Soils Report

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SAN TAN ROAD BRIDGE CROSSING
THE RWCD FLOODWAY CHANNEL
Pinal County, Arizona

12-20-78

prepared for

W.B.C. Consultants, Inc.
2444 E. University Dr., Suite 100
Phoenix, Arizona

ENGINEERS TESTING LABORATORIES, INC.

A121.919

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20 December 1978

W.B.C. Consultants, Inc.
2444 E. University Dr., Suite 100
Phoenix, Arizona

Attention: Mike Scott, Project Manager

Project: San Tan Road Bridge Crossing
the RWCD Floodway Channel
Pinal County, Arizona

Job No. 812-467A
Inv. No. 112-1138-2

In accordance with your request, this firm has performed soil engineering services relative to the subject project.

The accompanying report contains the results of the subsurface exploration, laboratory testing and the conclusions and recommendations derived from our engineering evaluation. This evaluation has been formulated in accordance with generally accepted professional engineering principles and practices.

To assist implementation of the recommendations presented, this firm provides complementary services. These services include discussion relative to compliance of final plans and specifications to the intent of this report; participation in the pre-construction conference; a site visitation with personnel for orientation purposes; and submission of addenda where report content clarifications are required. You are encouraged to avail yourself of these services.

Please do not hesitate to contact us if we can be of additional service.

Respectfully submitted,

ENGINEERS TESTING LABORATORIES, INC.
Geotechnical Services

By: Glen K. Copeland
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/jm

12-20-78

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San Tan Road Bridge Crossing
the RWCD Floodway Channel
Job No. 812-467A

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Registered Professional Engineer
CERTIFICATE NO.
GLENN K. COPELAND
Date Signed 12-20-78
ARIZONA, U.S.A.

PART I

REPORT

San Tan Road Bridge Crossing
the RWCD Floodway Channel
Job No. 812-467A

SCOPE

This report presents results of soil engineering services for the proposed San Tan Road Bridge Crossing the RWCD Floodway channel, Pinal County, Arizona. The purpose of this soils engineering report is to provide recommendations for use in the design of foundation elements, to provide comments relative to earthwork requirements and to provide drainage and slope protection recommendations. The results of the preliminary soils report and testing were reviewed and have been included herein. The field and laboratory testing has been performed and report prepared based upon the following information received from W.B.C. Consultants, Inc. and Magadini-Alagia Associates:

1. The proposed bridge will be 242 feet from abutment to abutment and approximately 32 feet in width with seven spans. A finished deck elevation of 1237.75 feet is proposed.

2. Maximum anticipated foundation loadings are as follows:

Support Member	Total Vertical Load Per Caisson Element	Lateral Load
Pier Caission	220 kips	--
Abutment Caisson	145 kips	15 kips*

*Acting 4 feet above top of caisson.

3. Channel will be constructed with side slopes of 2 to 1 (horizontal to vertical) and an initial invert elevation of 1227.84 feet (approximately 8 feet below the existing pavement grade); however, provisions for deepening the invert to Elevation 1225.84 have been included in the design. A gunite surfacing within the channel will be used to minimize erosion and scour.

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This office should be contacted for review and provision of required supplemental recommendations if finish grades, slope configurations, structure type, etc. are changed substantially or structural loadings are heavier than estimated.

SOIL EXPLORATION AND TESTING

Nine test borings were drilled with a rotary auger (CME-75) drilling rig, utilizing continuous flight augers, at locations shown on the accompanying site plan. Borings 1, 2 and 3 were drilled during preliminary study and borings 4 through 9 were drilled to confirm findings of the preliminary. During test drilling, encountered subsoils were visually examined, classified and sampled at appropriate intervals.

Representative surface and subsoil samples were subjected to the following laboratory analyses:

Test	Sample(s)	Purpose
Gradation and Atterberg Limits	Subsoil (5)	Classification
Consolidation	Undisturbed Subsoil (5)	Settlement analysis
Direct Shear	Undisturbed Subsoil (4)	Bearing capacity and shearing strength
Dry Density & Moisture Content*	Undisturbed Subsoil (29)	Physical properties of subsoils in-situ

*Reported on Soil Boring Data sheets.

The consolidation tests were performed on Casagrande "fixed ring" consolidometers. The samples were loaded to selected pressures at in-situ moisture contents and then immersed to show the effect of nearly complete saturation. The shear tests were conducted in a "Direct Shear" apparatus with selected samples immersed to approximate saturation.

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SITE AND SOIL CONDITIONS

The proposed bridge site is located within the present San Tan Road alignment south of State Highway 187. Existing development consists of an existing asphalt paved roadway with borrow ditches 1.5 to 2 feet deep on either side of the road. Adjacent lands are undeveloped desert property and vegetative cover consisted of grass, weeds and cacti with sparse trees. The ground surface was described as smooth and moderately firm.

As disclosed by the test borings and presented on the "Soil Boring Data" sheets, Part III, the subsoil profile is relatively uniform within the bridge alignment. Near surface soils, to depths ranging from 9.5 feet to 15.5 feet, are silty sandy clays of moderately firm to firm consistencies and exhibit moderate densities. These soils also exhibit variable degrees of cementation. Underlying soils, to depths of 20 to 25 feet are medium dense silty sands with occasional gravel lenses and which exhibit some zones of light cementation. Below the silty sands, a stratum of caliche (well cemented clayey sand-sandy clay) was encountered and was prevalent throughout the remaining depth of test boring penetration.

Moisture contents were described as near to slightly below plastic limits for near surface silty sandy clays; as slightly damp for silty sands; and as well below plastic limit for cemented silty sandy clays (caliche). No free groundwater table was encountered in any test borings.

DISCUSSION AND RECOMMENDATIONS

General: Based upon results of preliminary engineering evaluations, the structure will be supported by drilled caisson elements bearing upon undisturbed calcite cemented soils. It is assumed that subsurface conditions within the entire construction site do not vary substantially from soil profiles established at boring locations. If

unexpected subsoil variations are encountered during construction, this firm should be notified for supplemental recommendations.

The following generalized conclusions are drawn:

1. Near surface soils are silty sandy clays which exhibit none to light calcite cementation to depths of 4 to 8 feet and moderate cementation below these depths. These materials would be somewhat susceptible to erosion by water and weathering over prolonged time periods. Additionally, it is understood that the channel slopes at the abutments will be at 2 to 1 (horizontal to vertical) and that high water elevation of 1233.84 will result in a major portion of these soils being exposed to potential erosion during periods of peak runoff. Therefore, slope protection, in the form of rip-rap or shotcrete linings should be utilized to maintain the finished slope configuration.

2. Subsoils at the proposed channel base elevation will consist of both cemented silty sandy clays and underlying silty sands. Therefore, these soils, and particularly the silty sands, would be susceptible to scour under the mean water velocity of 6.71 fps. The scour depth is on the order of 3 to 4 feet. Therefore, the use of a shot-crete liner with turned-down approach and exit walls appears warranted to minimize scour potential and to reduce the possibility of undermining adjacent silty sandy clay slope materials which overlie the silty sands.

3. Circular drilled pier or caisson elements bearing upon the well cemented silty sandy clays (caliche) as encountered at depths of 20 to 25 feet below present grade will afford high bearing capacity with relatively low settlement potential.

4. Approach zone fills will be relatively minor. Therefore, native soils will be at pavement subgrade level and the resultant pavement sections, as presented herein, are based upon "R" value test results accomplished on native soils.

Foundation Design Recommendations: Circular drilled pier elements bearing upon undisturbed subsoils were analyzed for the anticipated loading conditions. Recommendations for other systems or loading conditions will be analyzed upon request.

Unit bearing pressures as presented herein should be considered allowable maximums for dead plus design live load conditions. A forty percent increase is permissible when considering total loads including wind or seismic forces, or to determine the maximum toe pressure of eccentrically loaded footings. Two (2.0) feet is recommended as the minimum diameter of circular piers.

The following tabulation presents the relationship between depth of caisson and allowable soil bearing capacity.

Circular Drilled Pier or Caisson:	Depth (Base Elevation)	Allowable Soil Bearing Capacity
Pier Location[1]	10.0 ft. (min.)[2] (El. 1210.0 to 1214.0)	15.0 ksf[3]
Abutment Location	20.0 ft. (min.)[2] (El. 1210.0 to 1214.0)	15.0 ksf[3]

(1) Where belled pier elements are proposed, it is recommended that the top of bell be located no less than 18 feet below existing grade so that the belling operations will in all cases be accomplished within the cemented silty sands or underlying caliche. Use of bells in non-cemented silty sands could result in significant caving.

(2) Depth to bottom of footing element referenced below lowest adjacent finished grade for abutment elements and below potential scour depth for pier elements.

(3) Bearing upon the moderate to heavy cemented subsoils.

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Estimated settlements for drilled foundations are 1/2 to 3/4 inches for the maximum anticipated load indicated under "Scope".

Drilling of straight shafts within the near surface and subsoils in the abutment areas should be readily accomplished with conventional rotary or bucket augers. However, harder drilling conditions should be anticipated at central pier elements where increased imbedment depth is required to achieve belling within cemented subsoils. It is anticipated that drilling of the elements can be accomplished provided that reasonable care is taken during drilling and construction. Some caving or raveling is anticipated where the silty sands are encountered and foundation concrete quantities will probably somewhat exceed ideal geometric volumes.

Disturbed soils (drilling spoil) must be removed from the bearing surface of drilled foundation elements designed on an end-bearing basis. Adequacy of cleaning and verification of proper configuration should be established by inspection of drilled elements. Applicable safety codes will require safety casing for protection of personnel entering shafts for cleaning or inspection. Two (2.0) feet is recommended as the minimum diameter of circular drilled foundations to be entered.

Lateral Soil Pressures: Recommended design factors to assess lateral earth pressures against retaining structures and resistances which will counteract lateral and overturning loads are presented in the following tabulation. Fill against footings, stem walls, and retaining structures should be placed to densities specified herein to minimize total active pressures and develop passive resistances with low strains.

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Equivalent Active Soil Pressures:

Undisturbed sandy clay	25 psf/ft.
Undisturbed silty sand	32 psf/ft.
Compacted granular backfill	30 psf/ft.
Compacted on-site clays	not recommended as backfill

Equivalent Passive Soil Pressures:

Abutment walls against sandy clays	400 psf/ft.
Abutment walls with slope down & away from wall	300 psf/ft.
Drilled shafts:	
Piers in silty sand	500 psf/ft.
Piers in sandy clay:	
Horizontal surface adjacent to pier	600 psf/ft.
Sloping surface (2:1) adjacent to pier	400 psf/ft.

Excavated Channel Slope Stability: Proposed channel slopes of 2 to 1 (horizontal to vertical) will provide adequate safety against failure based upon the existing soil conditions, anticipated construction procedures and proposed loading conditions. However, other variables such as embankment slope erosion, increased approach fill height, scour depth, etc. could have adverse effects on long term stability and should be considered. In addition, should the channel slopes become saturated or partially or completely submerged the factor of safety could be substantially reduced.

Corrosion: It is recommended that concrete on and below grade be made of Type II cement. Only minor corrosion of steel pipe or underground metallic conduits is indicated in areas where soil moisture contents become or remain high.

Site Grading: The following procedure is presented for placement and compaction of fill in approach fill zones and abutment areas.

1. Completely remove all loose soils, vegetation and any roadside debris, etc. from within proposed fill areas. Remove existing asphalt in areas where sufficient clearance does not

exist to place additional required base course thickness. Where sufficient clearance does exist, the existing pavement structure may be left in place but should be punctured, roughened, or otherwise treated to form an adequate shear bond between old pavement and newly placed fills.

2. Depressions, borrow ditches, etc. in excess of 8 inches should be cleaned of all loose or wet soils, widened to accommodate compaction equipment and sloping areas benched to provide a level surface for fill placement.

