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REPORT ON GEOTECHNICAL INVESTIGATION

DESIGNATION: Sossaman Channel Basin

LOCATION: Southern Avenue E/O
Sossaman Road
Mesa, Arizona

A108.902

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REPORT ON GEOTECHNICAL INVESTIGATION

DESIGNATION: Sossaman Channel Basin

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Mesa, Arizona

CLIENT: F.C.D.M.C.

PROJECT NO: 930220SA

DATE: October 14, 1993

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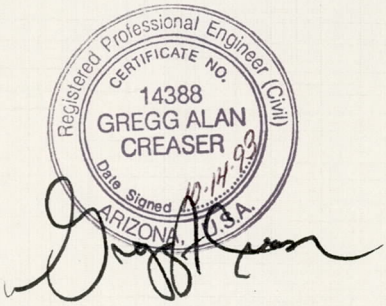

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INTRODUCTION

This report presents the results of a subsoil investigation carried out at the site of proposed flood control channel improvements near Sossaman Road and Southern Avenue in Mesa, Arizona.

Preliminary information calls for the construction of inlet structural improvements, channel lining, retention basin and other erosion protection features.

GENERAL SITE AND SOIL CONDITIONS

Site Conditions - The irregular shaped site is approximately 16 acres and is bounded on the north by Southern Avenue, on the south by Superstition Freeway, on the east by residential property and vacant desert, and on the west by a mobil home park. The subject site consists of an unlined earthen channel on the west side of the site and relatively level vacant desert property on the east side. At the time of the investigation the earthen channel contained a moderate growth of weeds and grasses that had recently been mowed. A row of ten to fifteen feet high palo verde trees is located near the southern end of the channel along the east side. The vacant portion of the site was covered with knee high weeds and brush and contained several piles of dumped soil along the northern boundary.

General Subsurface Conditions - Subsoil conditions at the site are quite variable. The subsoils generally consist of firm to hard sandy clays and sandy silts with occasional lenses of silty sands especially in the upper area outside of the channel. The subsoils generally exhibit variable levels of calcareous cementation resulting in the variable consistency of the soils. In-place dry densities are on the order of 102 to 114 pcf. Moisture contents are on the order of 1 to 8 percent and plasticity indices range from non-plastic to 16 percent. The upper loose soils exhibit a moderate potential for additional compression (collapse)T when subjected to inundation under typical foundation loading conditions. The subsoils also exhibit a low to moderate potential for volume increase (swelling) due to wetting when re-compacted to moistures and densities expected during construction.

The subsoils exhibit variable Standard Penetration Resistance (SPT) values ranging from 4 to 50-plus blows per foot again due to the variable degrees of cementation. All borings were dry upon completion and groundwater is reported to be on the order of 480 feet deep in the general vicinity. Therefore groundwater should not be a factor in the design or construction of channel improvements.

ANALYSIS AND RECOMMENDATIONS

Analysis - Analysis of the field and laboratory data indicates that subsoils at the site are variable both in classification and consistency, but generally consist of relatively loose (soft) low plasticity fine sandy clays and silts. The low relative density of these soils make them subject to erosion where disturbed and subject to higher velocity flows. There is no large size material available on site that could be used for rip-rap. The clayey nature of the soils indicates that a high cement ratio would most likely be required if the on-site soils were used for soil cement.

The subsoils located within the channel are acceptable for support of typical lightly loaded spread footings. The upper soils (from 2 to 8 feet deep) located within the vacant property east of the channel will require stabilization in order to provide adequate support of any proposed structures. Stabilization should consist of the overexcavation of subsoils to a depth of at least two feet directly beneath foundation elements and recompacted as set forth herein.

The swell potential of the soils is also a concern since any structures located in the bottom of the channel will be subject to inundation. The potential is usually strong enough to cause differential movements of slabs-on-grade such as floors and sidewalks and lightly loaded structures. Typical recommendations to reduce the swell potential include reducing the compaction requirements and requiring higher moisture contents during pad preparation and/or requiring at least one foot of non-expansive material to be placed directly beneath concrete slabs. For exterior slabs on grade, frequent jointing is recommended to control cracking and reduce tripping hazards should differential movement occur.

Site Preparation - The entire area to be occupied by the proposed construction should be stripped of all vegetation, debris, rubble and obviously loose surface soils. Subsoils located outside of the existing channel that are to provide support for structures should be excavated to a depth of at least two feet below proposed footing bottom elevation extending at least two feet beyond footing edges and recompacted as set forth herein.

Prior to placing structural fill below footing bottom elevation, the existing (exposed) grade should be scarified to a depth of 8 inches, moisture conditioned to optimum ($\pm$2 percent) and compacted to at least 95 percent of maximum dry density as determined by ASTM D-698. Pavement areas should be treated in a similar manner.

All cut areas and areas above footing bottom elevation that are to receive only slab-on-grade fill should be scarified 8 inches, moisture conditioned to at least optimum to 3 percent above optimum, and lightly but uniformly compacted to 88 to 92 percent of maximum dry density.

Foundation Design - It is recommended that minor structures be founded on shallow spread footings. If the structures are located within the existing channel the structure may be founded on undisturbed native soil, or on properly compacted fill. If the structures are located outside of the existing channel within the upper loose soils, the structures should be founded on at least 2.5 feet of properly compacted fill. All footings should be founded at a minimum depth of 18 inches below lowest adjacent finished grade or scour depth within five feet of the structure. If site preparation is carried out as set forth herein, a recommended safe allowable bearing capacity of 1500 psf can be utilized for design. This bearing capacity refers to the total of all loads, dead and live, and is a net pressure. It may be increased one-third for wind, seismic or other loads of short duration. All footing excavations should be level and cleaned of all loose or disturbed materials. Positive drainage away from the proposed buildings must be maintained at all times.

Continuous wall footings and isolated rectangular footings should be designed with minimum widths of 16 and 24 inches respectively, regardless of the resultant bearing pressure. Lightly loaded interior partitions (less than 800 plf) may be supported on reinforced thickened slab sections (minimum 12 inches of bearing width).

Estimated settlements under light design loads are on the order of 1/2-inch, virtually all of which will occur during construction. Post-construction differential settlements will be negligible, under existing and compacted moisture contents. Additional localized settlements of the same magnitude could occur if native supporting soils were to experience a significant increase in moisture content. Positive drainage away from structures should be provided to prevent ponding adjacent to perimeter walls.

Continuous footings and stem walls should be reinforced to distribute stresses arising from small differential movements, and long walls should be provided with control joints to accommodate these movements. Reinforcement and control joints are suggested to allow slight movement and prevent minor floor slab cracking.

Lateral Pressures - The following lateral pressure values may be utilized for the proposed construction:

Active Pressure	
Unrestrained Walls	35 PCF
Restrained Walls	60 PCF

Passive Pressure	
Continuous Footings	350 PCF
Spread Footings or Drilled Piers	400 PCF
Coefficient of Friction (With Passive Pressure)	0.35
Coefficient of Friction (Without Passive Pressure)	0.45

All backfill must be compacted to not less than 95 percent (ASTM D-698) to mobilize these passive values at low strain. Clay soils with a plasticity index above 10 should not be used as wall backfill. Expansive pressures could greatly increase active pressures

Fill And Backfill - Native soils are suitable for use in grading fills with some restriction if they are placed directly beneath concrete slabs or behind retaining walls. It is recommended that a minimum of one foot of low or non-expansive material be placed under the concrete slabs on grade. Native soils with a ML, SM or SC classification and a Plasticity index of less than 10 should be acceptable for this purpose.

