engineer, who recorded subsurface conditions and obtained samples for laboratory testing. Borings were advanced utilizing a truck mounted CME-55 drill rig utilizing 6.5 in. O.D. hollow stem augers with carbide teeth. In some cases, water was used as a drilling fluid to assist augers binding in clay soils.

Laboratory testing consisted of grain size distribution and plasticity (Atterberg Limits) tests for classification of materials and dry density and natural moisture content determinations. Triaxial shear tests were performed on selected relatively undisturbed samples of finer grained materials. Two consolidation tests were also performed on "undisturbed" samples to estimate settlement and affects of inundation. All field and laboratory test results are presented in this appendix as Figures 1 through 15.

Proposed Arizona
Canal Diversion
Channel



SCALE: 1"=100'

B-11 B-10 B-9 B-8 B-7 B-6 B-5 B-4 B-3 B-2 B-1

Relocated Arizona
Canal

Existing Arizona
Canal

SOIL BORING LOCATION PLAN

 Soil Boring Location

M.C.H.D. BRIDGES AT AZ.
CANAL DIVERSION CHANNEL
THUNDERBIRD @ 59th AVE.
GLENDALE, ARIZONA

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GEOTECHNICAL AND SITE ENGINEERS
Project No. 88910SS

PLATE 1

SOILS CLASSIFICATION CHART

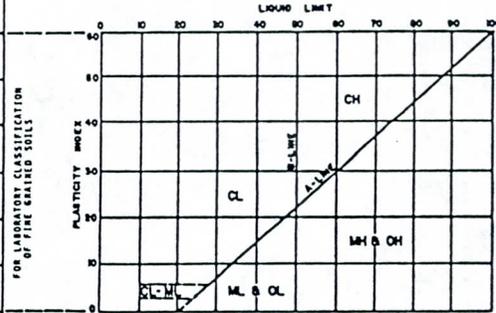
MAJOR DIVISIONS		GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 10 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVEL WITH FINES (APPRECIABLE AMOUNT OF FINES)	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GM	SILTY GRAVELS, GRAVEL-SAND SILT MIXTURES
	MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 100 SIEVE SIZE	CLEAN SAND (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SM	SILTY SANDS, SAND-SILT MIXTURES
FINE GRAINED SOILS	LIQUID LIMIT LESS THAN 50	[Symbol]	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCE FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, CLEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	LIQUID LIMIT GREATER THAN 50	[Symbol]	MH	INORGANIC SILTS, MUCOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS		[Symbol]	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

GRADATION CHART

MATERIAL SIZE	PARTICLE SIZE				
	LOWER LIMIT		UPPER LIMIT		
	MILLIMETERS	SIEM SIZE*	MILLIMETERS	SIEM SIZE*	
SAND	FINE	0.075	#200*	0.425	#40*
	MEDIUM	0.425	#40*	0.850	#20*
	COARSE	0.850	#20*	1.750	#10*
GRAVEL	FINE	2.0	#10*	4.75	#30*
	COARSE	4.75	#30*	75.0	3"
COBBLES		75.0	3"	300.0	12"
BOULDERS		300.0	12"	914.4	36"

*U.S. Standard *Clear Square Openings

PLASTICITY CHART



FOR LABORATORY CLASSIFICATION OF FINE GRAINED SOIL

CONSISTENCY			RELATIVE DENSITY	
CLAYS & SILTS	BLOWS/FOOT*	STRENGTH †	SANDS & GRAVELS	BLOWS/FOOT*
VERY SOFT	0-2	0-X	VERY LOOSE	0-4
SOFT	2-4	X-Y	LOOSE	4-10
FIRM	4-8	Y-Z	MEDIUM DENSE	10-30
STIFF	8-15	Z-1	DENSE	30-50
VERY STIFF	15-30	1-2	VERY DENSE	OVER 50
HARD	OVER 30	OVER 4		

* Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1-3/8 inch I.D.) split spoon (ASTM D-1586).
 † Unconfined compressive strength in tons/sq ft. Read from a pocket penetrometer.

SAMPLE DESIGNATION	PENETRATION RESISTANCE SYMBOL	DESCRIPTION
Bag	-	Large Bulk Sample
BS	-	Misc. Grab Sample - Bottle or Bag
AS	-	Auger Sample - A grab sample taken directly from auger flights
S	●	Spoon Sample - Standard Penetration Test (ASTM D-1586)-Driving a 2.0-inch outside diameter, 1 3/8-inch inside diameter, split spoon sampler into undisturbed soil for three successive 6-inch increments of penetration by means of a 140-pound weight falling freely through a distance of 30 inches. The cumulative number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).
LS	●	Liner Sample - Standard Penetration Test-Driving a 2.0-inch outside diameter split spoon, equipped with two, 3-inch long by 1 3/8-inch inside diameter brass liners, separated by a 1-inch long spacer, into undisturbed soil as above.
RS	○	Ring Sample - Driving a 3.0-inch outside diameter spoon, equipped with a series of 2.42-inch inside diameter, 1-inch long brass rings, into undisturbed soil for one 12-inch increment by means of a 140-pound weight falling freely through a distance of 30 inches. The blows required for the 12 inches of penetration are recorded.
ST	-	Shelby Tube - A 3.0-inch outside diameter thin-walled tube continuously pushed into undisturbed soil by a rapid motion, without impact or twisting. (ASTM D-1587)
-	■	Continuous Penetration Resistance (Bullnose) - Driving a 2.0-inch outside diameter "Bullnose penetrometer" continuously into undisturbed soil by means of a 140-pound weight falling freely through a distance of 30 inches. The blows for each successive 12-inch increment are recorded.

NOTE: The stratification lines shown on the Logs of Test Borings and/or Test Pit represent the approximate boundary between soil types, and the transition may be gradual.

SOIL LOG
LEGEND

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1125 NORTH 24TH AVENUE SUITE 100
PHOENIX, ARIZONA 85016

GROUND SURFACE ELEVATION: <u>1218.5</u>	
SOIL DESCRIPTION	
	FILL: Brown SILTY SAND With Trace Of Gravel (SM - Dry). 4.0
1210	Brown SANDY CLAY (CL - Moist) Gravel Noted Below 9.0 Feet. Gravel Lense. 14.5
1200	Dense Tan SANDY SILT (ML - Moist) Cementation Noted. 19.0
	Hard Brown To Light Brown FINE SANDY CLAY (CL - Moist) Cementation Noted. 25.0
CONTINUED ON NEXT PAGE	

SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)		
					0	50	100
S-1	202.0	-	-	-			
S-2	197.0	-	-	-			

ELEVATION (FEET)

BORING STARTED: July 6, 1982
 BORING COMPLETED: July 6, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulses
 CONTRACTOR: Heber Mining & Explor.