3. Scarify, moisten or dry as required, all exposed native ground surface to a minimum depth of 8 inches.

4. Place required fill in compacted horizontal lifts to sub-base level. Soils obtained during site grading which are free of vegetation and debris may be utilized as approach fill. More granular soils exhibiting non to low expansion characteristics should be used as backfill adjacent to abutment or wing walls.

5. Site clearing, fill placement and compaction should be accomplished under observation and testing directed by a soils engineer to ensure adequate lateral support for foundation elements, embankment slope stability and abutment walls or wing walls.

Pavement: Soils derived from channel excavation and which are free of vegetation, etc. or comparable soils borrowed from adjacent sites, may be used as fill materials to elevate paved sections and approaches. Bituminous surfacing should be dense graded central plant-mix asphaltic concrete conforming with Maricopa Association of Governments (M.A.G.) specification requirements. Either single or double lift surfacings can be utilized.

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Existing subgrade soils should be cleaned, scarified, moistened and recompacted for a minimum depth of 12 inches prior to placement of fill and pavement materials. Compaction requirements for subgrade soils and subbase fill are presented in the following sections.

The following pavement sections are recommended for indicated traffic conditions and service life and are based on an "R" value of 8.

D.T.N.	Service Life (years)	Pavement Section	Asphalt Concrete	Aggregate Base	Select Base
50	20	Alt. No. 1	11.5"	--	--
		Alt. No. 2	4"	6"	9"
100	20	Alt. No. 1	12.5"	--	--
		Alt. No. 2	4"	6"	11"

Minimum bituminous pavement thickness is indicated in all cases. The alternate system of full depth asphalt section has been provided to enable you to accomplish an economic evaluation of alternate sections.

Materials: Aggregate base course should conform to Maricopa Association of Government (M.A.G.) specifications.

The following specifications are recommended for imported granular subbase fill materials for use within construction areas:

	Imported Subbase Fill
1. Gradation (ASTM: C136): Percent passing by weight	
Sieve Size	
6"	100
1"	--
No. 4	60-100
No. 200	40 max.
2. Maximum Plasticity (ASTM: D424)	10

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	Imported Subbase Fill
3. Maximum Percent Expansion	1.5
4. Maximum Percent Soluble Sulfates	0.10

*Expansion measured upon saturation of remolded fill sample compacted to 95% of the ASTM: D698 density at a moisture content slightly below optimum under a 100 psf surcharge.

Compaction and Testing: Exposed, cleaned subgrade soils should be compacted as specified. All fill should be placed and compacted in horizontal lifts consistent with type of compaction equipment in use to achieve uniform density. Compaction should be to the following specified percent of maximum density as determined in accordance with ASTM: Designation D1557.

	Minimum Percent Compaction
Native subgrade	95
Subbase fill (on-site* or imported): Abutment backfill (pavement approach zones)	95
Miscallaneous backfill granular soils (non-pavement zones)	90

*Compaction of on-site clay soils should be accomplished with a moisture content between optimum minus 2 and optimum plus 3 percent.

DEFINITION OF TERMINOLOGY

ALLOWABLE SOIL BEARING CAPACITY ALLOWABLE FOUNDATION PRESSURE	The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.
BACKFILL	A specified material placed and compacted in a confined area.
BASE COURSE	A layer of specified material placed on a subgrade or subbase.
BASE COURSE GRADE	Top of base course.
BENCH	A horizontal surface in a sloped deposit.
CAISSON	A concrete foundation element cast in a circular excavation which may have an enlarged base. Sometimes referred to as a cast-in-place pier.
CONCRETE SLABS-ON-GRADE	A concrete surface layer cast directly upon a base, subbase or subgrade.
CRUSHED ROCK BASE COURSE	A base course composed of crushed rock of a specified gradation.
DIFFERENTIAL SETTLEMENT	Unequal settlement between or within foundation elements of a structure.
ENGINEERED FILL	Specified material placed and compacted to specified density and/or moisture conditions under observation of a representative of a soil engineer.
EXISTING FILL	Materials deposited through the action of man prior to exploration of the site.
EXISTING GRADE	The ground surface at the time of field exploration.
EXPANSIVE POTENTIAL	The potential of a soil to expand (increase in volume) due to the absorption of moisture.
FILL	Materials deposited by the action of man.
FINISHED GRADE	The final grade created as a part of the project.
GRAVEL BASE COURSE	A base course composed of naturally occurring gravel with a specified gradation.
HEAVE	Upward movement.
NATIVE GRADE	The naturally occurring ground surface.
NATIVE SOIL	Naturally occurring on-site soil.
ROCK	A natural aggregate of mineral grains connected by strong and permanent cohesive forces. Usually requires drilling, wedging, blasting or other methods of extraordinary force for excavation.
SAND AND GRAVEL BASE	A base course of sand and gravel of a specified gradation.
SAND BASE COURSE	A base course composed primarily of sand of a specified gradation.
SCARIFY	To mechanically loosen soil or break down existing soil structure.
SETTLEMENT	Downward movement.
SOIL	Any unconsolidated material composed of discrete solid particles, derived from the physical and/or chemical disintegration of vegetable or mineral matter, which can be separated by gentle mechanical means such as agitation in water.
STRIP	To remove from present location.

Continued on Reverse Side

PART II

RESULTS OF LABORATORY ANALYSES

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Job No. 812-467A

Boring No.	Depth, ft.	Soil Class.	Particle Size Distribution, %				Atterberg Limits			Moisture - Density Rel.			Specific Gravity	Permeability		'R' Value		
			Cobbles 3" to 12"	Gravel 3" to #4	Sand #4 to 200	Fines - 200	PL	LL	PI	Dry Density pcf	Optimum Moisture %	Meth.		Dry Density pcf	K Ft./Yr.	Corrected 'R'	Expansion Pressure psf	
1	12-14	SM		2	79	19												
5	10-15	SM		2	84	14	non-plastic											
8	15-20	SM		28	50	22	18	26	8									
SG"A"	0-2'	CL		1	36	58	16	32	16							8		
SG"B"	0-2'	SC			57	43	17	26	9									

Boring No.	Depth, ft.	Remarks

LEGEND

Moisture Density Relationship
1. Tested D-1556/AASHTO T-217
2. Tested ASTMD-2922/D-3017
3. Tested ASTMD-2922/AASHTO T-217
4. Rock correction applied to maximum dry density. AASHTO T-224
5. Other_____

Specific Gravity
6. Minus # 4
7. Plus # 4

Classification/Particle Size
8. Visual
9. Laboratory Tested

SOIL PROPERTIES

Job No. 812-467 A

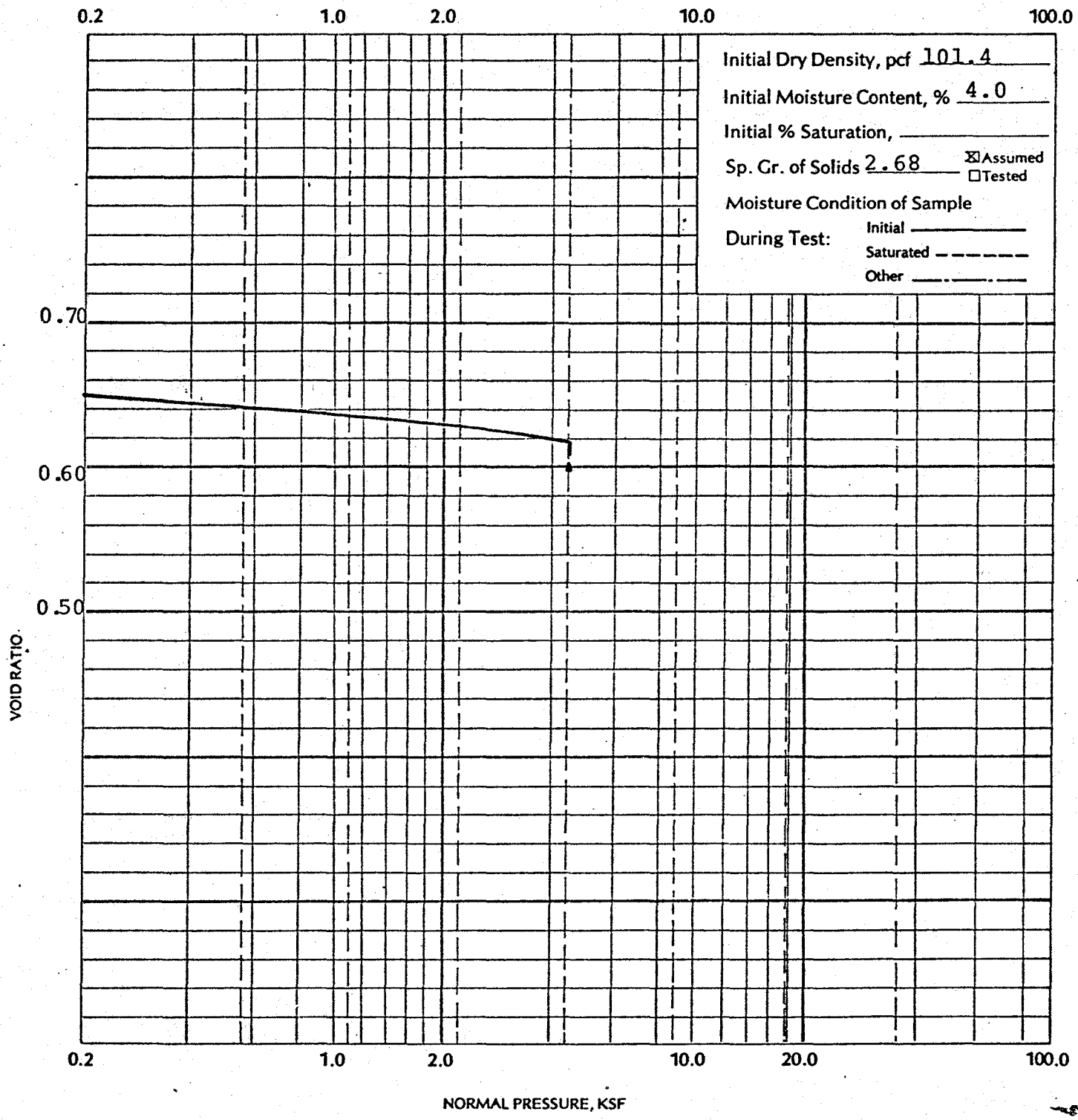
Lab No.