Imported common fill for use in site grading should be examined by a Soils Engineer to ensure that it is of low swell potential and free of organic or otherwise deleterious material. In general, the fill should have 100 percent passing the 3-inch sieve and no more than 60 percent passing the 200 sieve. For the fine fraction (passing the 40 sieve), the liquid limit and plasticity index should not exceed 30 percent and 10 percent, respectively. It should exhibit less than 1.5 percent swell potential when compacted to 95 percent of maximum dry density (ASTM D-698) at a moisture content of 2 percent below optimum, confined under a 100 psf surcharge, and inundated.

Fill should be placed on subgrade which has been properly prepared and approved by a Soils Engineer. Fill must be wetted and thoroughly mixed to achieve optimum moisture content, ± 2 percent (optimum to +3 percent for underslab fill). Fill should be placed in horizontal lifts of 8-inch thickness (or as dictated by compaction equipment) and compacted to the percent of maximum dry density per ASTM D-698 set forth as follows:

A.	Building Areas	
1.	Below footing level	95
2.	Below slabs-on-grade (expansive native soils)	88 - 92 (max)
3.	Below slabs-on-grade (non-expansive soils)	95
B.	Pavement Subgrade or Fill	95

C.	Utility Trench Backfill	
1.	More than 1.5' below finish S/G	90
2.	Within 1.5' of finish S/G	95
D.	Aggregate Base Course	
1.	Below floor slabs	95
2.	Below asphalt paving	100
E.	Landscape Areas	
1.	Miscellaneous fill	90
2.	Utility trench - more than 1.0' below F/G	85
3.	Utility trench - within 1.0' of F/G	90

Utilities Installation - Trench excavations for utilities can be accomplished by conventional trenching equipment. Trench walls will stand near-vertically for the short periods of time required to install utilities. If trenches are greater than shoulder-height, precautions must be taken to protect workmen.

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 requirements are summarized in the "Fill And Backfill" section of this report.

Slabs-On-Grade - To facilitate fine grading operations and aid in concrete curing, a 4-inch thick layer of granular material conforming to the gradation for Aggregate Base Course (A.B.C.) as per M.A.G. Specification Section 702 should be utilized beneath the slab. Dried subgrade soils should be moistened prior to placing the A.B.C.

Corrosion Protection - Selected samples were tested for minimum soil resistivity with values ranging from 1601 ohm-cm to 2868 ohm-cm. Based on these results, ADOT Figure 203.04-5 Preliminary Engineering and Design Manual recommends that metal culverts be aluminum alloy or bituminous coated. Type II low alkali cement is typically supplied in this area and should provide adequate protection for the potentially reactive soils. Type C fly ash admixtures should not be allowed for concrete in contact with the ground unless the supplier can provide test data indicating that the soils and aggregate do not contain harmful levels of sulfates or alkali reactive aggregate.

Erosion Control - The soils are relatively fine grained ranging in plasticity from non-plastic to 16 percent. They are subject to erosion at maximum mean velocities greater than 3.5 feet per second (Corps of Engineers EM 1110-2-1601).

10/19/93 - SJR.360 - 150' UPSTREAM OF WEIR - LINED
FROM THERE TO SOUTHERN V = 5 FPS 4.7-5.0

The D_{50} size for the soils in generally less than 0.075 mm with the D_{75} size ranging from 0.075 to 0.65 mm. There is no natural material available on site for the use as rip-rap. The relatively clayey nature of the soils makes them less desirable for soil cement mixtures. The cement content necessary to achieve 750 ~~500~~ psi at 28 days may be on the order of 12 to 15 percent. Mix designs will be necessary to determine the actual amount of cement required.

GENERAL

The scope of this investigation and report does not include regional considerations such as seismic activity and ground fissures resulting from subsidence due to groundwater withdrawal, nor any considerations of hazardous releases or toxic contamination of any type.

Our analysis of data and the recommendations presented herein are based on the assumption that soil conditions do not vary significantly from those found at specific sample locations. Our work has been performed in accordance with generally accepted engineering principles and practice; this warranty is in lieu of all other warranties expressed or implied.

We recommend that a Soils Engineer monitor the earthwork and foundation portions of this project to ensure compliance to project specifications and the field applicability of subsurface conditions which are the basis of the recommendations presented in this report. If any significant changes are made in the scope of work or type of construction that was assumed in this report, we must review such revised conditions to confirm our findings if the conclusions and recommendations presented herein are to apply.

Respectfully submitted,
SPEEDIE AND ASSOCIATES

Clay W. Spencer, Staff Geologist

Registered Professional Engineer (Civil) CERTIFICATE NO. 14388 GREGG ALAN CREASER Date Signed 10-14-93 ARIZONA, U.S.A.

Gregg A. Creaser, P.E.

