GEOTECHNICAL ENGINEERING INVESTIGATION

on

Agua Fria Channelization

500 ft Downstream of Interstate 10

to McDowell Road

SLA Project No AZ-MC-07

in

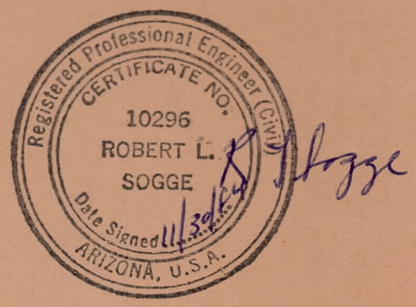
Phoenix, Arizona

for

Simons, Li & Associates, Inc.
120 West Broadway, Suite 170
Tucson, Arizona 85702

524 N. 6th Ave.
Tucson, Arizona
85705
(602) 623-7774

DESERT EARTH ENGINEERING



November 30, 1984
84-209

consulting geotechnical engineers

November 30, 1984
84-209

Simons, Li & Associates, Inc.
120 West Broadway, Suite 170
Tucson, Arizona 85702

ATTN: John Lynch

RE: Geotechnical Engineering Report on Agua Fria Channelization, 500 ft south of Interstate 10 to McDowell Road

Gentlemen:

Desert Earth Engineering is pleased to submit this report covering design recommendations relating to foundation aspects on the above-captioned project. Our field investigation was conducted on September 14 and 19, and October 31, 1984. Field testing results on selected samples obtained during the field investigation provide the basis for our engineering evaluation and our conclusions and recommendations.

The scope of geotechnical work undertaken for this project has three aspects. One is a subsurface investigation to provide foundation design information for a 1450-ft grade control structure across the Aqua Fria River 500 ft downstream of Interstate 10. The second is an investigation to evaluate subsurface soils to a depth of 20 ft over a 60-acre proposed siltation basin. This basin will be located immediately north of I-10 and east of the Agua Fria River channel. The third aspect

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is to perform soil-cement mix designs for the channel levies and the grade control structure.

This report covers the grade control foundation analysis and the siltation basin materials evaluation. All field work for the siltation basin and the grade control structure is completed. Data gathered from these borings was used to provide the information given in this report. Soil-cement design information will be given in a separate report pending completion of field and laboratory testing on that phase of the project.

Our firm should be consulted if conditions encountered in the field are substantially different from those described in this report. This office, as part of our design function, should be engaged to observe soil conditions as they are uncovered during foundation and substructure installation in order to insure that the construction procedure is in accordance with the design recommendations. Such services are particularly necessary for monitoring the placement of engineered fill where required.

We wish to thank you for the pleasure of being associated with you on this project. If we can be of any further assistance, please call us.

Prepared and reviewed by:

R. L. Sogge, P.E.
Ralph Pattison

RLS/lsm
Copies: (2) Addressee

TABLE OF CONTENTS

SITE DESCRIPTION

Project Location: The project is located along the Agua Fria River from McDowell Road downstream to 500 ft south of Interstate 10.

Site Size: The length of the river reach covered by this project is approximately 3400 feet. The siltation basin covers approximately 60 acres.

Present and Previous Uses: Plowed fields occupy the area that is to be used for the siltation basin. The I-10 bridge crosses the river 500 ft north of the grade-control structure alignment.

Topography: The topography is generally flat. A drainage channel bisects the siltation basin. Riverbed elevations are approximately 10-20 feet lower than surrounding flood plain elevations.

Surface Water Drainage: River flow is to the south. The siltation basin area has poor drainage, generally toward the southwest.

Vegetation Coverage: One tree grows on the east side of the river near the grade-control structure alignment. The siltation basin is partly overgrown by tall weeds.

PROPOSED DEVELOPMENT

Structure: A 1450-ft-long grade-control dike is to span the Agua Fria River.

Loads: Loads will depend on the depth of embedment of the structure. Assuming a maximum soil-cement wet density of 150 pounds per cubic foot, ten feet of embedment will impose a load of 1500 pounds per square foot; fifteen feet of embedment, 2250 psf; and 20 feet of imbedment, 3000 psf.

SCOPE OF WORK

The purpose of our work on this project is to conduct a field investigation and perform laboratory testing on the sampled soils in order to provide recommendations in report form for design of the foundation system. The report includes a discussion of the most suitable foundation type, depth of foundation embedment, allowable soil bearing pressures, estimated settlement, collapse or expansion potentials, and recommendations on earthwork. Also included are discussions on site and foundation preparation and on surface and groundwater control.

FIELD INVESTIGATION

No. of Test Borings to Date: 11

Location: See Site Plans, Figures 1 (Grade-control structure)
2 (Siltation Basin)

Date Drilled: September 14 and 19, and October 31, 1984

A subsurface field investigation was conducted at the site using a Central Mining Equipment Model 55 drill rig, equipped with 6 5/8 inch OD, 3 1/4 inch ID hollow stem augers, to drill the bore holes. Soil sampling was achieved using a 2 inch OD, Split Spoon (SS) sampler, a 3 inch OD ring sampler, or bagged samples of auger cuttings.

The driving of the split spoon provides a measure of a soil's strength through Standard Penetration Test (SPT) blow count (N) values expressed in blows/ft. The disturbed samples provided can be used for moisture and soil property determinations. The ring sampler also yields penetration resistance data and provides "undisturbed" samples of cohesive fine grained soils for expansion or collapse tests. When blow counts are determined by the ring sampler using the same SPT driving energy as for the split spoon, penetration resistances greater than the N-values will result due to its larger area. A penetrometer consisting of a 2 inch OD bull-nose sampler is also used to determine in-situ soil density. Penetration values from this device, expressed in blows/ft, also approximately correspond to split-spoon N values. The particular correspondence can be seen where both values were determined on the same soil strata. A blow count chart with density-consistency relations is presented in Appendix A.

Boring logs containing descriptions of the materials encountered in the subsurface investigation of the site are presented in Appendix A. A presentation of the penetration

resistance values is also included on the boring logs. Soil profiles for the project site are presented in Figure 3. These soil profiles are a generalizations of the subsurface soils found at each bore hole. They assume that the overall soil conditions do not vary appreciably from those found at specific bore locations.

LABORATORY TESTING RESULTS

Grain Size Determination - Results in Appendix B.

Summary of Gradation and Plastic Index Tests

Boring No.	Depth (ft)	% Passing #200 Sieve	Liquid Limit	Plastic Index	USCS Symbol
B-3	5-6.5	6	NP	NP	SW
B-3	10-11.5	5	NP	NP	SW
B-3	25-26.5	14	30	13	SC
B-4	15-16.5	6	NP	NP	SP
B-5	0-1.5	74	NP	NP	ML
B-8	5-6.5	27	NP	NP	SM
B-9	4.5-6	25	NP	NP	SM
B-10	9.5-11	6	NP	NP	SP
B-11	9.5-11	3	NP	NP	SP

CONCLUSIONS AND RECOMMENDATIONS

Eight boreholes to a depth of 20 feet were performed in the area of the proposed siltation basin. These borings show the material of the siltation basin to vary from clear, fine sands to silty sands. This material is generally loose near the surface with density increasing with depth. Occasional gravel and small cobble seams are found throughout the site.

The river-basin material along the alignment of the grade control structure is primarily sand with trace gravel. This material occupies the uppermost 20 feet and then gives way to a

sand-gravel-cobble seam that extends to at least 32.5 feet where auger refusal occurred. The density of this soil varies somewhat with depth. The upper ten to fifteen feet is medium dense, while below fifteen feet the soil is dense and well compacted and will easily support anticipated loads.

Excavation using conventional methods should be quite feasible in the upper 20 feet. However, if footings are required below this depth, bulldozers equipped with rippers may be required. Also, the quantity of large cobbles and occasional boulders that will be encountered here may prevent efficient scraper operation.

Foundation

Foundation Type - Continous, spread footings are recommended to support the soil-cement grade-control structure.

Supporting Foundations Soil - The grade control structure will be supported by dense well-graded sand, gravels and cobbles with occasional trace clay.

Allowable Bearing Capacity - 2000 psf for footings founded below Elevation 960. 2500 psf for footings founded below footings founded below Elevation 955. 3000 psf for footings founded below Elevation 950.

(Riverbed is approximately
Elevation 970)

The footing depth is measured from the top of lowest adjacent grade to the bottom of the footing.

The allowable soil-bearing values specified may be increased one-third when considering wind or seismic forces either acting alone or when combined with vertical loads. The allowable bearing capacity may be increased one-fourth below the toes of retaining walls.

Approximate Total Settlement - Total settlement will be less than one inch.

Approximate Differential Settlement - Differential settlement will be less than one half of total settlement.

Collapse Potential - Collapse potential is negligible.

Swell Potential - Swell potential is negligible.

Lateral Foundation Pressures -

Active Sliding Pressure	35 pcf E.F.P.
Passive Resistance Pressure	300 pcf E.F.P.
Base Friction Coefficient (poured on grade)	$\tan 20^{o}$
Foundation Toe Pressures	Allowable x 1.25

E.F.P. = Equivalent Fluid Pressure

The pressure distribution behind a retaining wall depends on

the deformation pattern of the wall. If wall movement is restrained near the top, pressures greater than the active condition, approaching K_o conditions, or 60 pcf E. F. P. are possible.

Passive and base friction resistance can be combined to resist sliding. A factor of safety of 1.5 should be used for sliding.

In view of the soils encountered, the following general procedure is recommended for preparation of the building site for support of foundation elements and interior or exterior slabs-on-grade.