CONSOLIDATION PROPERTIES OF SOIL

Type of Material Silty Sand ☒Undisturbed ☐Remolded ☐Compacted

Source of Material RWCD Bridge Crossing Boring 1 Depth 10-11'

Test Procedure ASTM D2435- Reviewed By GKC Date 7-31-78



E

Job No. 812-467 A

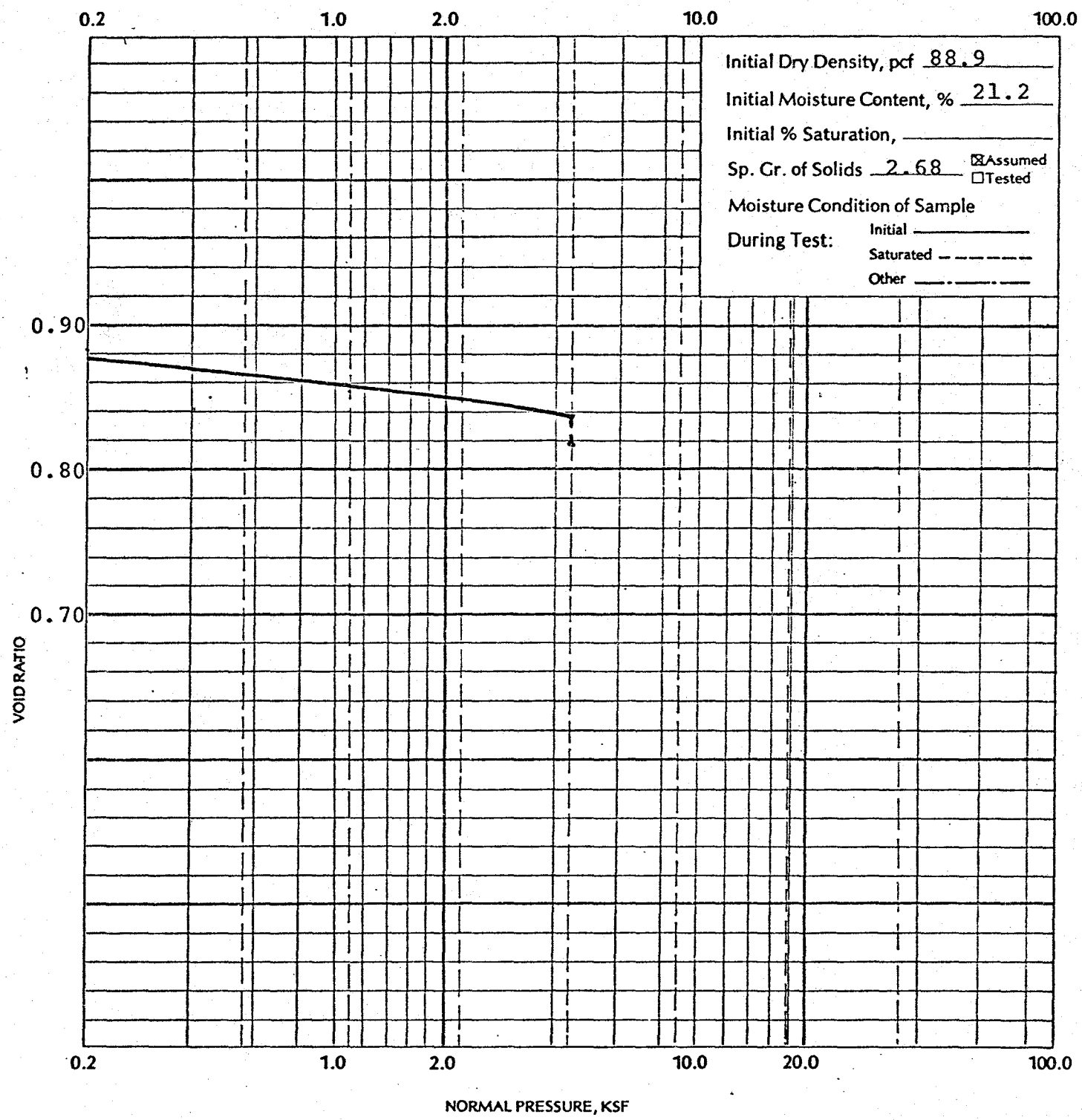
Lab No. _____

CONSOLIDATION PROPERTIES OF SOIL

Type of Material Silty Clay ☒Undisturbed ☐Remolded ☐Compacted

Source of Material RWCD Bridge Crossing Boring 2 Depth 5-6'

Test Procedure ASTM D2435- Reviewed By GKC Date 7-31-78



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Job No. 812-467 A

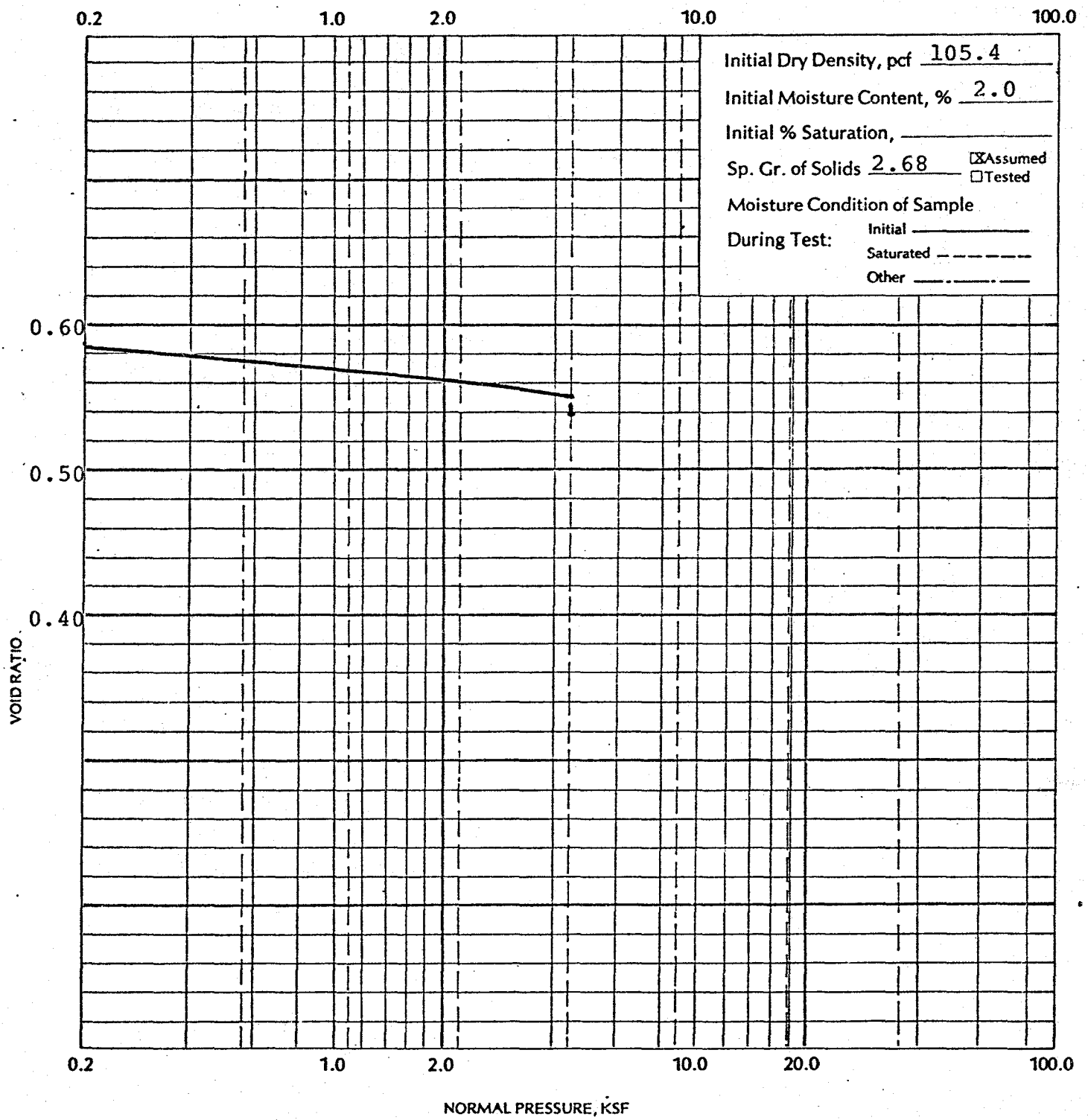
Lab No.

CONSOLIDATION PROPERTIES OF SOIL

Type of Material Sand ☒Undisturbed ☐Remolded ☐Compacted

Source of Material RWCD Bridge Crossing Boring 3 Depth 15-16

Test Procedure ASTM D2435- Reviewed By GKC Date 7-31-78



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Job No. 812-467A

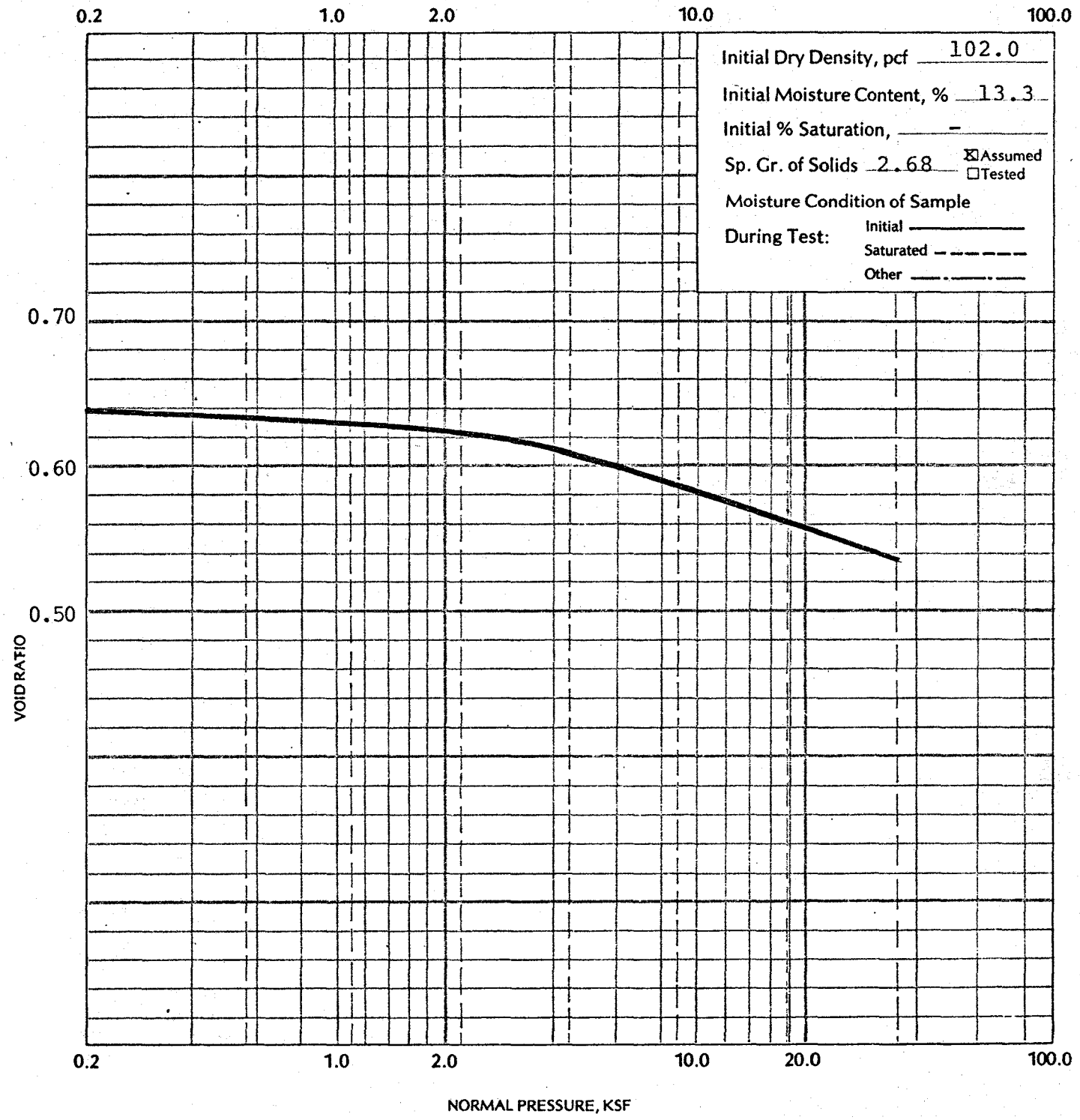
Lab No.