Sheet 1 of 2

WATER LEVEL OBSERVATION
 FIRST ENCOUNTERED:
 AT COMPLETION: Dry
 AFTER HOURS:
 = WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

SPEEDIE & ASSOCIATES GEOTECHNICAL AND SITE ENGINEERS	
LOG OF TEST BORING NUMBER <u>B-1</u>	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>gAe</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 1a

GROUND SURFACE ELEVATION: 1218.5

SOIL DESCRIPTION

ELEVATION (FEET)
1190
1180
1170

Hard Brown FINE SANDY CLAY (CL - Moist).
18 Inch Sand Lense Noted.

33.0'

Very Dense Brown SAND AND GRAVEL (SP - Moist).
Varying Amounts Of Clay Noted.

50.6'

END OF BORING

SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)
					0 50 100
S-2	192.0	-	-	-	
S-4	187.0	-	-	-	
LS-5	182.0	5.3	121.7	-	
S-6	177.0	-	-	-	43/5" →
LS-7	173.0	12.7	121.7	-	41/6" →
S-8	168.0	-	-	-	55/7" →

BORING STARTED: July 6, 1982
 BORING COMPLETED: July 6, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulses
 CONTRACTOR: Heber Mining & Explor.

WATER LEVEL OBSERVATION

FIRST ENCOUNTERED:
 AT COMPLETION: Dry
 AFTER HOURS:
 = WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

Sheet 2 of 2

SPEEDIE & ASSOCIATES	
GEOTECHNICAL AND SITE ENGINEERS	
LOG OF TEST BORING NUMBER <u>B-1</u>	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>gac</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 1b

GROUND SURFACE ELEVATION: <u>1218.0</u>	
SOIL DESCRIPTION	
ELEVATION (FEET)	<p>Brown SILTY CLAY (CL - Moist), Gravel Noted. Varying Amounts Of Sand Noted.</p> <p style="text-align: right;">15.0'</p> <hr/> <p>Dense Brown SAND AND FINE GRAVEL (SP - Moist).</p> <p style="text-align: right;">19.0'</p> <hr/> <p>Hard Brown FINE SANDY CLAY (CL - Moist).</p> <p style="text-align: right;">25.0'</p>
CONTINUED ON NEXT PAGE	

SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)
					0 50 100
S-4	201.5	-	-	-	
LS-2	196.5	18.3	109.9	-	

BORING STARTED: July 6, 1982
 BORING COMPLETED: July 6, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulises
 CONTRACTOR: Heber Mining & Explor.

WATER LEVEL OBSERVATION

FIRST ENCOUNTERED:
 AT COMPLETION: Dry
 AFTER HOURS:
 = WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

Sheet 1 of 2

SPEEDIE & ASSOCIATES	
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LOG OF TEST BORING NUMBER B-2	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>gac</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 2a

GROUND SURFACE ELEVATION: 1218.0

SOIL DESCRIPTION

1190

Hard Brown FINE SANDY CLAY (CL - Moist).

32.5'

1180

Very Dense Brown SAND With Varying Amounts Of Gravel And Clay (SP - Moist).

46.0

END OF BORING

ELEVATION (FEET)

SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)	
					0	50 100
S-3	191.5	-	-	-		
LS-4	186.5	16.9	112.6	-		
S-5	181.5	-	-	-		
LS-6	177.5	16.9	110.7	-	50/5.5"	
S-7	172.0	-	-	-		

BORING STARTED: July 6, 1982
 BORING COMPLETED: July 6, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulse
 CONTRACTOR: Heber Mining & Explor.

WATER LEVEL OBSERVATION

FIRST ENCOUNTERED:
 AT COMPLETION: Dry
 AFTER HOURS:
 = WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

Sheet 2 of 2

SPEEDIE & ASSOCIATES	
GEOTECHNICAL AND SITE ENGINEERS	
LOG OF TEST BORING NUMBER <u>B-2</u>	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>gac</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 2b

GROUND SURFACE ELEVATION: <u>1217.6</u>	
SOIL DESCRIPTION	
ELEVATION (FEET)	1210
	1200
	25.0'
	CONTINUED ON NEXT PAGE

FILL: Brown CLAYEY SAND AND GRAVEL (SC - Dry) (T'Bird Road Fill). <div style="text-align: right;">5.0'</div>	
Dense Light Brown CLAYEY SAND AND GRAVEL (SC - Moist). Clay And Gravel Amounts Varying Throughout). <div style="text-align: right;">16.0'</div>	S-1 201.1 - - -
Very Dense Tan To Brown SILTY SAND (SM - Moist); Trace Of Clay Noted. Small Voids, Black Decayed Roots Noted. <div style="text-align: right;">25.0'</div>	LS-2 196.1 - - -

SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)
					0 50 100

BORING STARTED: July 6, 1982
 BORING COMPLETED: July 6, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulser
 CONTRACTOR: Heber Mining & Explor.
WATER LEVEL OBSERVATION

FIRST ENCOUNTERED:
 AT COMPLETION: Dry
 AFTER HOURS:
 = WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

Sheet 1 of 2

SPEEDIE & ASSOCIATES	
GEOTECHNICAL AND SITE ENGINEERS	
LOG OF TEST BORING NUMBER <u>B-3</u>	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>gfe</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 3a

GROUND SURFACE ELEVATION: 1217.6

SOIL DESCRIPTION

1190	Very Dense Tan To Brown SILTY SAND (SM-Moist); Trace Of Clay Noted. Small Voids, Black Decayed Roots Noted.	28.0'
	Hard Brown SANDY CLAY (CL - Moist).	33.0'
1180	Dense To Very Dense Brown SAND (SP - Moist) With Varying Amounts Of Gravel.	40.3'
	END OF BORING	

ELEVATION (FEET)

SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)	
					0	50 100
S-3	191.1	-	-	-		
LS-4	186.1	15.0	117	-		
S-5	181.1	-	-	-		
LS-6	177.3	-	-	-		24/4"

BORING STARTED: July 6, 1982
 BORING COMPLETED: July 6, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulses
 CONTRACTOR: Heber Mining & Explor.