October 14, 1993

APPENDIX

FIELD AND LABORATORY INVESTIGATION

SOIL BORING LOCATION PLAN

SOIL LOG LEGEND

LOG OF TEST BORING

TABULATION OF TEST DATA

CONSOLIDATION DATA

MOISTURE-DENSITY RELATIONS

GRADATION CURVES

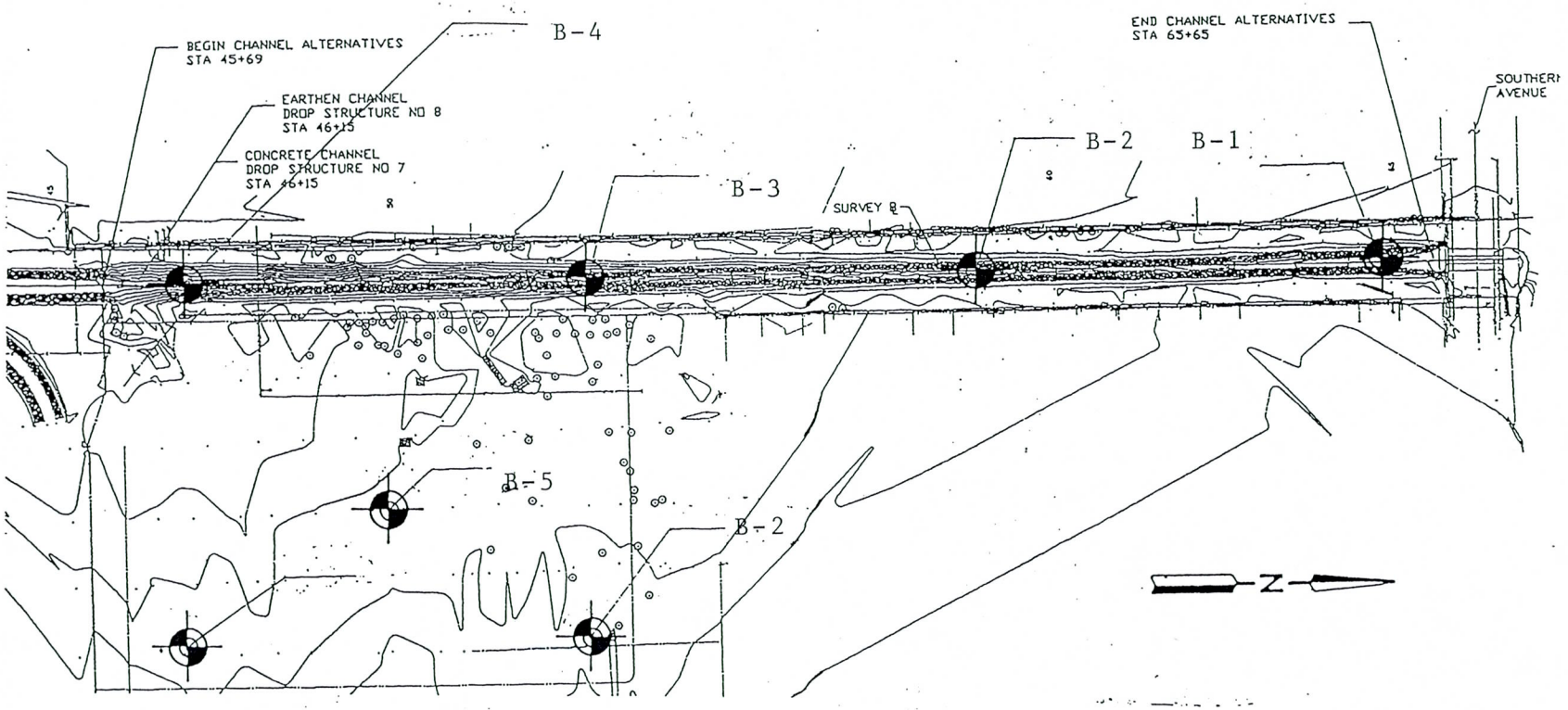
SWELL TEST DATA

SOIL RESISTIVITY

FIELD AND LABORATORY INVESTIGATION

On September 16, 1993, seven soil test borings were drilled at the approximate locations shown on the attached Soil Boring Location Plan. All exploration work was carried out under the full-time supervision of our engineer, who recorded subsurface conditions and obtained samples for laboratory testing. The soil borings were advanced with a truck-mounted CME-55 drill rig utilizing 7 inch diameter hollow stem flight augers. Detailed information regarding the borings and samples obtained can be found on an individual Log of Test Boring prepared for each drilling location.

Laboratory testing consisted of moisture content, dry density, grain-size distribution and plasticity (Atterberg Limits) tests for classification and pavement design parameters. Compression tests were performed on a selected ring sample in order to estimate settlements and determine effects of inundation. Remolded swell tests were performed on samples compacted to densities and moisture contents expected during construction. All field and laboratory data is presented in this appendix.



Soil Boring Location Plan

SOIL BORING LOCATION PLAN	
Flood Control District of Maricopa County Southern Ave. E/O Sossaman Rd.	SPEEDIE AND ASSOCIATES GEOTECHNICAL / MATERIALS / SITE ENGINEERS PROJECT NO. 930220SA

SOIL LEGEND

SAMPLE DESIGNATION	DESCRIPTION	
AS	Auger Sample-	A grab sample taken directly from auger flights
BS	Large Bulk 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 split spoon sampler into undisturbed soil for three successive 6-inch increments by means of a 140 lb. weight free falling through a distance of 30 inches. The cumulative number of blows for the final 12 inches of penetration is the Standard Penetration Resistance (N).
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 the same means of the Spoon Sample. The blows required for the 12 inches of penetration are recorded.
LS	Liner Sample-	Standard Penetration Test driving a 2.0 inch outside diameter split spoon equipped with two 3 inch long, 1⅜ inch inside diameter brass liners, separated by a 1 inch long spacer, into undisturbed soil by the same means of the spoon sample.
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-	Driving a 2.0 inch outside diameter "Bullnose Penetrometer" continuously into undisturbed soil by the same means of the spoon sample. The blows for each successive 12 inch increment are recorded.

CONSISTENCY

Clays & Silts	Blows/Foot *	Strength †
Very Soft	0-2	0-¼
Soft	2-4	¼-½
Firm	5-8	½-1
Stiff	9-15	1-2
Very Stiff	16-30	2-4
Hard	> 30	> 4

RELATIVE DENSITY

Sands and Gravels	Blows/Foot *
Very Loose	0-4
Loose	5-10
Medium Dense	11-30
Dense	31-50
Very Dense	> 50

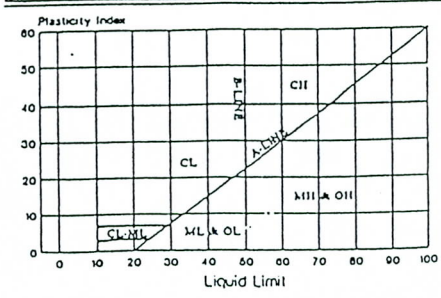
* Number of blows of a 140 lb hammer free falling 30 inches to drive a 2 inch O.D. split spoon sampler (ASTM D-1588)

† Unconfined compressive strength in tons/sq ft. Read from a pocket penetrometer

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
Coarse Grained Soils	Gravel and Gravelly Soils	Clean Gravels		GW	Well Graded Gravels
				GP	Poorly Graded Gravels
More than 50% of material is larger than #200 sieve size	50% Coarse Fraction is > #4 Sieve Size	Gravels w/Fines		GM	Silty Gravels
				GC	Clayey Gravels
	Sand and Sandy Soils	Clean Sands		SW	Well Graded Sands
				SP	Poorly Graded Sands
	50% Coarse Fraction is < #4 Sieve Size	Sands w/Fines		SM	Silty Sand
				SC	Clayey Sand
Fine Grained Soils	Silts and Clays			ML	Inorganic Silts, Low Plasticity
	Liquid limit is less than 50%			CL	Inorganic Clays, Low Plasticity
				OL	Organic Silts, High Plasticity
More than 50% of material is smaller than #200 sieve size	Silts and Clays			MH	Inorganic Silts, High Plasticity
	Liquid limit is greater than 50%			CH	Inorganic Clays, High Plastlcity
				OH	Organic Clays, High Plasticity
Highly Organic Soils				PT	Peat and Humus, Highly Organic

MATERIAL SIZE	PARTICLE SIZE			
	Lower Limit		Upper Limit	
	mm	Sieve Size †	mm	Sieve Size †
Sands				
Fine	.075	#200	0.42	#40
Medium	0.42	#40	2.00	#10
Coarse	2.00	#10	4.76	#4
Gravels				
Fine	4.76	#4	191	¾" °
Coarse	191	¾" °	762	3" °
Cobbles	762	3" °	304.8	12" °
Boulders	304.8	12" °	914.4	36" °

†U.S. Standard °Clear Square Openings



Rig Type: CME-55
Boring Type: Hollow Stem Auger
Surface Elevation: N/A
Sta. 65+00; CL