CONSOLIDATION PROPERTIES OF SOIL

Type of Material Cemented Sandy Clay ☒Undisturbed ☐Remolded ☐Compacted

Source of Material As Noted Boring 4 Depth 28-29'

Test Procedure ASTM D2435- Reviewed By GKC Date 12-15-78



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10-65

Job No. 812-467A

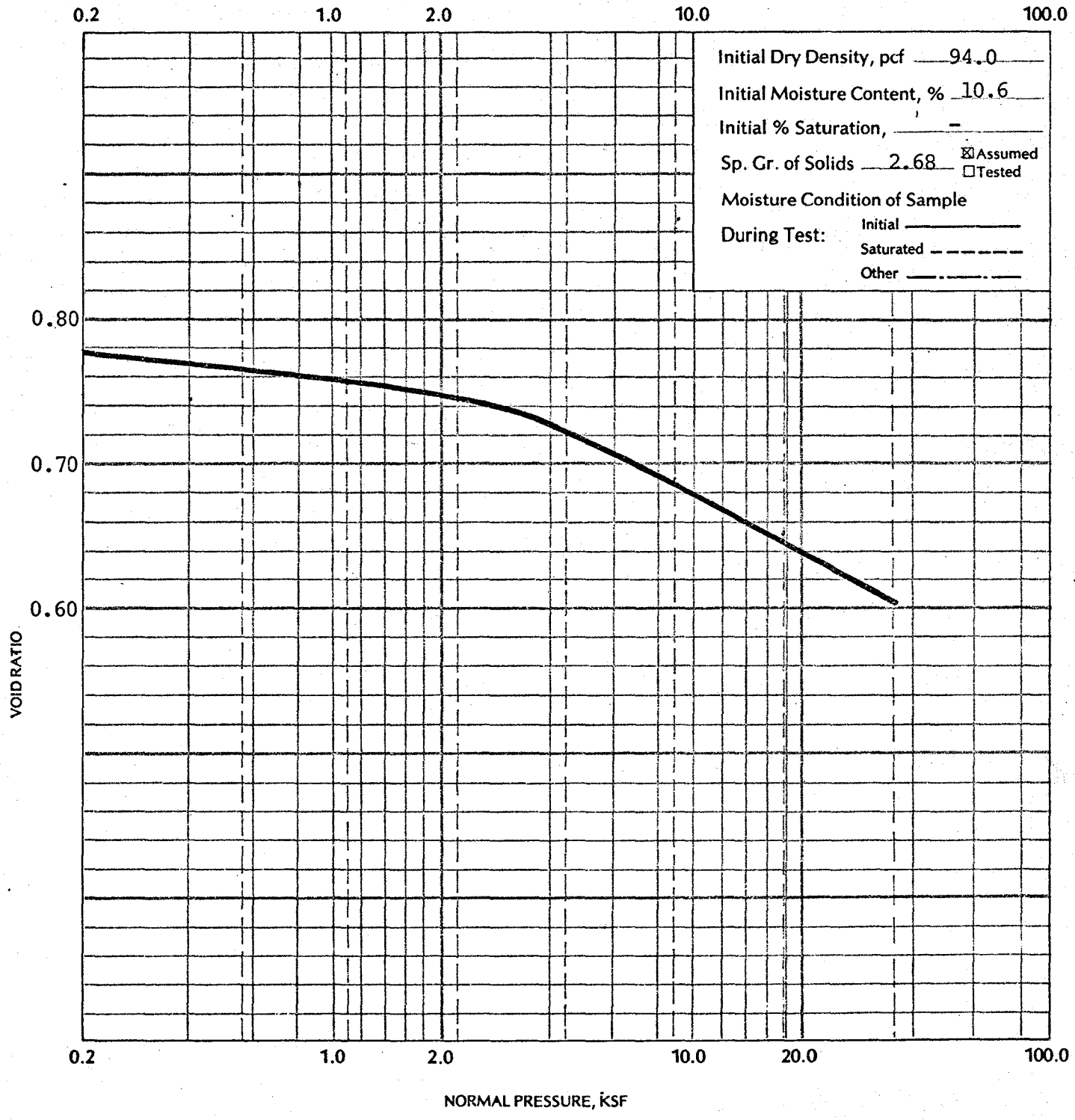
Lab No.

CONSOLIDATION PROPERTIES OF SOIL

Type of Material Caliche-Sandy Clay ☒Undisturbed ☐Remolded ☐Compacted

Source of Material Boring 4 Depth 33-34'

Test Procedure ASTM D2435- Reviewed By GKC Date 12-15-78



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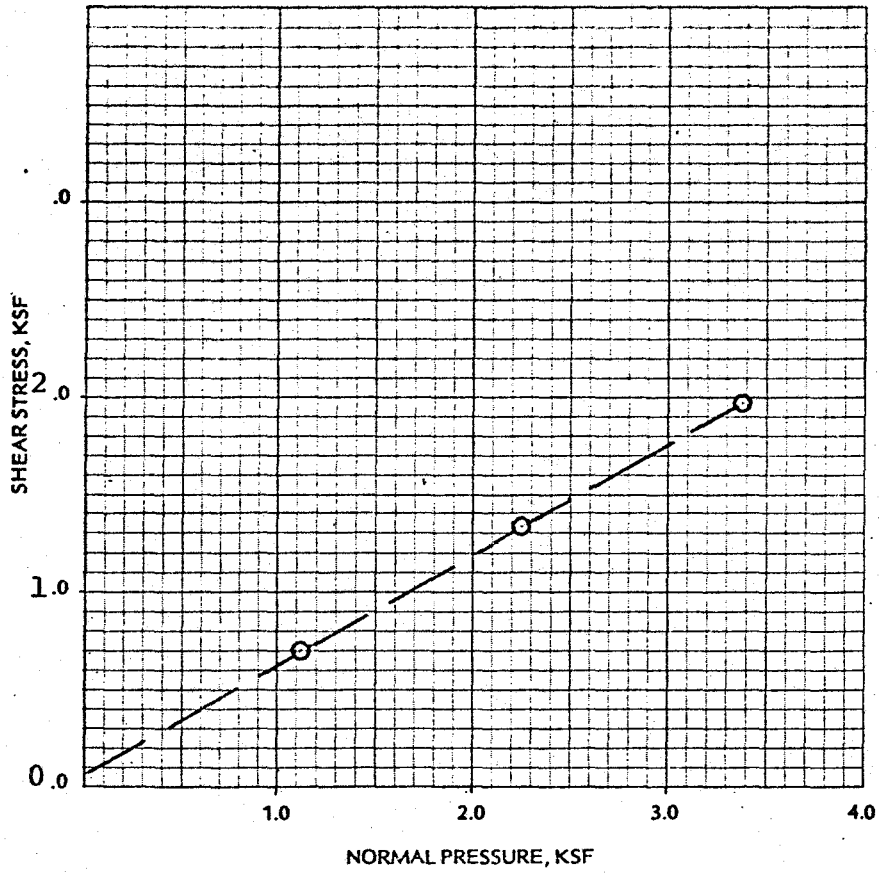
10-06

Job No. 812-467 A

DIRECT SHEAR TEST



Lab./Invoice No. _____

Type of Material _____

Source of Material TB#2; 5-6'

Sampled By GMD Date 7-10-78

Submitted By GMD Date 7-10-78

Reviewed By GKC Date 7-31-78

Test Procedure ASTM D3080- Single Shear

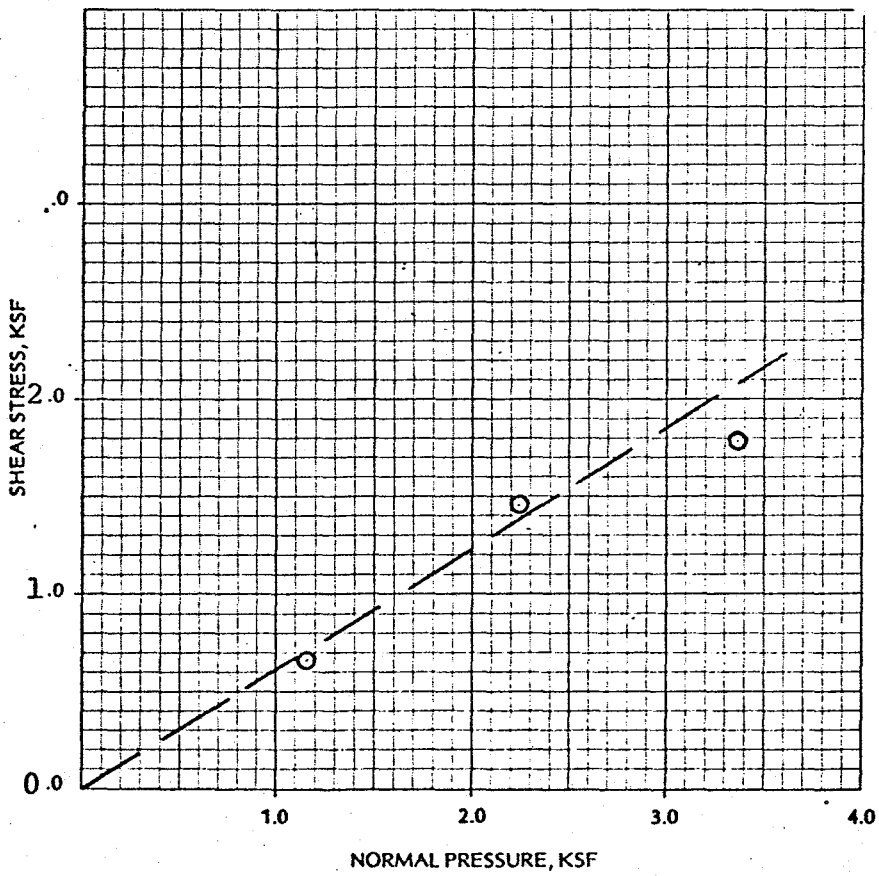
Test Condition: — — InSitu ------- Saturated

Sample Condition: ☒ Undisturbed ☐ Remolded

Initial Dry Density, pcf 88.9

Initial Moisture Content, % 21.2

ϕ = 29 ° C = 0.08 Kips/Sq. Ft.



Lab./Invoice No. _____

Type of Material _____

Source of Material TB#1; 15-16'

Sampled by GMD Date 7-10-78

Submitted By GMD Date 7-10-78

Reviewed By GKC Date 7-31-78

Test Procedure ASTM D3080- Single Shear

Test Condition: — — InSitu ------- Saturated

Sample Condition: ☒ Undisturbed ☐ Remolded

Initial Dry Density, pcf 100.9

Initial Moisture Content, % 2.5

ϕ = 31 ° C = 0 Kips/Sq. Ft.

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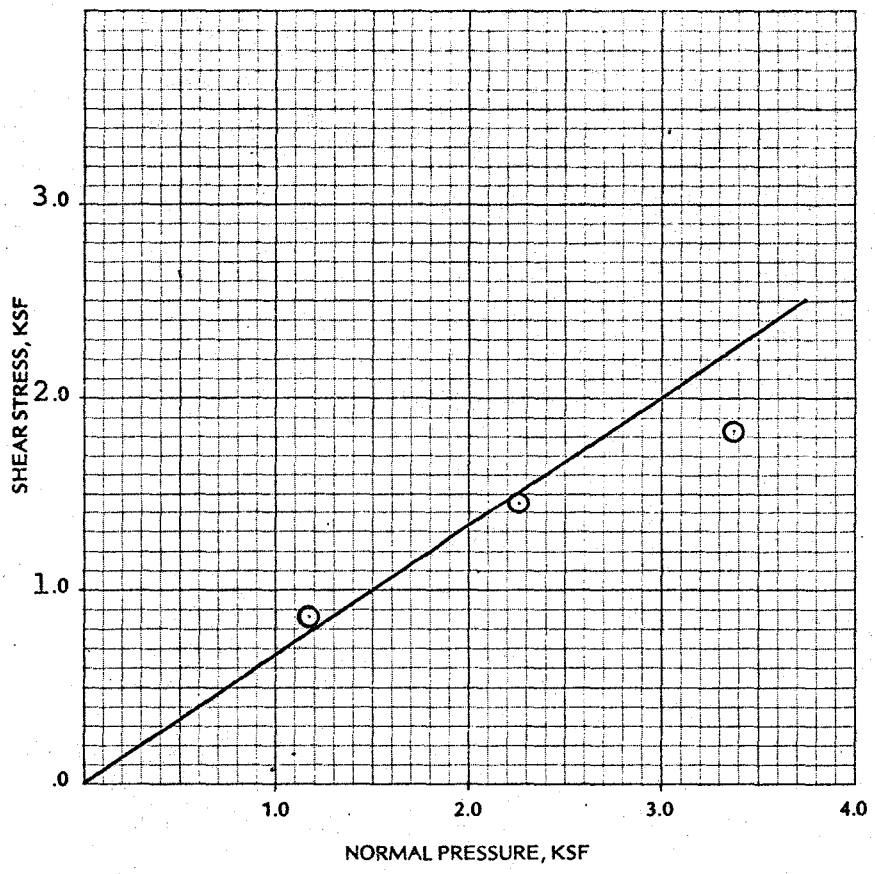
Job No. 812-467A

