

SSCL-SR-1193
SGR-7

Engineers, Geologists, Chemists, Water Planners, Hygienists and Environmental Scientists



12821 W. Golden Lane
P.O. Box 690287, San Antonio, TX 78269-0287
(512) 699-9090 FAX (512) 699-6426

Project No. ASA91-020-00
July 2, 1991

Mr. Charles Daugherty
The PB/MK Team
Redbird Business Center, Building 5
5610 Redbird Center Drive, Suite 400
Dallas, Texas 75237

Re.: Geotechnical Report
Hoyt Road Pavements
Superconducting Super Collider

Dear Mr. Daugherty:

Submitted here is a report of shallow subsurface conditions along the Hoyt Road right-of-way fronting the E1 Site of the Superconducting Super Collider in Ellis County, Texas. This report has been prepared for the use of The PB/MK Team for design purposes in accordance with accepted Geotechnical Engineering practices.

FIELD EXPLORATION AND LABORATORY TESTS

Borings Subsurface conditions at the site were evaluated by five borings drilled at the locations shown on the Plan of Borings, Plate 1. The number of borings included in this study, their field locations, and their termination depths were selected by The PB/MK Team. Grid coordinates and surface elevations for the boring locations were provided by PB/MK, and are shown on the individual boring logs. The borings were drilled in accordance with ASTM D 420 procedures to depths ranging from 4.5 to 5 ft below existing grades using a rotary drilling rig.

A field log was prepared for each boring by a staff geologist. Each log contains information concerning the boring method, drill crew, time of drilling, samples attempted and recovered, indications of the presence of various materials such as silt, clay, gravel, sand or rock, and observations of ground water.

The final logs represent our interpretation of the contents of the field logs for the purpose delineated by our client. The final logs are included in the Illustrations section of this report, Plates 2 through 6. A key to classification terms and symbols used on the logs appears on Plate 7.

Sampling The following samples were collected as a part of our subsurface exploration procedures:

<u>Type of Sample</u>	<u>ASTM Procedure</u>	<u>Number Collected</u>
Auger	D 1452	17
Undisturbed Shelby Tube	D 1587	2

Representative portions of all auger and tube samples were sealed to reduce moisture loss, placed in protective containers, and transported to our laboratory for testing. In addition, bulk samples of the subgrade clays were collected for laboratory moisture-density relationship and bearing ratio testing.

Laboratory Testing In the laboratory, each sample was inspected and classified by a geotechnical engineer. The geotechnical engineering properties of the strata were evaluated by the following tests:

<u>Type of Test</u>	<u>Procedure</u>	<u>Number Conducted</u>
Natural Moisture Content	ASTM D 2216	1
Unconfined Compression	ASTM D 2938	1
Atterberg Limits	ASTM D 2217 ASTM D 4318	1
Unit Dry Weight	ASTM D 2166	1
Moisture-Density Relationship	THD Tex-113-E	1
California Bearing Ratio	ASTM D 1883	1
Lime Series	THD Tex-112-E	1

The results of all laboratory tests are presented in graphical or numerical form on the appropriate boring log and Plates 8 and 9.

GENERAL SITE AND SUBSURFACE CONDITIONS

Existing Conditions The project site consists of an existing, asphaltic concrete paved roadway in varying degrees of disrepair. The existing pavement section generally consists of a 1/2 in. thick asphaltic concrete surface course overlying a 6 in. thick layer of clayey gravel aggregate base course.

Stratigraphy The soils/rock underlying the pavement section can be divided into two generalized strata that possess similar physical and engineering characteristics, as described below.

Stratum I consists of brown and dark brown clays and extends to depths ranging from 0.9 to 2.4 ft below existing grades in the test borings. These clays are indicated to be plastic to highly plastic, with a measured liquid limit of 58 percent and a plasticity index of 34. Designated as CH soils under the Unified Soil Classification System (USCS), clays of this plasticity are generally recognized to possess high shrink/swell potential. These clays exhibit stiff to very stiff consistencies.

Stratum II consists of tan, weathered limestone of the Austin Chalk Formation and extends to the 4.5 to 5 ft termination depths of the borings. Argillaceous seams are common on an intermittent basis within this formation.

Ground Water Ground water was not encountered either during or immediately upon completion of the drilling operations.

COMMENTS

Based on the thin nature and poor condition of the existing pavement section materials, we recommend that new pavement designs exclude consideration of structural support from the existing pavement materials in their present state. However, consideration may be given to shredding, pulverizing and mixing the existing asphaltic concrete and base course materials into the underlying plastic subgrade clays (possibly with the addition of hydrated lime or fly ash), thereby resulting in a subbase layer accountable in new pavement design analyses.

* * * * *

The following illustrations are attached and complete this report:

Plate 1	Plan of Borings
Plates 2 through 6	Logs of Borings
Plate 7	Key to Terms and Symbols
Plate 8	Moisture-Density Relationship and Results of CBR Testing
Plate 9	Lime Series Curve

Project No. ASA91-020-00
July 2, 1991

4.

We appreciate the opportunity to be of service to you on this project. Please call should you have questions concerning the contents of this report, or other aspects of the project.