WATER LEVEL OBSERVATION

FIRST ENCOUNTERED:
 AT COMPLETION: Dry
 AFTER HOURS:
 = WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

Sheet 2 of 2

SPEEDIE & ASSOCIATES	
GEOTECHNICAL AND SITE ENGINEERS	
LOG OF TEST BORING NUMBER <u>B-3</u>	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>gac</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 3b

GROUND SURFACE ELEVATION: 1217.0

SOIL DESCRIPTION

FILL: Light Brown SANDY SILT (ML - Dry) (T'Bird Road Fill). 2.5'

Brown SANDY CLAY (CL - Moist). Gravel Lense At 8.0'. 8.0'

Brown CLAYEY SAND (SC - Moist). 25.0'

CONTINUED ON NEXT PAGE

SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)		
					0	50	100

ELEVATION (FEET)
1210
1200

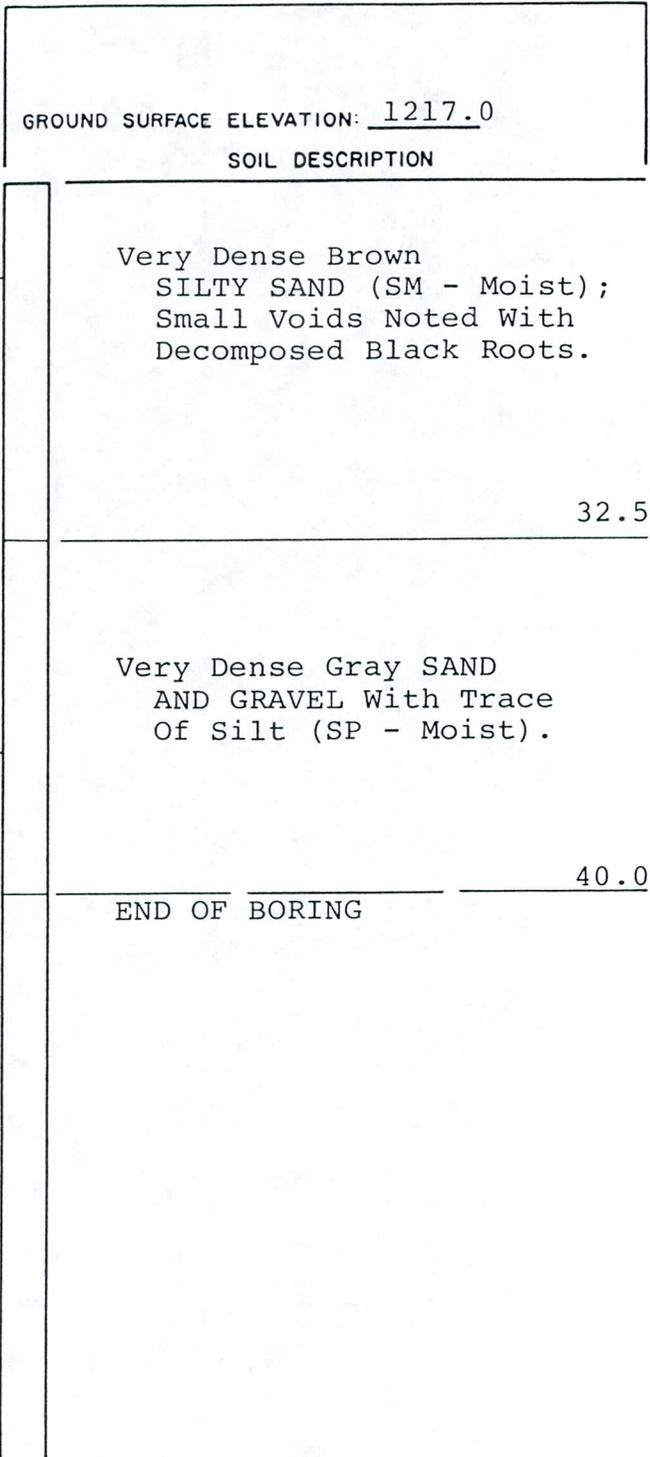
BORING STARTED: July 6, 1982
 BORING COMPLETED: July 6, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulser
 CONTRACTOR: Heber Mining & Explor.

WATER LEVEL OBSERVATION

FIRST ENCOUNTERED:
 AT COMPLETION: Dry
 AFTER HOURS:
 = WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

Sheet 1 of 2

SPEEDIE & ASSOCIATES	
GEOTECHNICAL AND SITE ENGINEERS	
LOG OF TEST BORING NUMBER <u>B-4</u>	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>gac</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 4a



SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)
					0 50 100
RS-1	191.0	-	-	-	50/9" →
LS-2	186.0	-	-	-	
S-3	182.0	-	-	-	10/0" →
S-4	177.0	-	-	-	20/1" →

BORING STARTED: July 6, 1982
 BORING COMPLETED: July 6, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulises
 CONTRACTOR: Heber Mining & Explor.

WATER LEVEL OBSERVATION

FIRST ENCOUNTERED:
 AT COMPLETION: Dry
 AFTER HOURS:
 = WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

SPEEDIE & ASSOCIATES	
GEOTECHNICAL AND SITE ENGINEERS	
LOG OF TEST BORING NUMBER <u>B-4</u>	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>ghe</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 4b

GROUND SURFACE ELEVATION: 1216.2

SOIL DESCRIPTION

1210

Dense Brown SILTY SAND
AND GRAVEL (SP-SM -
Moist) With Varying
Amounts Of Clay.

ELEVATION (FEET)

1200

23.0

Very Dense Brown Medium To
Fine SANDY SILT With Some
Clay (ML-Moist). 25.0'

CONTINUED ON NEXT PAGE

SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)		
					0	50	100
S-1	194.7	-	-	-			

BORING STARTED: July 7, 1982
 BORING COMPLETED: July 7, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulser
 CONTRACTOR: Heber Mining & Explor.