Depth (feet)	Visual Classification	Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot (0 25 50)
0	Stiff Brown SANDY CLAY/SANDY SILT (CL/ML-Dry)	RS-1	2.0	8.6	111.3	
4.0						
5	Firm Reddish Brown SANDY CLAY (CL-Dry) With a Little Gravel and Weak Calcareous Cementation	S-2	6.0	--	--	
7.5						
10	Stiff to Very Stiff Brown to Light Brown SANDY CLAY With a Trace of Weak Calcareous Cementation	S-3	11.0	--	--	
15		S-4	16.0	--	--	
20		S-5	21.0	--	--	
21.0	End of Boring					
25						

Boring Date: 9-16-93
Field Engineer/Technician: M. Vanhook
Driller: S. Belsky
Contractor: Heber Mining

Water Level

Depth	Hour	Date

SPEEDIE AND ASSOCIATES

Log of Test Boring Number: B- 1

Sossaman Channel and Basin

Southern Avenue E/O Sossaman Road

Mesa, Arizona

Project No.: 930220SA

Rig Type: CME-55
Boring Type: Hollow Stem Auger
Surface Elevation: N/A
Sta. 59+00; CL

Depth (feet)	Visual Classification	Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot (0 – 25 – 50)
0	Stiff Brown SANDY CLAY (CL-Dry)					
1.5	Medium Dense Brown CLAYEY SAND (SC-Dry) With a Trace of Gravel and Weak Calcareous Cementation	S-1	2.5	--	--	
4.0	Hard Mottled Light Brown/Brown SANDY CLAY/SANDY SILT (CL/ML-Dry) With a Little Weak to Moderate Calcareous Cementation	RS-2	5.5	--	--	
5						
8.5	Loose Brown CLAYEY SAND (SC-Dry) With Trace of Weak Calcareous Cementation	S-3	11.0	--	--	
10						
12.0	Stiff to Very Stiff Brown SANDY CLAY (CL-Dry) With a Trace of Gravel and Weak to Moderate Calcareous Cementation					
15		S-4	16.0	--	--	
16.0	End of Boring					
20						
25						

Boring Date: 9-16-93
Field Engineer/Technician: M. Vanhook
Driller: S. Belsky
Contractor: Heber Mining

Water Level

Depth	Hour	Date

SPEEDIE AND ASSOCIATES

Log of Test Boring Number: B- 2

Sossaman Channel and Basin

Southern Avenue E/O Sossaman Road

Mesa, Arizona

Project No.: 930220SA

Rig Type: **CME-55**
Boring Type: **Hollow Stem Auger**
Surface Elevation: **N/A**
Sta. 53+00; CL

Visual Classification

Depth (feet)	Graphic Log	Visual Classification	Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot (0 – 25 – 50)
0		Hard Mottled Brown/Light Brown SANDY CLAY/SANDY SILT (CL/ML-Dry) With a Trace of Gravel and Weak Calcareous Cementation	RS-1	2.0	--	--	50/7"
			BS-2	4.0	--	--	
4.0							
5		Loose Reddish Brown CLAYEY SAND (SC-Dry)	S-3	6.0	--	--	
7.5							
		Stiff to Hard Brown SANDY CLAY (CL-Dry) With a Trace of Gravel and Weak to Moderate Calcareous Cementation					
10			S-4	11.0	--	--	
15			S-5	16.0	--	--	
16.0		End of Boring					
20							
25							

Boring Date: **9-16-93**
Field Engineer/Technician: **M. Vanhook**
Driller: **S. Belsky**
Contractor: **Heber Mining**

Water Level

Depth	Hour	Date

SPEEDIE AND ASSOCIATES

Log of Test Boring Number: **B-3**

Sossaman Channel and Basin

Southern Avenue E/O Sossaman Road

Mesa, Arizona

Project No.: **930220SA**

Rig Type: CME-55
Boring Type: Hollow Stem Auger
Surface Elevation: N/A
Sta. 47+00; CL

Visual Classification

Depth (feet)	Visual Classification	Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot
0	Stiff to Very Stiff Brown SANDY CLAY/SANDY SILT (CL/ML-Dry)	S-1	2.5	--	--	
4.0						
5	Stiff to Very Stiff Brown SANDY CLAY (CL-Dry) With a Little Gravel and Weak Calcareous Cementation	RS-2	5.5	--	--	
7.5						
10	Very Stiff to Hard Brown to Light Brown SANDY CLAY With a Little Gravel and Weak to Moderate Calcareous Cementation Note: Occasional Thin Lenses of Clayey Sand and Silty Sand Observed	S-3	11.0	--	--	
15	Note: Heavy Gravel Encountered From 12.5' to 13.0'	S-4	16.0	--	--	
16.0						
20						
25						

Penetration Resistance Blows per Foot: 0, 25, 50

Boring Date: 9-16-93
Field Engineer/Technician: M. Vanhook
Driller: S. Belsky
Contractor: Heber Mining