Very truly yours,

RABA-KISTNER CONSULTANTS

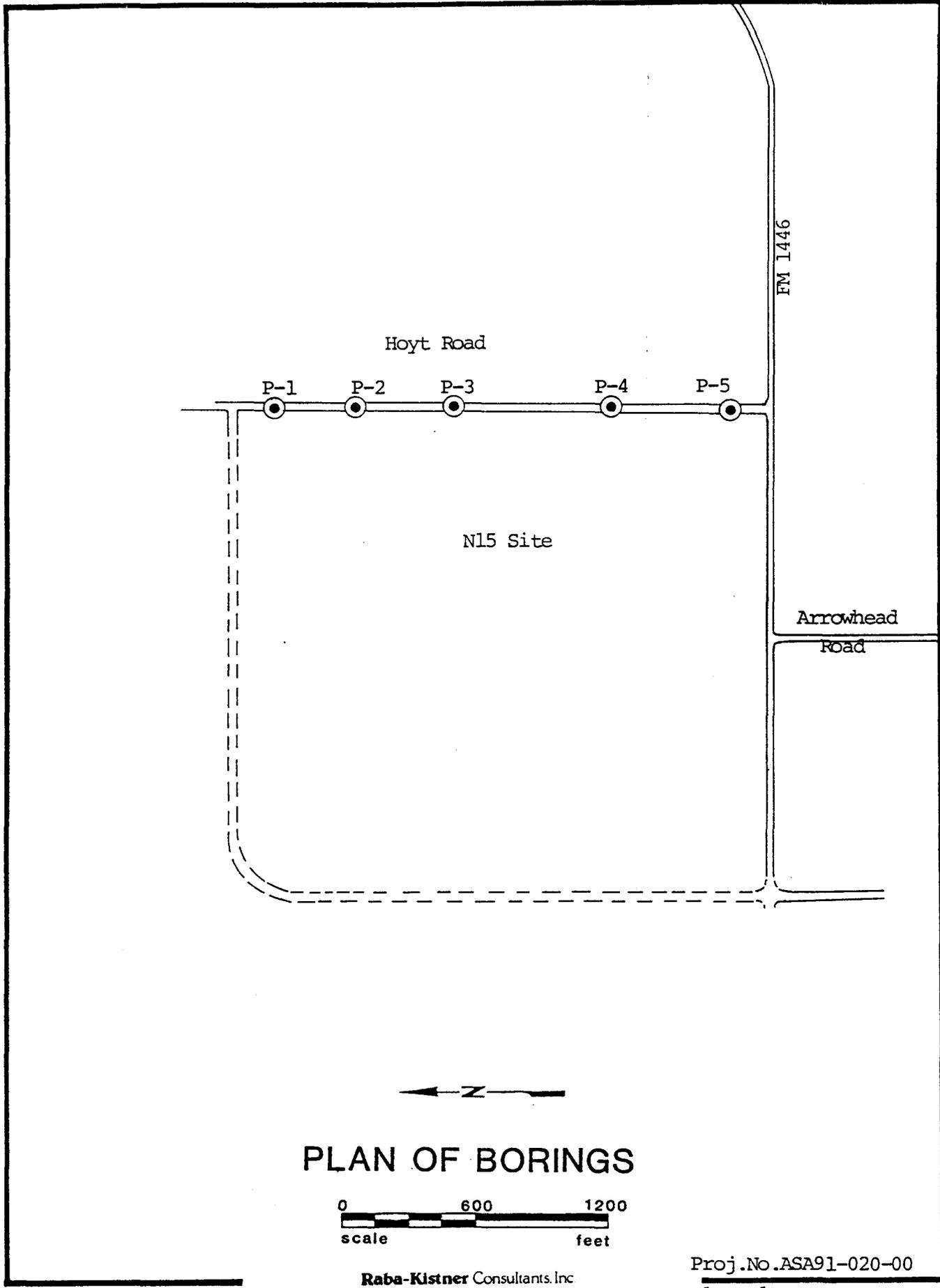
A. Scot Harrell

A. Scot Harrell, P.E.
Project Manager



ASH/cad
Copies submitted: Above (4)

I L L U S T R A T I O N S



PLAN OF BORINGS



Raba-Kistner Consultants, Inc

Proj.No. ASA91-020-00
Plate 1

LOG OF BORING NO. P-1
NE 15 (E1) ACCESS ROADWAYS (HOYT ROAD) - SSC PROJECT
WAXAHACHIE, TEXAS



Raha-Kistner
 ultants, Inc.
 2449075.82

DRILLING METHOD: Hollow Stem Auger

*Originals w/
 specs.*

DEPTH, FT	SYMBOL	DESCRIPTION OF MATERIA	T	⊙	%-200
		SURFACE ELEVATION: 761.86		2.1	
		ASPHALT 0.0			
		BASE: Clay, Gravelly (medium t fine river gravels) 0.5'			
5		CLAY, Slightly Silty, Very Stiff, Plastic, Dark Brown, Slightly Moist 2.3'			
10		LIMESTONE, Weathered, Mediu Hard, Light Tan			
15		START: 7:05 AM END: 7:25 AM			
20		GEOLOGIST: MICHAEL A. GILES			
25		DRILL CREW: LARRY TAYLOR JAMES STUBBS JOHN SALMON			
30					
35					
40					
45					
50					

DEPTH DRILLED: 5.0'	DEPTH TO WATER: Dry	PROJ. No. ASA91-020-00
DATE DRILLED: 5-18-91	DATE MEASURED: 5-18-91	PLATE 2

LOG OF BORING NO. P-2
NE 15 (E1) ACCESS ROADWAYS (HOYT ROAD) - SSC PROJECT
WAXAHACHIE, TEXAS



Raba-Kistner
 Consultants, Inc.