WATER LEVEL OBSERVATION

FIRST ENCOUNTERED:
 AT COMPLETION: Dry
 AFTER HOURS:
 = WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

Sheet 1 of 2

SPEEDIE & ASSOCIATES	
GEOTECHNICAL AND SITE ENGINEERS	
LOG OF TEST BORING NUMBER <u>B-5</u>	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>gfk</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 5a

GROUND SURFACE ELEVATION: 1216.2

SOIL DESCRIPTION

1190

Very Dense Brown Medium
To Fine SANDY SILT With
Some Clay (ML - Moist).

33.5'

Very Dense Gray SAND
AND GRAVEL (SP - Moist).

35.5'

END OF BORING

1180

ELEVATION (FEET)

SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)
					0 50 100
S-2	189.7	-	-	-	
S-3	185.2	-	-	-	
S-4	180.7	-	-	-	

BORING STARTED: July 7, 1982
 BORING COMPLETED: July 7, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulse
 CONTRACTOR: Heber Mining & Explor.
WATER LEVEL OBSERVATION

FIRST ENCOUNTERED: Dry
 AT COMPLETION: Dry
 AFTER HOURS:
 = WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

Sheet 2 of 2

SPEEDIE & ASSOCIATES	
GEOTECHNICAL AND SITE ENGINEERS	
LOG OF TEST BORING NUMBER <u>B-5</u>	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>gac</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 5b

GROUND SURFACE ELEVATION: 1215.5
 SOIL DESCRIPTION

SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)
					0 50 100
AS-1	211.5	-	-	-	
S-2	194.4	-	-	-	50/7" →

ELEVATION (FEET)	1210	Light Brown SILTY CLAY (CL - Dry). 7.0'
		Light Brown SILTY SAND AND GRAVEL (SM - Moist). Sand Lense At 9.0 Feet. 10.0'
		GRAVEL LENSE (GP). 11.0'
	1200	Brown SILTY SAND With Some Gravel, Trace Of Clay. Gravel Lense At 15.5 Feet (SM - Moist). 23.0'
		Hard Brown SANDY SILT (ML - Moist) With Some Clay. 25.0'

CONTINUED ON NEXT PAGE

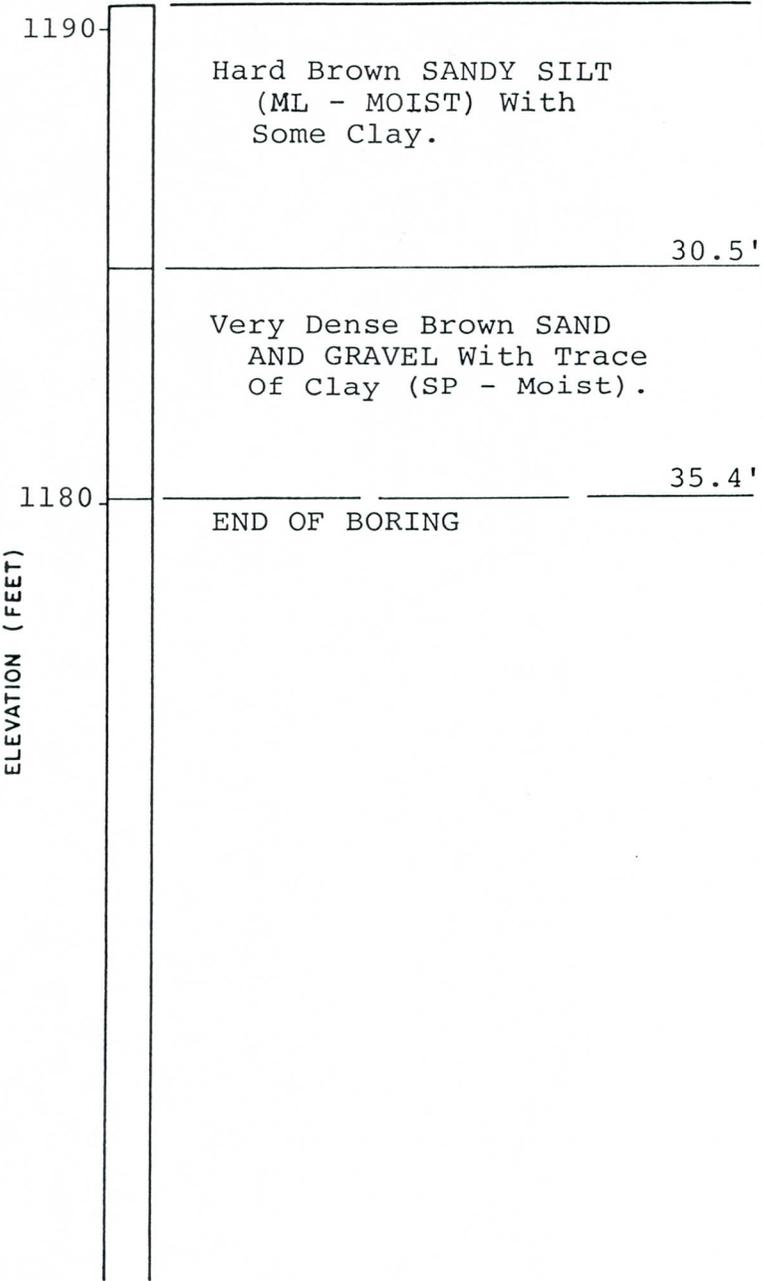
BORING STARTED: July 7, 1982
 BORING COMPLETED: July 7, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulses
 CONTRACTOR: Heber Mining & Explor.

WATER LEVEL OBSERVATION
 FIRST ENCOUNTERED:
 AT COMPLETION: Dry
 AFTER HOURS:
 = WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

SPEEDIE & ASSOCIATES	
GEOTECHNICAL AND SITE ENGINEERS	
LOG OF TEST BORING NUMBER <u>B-6</u>	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>gmc</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 6a

GROUND SURFACE ELEVATION: 1215.5
 SOIL DESCRIPTION

SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)
RS-3	189.5	-	-	-	
S-4	184.5	-	-	-	
S-5	180.5	-	-	-	36/3.5"



BORING STARTED: July 7, 1982
 BORING COMPLETED: July 7, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulses
 CONTRACTOR: Heber Mining & Explor.
WATER LEVEL OBSERVATION
 FIRST ENCOUNTERED: Dry
 AT COMPLETION: Dry
 AFTER HOURS:
 = WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

SPEEDIE & ASSOCIATES GEOTECHNICAL AND SITE ENGINEERS	
LOG OF TEST BORING NUMBER <u>B-6</u>	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>gnc</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 6b

GROUND SURFACE ELEVATION: 1214.4

SOIL DESCRIPTION

SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)
					0 50 100
S-1	193.5	-	-	-	

1210

5.0'

Brown SILTY CLAY (CL - Dry).
Gravel Noted. Gravel Lense At 5.0 Feet.