DIRECT SHEAR TEST



Lab./Invoice No. _____

Type of Material Sand

Source of Material TB#9; 20-21'

Sampled By GMD Date 12-1-78

Submitted By GMD Date 12-1-78

Reviewed By GKC Date 12-15-78

Test Procedure ASTM D3080- Single Shear

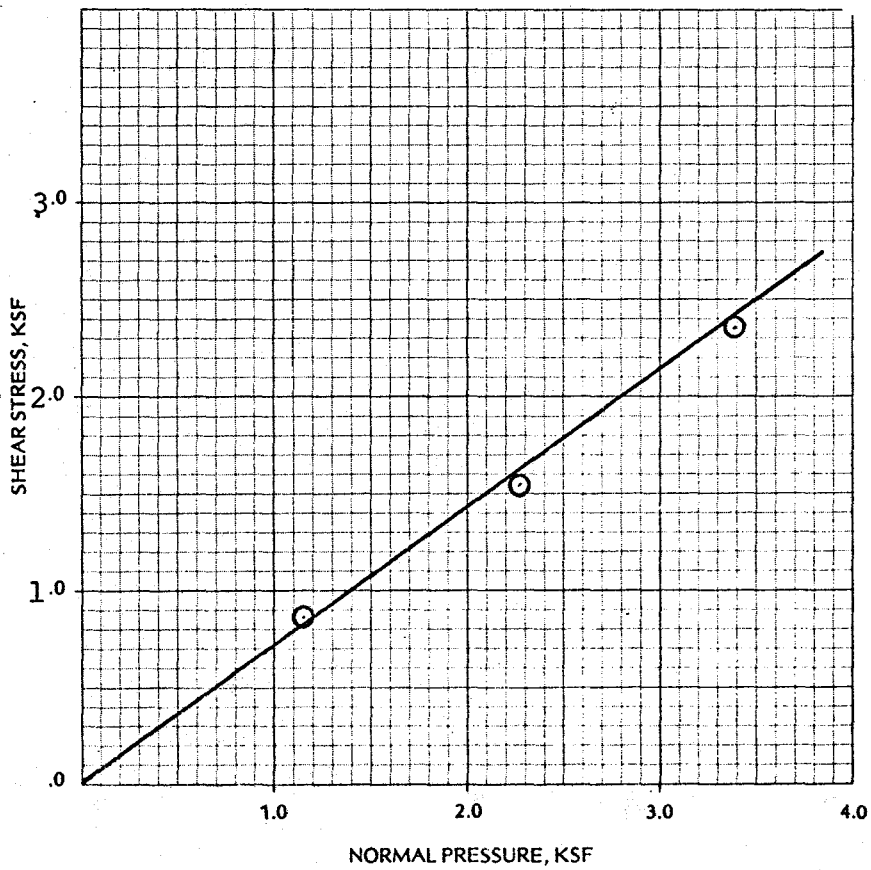
Test Condition: — — InSitu -------- Saturated

Sample Condition: ☒ Undisturbed ☐ Remolded

Initial Dry Density, pcf 104.0

Initial Moisture Content, % 2.2

ϕ = 32 ° C = 0 Kips/Sq. Ft.



Lab./Invoice No. _____

Type of Material Sand

Source of Material TB#6; 15-16'

Sampled by GMD Date 12-1-78

Submitted By GMD Date 12-1-78

Reviewed By GKC Date 12-15-78

Test Procedure ASTM D3080- Single Shear

Test Condition: — — InSitu --------Saturated

Sample Condition: ☒ Undisturbed ☐ Remolded

Initial Dry Density, pcf 106.6

Initial Moisture Content, % 4.1

O = 35 ° C = 0 Kips/Sq. Ft.

E

10-06

PART III

RESULTS OF FIELD EXPLORATION

SOIL CLASSIFICATION AND LEGEND

COARSE-GRAINED SOIL

MORE THAN 50% LARGER THAN 200 SIEVE SIZE

Symbol	Letter	DESCRIPTION	MAJOR DIVISONS
	GW	WELL-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LESS THAN 5% - 200 FINES	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size.
	GP	POORLY-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LESS THAN 5% - 200 FINES	
	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, MORE THAN 12% - 200 FINES	
	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, MORE THAN 12% - 200 FINES	
	SW	WELL-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% - 200 FINES	SANDS More than half of coarse fraction is smaller than No. 4 sieve size.
	SP	POORLY-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% - 200 FINES	
	SM	SILTY SANDS, SAND-SILT MIXTURES MORE THAN 12% - 200 FINES	
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES MORE THAN 12% - 200 FINES	

FINE-GRAINED SOIL

MORE THAN 50% SMALLER THAN 200 SIEVE SIZE

Symbol	Letter	DESCRIPTION	MAJOR DIVISIONS
	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	SILTS AND CLAYS Liquid limit less than 50
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
	OL	ORGANIC SILTS AND ORGANIC SILT-CLAYS OF LOW PLASTICITY	
	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS	SILTS AND CLAYS Liquid limit greater than 50
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
	PT	PEAT AND OTHER HIGHLY ORGANIC SOILS	

NOTE — Soils with 5 to 12 percent minus 200 fines should be classified with dual symbols

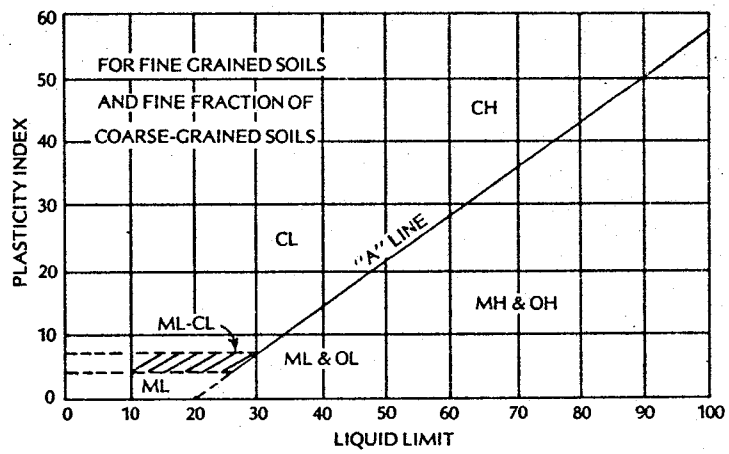
SOIL FRACTIONS

Component	Size Range
Boulders	Above 12 in.
Cobbles	3 in to 12 in.
Gravel	3 in. to No. 4 sieve
Coarse Gravel	3 in. to ¾ in.
Fine Gravel	¾ in. to No. 4 sieve
Sand	No. 4 to No. 200
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Fines (silt or clay)	Below No. 200 sieve

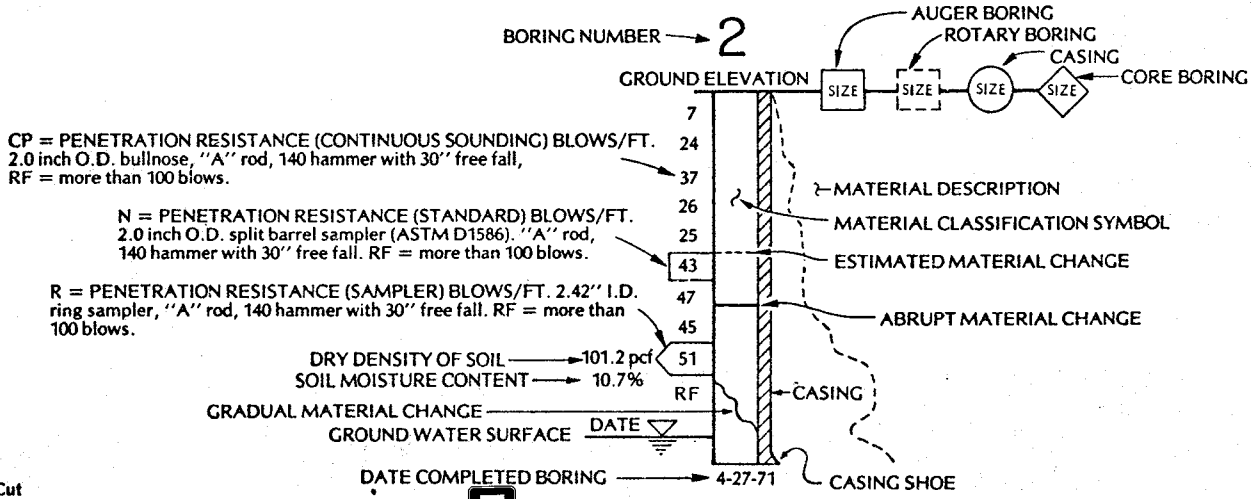
Soil Classification: ASTM D2487

Classification is visual unless accompanied by mechanical analysis and Atterberg limits. Percentage shown on log denotes visual approximation ± 5%.

PLASTICITY CHART



LEGEND OF BORING OPERATIONS



Sample Type

- **R** Ring
- **T** Shelby Tube
- **S** Standard Split Barrel
- **B** Block
- **G** Grab
- **C** Cutting
- **V** Vertical Face Cut

10-27

E

SOIL BORING DATA

Location of Boring: RWCD Bridge Crossing No. 1 Job No. 812-467 A

Elev. Top of Hole: 1236.1 Datum: Per WBC Datum Prepared By: GMD Date: 7-10-78

Type/Size of Boring: 8" Date: 7-10-78 Driller: Pete/Frank Reviewed By: KLR Date: 7-31-78

Depth Ft.	Penetration Resistance Blows/Ft. C	Penetration Resistance Blows/Ft. N	Sample Type	Dry Density pcf	Moisture Content	Graphical Log	Description	Soil Classification	Max. Size. In.	Particle Size Distribution % Boulders	Cobbles	Gravel	Sand	Silt & Clay	Gradation Well Med. Poor	Grain Shape Angular Subangular Rounded Subrounded	Relative Density Low Med High	Dry Strength None Very Low Low Medium High Very High	Plasticity None Low Medium High	Consistency Soft Firm Stiff Very Stiff Hard	Cementation None Light Moderate Heavy
1							SILTY CLAY; Light Brown	CL	1/2"				0	100		xxx			x	xx	x x
2		21	R	102.8	10.1		Trace fine sand, moderate cementa-						Tr	-							
3				near or			tion below approximately 5 feet.														
4				below PL																	
5																					
6		37	R	94.0	21.9																
7																					
8																					
9																					
10																					
1		17	R	101.4	4.0																
2																					
3				slightly			SILTY SAND; Brown; Trace Clay;	SM	1/2"			Tr	55	35		xxx	x		x		x
4				damp			Trace medium to coarse sand below						65	45							
5							17.0'.														
6		15	R	100.9	2.5																
7																					
8																					
9																					
20							Moderate to heavy calcite cementation														
1		51	R	102.2	2.2		below 20'.														
2																					
3																					
4																					
5																					
6		50/2"	R	No Recovery																	
7				slightly			CALICHE; Tan; Difficult drilling														
8				damp			below 27'.														
9																					
30																					

Stopped @ 30'
No groundwater encountered

NOTE: THE DATA PRESENTED ON THESE BORING LOGS REPRESENTS SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC TEST LOCATIONS AND AT THE TIME DESIGNATED. THIS DATA MAY NOT REPRESENT CONDITIONS AT OTHER LOCATIONS AND/OR TIMES. THIS BORING DATA WAS COMPILED PRIMARILY FOR DESIGN PURPOSES. THIS DATA SHOULD NOT BE CONSTRUED AS PART OF THE PLANS GOVERNING CONSTRUCTION OR AS DEFINING CONSTRUCTION TECHNIQUES.