- Prepare the surface by stripping and removing all existing debris, vegetation, etc. from the project site.
- Any soil disturbed during site cleaning must be replaced and recompacted.
- Engineered fill shall be placed in lifts no greater than 8 inches loose and compacted to 95% of Standard Proctor Density.
- No compaction of undisturbed native material will be required.
- Recommended compaction equipment for fill is either conventional vibratory, sheepfoot or rubber-tired rollers. The backfill around footings and foundation wall must be compacted. Jumping jacks or vibrating turtles can be used

in tight areas such as foundation trenches and adjacent walls.

- Engineered fill or native soil beneath all peripheral structures such as pipelines, sidewalks, exterior slabs and pavements, shall be compacted to 90% of the Standard Proctor density.
- Engineered fill not supporting a structure, such as that placed above a footing, shall be compacted to 90% of Standard Proctor density.
- In no case shall compaction be attempted using water settling.
- For fill placed above the elevation of the surrounding grade the compaction requirement should be enforced to a setback distance of 5 ft beyond the edges of the stemwall.
- All structures should be set back a distance of approximately 8 ft from the edge of slopes. This requirement insures a stable foundation in areas such as the face of slopes where compaction is difficult to achieve.
- The top material should have sufficient binder to prevent erosion by wind, water, or traffic. This requirement is necessary to maintain the specified footing embedment.

Summary of Compaction Requirements

Use	Min % Compaction*
Beneath foundation components and slabs-on-grade	
exposed in-situ subgrade soil	95%
engineered fill	95%
ABC (aggregate base course)	95%
Fill above footing bottom	90%
Beneath roadways	95%
Beneath exterior slabs, pavements and pipelines	
exposed in-situ subgrade soil	90%
engineered fill	90%
ABC	95%

* These percentages are of Standard Proctor (ASTM D 698)

Surface Water and Groundwater Control

The material at this site is such that it will not be greatly affected by surface and subsurface groundwater. It is nevertheless recommended that surface water runoff be controlled to prevent ponding and infiltration into the foundation soil. The grade of the surface shall be sloped away from the structure as soon as backfill around the walls and footings are in place.

During the construction period water should not be allowed to enter any trenches for footings or other locations which will

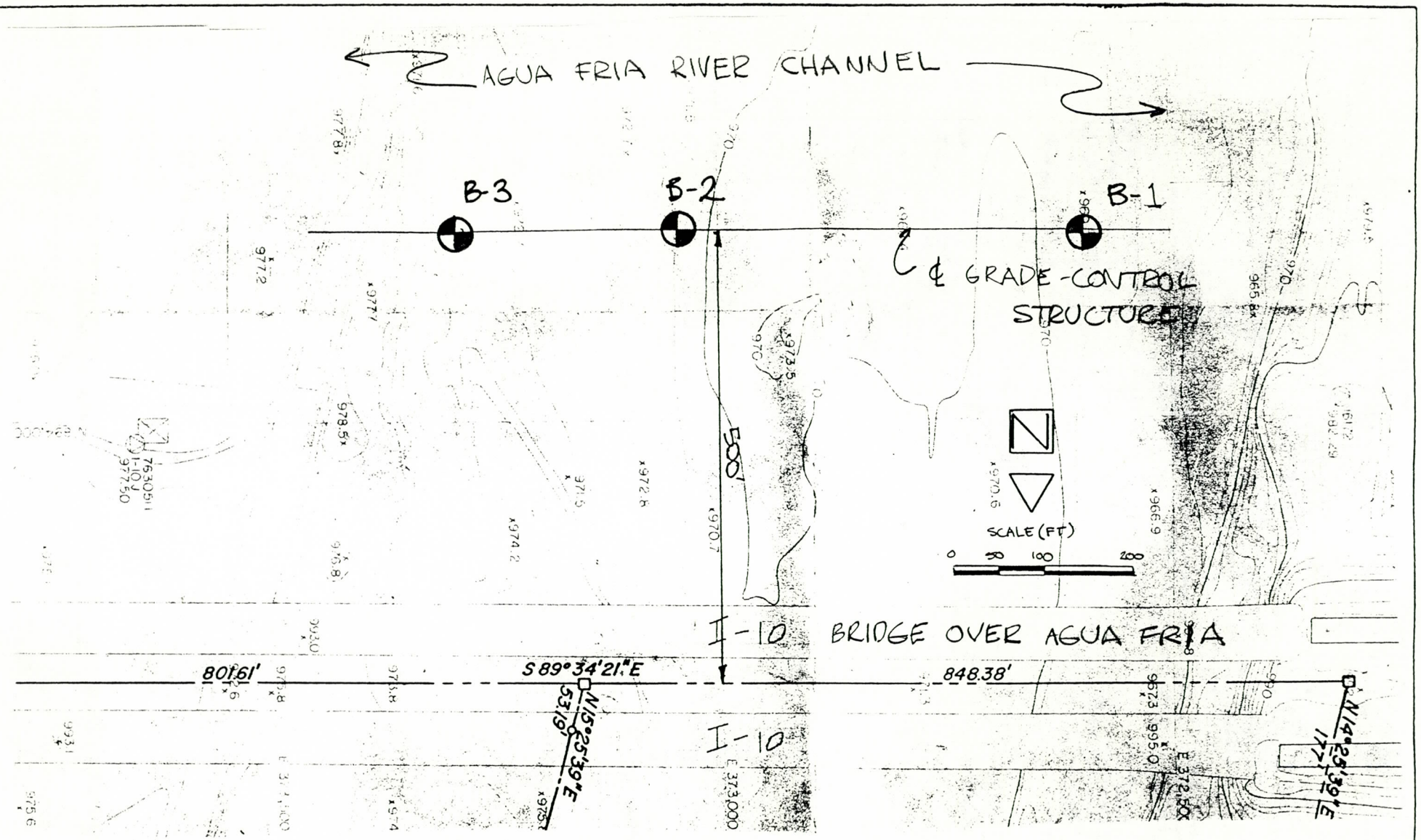
support structural components. If water softening of the soil occurs the softened soil should be removed.

LIMITATIONS

The field and laboratory testing relevant to this report was performed, unless otherwise noted, by Desert Earth Engineering. This work was performed in accordance with generally accepted engineering principles and practices.

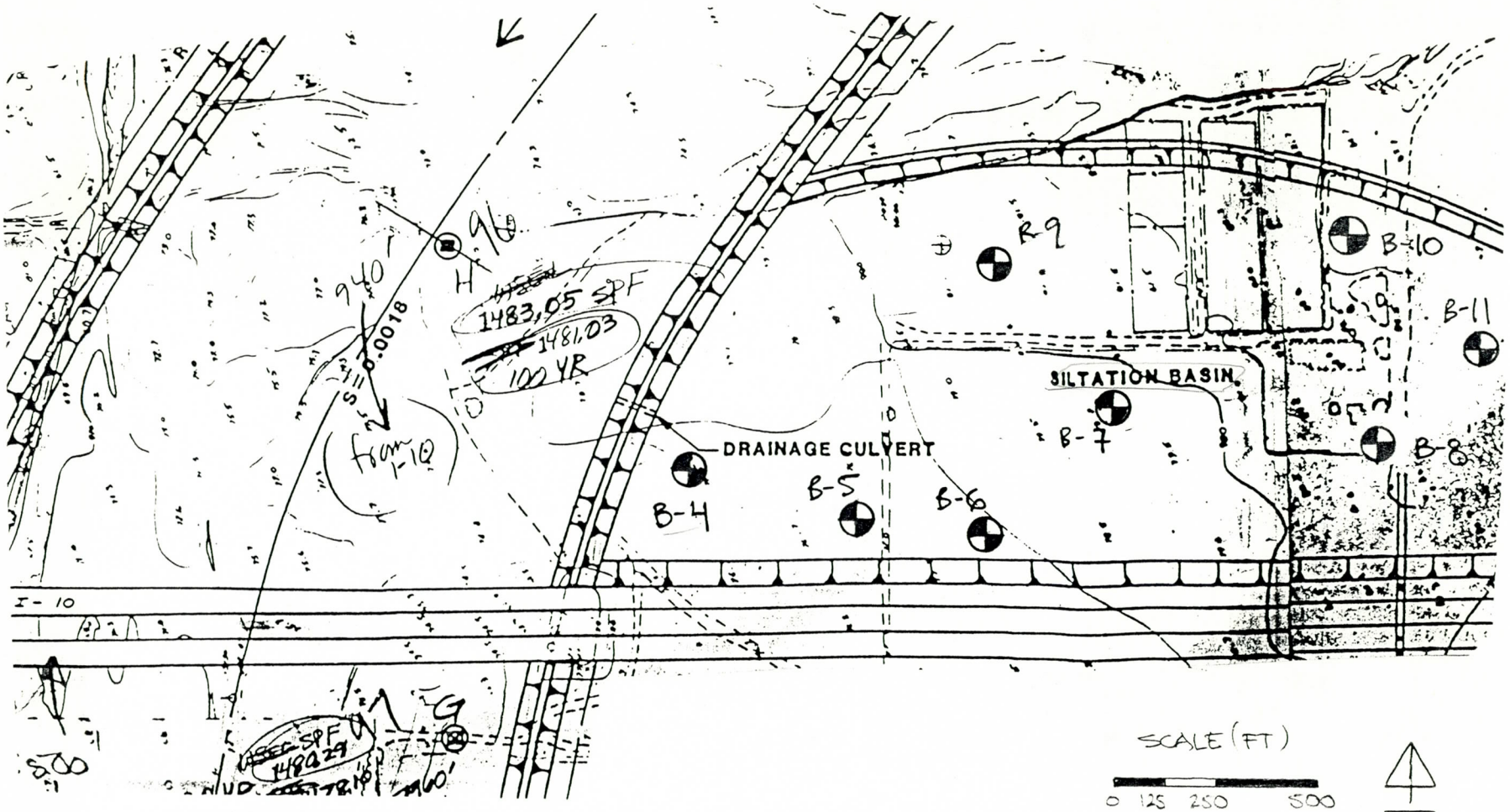
This report assumes the subsurface conditions are as found in the test bore holes. If any conditions other than those assumed are encountered when making excavations, the owner or his representative should notify the Soil Engineer immediately so that supplementary recommendations can be made.