1200

15.0'

Light Brown SILTY SAND AND GRAVEL (SM - Moist) With Trace Of Clay. Gravel Lense At 11.5 Feet.

1190

23.0'

Very Dense Brown SAND (SP - Moist) With Trace Of Silt And Gravel.

25.0'

Hard Brown SILTY CLAY (CL - Moist) With Trace Of Sand.

CONTINUED ON NEXT PAGE

ELEVATION (FEET)

BORING STARTED: July 7, 1982
 BORING COMPLETED: July 7, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulses
 CONTRACTOR: Heber Mining & Explor.

WATER LEVEL OBSERVATION
 FIRST ENCOUNTERED: Dry
 AT COMPLETION: Dry
 AFTER HOURS:
 WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

Sheet 1 of 2

SPEEDIE & ASSOCIATES GEOTECHNICAL AND SITE ENGINEERS	
LOG OF TEST BORING NUMBER <u>B-7</u>	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>gac</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 7a

GROUND SURFACE ELEVATION: 1214.4
 SOIL DESCRIPTION

Hard Brown SILTY CLAY (CL - Moist) With Trace Of Sand. Black Root Holes Noted.
 29.0'

Very Dense Brown SILTY SAND (SM - Moist) With Trace Of Gravel.
 40.0'

END OF BORING

SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)
S-2	187.9	-	-	-	
S-3	182.9	-	-	-	
S-4	178.9	-	-	-	50/6"
S-5	174.4	-	-	-	14/0"

ELEVATION (FEET)

1180

BORING STARTED: July 7, 1982
 BORING COMPLETED: July 7, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulses
 CONTRACTOR: Heber Mining & Explor.

WATER LEVEL OBSERVATION
 FIRST ENCOUNTERED:
 AT COMPLETION: Dry
 AFTER HOURS:
 = WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

Sheet 2 of 2

SPEEDIE & ASSOCIATES GEOTECHNICAL AND SITE ENGINEERS	
LOG OF TEST BORING NUMBER <u>B-7</u>	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>gpc</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 7b

GROUND SURFACE ELEVATION: 1214.7
 SOIL DESCRIPTION

SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)	
					0	50 100
S-1	198.2	-	-	-		
S-2	193.7	-	-	-		50/6.5"

ELEVATION (FEET)	1210	Brown SILTY CLAY (CL - Dry). Gravel Lense At 3.5 Feet. 3.5'
		Light Brown CLAYEY SAND AND GRAVEL (SC - Moist). Gravel Lense At 5.0 Feet Noted. Gravel To 3 Inches Diameter. 10.0'
	200	Hard Brown SANDY CLAY (SC - Moist). 18.0'
	1190	Very Dense Brown SAND AND GRAVEL (SM - Moist) With Trace of Silt. 24.5'
		CONTINUED ON NEXT PAGE

BORING STARTED: July 7, 1982
 BORING COMPLETED: July 7, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulse
 CONTRACTOR: Heber Mining & Explor.

WATER LEVEL OBSERVATION
 FIRST ENCOUNTERED:
 AT COMPLETION: Dry
 AFTER HOURS:
 WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

SPEEDIE & ASSOCIATES <small>GEOTECHNICAL AND SITE ENGINEERS</small>	
LOG OF TEST BORING NUMBER <u>B-8</u>	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>gjk</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 8a

GROUND SURFACE ELEVATION: <u>1214.7</u>	
SOIL DESCRIPTION	
Very Dense Light Brown SANDY SILT With Some Clay.	28.0'
Very Dense Brown SAND With Varying Amounts Of Gravel.	36.1'
END OF BORING	

SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)
RS-3	189.4	19.8	96.4	-	50/4"
S-4	183.2	-	-	-	
S-5	178.6	-	-	-	50/7"

ELEVATION (FEET)

1180

BORING STARTED: July 7, 1982
 BORING COMPLETED: July 7, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulser
 CONTRACTOR: Heber Mining & Explor.

Sheet 2 of 2

WATER LEVEL OBSERVATION
 FIRST ENCOUNTERED:
 AT COMPLETION: Dry
 AFTER HOURS:
 = WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

SPEEDIE & ASSOCIATES GEOTECHNICAL AND SITE ENGINEERS	
LOG OF TEST BORING NUMBER <u>B-8</u>	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>gfe</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 8b

GROUND SURFACE ELEVATION: 1213.0
 SOIL DESCRIPTION

SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)	
					0	50 100
AS-1	210.0	-	-	-		
S-2	206.5	-	-	-		
S-3	201.5	-	-	-		
S-4	196.5	-	-	-		

ELEVATION (FEET)	1210	Brown SANDY CLAY (CL - Dry) With A Little Gravel. 3.5'
		Very Stiff Light Brown CLAYEY SAND AND GRAVEL (SC - Moist); Lightly Cemented. 6.5'
	1200	Dense Brown SAND With A Little Gravel And Trace Of Silt And Clay (SM-SC - Moist). 16.5'
		END OF BORING

BORING STARTED: July 7, 1982
 BORING COMPLETED: July 7, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulses
 CONTRACTOR: Heber Mining & Explor.

WATER LEVEL OBSERVATION

FIRST ENCOUNTERED:
 AT COMPLETION: Dry
 AFTER HOURS:
 = WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

SPEEDIE & ASSOCIATES GEOTECHNICAL AND SITE ENGINEERS	
LOG OF TEST BORING NUMBER <u>B-9</u>	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>GAC</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 9

GROUND SURFACE ELEVATION: <u>1212.7</u>	
SOIL DESCRIPTION	
1200	Brown SILTY CLAY (CL - Dry) With Trace Of Gravel. 3.0'
	Very Stiff Light Brown CLAYEY SAND (SC - Moist) With A Little Gravel. 6.0'
1190	Very Dense Brown SAND AND GRAVEL With Trace Of Silt (SP-SM - Moist); Light Cementation. 16.5'
	END OF BORING

ELEVATION (FEET)

SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)		
					0	50	100
S-1	206.0	-	-	-			
S-2	201.7	-	-	-		74/11"	
S-3	196.2	-	-	-			

BORING STARTED: July 7, 1982
 BORING COMPLETED: July 7, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulses
 CONTRACTOR: Heber Mining & Explor.