10-27

E

SOIL BORING DATA

Location of Boring: RWCD Bridge Crossing No. 2 Job No. 812-467 A

Elev. Top of Hole: 1236.1 Datum: per WBC Datum Prepared By: GMD Date: 7-10-78

Type/Size of Boring: 8" Date: 7-10-78 Driller: Pete/Frank Reviewed By: KLR Date: 7-31-78

Depth Ft.	Penetration Resistance Blows/Ft. C	Penetration Resistance Blows/Ft. N	Sample Type	Dry Density pcf	Moisture Content	Graphical Log	Description	Soil Classification	Max. Size. In.	Particle Size Distribution % Boulders	Cobbles	Gravel	Sand	Silt & Clay	Gradation Well Med. Poor	Grain Shape Angular Subangular Rounded Subrounded	Relative Density Low Med High	Dry Strength None Very Low Low Medium High Very High	Plasticity None Low Medium High	Consistency Soft Firm Stiff Very Stiff Hard	Cementation None Light Moderate Heavy
1					near		SILTY CLAY; Light Brown	CL	1/2"				0	100		xxx			x	xx	x	x
2		21	R	103.7	9.4		Trace fine sand, moderate cementa-						Tr	-								
3					or		tion below approximately 5 feet.															
4					below PL																	
5																						
6		20	R	88.9	21.2																	
7																						
8																						
9																						
10																						
1		20	R	97.9	5.2																	
2																						
3					slightly		SILTY SAND; Brown; Trace Clay;	SM	1/2"			Tr	55	35		xxx	x			x		x
4					damp		Trace medium to coarse sand below						65	45								
5							15'.															
6		50	R	*	6.1		Moderate to heavy calcite cementation															
7							below 15 ft.															
8																						
9																						
20																						
1		50/10"	R	No Recovery																		
2					slightly		CALICHE; Tan; Difficult drilling															
3					damp		below 27'.															
4																						
5																						
6		50/2"	R	No Recovery																		
7																						
8																						
9																						
30																						

Stopped @ 30'
No groundwater encountered

NOTE: THE DATA PRESENTED ON THESE BORING LOGS REPRESENTS SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC TEST LOCATIONS AND AT THE TIME DESIGNATED. THIS DATA MAY NOT REPRESENT CONDITIONS AT OTHER LOCATIONS AND/OR TIMES. THIS BORING DATA WAS COMPILED PRIMARILY FOR DESIGN PURPOSES. THIS DATA SHOULD NOT BE CONSTRUED AS PART OF THE PLANS GOVERNING CONSTRUCTION OR AS DEFINING CONSTRUCTION TECHNIQUES.

10-27

E

SOIL BORING DATA

Location of Boring: RWCD Bridge Crossing No. 3 Job No. 812-467 A

Elev. Top of Hole: 1235.9 Datum: per WBC Datum Prepared By: GMD Date: 7-10-78

Type/Size of Boring: 8" Date: 7-10-78 Driller: Pete/Frank Reviewed By: KLR Date: 7-31-78

Depth Ft.	Penetration Resistance Blows/Ft. C	Penetration Resistance Blows/Ft. N	Sample Type	Dry Density pcf	Moisture Content	Graphical Log	Description	Soil Classification	Max. Size. In.	Particle Size Distribution % Boulders	Cobbles	Gravel	Sand	Silt & Clay	Gradation Well Med. Poor	Grain Shape Angular Subangular Rounded Subrounded	Relative Density Low Med High	Dry Strength None Very Low Low Medium High Very High	Plasticity None Low Medium High	Consistency Soft Firm Stiff Very Stiff Hard	Cementation None Light Moderate Heavy
1							SILTY SANDY CLAY; Light Brown	CL	1/2"				Tr	60		xxx			x	xx	x x
2		19	R	95.7	11.5		Trace fine sand						40	90							
3				near or																	
4				below PL																	
5																					
6		48	R	94.6	22.1																
7																					
8							Moderate cementation below 8'														
9																					
10																					
1		25	R	94.7	5.0																
2																					
3				slightly			SILTY SAND; Brown; Trace Clay;	SM	1/2"			Tr	55	35		xxx	x		x		x
4				damp			Trace medium to coarse sand below						65	45							
5							15'.														
6		16	R	105.4	2.0																
7																					
8																					
9																					
20																					
1		49	R	101.4	15.3																
2																					
3																					
4				slightly			CALICHE; Tan; Difficult drilling														
5				damp			below 27'.														
6		75/5"	S																		
7																					
8																					
9																					
30																					

Stopped @ 30'
No groundwater encountered

NOTE: THE DATA PRESENTED ON THESE BORING LOGS REPRESENTS SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC TEST LOCATIONS AND AT THE TIME DESIGNATED. THIS DATA MAY NOT REPRESENT CONDITIONS AT OTHER LOCATIONS AND/OR TIMES. THIS BORING DATA WAS COMPILED PRIMARILY FOR DESIGN PURPOSES. THIS DATA SHOULD NOT BE CONSTRUED AS PART OF THE PLANS GOVERNING CONSTRUCTION OR AS DEFINING CONSTRUCTION TECHNIQUES.

10-27

E

SOIL BORING DATA

Location of Boring: RWCD Bridge Crossing -Offset 29'E of staked position No. 4 Job No. 812-467A

Elev. Top of Hole: 1234.9 Datum: per WBC Datum Prepared By: GMD Date: 12-1-78

Type/Size of Boring: 8" Date: 12-1-78 Driller: PL Reviewed By: GKC Date: 12-20-78

Depth Ft.	Penetration Resistance Blows/Ft. C	N	Sample Type	Dry Density pcf	Moisture Content	Graphical Log	Description	Soil Classification	Max. Size, In.	Particle Size Distribution % Boulders	Cobbles	Gravel	Sand	Silt & Clay	Gradation Well Med. Poor	Grain Shape Angular Subangular Rounded Subrounded	Relative Density Low Med High	Dry Strength None Very Low Low Medium High Very High	Plasticity None Low Medium High	Consistency Soft Firm Stiff Very Stiff Hard	Cementation None Light Moderate Heavy
1			sli. below PL				SILTY SANDY CLAY; Brown to Tan;	CL	½"				Tr	60		XXX	-		X	X	XX
2							Light cementation to 3.5'; moder-						40	90							
3							ate to heavy calcite cementation														
4		43	R	83.8	19.6		below 3.5'.														X
5																					X
6																					
7							Becomes sandier below 7'														
8																					
9		55	R	107.6	17.5																
10																					
1																					
2																					
3				sli. damp			SILTY SAND; Light Brown to Brown	SM	3/4"			Tr	70	20	XX	X X	X	X	XX	-	X
4		19	R	No Recovery			Light cementation. Fine to coarse						80	30							
5							sand, trace fine gravel.														
6		19	R	No Recovery																	
7																					
8																					
9		33	S				Gravel content increases below 19'														
20																					
1																					
2																					
3																					
4		129/9"	S																		
5			well below PL				CALICHE-SILTY SANDY CLAY; Tan	CL	¼"				25	65		XXX	-		X	X	X	XX
6							Heavy calcite cementation.						35	75							
7																					
8																					
9		50/10"	R	102.0	13.3																
30							(continued)														

NOTE: THE DATA PRESENTED ON THESE BORING LOGS REPRESENTS SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC TEST LOCATIONS AND AT THE TIME DESIGNATED. THIS DATA MAY NOT REPRESENT CONDITIONS AT OTHER LOCATIONS AND/OR TIMES. THIS BORING DATA WAS COMPILED PRIMARILY FOR DESIGN PURPOSES. THIS DATA SHOULD NOT BE CONSTRUED AS PART OF THE PLANS GOVERNING CONSTRUCTION OR AS DEFINING CONSTRUCTION TECHNIQUES.

10-27

E

SOIL BORING DATA

Location of Boring: RWCD Bridge Crossing - Offset 29'E of staked position No. 4 Job No. 812-467A

Elev. Top of Hole: 1234.9 Datum: per WBC Datum Prepared By: GMD Date: 12-1-78

Type/Size of Boring: 8" Date: 12-1-78 Driller: PL Reviewed By: GKC Date: 12-20-78

Depth Ft.	Penetration Resistance Blows/Ft. C	Penetration Resistance Blows/Ft. N	Sample Type	Dry Density pcf	Moisture Content	Graphical Log	Description (continued)	* Soil Classification	Max. Size. In.	Particle Size Distribution % Boulders	Cobbles	Gravel	Sand	Silt & Clay	Gradation Well Med. Poor	Grain Shape Angular Subangular Rounded Subrounded	Relative Density Low Med High	Dry Strength None Very Low Low Medium High Very High	Plasticity None Low Medium High	Consistency Soft Firm Stiff Very Stiff Hard	Cementation None Light Moderate Heavy
30							CALICHE-SILTY SANDY CLAY; Tan														
2																					
3																					
4		50/5"	R	94.0	10.6		Very heavy cementation below 32'; rock-hard nodules 2" in diameter.														
5																					
6																					
7																					
8																					
9		50	R	No Recovery																	
40																					
1																					
2							Stopped @ 40'														
3							No groundwater encountered														
4																					
5																					
6																					
7																					
8																					
9																					
1																					
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					

NOTE: THE DATA PRESENTED ON THESE BORING LOGS REPRESENTS SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC TEST LOCATIONS AND AT THE TIME DESIGNATED. THIS DATA MAY NOT REPRESENT CONDITIONS AT OTHER LOCATIONS AND/OR TIMES. THIS BORING DATA WAS COMPILED PRIMARILY FOR DESIGN PURPOSES. THIS DATA SHOULD NOT BE CONSTRUED AS PART OF THE PLANS GOVERNING CONSTRUCTION OR AS DEFINING CONSTRUCTION TECHNIQUES.

10-27

E

SOIL BORING DATA

Location of Boring: RWCD Bridge Crossing -Offset 23'10" W of staked position No. 5 Job No. 812-467A

Elev. Top of Hole: 1236.0 Datum: per WBC Datum Prepared By: GMD Date: 12-1-78

Type/Size of Boring: 8" Date: 12-1-78 Driller: PL Reviewed By: GKC Date: 12-20-78

Depth Ft.	Penetration Resistance Blows/Ft. C	N	Sample Type	Dry Density pcf	Moisture Content	Graphical Log	Description	Soil Classification	Max. Size. In.	Particle Size Distribution % Boulders	Cobbles	Gravel	Sand	Silt & Clay	Gradation Well Med. Poor	Grain Shape Angular Subangular Rounded Subrounded	Relative Density Low Med High	Dry Strength None Very Low Low Medium High Very High	Plasticity None Low Medium High	Consistency Soft Firm Stiff Very Stiff Hard	Cementation None Light Moderate Heavy
1				sli.	below PL		SILTY SANDY CLAY; Brown to Tan;	CL	½"				Tr	60		XXX			X	X	X X X
2							Moderate to heavy cementation						40	90							
3							below 6.5'														
4																					
5																					
6																					X
7																					X
8																					
9							Becomes sandier below 9'														
10																					
1																					
2																					
3																					
4		16	S				SILTY SAND; Light Brown to Brown	SM	3/4"			Tr	70	20	XX	X X	X	X	XX		X
5				sli.	damp		Light cementation						80	30							
6							Fine to coarse sand, trace fine														
7		17	S				gravel.														
8																					
9																					
20																					
1		24	S																		
2																					
3																					
4																					
5				well below PL			CALICHE-SILTY SANDY CLAY; Tan	CL	¼"				25	65		XXX		—	X	X	X XX
6							Heavy calcite cementation.						35	75							
7																					
8																					
9																					
30							(continued)														

NOTE: THE DATA PRESENTED ON THESE BORING LOGS REPRESENTS SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC TEST LOCATIONS AND AT THE TIME DESIGNATED. THIS DATA MAY NOT REPRESENT CONDITIONS AT OTHER LOCATIONS AND/OR TIMES. THIS BORING DATA WAS COMPILED PRIMARILY FOR DESIGN PURPOSES. THIS DATA SHOULD NOT BE CONSTRUED AS PART OF THE PLANS GOVERNING CONSTRUCTION OR AS DEFINING CONSTRUCTION TECHNIQUES.