Water Level

Depth	Hour	Date

SPEEDIE AND ASSOCIATES

Log of Test Boring Number: B-4

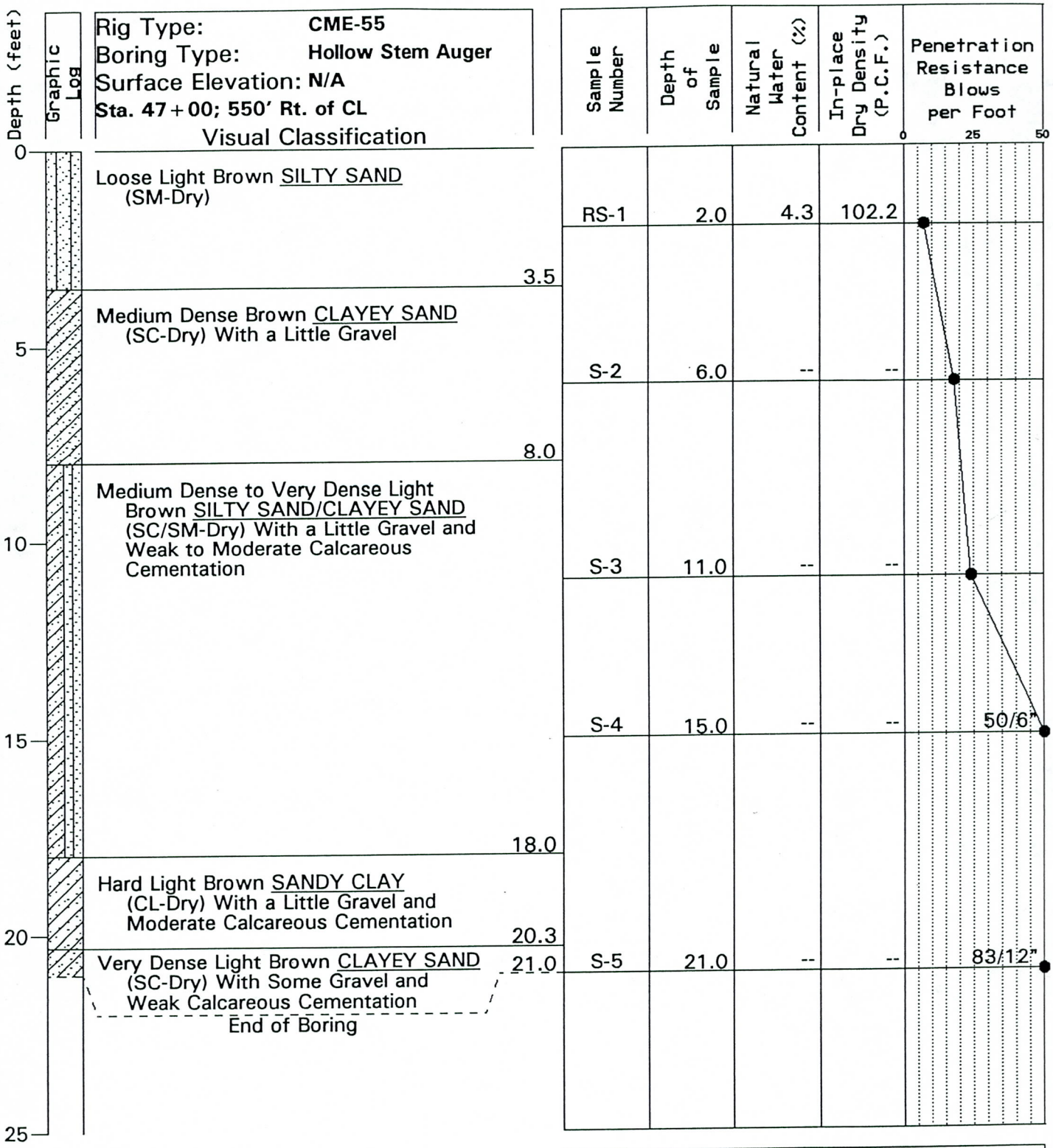
Sossaman Channel and Basin

Southern Avenue E/O Sossaman Road

Mesa, Arizona

Project No.: 930220SA

Rig Type: CME-55
Boring Type: Hollow Stem Auger
Surface Elevation: N/A
Sta. 47+00; 550' Rt. of CL



Boring Date: 9-16-93
Field Engineer/Technician: M. Vanhook
Driller: S. Belsky
Contractor: Heber Mining

Water Level

Depth	Hour	Date

SPEEDIE AND ASSOCIATES

Log of Test Boring Number: B-5

Sossaman Channel and Basin

Southern Avenue E/O Sossaman Road

Mesa, Arizona

Project No.: 930220SA

Rig Type: CME-55
Boring Type: Hollow Stem Auger
Surface Elevation: N/A
Sta. 50+00; 350' Rt. of CL

Depth (feet)	Graphic Log	Visual Classification	Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot (0 – 25 – 50)
0		Loose Light Brown SILTY SAND (SM-Dry)	S-1	2.5	--	--	
4.0							
5		Loose Brown SAND/SILTY SAND (SW/SM-Dry) With Some Gravel	RS-2	5.5	--	--	
8.0							
10		Very Dense Light Brown CLAYEY SAND (SC-Dry) With a Little Gravel and Weak to Moderate Calcareous Cementation	S-3	11.0	--	--	66/12"
15			S-4	15.5	--	--	50/6"
20.0			S-5	20.0	--	--	50/6"
20		End of Boring					
25							

Boring Date: 9-16-93
Field Engineer/Technician: M. Vanhook
Driller: S. Belsky
Contractor: Heber Mining

Water Level

Depth	Hour	Date

SPEEDIE AND ASSOCIATES

Log of Test Boring Number: B- 6

Sossaman Channel and Basin

Southern Avenue E/O Sossaman Road

Mesa, Arizona

Project No.: 930220SA

Rig Type: CME-55
Boring Type: Hollow Stem Auger
Surface Elevation: N/A
Sta. 53+00; 550' Rt. of CL

Depth (feet)	Visual Classification	Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot (0 25 50)
0	Firm Brown SANDY CLAY (CL-Dry)					
2.0		RS-1	2.0	--	--	
	Medium Dense Reddish Brown SILTY SAND (SM-Dry) With a Little Gravel					
5		S-2	6.0	--	--	
7.5						
	Very Stiff Light Brown SANDY CLAY (CL-Dry)					
10		S-3	11.0	--	--	
13.0						
	Dense to Very Dense Mottled Brown/Light Brown CLAYEY SAND (SC-Dry) With a Little Gravel and Weak to Moderate Calcareous Cementation					
15		S-4	16.0	--	--	
20		S-5	20.4	--	--	50/4"
20.4	End of Boring					
25						

Boring Date: 9-16-93
Field Engineer/Technician: M. Vanhook
Driller: S. Belsky
Contractor: Heber Mining