WATER LEVEL OBSERVATION
 FIRST ENCOUNTERED: Dry
 AT COMPLETION: Dry
 AFTER HOURS:
 = WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

SPEEDIE & ASSOCIATES	
GEOTECHNICAL AND SITE ENGINEERS	
LOG OF TEST BORING NUMBER <u>B-10</u>	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>gpc</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 10

GROUND SURFACE ELEVATION: 1212.3

SOIL DESCRIPTION

SAMPLE NUMBER	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (%)	IN-PLACE DRY DENSITY (P.C.F.)	COHESION (P.C.F.)	STANDARD PENETRATION RESISTANCE (N)	
					0	50 100
S-1	205.8	-	-	-		
S-2	201.3	-	-	-	50/6.5"	
S-3	195.8	-	-	-		

1210-

Medium Dense Light Brown SILTY GRAVELLY SAND With Trace Of Clay (SM-Dry). Gravel Lense At 6.5 Feet.

6.5'

1200-

Very Dense Brown SAND (SP - Moist) With Varying Amounts Of Silt And Gravel.

16.5'

END OF BORING

ELEVATION (FEET)

BORING STARTED: July 7, 1982
 BORING COMPLETED: July 7, 1982
 FIELD ENGINEER/TECHNICIAN: G. Creaser
 DRILLER: D. Ulses
 CONTRACTOR: Heber Mining & Explor.

WATER LEVEL OBSERVATION

FIRST ENCOUNTERED:
 AT COMPLETION: Dry
 AFTER HOURS:
 = WATER LEVEL IN HOLE AT
 NUMBER OF HOURS AFTER

SPEEDIE & ASSOCIATES	
GEOTECHNICAL AND SITE ENGINEERS	
LOG OF TEST BORING NUMBER <u>B-11</u>	
M.C.H.D. BRIDGES AT PROPOSED ARIZONA CANAL DIVERSION CHANNEL THUNDERBIRD ROAD AT 59th AVENUE GLENDALE, ARIZONA	
APPROVED: <i>gar</i>	DATE: 7/19/82
PROJECT NO: 88910SS	FIGURE NO: 11

TABULATION OF TEST DATA

TEST BORING OR TEST PIT NUMBER	SAMPLE NUMBER	DEPTH OF SAMPLE TIP	ELEVATION OF SAMPLE TIP	NATURAL WATER CONTENT (PERCENT OF DRY WEIGHT)	IN-PLACE DRY DENSITY (POUNDS PER CUBIC FOOT)	PARTICLE SIZE DISTRIBUTION							ATTERBERG LIMITS			UNIFIED SOIL CLASSIFICATION	COHESION - ONE-HALF OF UNCONFINED COMPRESSIVE STRENGTH (PSF)		
						COLLOIDS (PERCENT)	CLAY (PERCENT)	SILT (PERCENT)	FINE SAND (PERCENT)	MEDIUM SAND (PERCENT)	COARSE SAND (PERCENT)	GRAVEL (PERCENT)	LIQUID LIMIT (PERCENT)	PLASTIC LIMIT (PERCENT)	PLASTICITY INDEX (PERCENT)				
B-1	LS-5	36.5	1182.0	5.3	121.7		-	-	-	-	-	-	-	-	-	-	-	-	-
B-1	LS-7	45.5	1173.0	12.7	121.2	←	15	→	13	40	24	8	-	-	-	-	-	-	-
B-2	LS-2	21.5	1196.5	18.3	109.9		-	-	-	-	-	-	-	-	-	-	-	-	-
B-2	LS-4	31.5	1186.5	16.9	112.6		-	-	-	-	-	-	-	-	-	-	-	-	-
B-2	LS-6	40.5	1177.5	16.9	110.7		-	-	-	-	-	-	-	-	-	-	-	-	-
B-3	S-3	26.5	1191.1	-	-	←	34	→	28	25	11	2	39	31	8	SM	-	-	-
B-3	LS-4	31.5	1186.1	15.0	117.6		-	-	-	-	-	-	-	-	-	-	-	-	-
B-4	RS-1	26.0	1191.0	4.8	100.1	←	25	→	26	25	14	10	41	35	6	SM	-	-	-
B-5	S-2	26.5	1189.7	-	-	←	50	→	30	15	04	01	41	27	14	ML	-	-	-
B-6	RS-3	26.0	1189.5	20.7	92.7	←	54	→	20	17	6	3	46	33	13	ML	-	-	-
B-8	RS-3	25.3	1189.4	19.8	96.4	←	50	→	17	16	8	9	46	34	12	ML	-	-	-
B-9	S-3	11.5	1201.5	-	-	←	4	→	8	35	28	25	NP	NP	NP	SP	-	-	-
B-11	S-1	6.5	1205.8	-	-	←	24	→	17	11	6	42	23	19	04	SM	-	-	-