10-27

E

SOIL BORING DATA

Location of Boring: RWCD Bridge Crossing -Offset 23' 10" W of staked position No. 5 Job No. 812-467A

Elev. Top of Hole: 1236.0 Datum: per WBC Datum Prepared By: GMD Date: 12-1-78

Type/Size of Boring: 8" Date: 12-1-78 Driller: PL Reviewed By: GKC Date: 12-20-78

Depth Ft.	Penetration Resistance Blows/Ft. C	Penetration Resistance Blows/Ft. N	Sample Type	Dry Density pcf	Moisture Content	Graphical Log	Description (continued)	Soil Classification	Max. Size. In.	Particle Size Distribution % Boulders	Cobbles	Gravel	Sand	Silt & Clay	Gradation Well Med. Poor	Grain Shape Angular Subangular Rounded Subrounded	Relative Density Low Med High	Dry Strength None Very Low Low Medium High Very High	Plasticity None Low Medium High	Consistency Soft Firm Stiff Very Stiff Hard	Cementation None Light Moderate Heavy
30		50/9"	R	83.6	13.8		CALICHE-SILTY SANDY CLAY; Tan														
2																					
3							Very heavy cementation below 31',														
4							nodules 2" in diameter.														
5																					
6																					
7																					
8																					
9																					
40																					
1		50/5"	R	78.1	9.3																
2																					
3							Stopped @ 41'														
4							No groundwater encountered														
5																					
6																					
7																					
8																					
9																					
20																					
1																					
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
30																					

NOTE: THE DATA PRESENTED ON THESE BORING LOGS REPRESENTS SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC TEST LOCATIONS AND AT THE TIME DESIGNATED. THIS DATA MAY NOT REPRESENT CONDITIONS AT OTHER LOCATIONS AND/OR TIMES. THIS BORING DATA WAS COMPILED PRIMARILY FOR DESIGN PURPOSES. THIS DATA SHOULD NOT BE CONSTRUED AS PART OF THE PLANS GOVERNING CONSTRUCTION OR AS DEFINING CONSTRUCTION TECHNIQUES.

10-27

SOIL BORING DATA

Location of Boring: RWCD Bridge Crossing -Offset 20'9" E of staked position No. 6 — Job No. 812-467A

Elev. Top of Hole: 1234.9 — Datum: per WBC Datum — Prepared By: GMD — Date: 12-1-78

Type/Size of Boring: 8" — Date: 12-1-78 — Driller: PL — Reviewed By: GKC — Date: 12-20-78

Depth Ft.	Penetration Resistance Blows/Ft. C	N	Sample Type	Dry Density pcf	Moisture Content	Graphical Log	Description	Soil Classification	Max. Size. In.	Particle Size Distribution % Boulders	Cobbles	Gravel	Sand	Silt & Clay	Gradation Well Med. Poor	Grain Shape Angular Subangular Rounded Subrounded	Relative Density Low Med High	Dry Strength None Very Low Low Medium High Very High	Plasticity None Low Medium High	Consistency Soft Firm Stiff Very Stiff Hard	Cementation None Light Moderate Heavy
1				sli. below			SILTY SANDY CLAY; Brown to Tan;	CL	½"				Tr	60		xxx	–	x	x	x x	x
2					PL								40	90							
3							Light cementation to 5'; moderate														
4							to heavy cementation below 5'.														
5																					x
6																					x
7																					
8																					
9																					
10																					
1		50/9"	R	101.4	10.3																
2																					
3																					
4																					
5																					
6		39	R	106.0	4.1																
7																					
8				sli. damp			SILTY SAND; Light Brown to Brown	SM	3/4"			Tr	70	20	xx	x x	x	x	xx	–	x
9							Light cementation.						80	30							
20							Gravelly Silty Sand zone 19-22'														
1																					
2																					
3																					
4																					
5																					
6		50/2"	R	No Recovery																	
7																					
8		well	below	PL			CALICHE-SILTY SANDY CLAY; Tan	CL	¼"				25	65		xxx	–	x	x	x	xx
9							Heavy calcite cementation.						35	75							
30							(continued)														

NOTE: THE DATA PRESENTED ON THESE BORING LOGS REPRESENTS SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC TEST LOCATIONS AND AT THE TIME DESIGNATED. THIS DATA MAY NOT REPRESENT CONDITIONS AT OTHER LOCATIONS AND/OR TIMES. THIS BORING DATA WAS COMPILED PRIMARILY FOR DESIGN PURPOSES. THIS DATA SHOULD NOT BE CONSTRUED AS PART OF THE PLANS GOVERNING CONSTRUCTION OR AS DEFINING CONSTRUCTION TECHNIQUES.

SOIL BORING DATA

Location of Boring: RWCD Bridge Crossing -Offset 20'9"E of staked position No. 6 Job No. 812-467A

Elev. Top of Hole: 1234.9 Datum: per WBC Datum Prepared By: GMD Date: 12-1-78

Type/Size of Boring: 8" Date: 12-1-78 Driller: PL Reviewed By: GKC Date: 12-20-78

Depth Ft.	Penetration Resistance Blows/Ft. C	Penetration Resistance Blows/Ft. N	Sample Type	Dry Density pcf	Moisture Content	Graphical Log	Description (continued)	Soil Classification	Max. Size. In.	Particle Size Distribution % Boulders	Cobbles	Gravel	Sand	Silt & Clay	Gradation Well Med. Poor	Grain Shape Angular Subangular Rounded Subrounded	Relative Density Low Med High	Dry Strength None Very Low Low Medium High Very High	Plasticity None Low Medium High	Consistency Soft Firm Stiff Very Stiff Hard	Cementation None Light Moderate Heavy
31							CALICHE-SILTY SANDY CLAY; Tan														
2																					
3							very heavy cementaiton below 31'														
4																					
5																					
6		50/5"	R	96.2	10.9																
7																					
8																					
9																					
40																					
1																					
2							Stopped @ 40'														
3							No groundwater encountered														
4																					
5																					
6																					
7																					
8																					
9																					
1																					
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					

NOTE: THE DATA PRESENTED ON THESE BORING LOGS REPRESENTS SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC TEST LOCATIONS AND AT THE TIME DESIGNATED. THIS DATA MAY NOT REPRESENT CONDITIONS AT OTHER LOCATIONS AND/OR TIMES. THIS BORING DATA WAS COMPILED PRIMARILY FOR DESIGN PURPOSES. THIS DATA SHOULD NOT BE CONSTRUED AS PART OF THE PLANS GOVERNING CONSTRUCTION OR AS DEFINING CONSTRUCTION TECHNIQUES.

E

SOIL BORING DATA

Location of Boring: RWCD Bridge Crossing - Offset 25'4" W of staked position No. 7 Job No. 812-467A

Elev. Top of Hole: 1235.9 Datum: per WBC Datum Prepared By: GMD Date: 12-1-78

Type/Size of Boring: 6" Date: 12-1-78 Driller: PL Reviewed By: GKC Date: 12-20-78

Depth Ft.	Penetration Resistance Blows/Ft. C	N	Sample Type	Dry Density pcf	Moisture Content	Graphical Log	Description	Soil Classification	Max. Size. In.	Particle Size Distribution % Boulders	Cobbles	Gravel	Sand	Silt & Clay	Gradation Well Med. Poor	Grain Shape Angular Subangular Rounded Subrounded	Relative Density Low Med High	Dry Strength None Very Low Low Medium High Very High	Plasticity None Low Medium High	Consistency Soft Firm Stiff Very Stiff Hard	Cementation None Light Moderate Heavy
1			sli. below PL				SILTY SANDY CLAY; Brown to Tan	CL	½"				Tr	60	XXX		–	X	X	X X	X
2							Light cementation to 6'; moderate						40	90							
3							to heavy cementation below 6'														
4																					
5																					
6																					X
7																					X
8																					
9																					
10																					
1																					
2																					
3																					
4																					
5				sli. damp			SILTY SAND; Light Brown to Brown	SM	34/"			Tr	70	20	XX	X X X	X	X	XX	–	X
6							Light cementation.						80	30							
7																					
8																					
9																					
20																					
1																					
2							Gravelly sand layer 22-24'														
3																					
4																					
5																					
6																					
7			well below PL				CALICHE-SILTY SANDY CLAY; Tan	CL	¼"				25	65	XXX		–	X	X	X	XX
8							Heavy calcite cementation						35	75							
9																					
30							(continued)														

NOTE: THE DATA PRESENTED ON THESE BORING LOGS REPRESENTS SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC TEST LOCATIONS AND AT THE TIME DESIGNATED. THIS DATA MAY NOT REPRESENT CONDITIONS AT OTHER LOCATIONS AND/OR TIMES. THIS BORING DATA WAS COMPILED PRIMARILY FOR DESIGN PURPOSES. THIS DATA SHOULD NOT BE CONSTRUED AS PART OF THE PLANS GOVERNING CONSTRUCTION OR AS DEFINING CONSTRUCTION TECHNIQUES.

E

SOIL BORING DATA

Location of Boring: RWCD Bridge Crossing - Offset 25'4" W of staked position No. 7 Job No. 812-467A

Elev. Top of Hole: 1235.9 Datum: per WBC Datum Prepared By: GMD Date: 12-1-78

Type/Size of Boring: 6" Date: 12-1-78 Driller: PL Reviewed By: GKC Date: 12-20-78

Depth Ft.	Penetration Resistance Blows/Ft. C	Penetration Resistance Blows/Ft. N	Sample Type	Dry Density pcf	Moisture Content	Graphical Log	Description	Soil Classification	Max. Size. In.	Particle Size Distribution % Boulders	Cobbles	Gravel	Sand	Silt & Clay	Gradation Well Med. Poor	Grain Shape Angular Subangular Rounded Subrounded	Relative Density Low Med High	Dry Strength None Very Low Low Medium High Very High	Plasticity None Low Medium High	Consistency Soft Firm Stiff Very Stiff Hard	Cementation None Light Moderate Heavy
31							CALICHE-SILTY SANDY CLAY; TAn														
2																					
3							Very heavy cementation below 32';														
4							cementation nodules 2"in diameter														
5																					
6																					
7																					
8																					
9																					
40																					
1																					
2							Stopped @ 40'														
3							No groundwater encountered														
4																					
5																					
6																					
7																					
8																					
9																					
1																					
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					

NOTE: THE DATA PRESENTED ON THESE BORING LOGS REPRESENTS SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC TEST LOCATIONS AND AT THE TIME DESIGNATED. THIS DATA MAY NOT REPRESENT CONDITIONS AT OTHER LOCATIONS AND/OR TIMES. THIS BORING DATA WAS COMPILED PRIMARILY FOR DESIGN PURPOSES. THIS DATA SHOULD NOT BE CONSTRUED AS PART OF THE PLANS GOVERNING CONSTRUCTION OR AS DEFINING CONSTRUCTION TECHNIQUES.