This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the applicable provisions of the recommendations contained herein are called to the attention of the Structural Engineers and incorporated into the plans. Also, it is assumed that the necessary steps are taken to see that the contractor and subcontractors carry out such provisions in the field.



BOREHOLE LOCATION
GRADE-CONTROL DIKE
AGUA FRIA RIVER & INTERSTATE 10

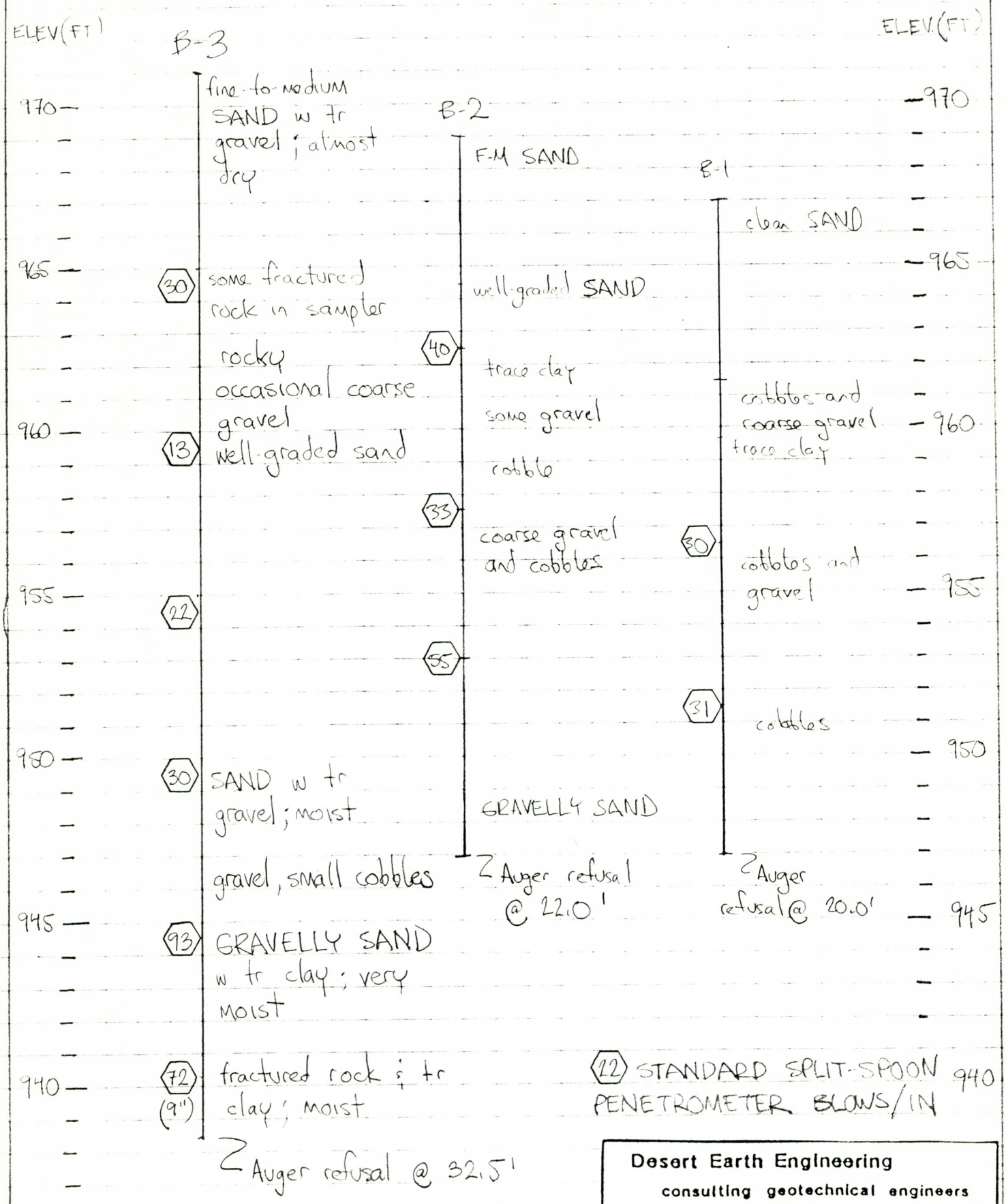
Desert Earth Engineering consulting geotechnical engineers		
Drawn by: RMP Date: 17 OCT 84	Checked by: RJ Date: 11/30/84	
Sheet of	Job No. 84-209	Figure No. 1



BOREHOLE LOCATIONS

SILTATION BASIN, AGUA FRIA RIVER & INTERSTATE 10

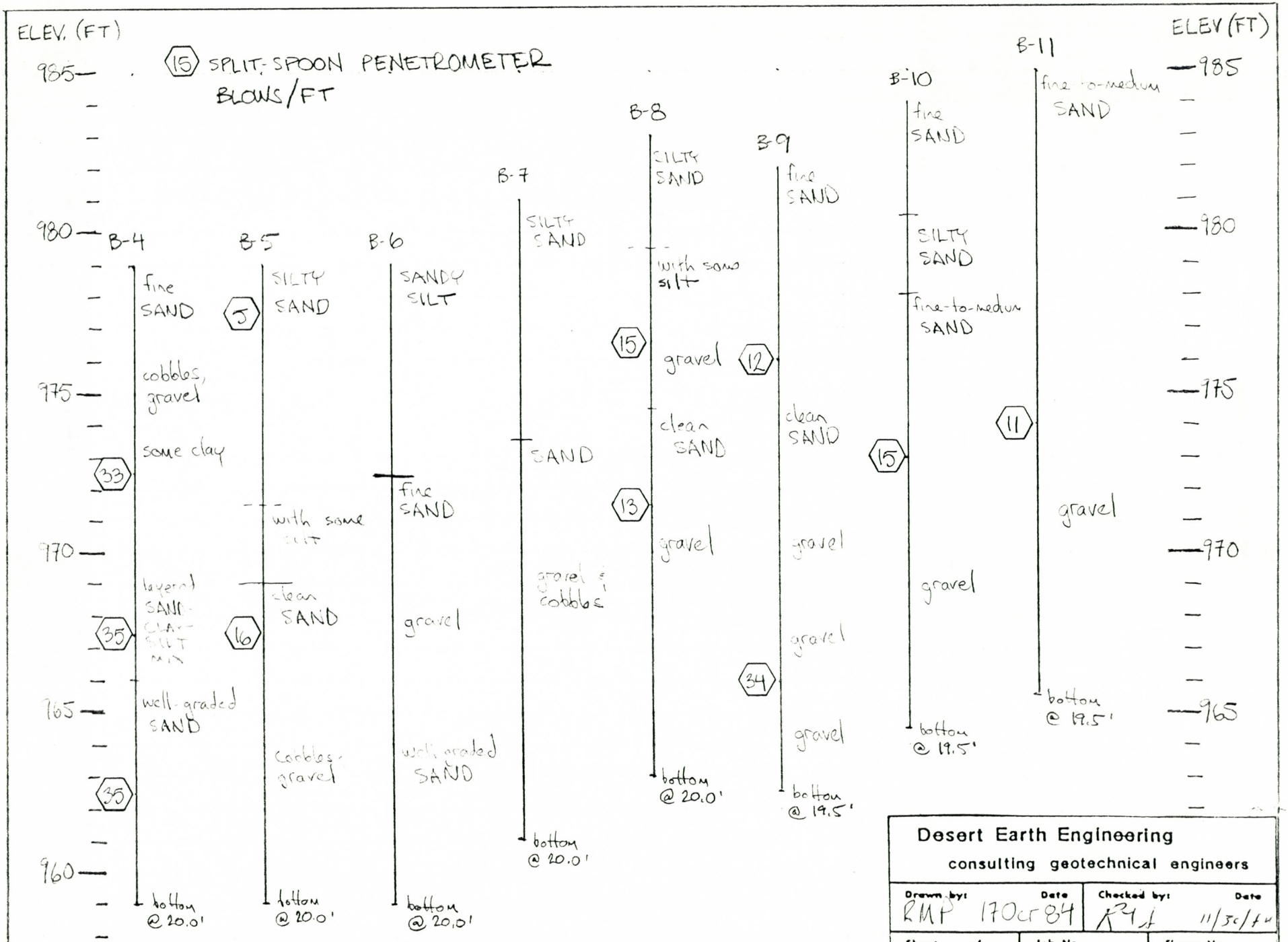
Desert Earth Engineering consulting geotechnical engineers			
Drawn by: RMP	Date: 17 OCT 84	Checked by: KYA	Date: 11/21/84
Sheet of	Job No.: 84-209	Figure No.: 2	



BORE HOLE PROFILE - GRADE CONTROL

DIKE - I-10 AT AGUA FRIA RIVER

Desert Earth Engineering consulting geotechnical engineers			
Drawn by: RMP	Date: 17 OCT 84	Checked by: K.J.	Date: 11/30/84
Sheet of	Job No.: 84-209	Figure No.: 3	



BOREHOLE LOCATIONS - SILTATION BASIN

Desert Earth Engineering consulting geotechnical engineers			
Drawn by: RMP Date 17 Oct 84	Checked by: Date 11/30/84		
Sheet of	Job No. 84-209	Figure No. 4	

APPENDIX A

Soil Boring Logs

DRILLING, SAMPLING, AND FIELD TESTING EQUIPMENT

DRILLING: The drilling is performed using a Central Mining Equipment CME-55 drill rig capable of auger drilling, rotary wash drilling, and rock coring. Auger drilling is performed using 6 5/8" OD x 3 1/4" ID hollow-stem augers with carbide-tipped teeth. Rotary wash drilling employs a tricone gear bit and core drilling a diamond bit. These latter methods use high pressure water as a drilling fluid.