Water Level

Depth	Hour	Date

SPEEDIE AND ASSOCIATES

Log of Test Boring Number: B- 7

Sossaman Channel and Basin

Southern Avenue E/O Sossaman Road

Mesa, Arizona

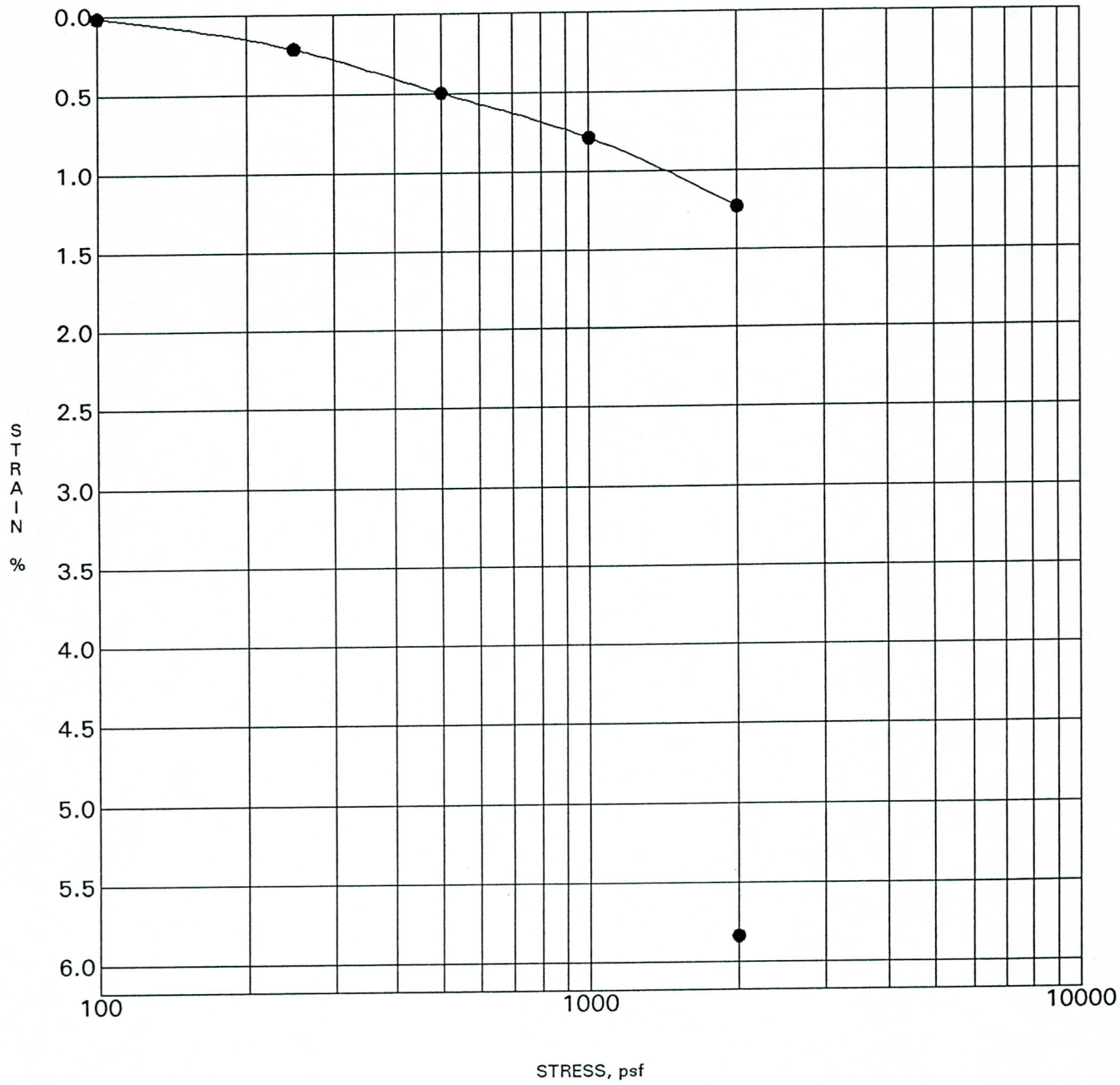
Project No.: 930220SA

TABULATION OF TEST DATA

PROJECT: Sossaman Channel and Basin - Southern Avenue E/O Sossaman Road
NUMBER: 930220SA

Test Boring Number	Sample Depth (feet)	Water Content %	Dry Density (pcf)	<#200 Sieve %	<#40 Sieve %	<#10 Sieve %	<#4 Sieve %	<3" Sieve %	Liquid Limit %	Plastic Limit %	Plasticity Index %	ASTM Classification
B- 1	2.0	8.6	111.3	76	88	96	99	100	22	17	5	CL-ML
B- 1	16.0	--	--	64	83	95	99	100	36	20	16	CL
B- 2	11.0	--	--	50	71	86	95	100	29	20	9	SC
B- 3	4.0	--	--	57	77	90	95	100	25	20	5	CL-ML
B- 3	11.0	--	--	58	78	93	98	100	30	20	10	CL
B- 5	2.0	4.3	102.2	49	71	93	99	100	19	18	2	SM
B- 6	5.5	--	--	6	17	55	81	100	NP	NP	NP	SW-SM
B- 7	11.0	--	--	59	84	96	99	100	34	21	12	CL

CONSOLIDATION TEST



BORING B- 5

SAMPLE No. RS-1

Sample inundated at end of test at 2000 psf

PROJECT	Sossaman Channel and Basin - Southern Avenue E/O Sossaman Road	JOB NO.	930220SA
		DATE	9/16/93

SPEEDIE AND ASSOCIATES

MOISTURE-DENSITY RELATIONS

PROJECT: Sossaman Channel and Basin **PROJECT NO.:** 930220SA **DATE:** 9/16/93

LOCATION: Southern Avenue E/O Sossaman Road

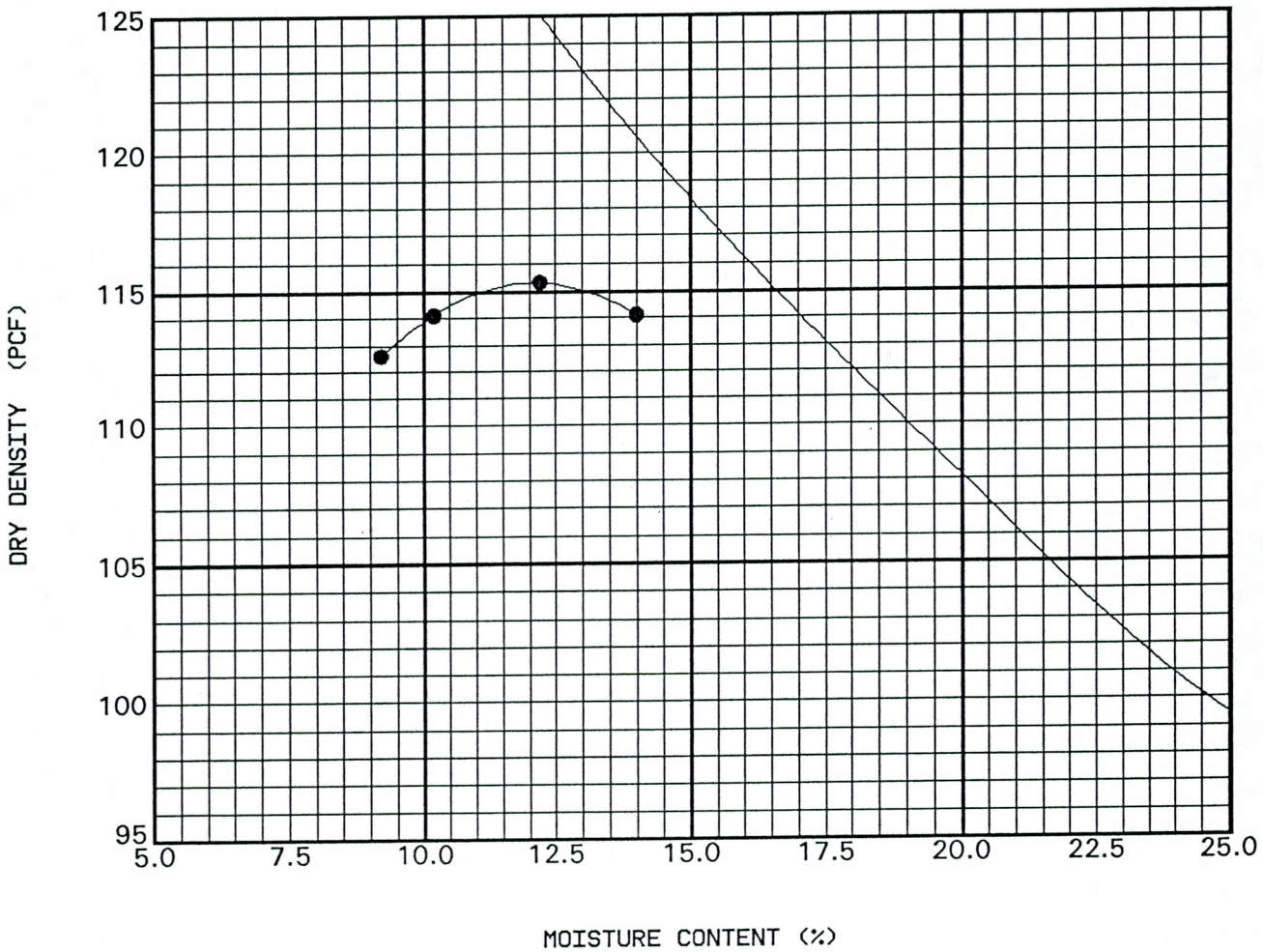
BORING NO.: B- 3 **SAMPLE NO.:** BS-2 **SAMPLE DEPTH:** 4.00