Figure No. 12

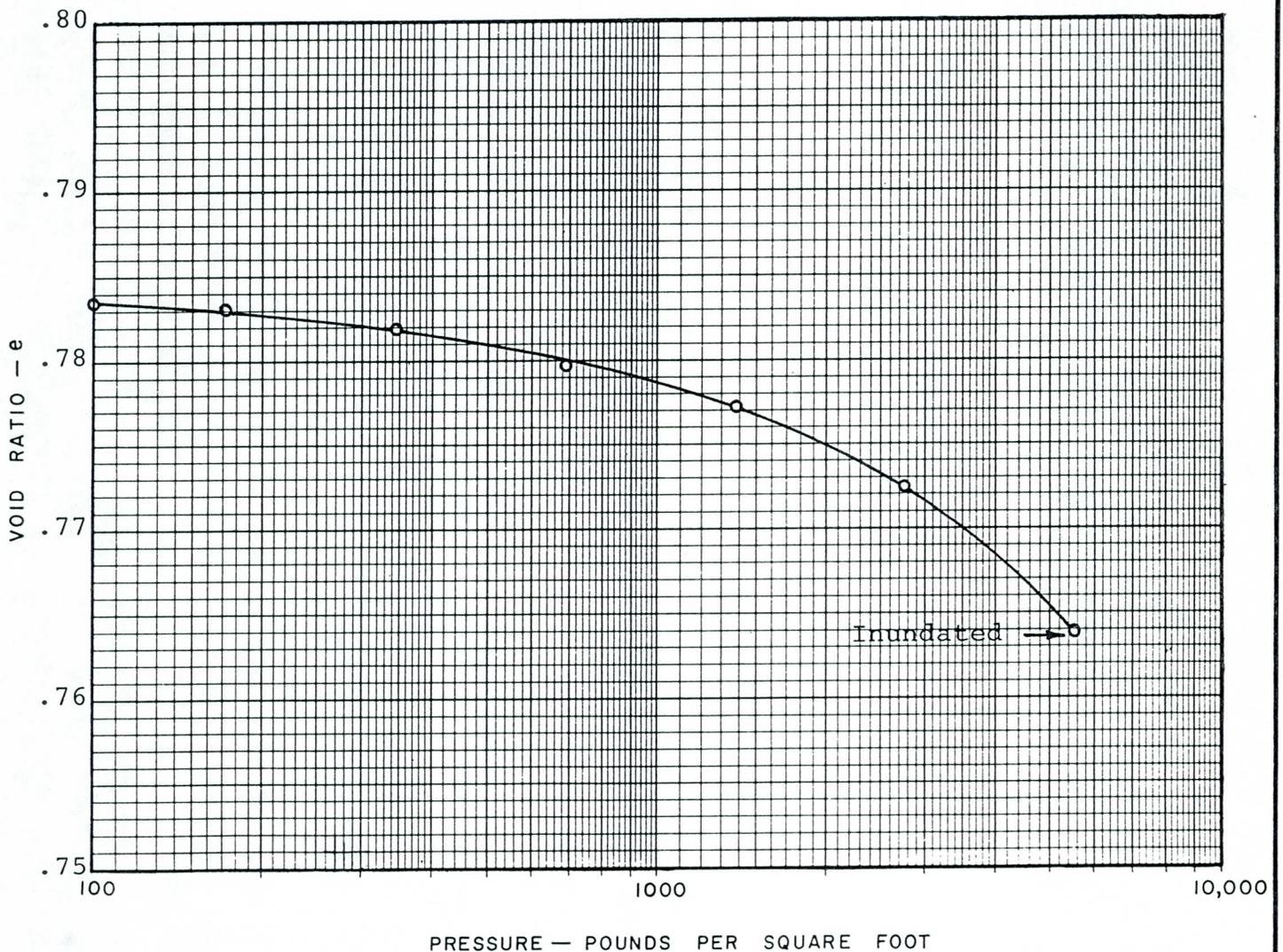
SPEEDIE & ASSOCIATES

GEOTECHNICAL AND SITE ENGINEERS

11029 NORTH 24TH AVENUE, SUITE 805 • PHOENIX, ARIZONA 85029 • (602) 997-6391

CONSOLIDATION TEST

PROJECT: MCHD Thunderbird Rd. Bridges PROJECT NO.: 88910SS DATE: 7-19-82
LOCATION: Thunderbird Road West of 59th Avenue, Glendale, Arizona
CLIENT: Sverdrup & Parcel LAB. SAMPLE NO.: 2188
BORING NO.: B-6 FIELD SAMPLE NO.: RS-3 SAMPLE DEPTH: 26.0 SAMPLE ELEV. (TIP) 1189.5
TESTED BY: GAC/BPC DATE: 7-14-82 CHECKED BY: SAG DATE: 7-20-82
REMARKS: Sample inundated at 5520 psi. No additional deflection.



SPEEDIE & ASSOCIATES

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CONSOLIDATION TEST

PROJECT: MCHD Thunderbird Rd. Bridges PROJECT NO.: 88910SS DATE: 7-19-82
LOCATION: Thunderbird Road West of 59th Avenue, Glendale, Arizona
CLIENT: Sverdrup & Parcel LAB. SAMPLE NO.: 2189
BORING NO.: B-8 FIELD SAMPLE NO.: RS-3 SAMPLE DEPTH: 25.3 SAMPLE ELEV. (TIP): 1189.4
TESTED BY: GAC/BPC DATE: 7-14-82 CHECKED BY: SAG DATE: 7-20-82
REMARKS: Sample inundated at 5520 PSF.