SAMPLING: Disturbed samples are achieved using a standard 2" OD x 1 3/8" ID split spoon sampler. The ID dimension is that of the inner brass liner. "Undisturbed" samples of cohesive fine-grained soils are obtained using a ring sampler of 3" OD x 2.416" ID. The series of 1" long, 2.416" ID brass rings in the sampler have a 2.5" OD and therefore readily fit into laboratory direct-shear and consolidation equipment.

In very soft cohesive soils, thin-walled Shelby tube samples can be taken. Rock cores are obtained from diamond-core drilling.

FIELD TESTING: An approximation of the soil's density and consistency, from which strength estimates can be made, is obtained using the penetration resistance to driving of the samplers. The Standard Penetration Test (SPT) N-value is the number of blows to drive a standard 2" OD x 1 3/8" ID split spoon sampler 1 ft. using a 140-pound weight dropping 30". Where driving resistance is difficult, blows/inches-driven values are presented.

A 3" OD ring sampler will generally have a larger blow count than will the split spoon sampler if the same driving energy is used for both.

Continuous-penetration resistance can be obtained using a 2" OD bull-nose penetrometer. When using the SPT driving energy the blow counts on a bull-nosed penetrometer are approximately equal to or greater than the N-value (blows/ft) resistance obtained.

METHOD OF SOIL CLASSIFICATION

GRAVEL (GP,GW)

SAND, SANDY (SP,SW,S)

SILT (ML,MH)

SILTY (M)

CLAY (CL,CH)

CLAYEY (C)

ORGANIC MATERIAL (OL,OH,PT)

WEATHERED TO DECOMPOSED BEDROCK

BEDROCK

CLASSIFICATION	U.S. Standard Sieve Size
BOULDERS	Above 12"
COBBLES	12" to 3"
GRAVEL Coarse Fine	3" to No.4 3"to3/4" 3/4"toNo.4
SAND Coarse Medium Fine	No.4toNo.200 No.4toNo.10 No.10toNo.40 No.40toNo.200
SILT & CLAY	Below No.200

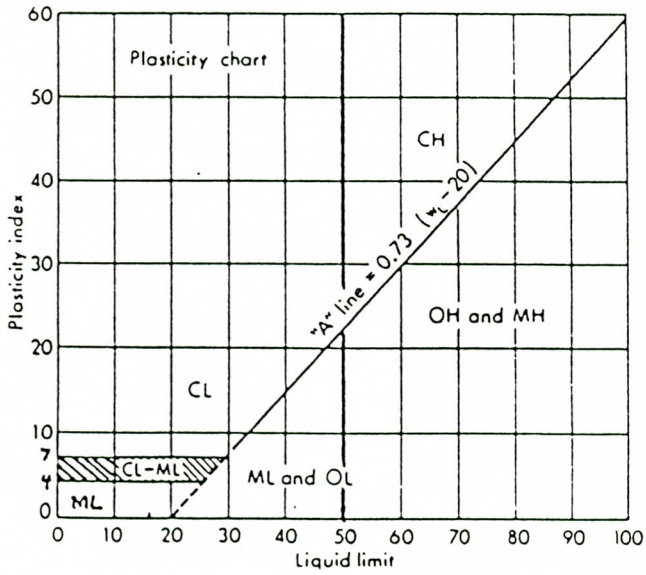
GRAIN SIZE CHART

Coarse Grained Scale
(50% retained on #200 sieve)

Adjective	%
with trace	1-12
with some	12-30
add "y" (ey)	> 30

P = poorly graded
W = well graded

Fine Grained Soils
(50% passing #200 sieve)



L = low compressibility
H = high compressibility

P.I.	Adjective	Silt (ML & MH)	Clay (CL & CH)	Organics (OL & OH)
< 1	non-plastic	--	--	--
1-10	slightly plastic	--	silty	--
10-20	medium plastic	clayey	silty to no adj.	silty
20-40	plastic	clayey	--	clayey
> 40	very plastic	clayey	--	--

BLOW COUNT - DENSITY RELATIONS

Cohesionless coarse-grained soils

Density	Nspt *
very loose	< 4
loose	4 - 10
medium dense	10 - 30
dense	30 - 50
very dense	> 50

Cohesive fine-grained soils

For cohesive fine-grained soils, design is usually governed by the moisture content, plasticity, consolidation, compressibility, or swell properties. Therefore, field penetrometer readings giving an indication of strength as characterized by the consistency or cohesion of a soil can be misleading and are not presented here.

The blows to drive a 3" OD x 2.42" I.D. ring sampler 1 ft will be greater than for a split spoon sampler if the same driving energy is used for both.

* Nspt is the Standard Penetration Test (SPT) blows/ft resistance using a 2" OD x 1 3/8 I.D. sampler (ASTM D1586).

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JOB NO.	CLIENT	LOCATION
84-209	Simons, Li & Associates	AF & I-10

LOCATION OF BORING

See Site Plan, Figure 1

DRILLING METHOD & EQUIPMENT	CME-55 Drill Rig equipped with 6 5/8" OD 3 1/4" ID hollow-stem continuous flight augers
SAMPLING METHOD	Split-spoon Penetrometer and Ring Sampler
CASING DEPTH	
BORING NO.	B-1
SHEET	1 OF 1
ENGINEER	RMP
TIME	1:00
DATE	31 Oct 84

DATUM ELEVATION 967

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	BLOWS/6" SAMPLER	DEPTH IN FEET	BULL-NOSE BLOWS/FT	SOIL GRAPH	SURFACE CONDITIONS
			0		(SW)	Loose riverbed sand brown clean SAND; almost dry, well-graded
			1			
			2			
			3			
			4			
			5			
			6			cobbles and coarse gravel; subrounded to subangular
			7			trace clay, moist
			8			
			9			
SS	18/18	11/13/17	10			
			11			cobbles and gravel
			12			
			13			
			14			
SS	18/18	16/17/14	15			
			16			cobbles
			17			
			18			
SS	3/0	15 (3")	19			split-spoon refusal on a cobble @ 19.5 auger refusal @ 20.0'
			20			

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JOB NO.	CLIENT	LOCATION
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LOCATION OF BORING

See Site Plan, Figure 1

DRILLING METHOD & EQUIPMENT	CME-55 Drill Rig equipped with 6 5/8" OD 3 1/4" ID hollow-stem continuous flight augers
SAMPLING METHOD	Split-spoon Penetrometer and Ring Sampler
CASING DEPTH	
BORING NO.	B-2
SHEET	1 OF 2
ENGINEER	RMP
TIME	12:10
DATE	31 Oct 84

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	BLOWS/6" SAMPLER	DEPTH IN FEET	BULL-NOSE BLOWS/FT	SOIL GRAPH	SURFACE CONDITIONS
			0		(SP)	brown F-M SAND; loose, almost dry
			1			
			2			
			3			
			4			
			5		(SW)	sand more well-graded, dense
SS	18/18	5/16/24	6			
			7			trace clay, slightly moist
			8			some gravel, small cobbles, subrounded
			9			cobble
			10			
SS	18/18	12/17/16	11			
			12			coarse gravel & cobbles, subrounded
			13			
			14			slow drilling
			15			red-brown, trace clay; fractured rock in sampler
SS	12/12	28/27	16			
			17			rocky drilling; cobbles & possibly small boulders
			18			
			19			
			20			

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JOB NO.	CLIENT	LOCATION
84-209	Simons, Li & Associates	AF & I-10

LOCATION OF BORING

See Site Plan, Figure 1

DRILLING METHOD & EQUIPMENT	CME-55 Drill Rig equipped with 6 5/8" OD 3 1/4" ID hollow-stem continuous flight augers
SAMPLING METHOD	Split-spoon Penetrometer and Ring Sampler
CASING DEPTH	
BORING NO.	B-2
SHEET	2 OF 2
ENGINEER	RMP
TIME	
DATE	31 Oct 84

DATUM ELEVATION 969

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	BLOWS/6" SAMPLER	DEPTH IN FEET	BULL-NOSE BLOWS/FT	SOIL GRAPH	SURFACE CONDITIONS
			20			
SS	16 / 10	8/6/20(4")	21			red-brown GRAVELLY SAND with clay; moist slightly plastic. This material is the matrix of a SAND-GRAVEL-COBBLE seam that started @ 11.5'
			22			
			23			Auger refusal @ 22.0' Two teeth lost
			24			
			25			
			26			
			27			
			28			
			29			
			30			
			31			
			32			
			33			
			34			
			35			
			36			
			37			
			38			
			39			
			40			

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JOB NO.	CLIENT	LOCATION
84-209	Simons, Li	I-10 and AF

LOCATION OF BORING

See Site Plan, Figure 1

DRILLING METHOD & EQUIPMENT	BORING NO.
CME-55 Drill Rig equipped with 6 5/8" OD 3 1/4" ID hollow-stem continuous flight augers	B-3
	SHEET 1 OF 2
	ENGINEER RMP
SAMPLING METHOD	TIME
Split-spoon Penetrometer	
	DATE 19 Sept 84
CASING DEPTH	

DATUM ELEVATION

SAMPLE TYPE	INCHES DRIVEN / INCHES RECOVERED	BLOWS/6" SAMPLER	DEPTH IN FEET	BULL-NOSE BLOWS/FT	SOIL GRAPH	SURFACE CONDITIONS
			0			River bottom
			1			(SP) brown f-m SAND with trace gravel, almost dry
			2			
			3			
			4			
			5			some fractured rock in sampler
S	18/18	6/14/16	6			
			7			rocky
			8			occasional coarse gravel, moist
			9			(SW) sand well-graded
			10			
S	18/18	6/6/7	11			
			12			
			13			
			14			
			15			
S	18/18	7/11/11	16			
			17			
			18			
			19			
			20			log continued on next page