10-27

E

SOIL BORING DATA

Location of Boring RWCD Bridge Crossing - Offset 29'11" E of staked position No. 8 Job No. 812-467A

Elev. Top of Hole 1235.0 Datum per WBC Datum Prepared By GMD Date 12-1-78

Type/Size of Boring 8" Date 12-1-78 Driller PL Reviewed By GKC Date 12-20-78

Depth Ft.	Penetration Resistance Blows/Ft. C	N	Sample Type	Dry Density pcf	Moisture Content	Graphical Log	Description	Soil Classification	Max. Size. In.	Particle Size Distribution % Boulders	Cobbles	Gravel	Sand	Silt & Clay	Gradation Well Med. Poor	Grain Shape Angular Subangular Rounded Subrounded	Relative Density Low Med High	Dry Strength None Very Low Low Medium High Very High	Plasticity None Low Medium High	Consistency Soft Firm Stiff Very Stiff Hard	Cementation None Light Moderate Heavy
1				sli.	below	PL	SILTY SANDY CLAY; Brown to Tan	CL	½"				Tr	60		XXX			X	X	X X X
2													40	90							
3							Light cementation to 7';														
4							moderate to heavy calcite cementa-														
5							tion below 7'														
6																					
7																					X
8																					X
9																					
10																					
1		41	S																		
2																					
3				sli.	damp		SILTY SAND; Light Brown to Brown	SM	3/4"			Tr	70	20	XX	X X	X	X	XX	–	X
4		10	S				Light cementation.						80	30							
5																					
6																					
7		39	S				SILTY SAND AND GRAVEL; Light	SM-GM	4"		0	35	40	15	XXXXXX		X		X		XX
8				sli.	damp		Brown; Fine to coarse sand &				Tr	45	50	25							
9							gravel; trace cobbles.														
20																					
1		41	S																		
2																					
3				sli.	damp		SILTY SAND; Light Brown to Brown	SM	3/4"			Tr	70	20	XX	X X	X	X	XX	–	X
4							Light cementation.						80	30							
5																					
6		50/2"	R	–	11.8																
7		well	below	PL			CALICHE-SILTY SANDY CLAY; Tan	CL	¼"				25	65		XXX		–	X	X	X XX
8													35	75							
9																					
30							(continued)														

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10-27

SOIL BORING DATA

Location of Boring: RWCD Bridge Crossing - Offset 29'11" E of staked position No. 8 Job No. 812-467A

Elev. Top of Hole: 1235.0 Datum: per WBC Datum Prepared By: GMD Date: 12-1-78

Type/Size of Boring: 8" Date: 12-1-78 Driller: PL Reviewed By: GKC Date: 12-20-78

Depth Ft.	Penetration Resistance Blows/Ft. C	Penetration Resistance Blows/Ft. N	Sample Type	Dry Density pcf	Moisture Content	Graphical Log	Description (continued)	Soil Classification	Max. Size. In.	Particle Size Distribution % Boulders	Cobbles	Gravel	Sand	Silt & Clay	Gradation Well Med. Poor	Grain Shape Angular Subangular Rounded Subrounded	Relative Density Low Med High	Dry Strength None Very Low Low Medium High Very High	Plasticity None Low Medium High	Consistency Soft Firm Stiff Very Stiff Hard	Cementation None Light Moderate Heavy
31							CALICHE-SILTY SANDY CLAY; Tan														
2																					
3							Heavy calcite cementation below														
4							31'; frequent 2" cementation														
5							nodules.														
6		50/8"	R	98.0	12.3																
7																					
8																					
9																					
40																					
1																					
2							Stopped @ 40'														
3							No groundwater encountered														
4																					
5																					
6																					
7																					
8																					
9																					
20																					
1																					
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
30																					

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E

SOIL BORING DATA

Location of Boring: RWCD Bridge Crossing - Offset 23'2" W of staked position No. 9 Job No. 812-467A

Elev. Top of Hole: 1236.0 Datum: per WBC Datum Prepared By: GMD Date: 12-1-78

Type/Size of Boring: 8" Date: 12-1-78 Driller: PL Reviewed By: GKC Date: 12-20-78

Depth Ft.	Penetration Resistance Blows/Ft. C	Penetration Resistance Blows/Ft. N	Sample Type	Dry Density pcf	Moisture Content	Graphical Log	Description	Soil Classification	Max. Size. In.	Particle Size Distribution % Boulders	Cobbles	Gravel	Sand	Silt & Clay	Gradation Well Med. Poor	Grain Shape Angular Subangular Rounded Subrounded	Relative Density Low Med High	Dry Strength None Very Low Low Medium High Very High	Plasticity None Low Medium High	Consistency Soft Firm Stiff Very Stiff Hard	Cementation None Light Moderate Heavy
1				sli.	below		SILTY SANDY CLAY; Brown to Tan	CL	½"				Tr	60	X	XX	–	X	X	X X	X
2					PL		Light to moderate cementation						40	90							
3							to 8'; moderate to heavy cementa-														
4							tion below 8'														
5																					
6		50/11"	R	88.3	20.3																
7																					
8																					X
9																					X
10																					
1		50	R	102.5	9.4																
2							Becomes sandier below 12'														
3																					
4																					
5																					
6		25	R	84.3	5.8																
7																					
8				sli.	damp		SILTY SAND; Light Brown to Brown	SM	3/4"			Tr	70	20	XX	X X	X	X	XX	–	X
9							Light cementation.						80	30							
20																					
1		50	R	104.0	2.2																
2																					
3																					
4																					
5																					
6				well below PL			CALICHE-SILTY SANDY CLAY; Tan	CL	¼"				25	65	XX	X	–	X	X	X	X X
7							Heavy cementation						35	75							
8																					
9																					
30							(continued)														

NOTE: THE DATA PRESENTED ON THESE BORING LOGS REPRESENTS SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC TEST LOCATIONS AND AT THE TIME DESIGNATED. THIS DATA MAY NOT REPRESENT CONDITIONS AT OTHER LOCATIONS AND/OR TIMES. THIS BORING DATA WAS COMPILED PRIMARILY FOR DESIGN PURPOSES. THIS DATA SHOULD NOT BE CONSTRUED AS PART OF THE PLANS GOVERNING CONSTRUCTION OR AS DEFINING CONSTRUCTION TECHNIQUES.

E

SOIL BORING DATA

Location of Boring: RWCD Bridge Crossing - Offset 23'2" W of staked position No. 9 Job No. 812-467A

Elev. Top of Hole: 1236.0 Datum: per WBC Datum Prepared By: GMD Date: 12-1-78

Type/Size of Boring: 8" Date: 12-1-78 Driller: PL Reviewed By: GKC Date: 12-20-78

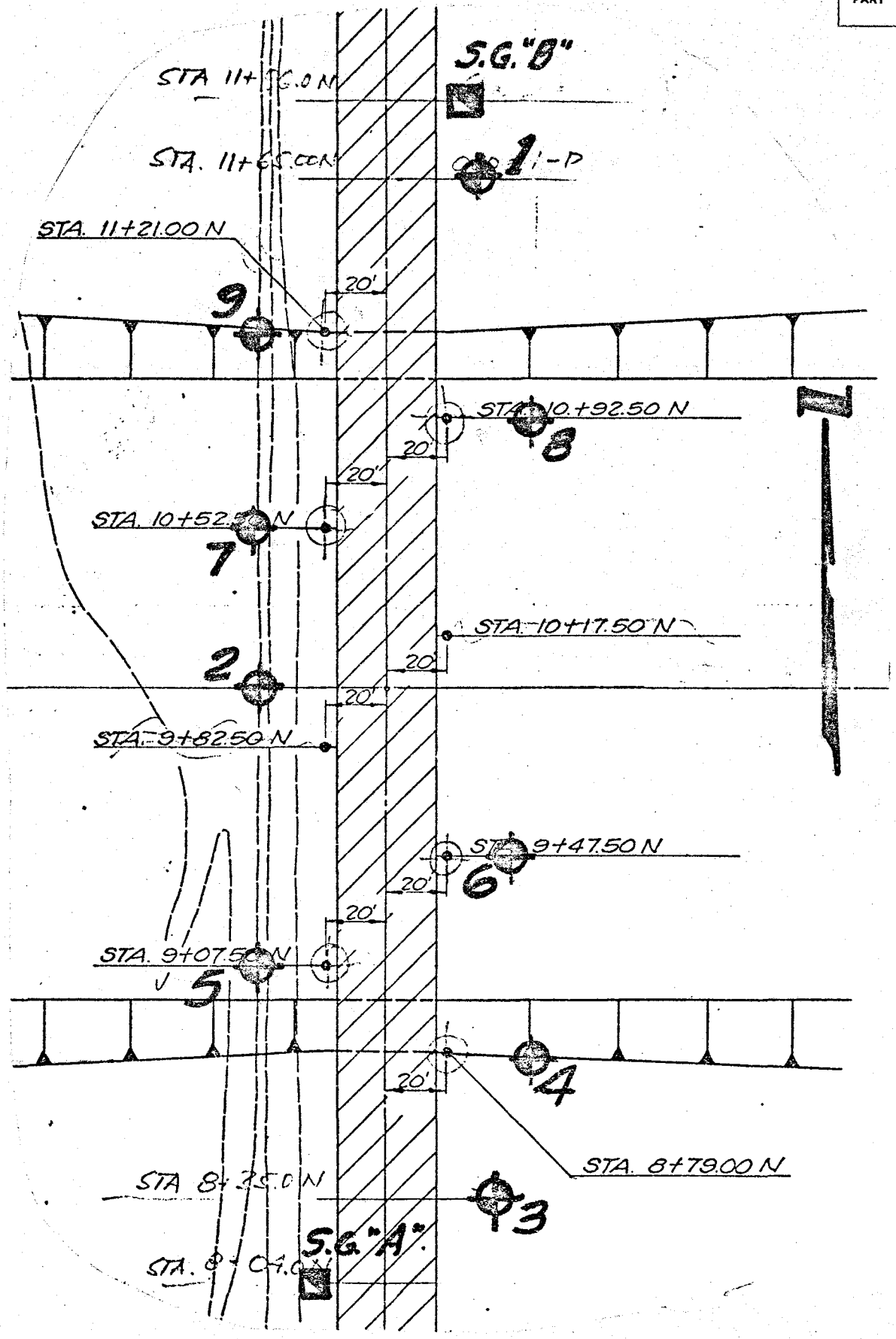
Depth Ft.	Penetration Resistance Blows/Ft. C	Penetration Resistance Blows/Ft. N	Sample Type	Dry Density pcf	Moisture Content	Graphical Log	Description (continued)	Soil Classification	Max. Size, In.	Particle Size Distribution % Boulders	Cobbles	Gravel	Sand	Silt & Clay	Gradation Well Med. Poor	Grain Shape Angular Subangular Rounded Subrounded	Relative Density Low Med High	Dry Strength None Very Low Low Medium High Very High	Plasticity None Low Medium High	Consistency Soft Firm Stiff Very Stiff Hard	Cementation None Light Moderate Heavy
31		50/9"	R	99.9	19.9		CALICHE-SILTY SANDY CLAY; Tan														
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
40																					
1		50/10"	R	116.0	8.5																
2																					
3																					
4							Stopped @ 41'														
5							No groundwater encountered														
6																					
7																					
8																					
9																					
20																					
1																					
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
30																					

NOTE: THE DATA PRESENTED ON THESE BORING LOGS REPRESENTS SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC TEST LOCATIONS AND AT THE TIME DESIGNATED. THIS DATA MAY NOT REPRESENT CONDITIONS AT OTHER LOCATIONS AND/OR TIMES. THIS BORING DATA WAS COMPILED PRIMARILY FOR DESIGN PURPOSES. THIS DATA SHOULD NOT BE CONSTRUED AS PART OF THE PLANS GOVERNING CONSTRUCTION OR AS DEFINING CONSTRUCTION TECHNIQUES.

PART IV

SITE PLAN

E

Job No. _____

SITE PLAN/TEST BORING LOCATION