METHOD OF COMPACTION: ASTM D698A

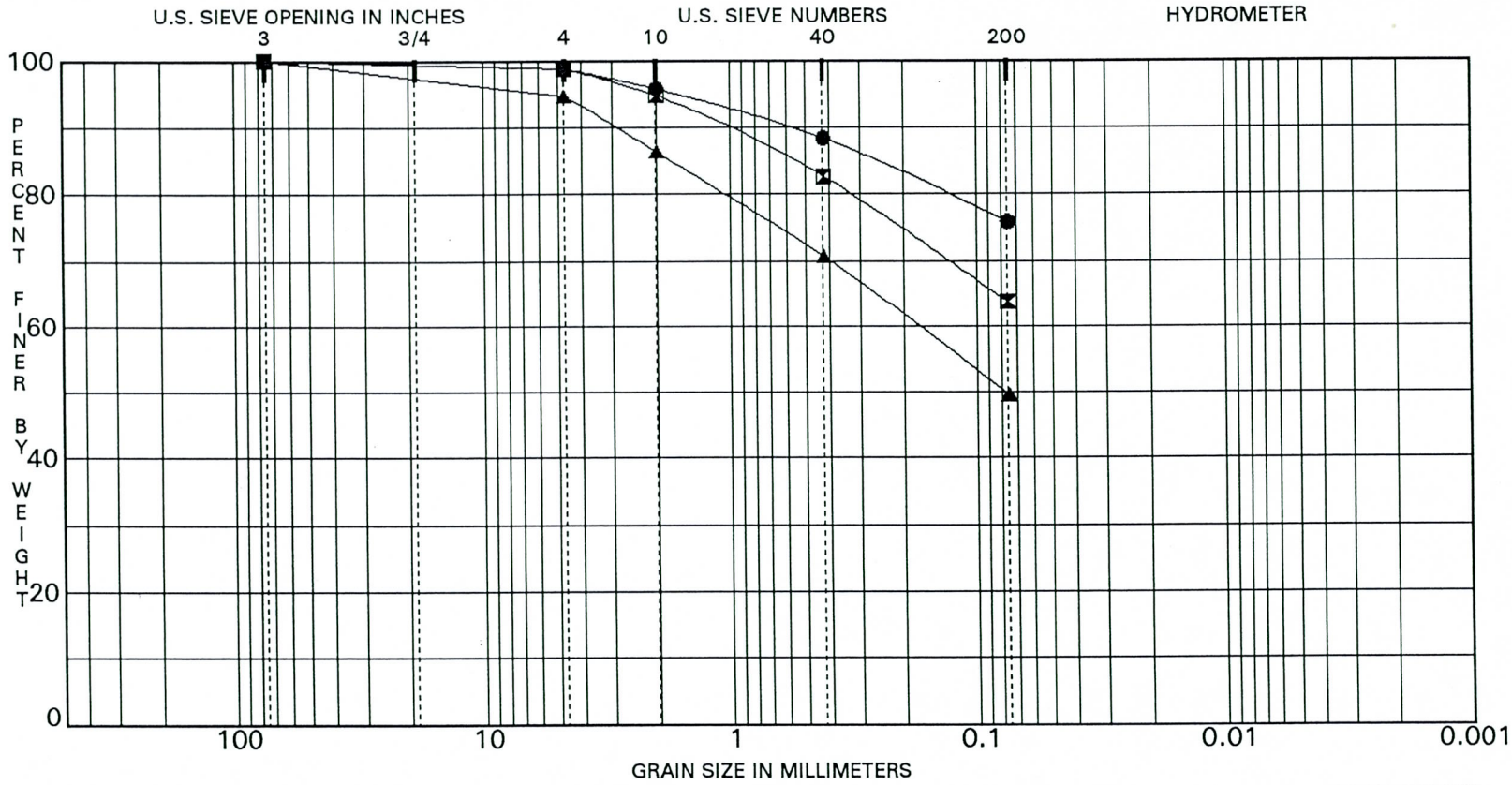
LIQUID LIMIT: 25 **PLASTIC LIMIT:** 20 **PLASTICITY INDEX:** 5