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JOB NO.	CLIENT	LOCATION
84-200	Simons, Li & Associates	Siltation Basin

LOCATION OF BORING

See Site Plan Figure #1

DRILLING METHOD & EQUIPMENT	BORING NO.
CME-55 Drill Rig equipped with 6 5/8" OD 3 1/4" ID hollow-stem continuous flight augers	B-4
	SHEET 1 OF 1
SAMPLING METHOD	ENGINEER RMP
Split-spoon Penetrometer	TIME 7:00-7:50
	DATE 14 Sept 84
CASING DEPTH	

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	BLOWS/6" SAMPLER	DEPTH IN FEET	BULL-NOSE BLOWS/FT	SOIL GRAPH	SURFACE CONDITIONS
						flat flood plain
			0			(SP) brown fine SAND, moist, loose
			1			
			2			coarser sand
			3			cobbles, trace gravel
			4			
			5			some varved SAND w/some clay, slightly plastic
SS	18/18	15/14/19	6			
			7			
			8			
			9			
			10			Layered, SAND-CLAY-SILT mixes, mostly sand, slightly plastic
SS	18/18	9/21/14	11			
			12			(SW) well-graded SAND w/trace gravel, moist subangular to subrounded
			13			
			14			
			15			
SS	18/18	8/17/18	16			almost dry
			17			
			18			
			19			rocky; gravel & cobbles, subrounded
			20			bottom @ 20.0

CHKD BY

DATE

desert earth engineering

JOB NO.	CLIENT	LOCATION
84-209	Simons, Li & Associates	Siltation Basin

LOCATION OF BORING

See Site Plan Figure #1

DRILLING METHOD & EQUIPMENT	BORING NO.
CME-55 Drill Rig equipped with 6 5/8" OD 3 1/4" ID hollow-stem continuous flight augers	B- 5
	SHEET 1 OF 1
SAMPLING METHOD	ENGINEER
Split-spoon Penetrometer	RMP
	TIME 8:30-9:15
CASING DEPTH	DATE 14 Sept 84

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	BLOWS/6" SAMPLER	DEPTH IN FEET	BULL-NOSE BLOWS/FT	SOIL GRAPH	SURFACE CONDITIONS
			0			flat flood plain
SS	18 / 10	3/2/3	1			(SM) brown SILTY SAND, slightly moist, loose, nonplastic
			2			
			3			
			4			dry
			5			
			6			
			7			
			8			with some silt
			9			gravel
			10			(SW) almost clean SAND, loose, well-graded
SS	18 / 18	5/10/6	11			
			12			
			13			
			14			cobbels & coarse gravel, subangular to subrounded
			15			
			16			
			17			
			18			
			19			bottom @ 20.0'
			20			

CHKD BY

DATE

desert earth engineering

JOB NO.	CLIENT	LOCATION
84-209	Simons, Li & Associates	Siltation Basin

LOCATION OF BORING

See Site Plan Figure #1

DRILLING METHOD & EQUIPMENT	BORING NO.
CME-55 Drill Rig equipped with 6 5/8" OD 3 1/4" ID hollow-stem continuous flight augers	B-6
	SHEET 1 OF 1
	ENGINEER RMP
SAMPLING METHOD	TIME
Split-spoon Penetrometer	10:30-10:50
	DATE
CASING DEPTH	14 Sept 84

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	BLOWS/6" SAMPLER	DEPTH IN FEET	BULL-NOSE BLOWS/FT	SOIL GRAPH	SURFACE CONDITIONS
						flat flood plain
			0			(ML) brown SANDY SILT, moist, loose, nonplastic
			1			
			2			dry
			3			
			4			
			5			
			6			rocky-cobbles or coarse gravel
			7			(SP-SM) light brown fine SAND w/trace silt
			8			slightly coarser sand
			9			
			10			rocky - coarse gravel
			11			
			12			
			13			
			14			
			15			rocky - coarse gravel, slightly moist
			16			(SW) sand well-graded
			17			
			18			
			19			bottom @ 20.0'
			20			

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JOB NO.	CLIENT	LOCATION
84-200	Simons, Li & Associates	Siltation Basin

LOCATION OF BORING

See Site Plan Figure #1

DRILLING METHOD & EQUIPMENT	BORING NO.
CME-55 Drill Rig equipped with 6 5/8" OD 3 1/4" ID hollow-stem continuous flight augers	B-7
	SHEET 1 of 1
SAMPLING METHOD	ENGINEER RMP
Split-spoon Penetrometer	TIME 12:20-12:50
	DATE 14 Sept 84
CASING DEPTH	

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	BLOWS/6" SAMPLER	DEPTH IN FEET	BULL-NOSE BLOWS/FT	SOIL GRAPH	SURFACE CONDITIONS
			0			flat flood plain
			1			(SM) light brown SILTY SAND w/trace gravel, dry. loose, nonplastic
			2			
			3			
			4			
			5			
			6			
			7			
			8			(SP-SM) brown fine-medium SAND w/trace silt dry
			9			gravel
			10			
			11			
			12			(SW-SM) sand more well-graded gravel & cobbles
			13			
			14			
			15			
			16			
			17			cobbles
			18			
			19			bottom @ 20.0'
			20			gravel seam

desert earth engineering

JOB NO.	CLIENT	LOCATION
84-200	Simons, Li & Associates	Siltation Basin

LOCATION OF BORING

See Site Plan Figure #1

DRILLING METHOD & EQUIPMENT	BORING NO.
CME-55 Drill Rig equipped with 6 5/8" OD 3 1/4" ID hollow-stem continuous flight augers	B-8
	SHEET 1 OF 1
	ENGINEER RMP
SAMPLING METHOD	TIME
Split-spoon Penetrometer	10:55-12:00
	DATE
CASING DEPTH	14 Sept 84

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	BLOWS/6" SAMPLER	DEPTH IN FEET	BULL-NOSE BLOWS/FT	SOIL GRAPH	SURFACE CONDITIONS
			0			(SM) brown SILTY SAND w/trace gravel, slightly moist, loose, nonplastic
			1			
			2			
			3			
			4			with some silt
			5			
SS	18/18	7/7/8	6			rocky - coarse gravel
			7			rocky
			8			
			9			(SP) fine-medium almost lcean SAND, medium dense
			10			
SS	18/18	5/6/7	11			
			12			some gravel
			13			
			14			
			15			
			16			
			17			
			18			
			19			bottom @ 20.0'
			20			

LOGGED BY

DATE

desert earth engineering

JOB NO.	CLIENT	LOCATION
84-209	Simons, Li	Siltation Basin

LOCATION OF BORING

See Site Plan, Figure 1

DRILLING METHOD & EQUIPMENT	BORING NO.
CME-55 Drill Rig equipped with 6 5/8" OD 3 1/4" ID hollow-stem continuous flight augers	B-9
	SHEET OF
	ENGINEER RMP
SAMPLING METHOD	TIME
Split-spoon Penetrometer	7:50
	DATE
CASING DEPTH	19 Sept 84

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	BLOWS/6" SAMPLER	DEPTH IN FEET	BULL-NOSE BLOWS/FT	SOIL GRAPH	SURFACE CONDITIONS
			0			(SP) brown fine SAND with trace silt and gravel; loose non-plastic
			1			
			2			
			3			(SM) drier, slightly more silt
			4			
SS	18/18	6/6/6	5			
			6			
			7			
			8			clean sand, slightly moist
			9			
			10			
			11			
			12			trace gravel
			13			
			14			(SW) trace gravel, more well-graded
SS	18/	12/12/22	15			
			16			
			17			gravel
			18			
			19			
			20			bottom at 19.5ft

desert earth engineering

JOB NO.	CLIENT	LOCATION
84-209	Simons, Li	Siltation Basin

LOCATION OF BORING

See Site Plan, Figure 1

DRILLING METHOD & EQUIPMENT

CME-55 Drill Rig equipped with 6 5/8" OD 3 1/4" ID hollow-stem continuous flight augers

SAMPLING METHOD

Split-spoon Penetrometer

CASING DEPTH

BORING NO. B-10

SHEET OF

ENGINEER RMP

TIME 7:00

DATE 19 Sept 84

DATUM

ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	BLOWS/6" SAMPLER	DEPTH IN FEET	BULL-NOSE BLOWS/FT	SOIL GRAPH	SURFACE CONDITIONS
						Flat field
			0			(SP) brown fine SAND with trace gravel and trace salt, slightly moist, loose
			1			
			2			
			3			
			4			(SM) brown SILTY fine SAND, dry, loose, non-plastic
			5			
			6			(SP) brown F-M SAND with trace gravel, loose dry
			7			
			8			
			9			
SS	18 / 18	5/6/9	10			
			11			
			12			(SW) sand more well-graded
			13			
			14			
			15			
			16			more gravel
			17			
			18			
			19			
			20			bottom at 19.5ft

CHKD BY

DATE

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JOB NO.	CLIENT	LOCATION
84-209	Simons, Li	Siltation Basin

LOCATION OF BORING

See Site Plan, Figure 1

DRILLING METHOD & EQUIPMENT

CME-55 Drill Rig equipped with 6 5/8" OD 3 1/4" ID hollow-stem continuous flight augers

SAMPLING METHOD

Split-spoon Penetrometer

CASING DEPTH

BORING NO. B-11

SHEET OF

ENGINEER RMP

TIME 6:30

DATE 19 Sept 84

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	BLOWS/6" SAMPLER	DEPTH IN FEET	BULL-NOSE BLOWS/FT	SOIL GRAPH	SURFACE CONDITIONS
			0			(SP) brown f-m SAND with trace gravel, loose moist, rounded to subrounded
			1			
			2			
			3			
			4			
			5			
			6			
			7			
			8			
			9			
SS	18/18	5/5/6	10			
			11			
			12			
			13			
			14			slight rockiness - gravel
			15			
			16			
			17			
			18			
			19			
			20			bottom at 19.5ft