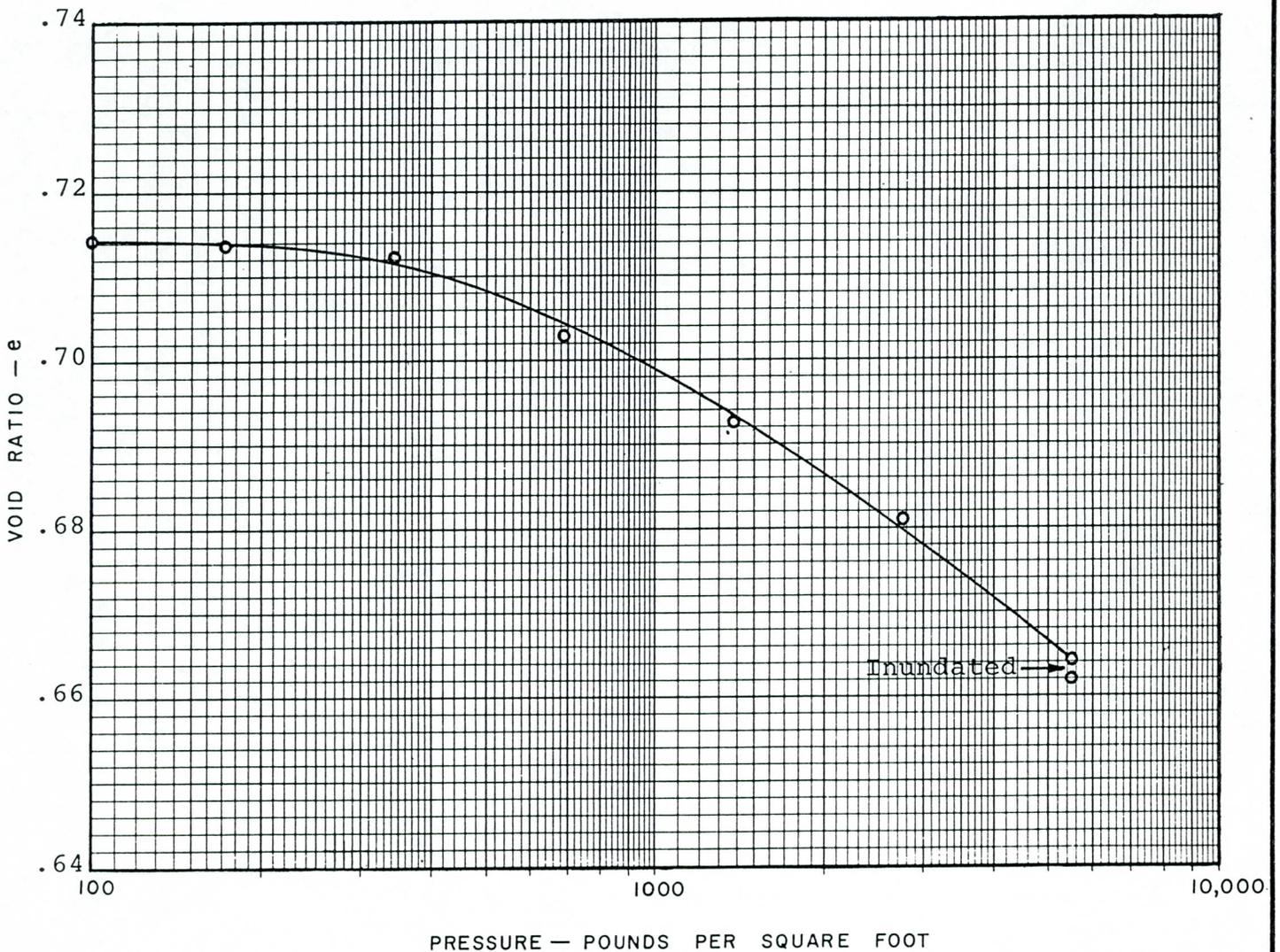
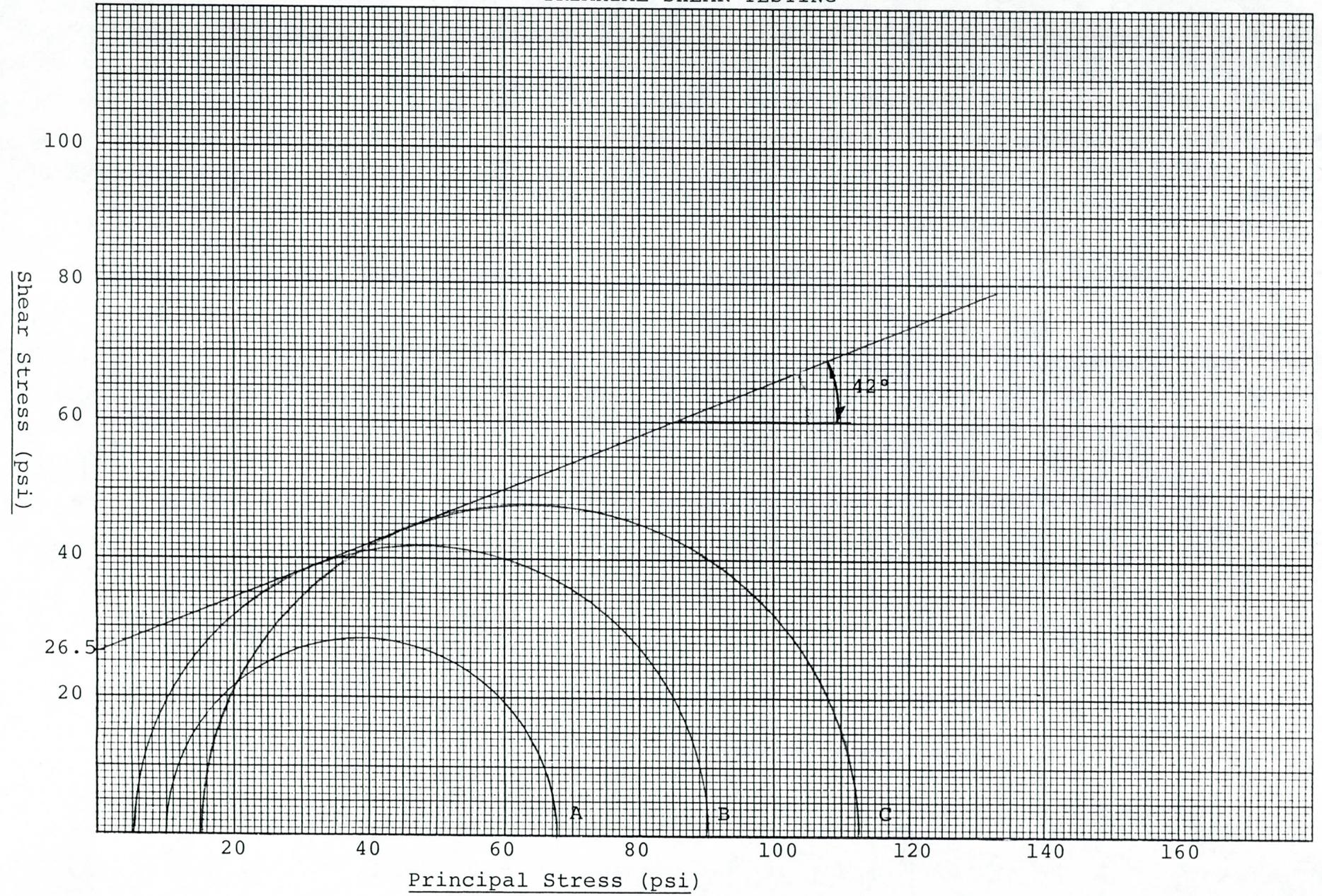


Figure No. 14

TRIAXIAL SHEAR TESTING



A = B-2, LS-4
 B = B-2, LS-2
 C = B-3, LS-4

M.C.H.D. BRIDGES
 ARIZONA CANAL DIVERSION
 CHANNEL
 GLENDALE, ARIZONA

SPEEDIE & ASSOCIATES
 GEOTECHNICAL AND SITE ENGINEERS
 Project No. 88910SS

Figure No. 15