CLASSIFICATION: CL-ML **ASTM SOIL DESCRIPTION:** SANDY SILTY CLAY

MAXIMUM DRY DENSITY: 115.5 PCF **OPTIMUM MOISTURE CONTENT:** 12.0 %

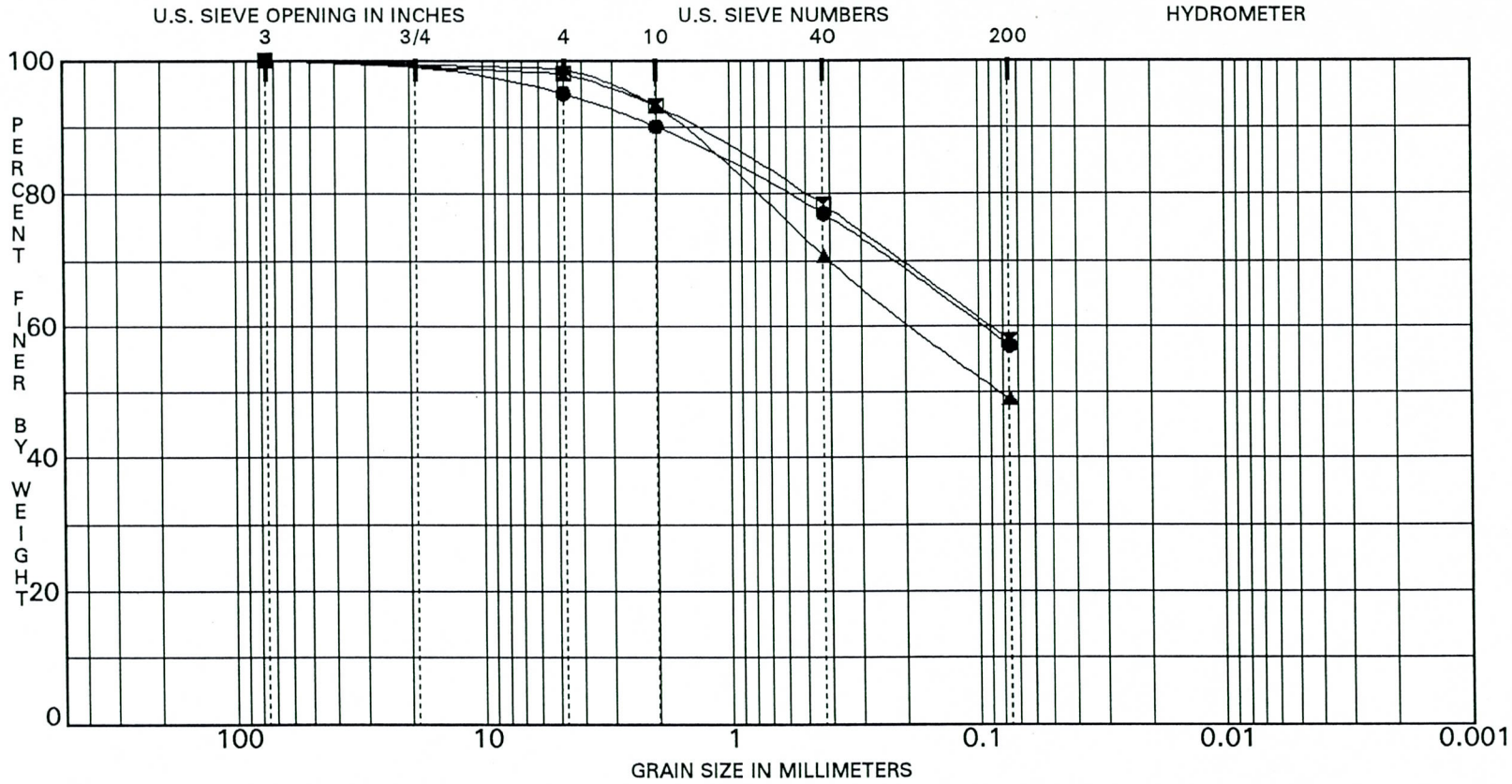


SPEEDIE AND ASSOCIATES



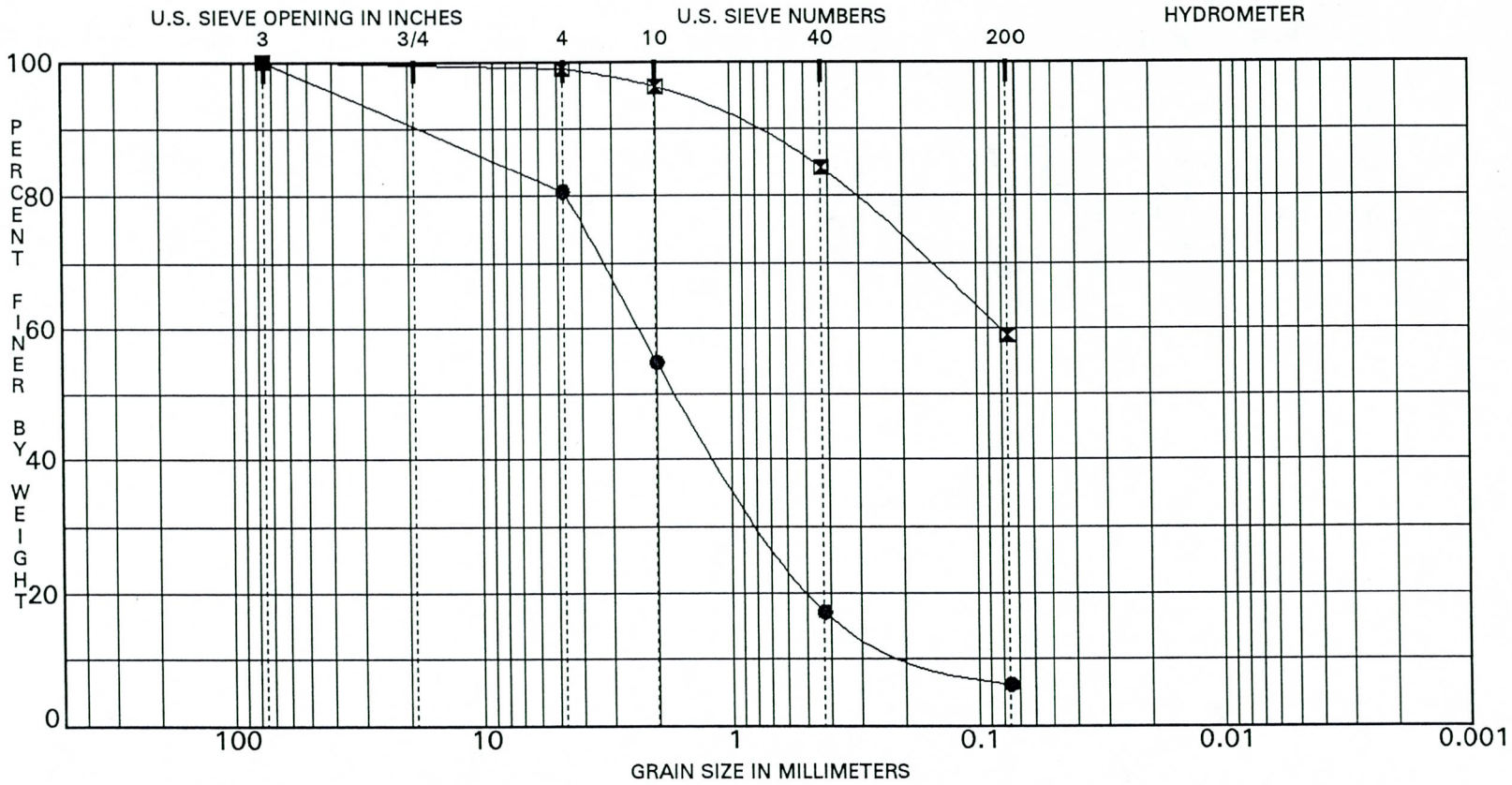
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			ASTM Classification		LL	PL	PI	%Gravel	%Sand	%Fines
●	B- 1	2.0	SILTY CLAY with SAND	CL-ML	22	17	5	1.3	22.9	75.8
⊠	B- 1	16.0	SANDY LEAN CLAY	CL	36	20	16	1.3	35.0	63.7
▲	B- 2	11.0	CLAYEY SAND	SC	29	20	9	5.4	45.1	49.5



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			ASTM Classification		LL	PL	PI	%Gravel	%Sand	%Fines
●	B- 3	4.0	SANDY SILTY CLAY	CL-ML	25	20	5	5.0	38.0	57.0
⊠	B- 3	11.0	SANDY LEAN CLAY	CL	30	20	10	2.0	40.2	57.8
▲	B- 5	2.0	SILTY SAND	SM	19	18	2	1.3	49.9	48.8



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		ASTM Classification		LL	PL	PI	%Gravel	%Sand	%Fines
●	B- 6	5.5	WELL GRADED SAND with SILT and GRAVEL	SW-SM	NP	NP	NP	19.4	74.4	6.2
⊠	B- 7	11.0	SANDY LEAN CLAY	CL	34	21	12	1.1	40.0	58.9

SWELL TEST DATA

BORING/ PIT NO.	SAMPLE DEPTH (FT.)	REMOLDED DRY DENSITY (PCF)	INITIAL MOISTURE CONTENT PERCENT	PERCENT COMPACTION	INITIAL DEGREE OF SATURATION PERCENT	FINAL DEGREE OF SATURATION PERCENT	TOTAL SWELL PERCENT
B-3	4.0	110.2	9.8	95.4*	52	89	2.1

*Based on a maximum dry density of 115.5 pcf at 12.0 percent optimum moisture

Sossaman Channel Basin
Southern Ave. E/O
Sossaman Rd.
Mesa, Arizona

SPEEDIE AND ASSOCIATES
GEOTECHNICAL AND SITE ENGINEERS
PROJECT NO. 930220SA

RESULTS OF LABORATORY TEST DATA

Soil Resistivity/pH
Ariz 236a

Sample Designation	Depth	Min. Resistivity ohm-cm	pH
B3/BS-2	2 feet	2866	8.2
Combination	4 - 6 feet	1601	8.1