CHKD BY

DATE

APPENDIX B

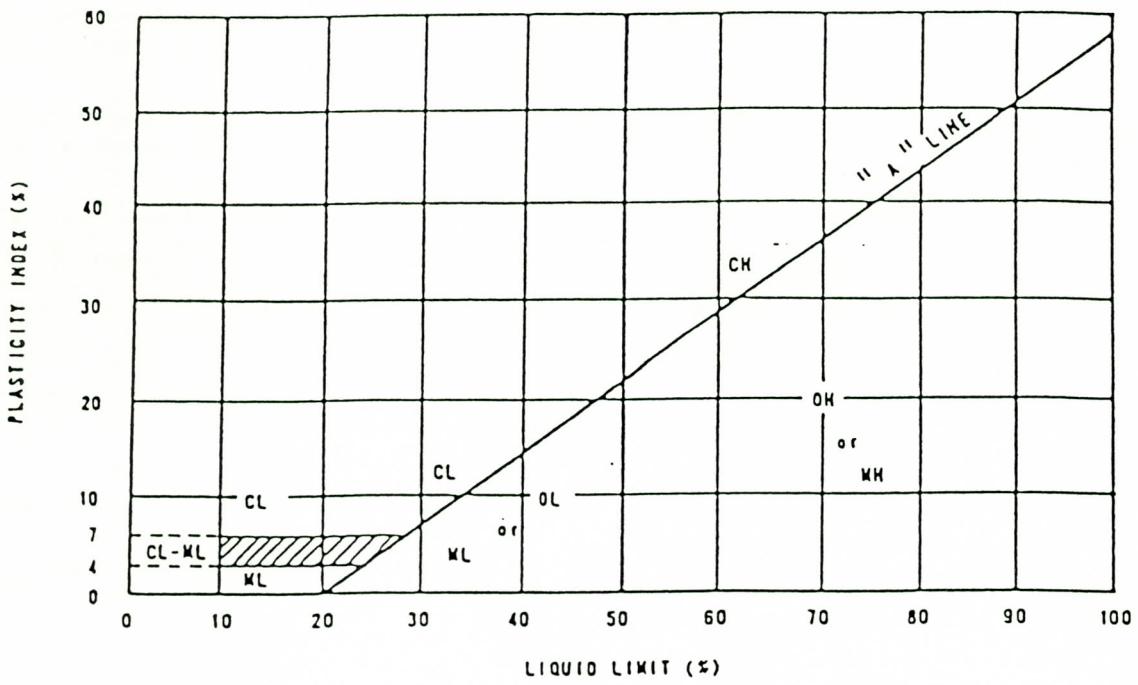
Laboratory Results

JOB 84-209

DATE 9 Oct 84

BY RMP

PLASTICITY CHART



PLASTICITY DATA

KEY SYMBOL	HOLE NO	DEPTH (feet)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	UNIFIED SOIL CLASSI-FICATION SYMBOL	% PASSING # 200
	B-3	25-26.5	30	13	SC	14

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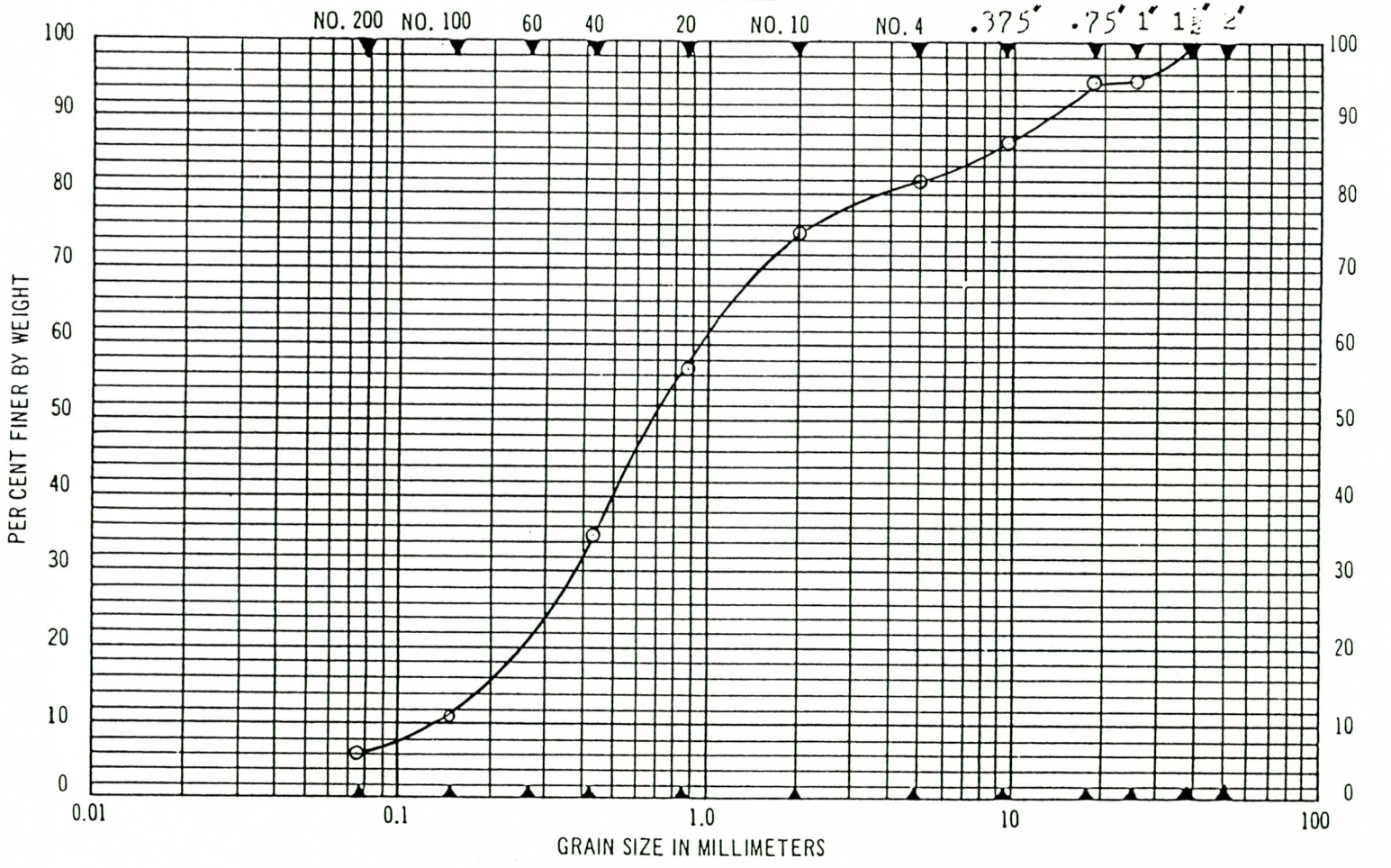
JOB NO. 84-209 BY RMP DATE 19 Oct 84

KEY	BORING	DEPTH	ELEV.	SOIL CLASSIFICATION
	B-3	5-6.5		(SW) SAND with some gravel

GRAIN-SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION SYSTEM)



SILT OR CLAY	SAND			GRAVEL		*
	FINE	MEDIUM	COARSE	FINE	COARSE	

*COBBLES

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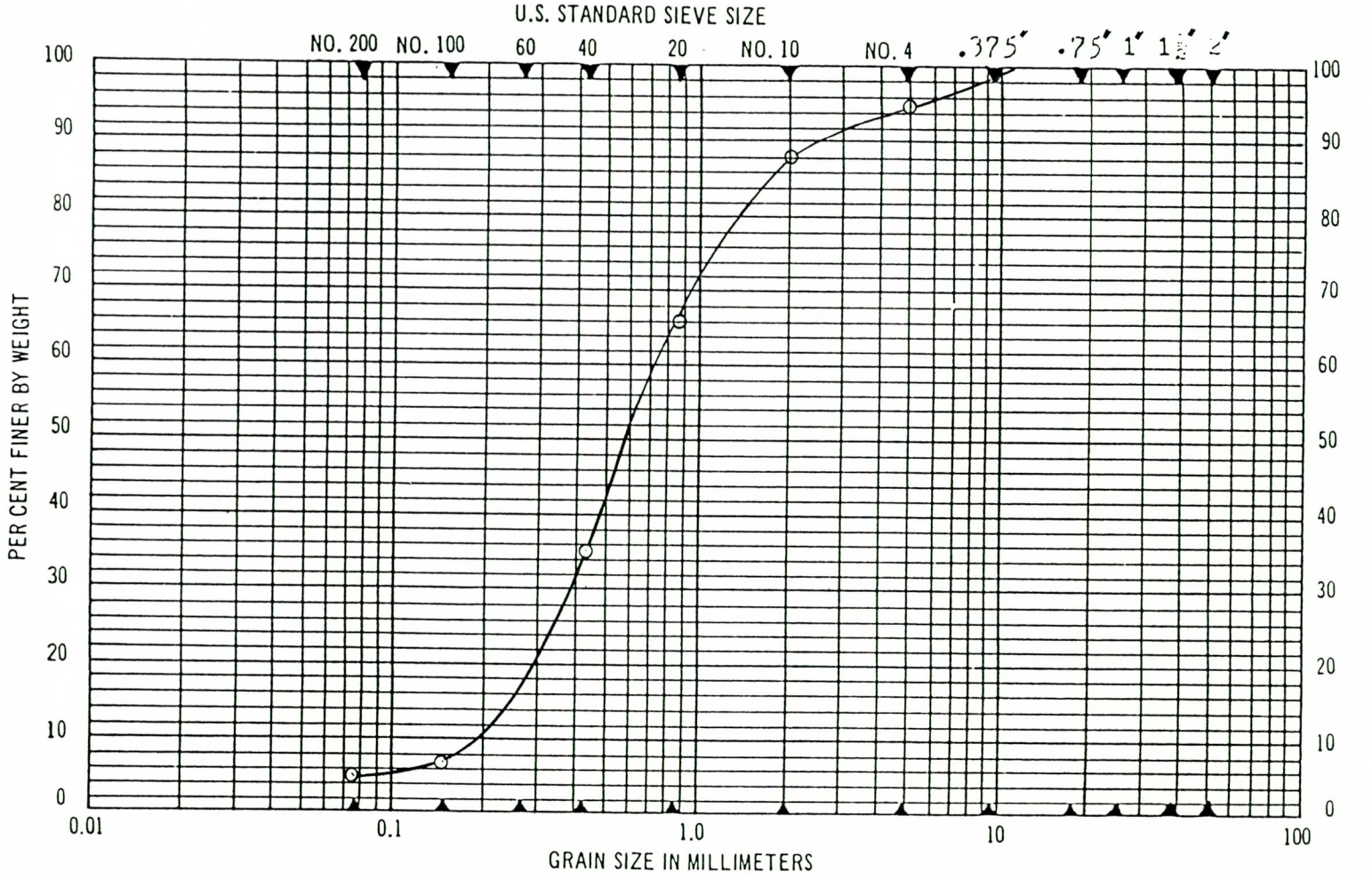
JOB NO. 84-209 BY RMP DATE 19 Oct 84

KEY	BORING	DEPTH	ELEV.	SOIL CLASSIFICATION
	B-3	10-11.5		(SP) f-m SAND with trace gravel and silt

GRAIN-SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION SYSTEM)



SILT OR CLAY	SAND			GRAVEL		*
	FINE	MEDIUM	COARSE	FINE	COARSE	

*COBBLES

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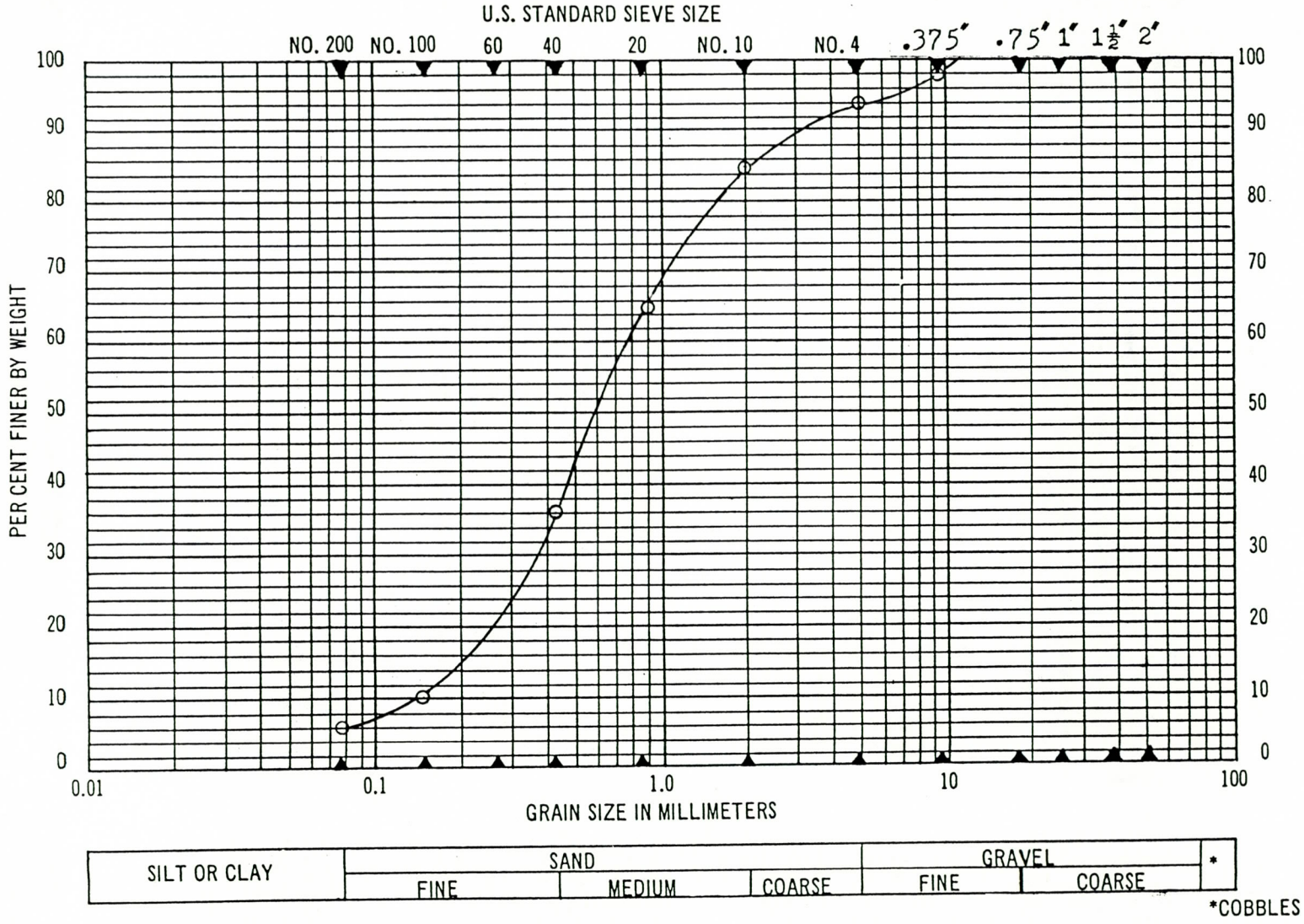
JOB NO. 84-209 BY RMP DATE 27 Sep 84

KEY	BORING	DEPTH	ELEV.	SOIL CLASSIFICATION
	B-4	15-16.5		(SW) well-graded SAND with some gravel

GRAIN-SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION SYSTEM)



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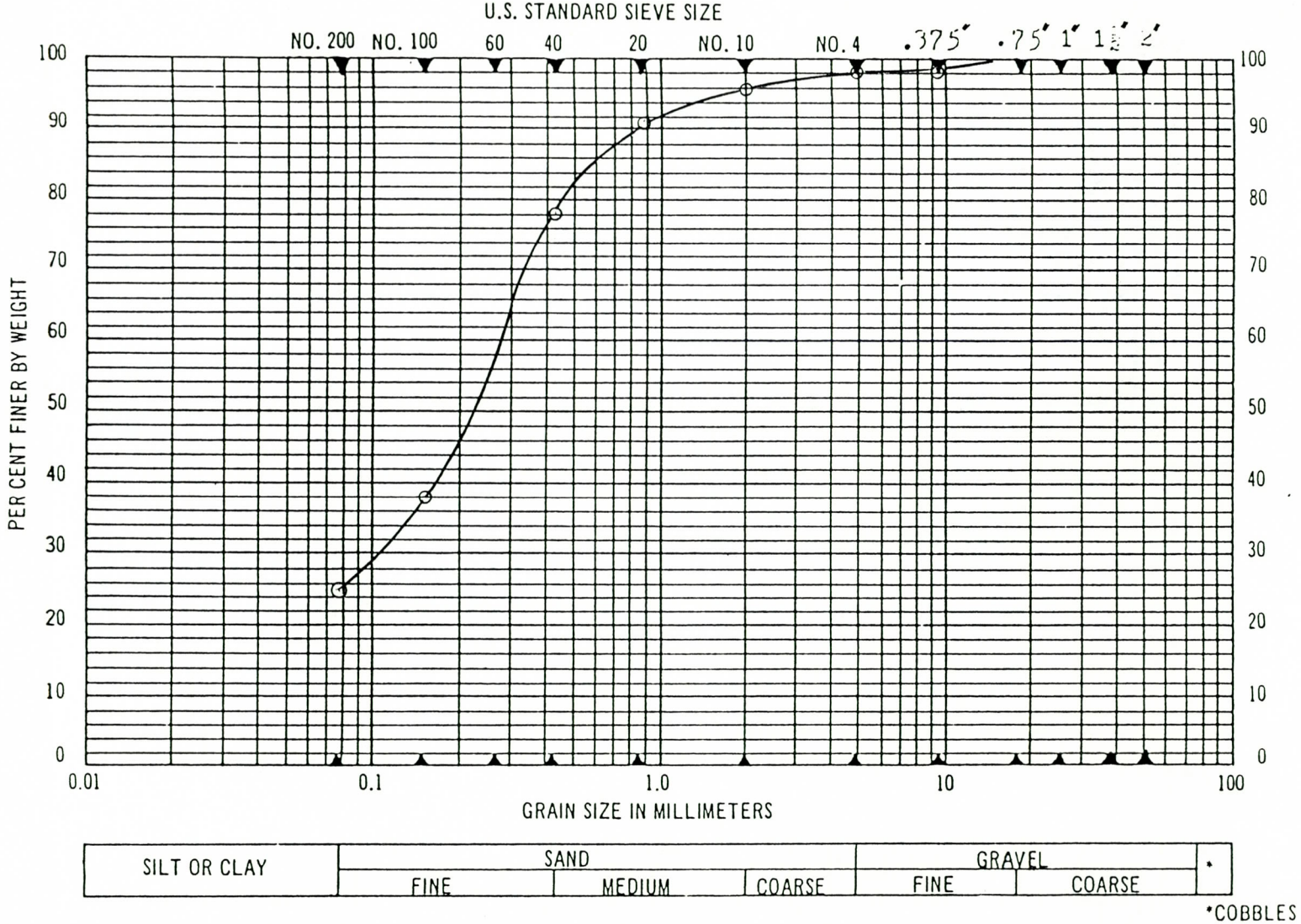
JOB NO. 84-209 BY RMP DATE 16 Oct 84

KEY	BORING	DEPTH	ELEV.	SOIL CLASSIFICATION
	B-9	4.5-6		(SM) f-m SAND with some silt

GRAIN-SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION SYSTEM)



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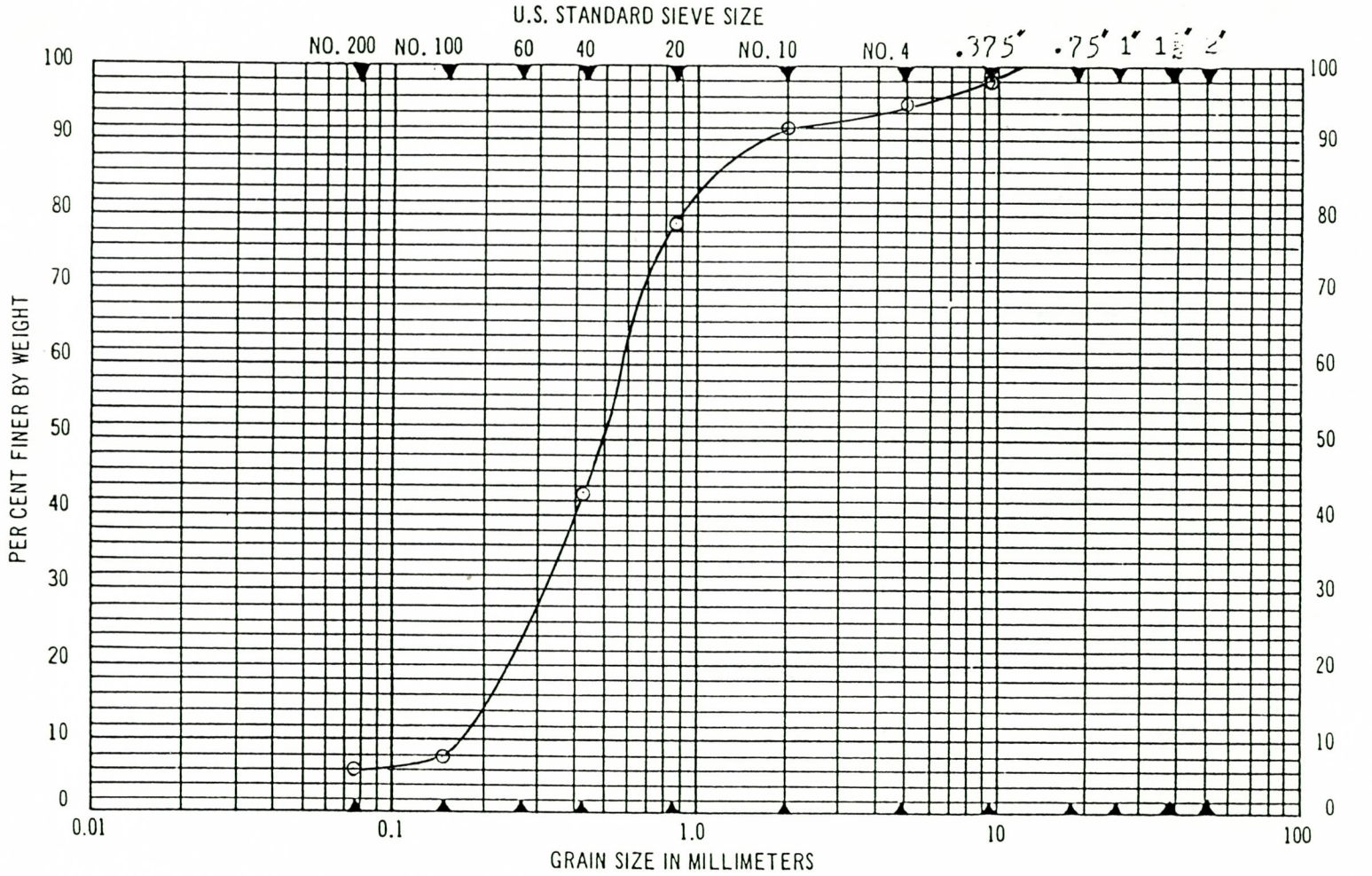
JOB NO. 84-209 BY RMP DATE 19 Oct 84

KEY	BORING	DEPTH	ELEV.	SOIL CLASSIFICATION
	B-10	9.5-11		(SP) F-M SAND with trace silt and gravel

GRAIN-SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION SYSTEM)



SILT OR CLAY	SAND			GRAVEL		*
	FINE	MEDIUM	COARSE	FINE	COARSE	

*COBBLES

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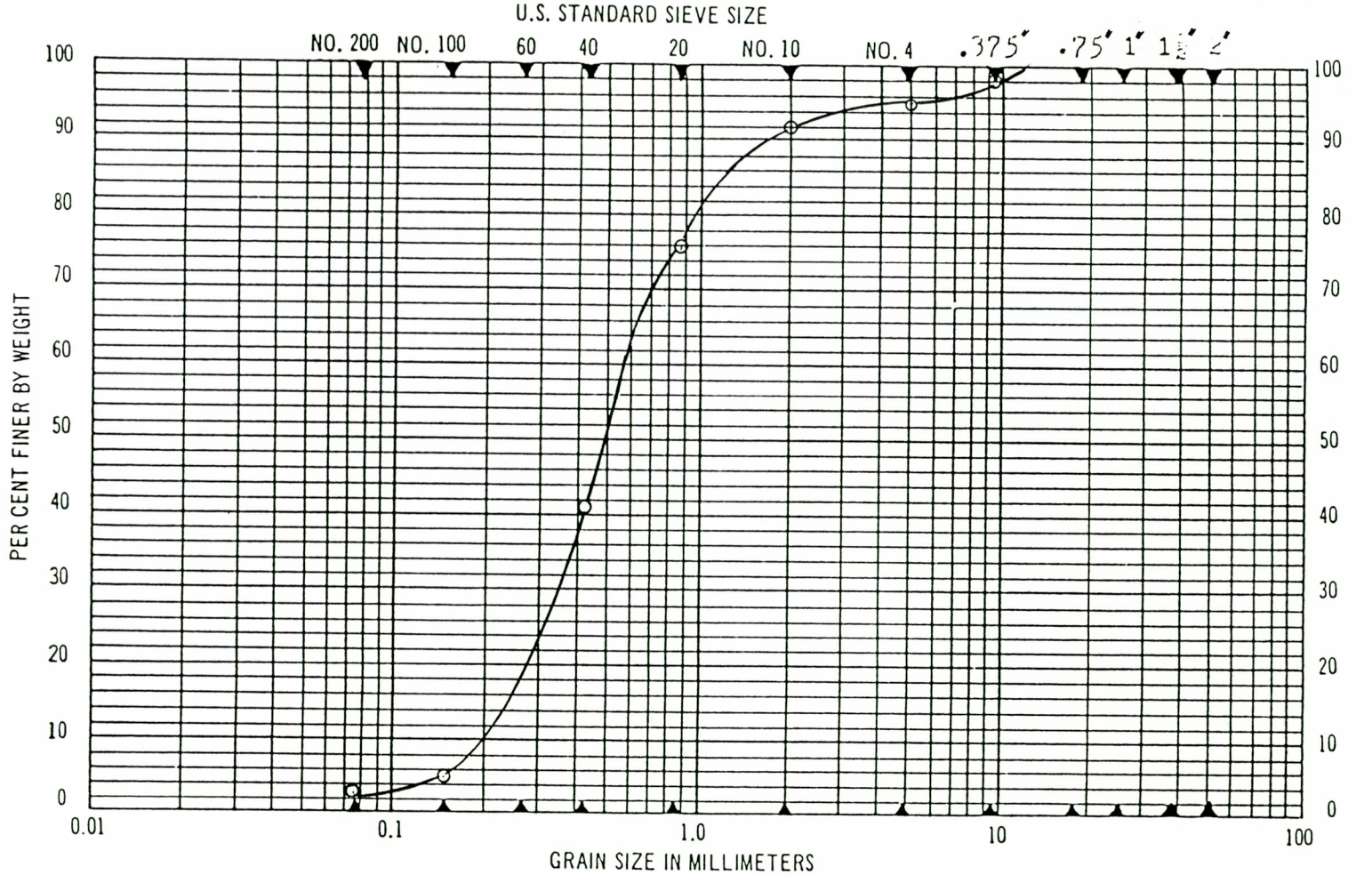
JOB NO. 84-209 BY RMP DATE 16 Oct 84

KEY	BORING	DEPTH	ELEV.	SOIL CLASSIFICATION
	B-11	9.5-11		(SP) f-m SAND with trace gravel silt

GRAIN-SIZE DISTRIBUTION
(UNIFIED SOIL CLASSIFICATION SYSTEM)



SILT OR CLAY	SAND			GRAVEL		*
	FINE	MEDIUM	COARSE	FINE	COARSE	

*COBBLES

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APPENDIX C

Fill Specification

ENGINEERED FILL SPECIFICATION

The engineered fill material or aggregate base course (ABC) material composing such a fill should be thoroughly mixed for uniform consistency, be completely free of vegetation, roots, rubble, debris or other deleterious matter, and shall conform to the following specifications.

Gradation (ASTM D422) Sieve Size	% Passing by Weight Fill	ABC
6"	100	--
1 1/2"	--	100
#4	--	45-90
#200	50 Max	0-12
Plastic Index (ASTM D424)	12 Max	5 Max
Percent Expansion	1.0 Max	0.0
Abrasion	--	50 Max
Soluble Sulfates (%)	0.10 Max	0.10 Max

*Expansion shall be measured during saturation of a remolded sample compacted to 95% of Standard Proctor (ASTM D698) density at optimum moisture content which is subject to a load intensity of 1 PSI.