DRILLING METHOD: Hollow Stem Auger

LOCATION: N6819963.93 / E2449335.06

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	⊗ COHESION, TON/SQ FT ⊙							X-200							
						0.3	0.6	0.9	1.2	1.5	1.8	2.1								
						PLASTIC LIMIT		WATER CONTENT			LIQUID LIMIT									
			SURFACE ELEVATION: 759.65'																	
			ASPHALT 0.05'																	
			BASE: Clay, Gravelly (medium to fine river gravels) 0.5'		87															
5			CLAY, Very Stiff, Plastic, Black to Brown, Moist with small limestone fragments 2.2'																	
10			LIMESTONE, Weathered, Medium Hard, White to Light Tan with argillaceous seams																	
15			START: 7:40 AM END: 8:25 AM																	
20			GEOLOGIST: MICHAEL A. GILES																	
25			DRILL CREW: LARRY TAYLOR JAMES STUBBS JOHN SALMON																	
30																				
35																				
40																				
45																				
50																				

DEPTH DRILLED: 4.5'	DEPTH TO WATER: Dry	PROJ. No. ASA91-020-00
DATE DRILLED: 5-18-91	DATE MEASURED: 5-18-91	PLATE 3

LOG OF BORING NO. P-3
NE 15 (E1) ACCESS ROADWAYS (HOYT ROAD) - SSC PROJECT
WAXAHACHIE, TEXAS



Raba-Kistner
 Consultants, Inc.

DRILLING
METHOD: Hollow Stem Auger

LOCATION: N6819611.10 / E2449560.36

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	⊗ COHESION, TON/SQ FT ⊙							X-200
						0.3	0.6	0.9	1.2	1.5	1.8	2.1	
						PLASTIC LIMIT			WATER CONTENT		LIQUID LIMIT		
						+	-	-	-	-	-	+	
						10	20	30	40	50	60	70	
			SURFACE ELEVATION: 754.10'										
			ASPHALT 0.05'										
			BASE: Clay, Gravelly (medium to fine river gravels) 0.5'										
5			CLAY, Very Stiff, Plastic, Dark Brown, Moist 2.3'										
10			LIMESTONE, Weathered, Medium Hard, White to Light Tan										
15			START: 8:35 AM END: 9:00 AM										
20			GEOLOGIST: MICHAEL A. GILES										
25			DRILL CREW: LARRY TAYLOR JAMES STUBBS JOHN SALMON										
30													
35													
40													
45													
50													

DEPTH DRILLED: 5.0'	DEPTH TO WATER: Dry	PROJ. No. ASA91-020-00
DATE DRILLED: 5-18-91	DATE MEASURED: 5-18-91	PLATE 4

LOG OF BORING NO. P-4
NE 15 (E1) ACCESS ROADWAYS (HOYT ROAD) - SSC PROJECT
WAXAHACHIE, TEXAS



Raba-Kistner
 Consultants, Inc.

DRILLING

METHOD: Hollow Stem Auger

LOCATION: N6819138.00 / E2449828.41

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, Pcf	⊗ COHESION, TON/SQ FT ⊙							X-200
						0.3	0.6	0.9	1.2	1.5	1.8	2.1	
						PLASTIC LIMIT			WATER CONTENT		LIQUID LIMIT		
						+	-	-	●	-	-	+	
						10	20	30	40	50	60	70	
			SURFACE ELEVATION: 744.90'										
			ASPHALT 0.05'										
			BASE: Clay, Gravelly (medium to fine river gravel) 0.5'										⊙
5			CLAY, Firm, Plastic, Dark Brown, Moist 0.9'										
10			LIMESTONE, Weathered, Medium Hard, White and Tan fractured from 4' to 4.5'										
15			START: 9:03 AM END: 9:45 AM										
20			GEOLOGIST: MICHAEL A. GILES										
25			DRILL CREW: LARRY TAYLOR JAMES STUBBS JOHN SALMON										
30													
35													
40													
45													
50													

DEPTH DRILLED: 4.5'	DEPTH TO WATER: Dry	PROJ. No. ASA91-020-00
DATE DRILLED: 5-18-91	DATE MEASURED: 5-18-91	PLATE 5

LOG OF BORING NO. P-5
NE 15 (E1) ACCESS ROADWAYS (HOYT ROAD) - SSC PROJECT
WAXAHACHIE, TEXAS



Raba-Kistner
 Consultants, Inc.

DRILLING

METHOD: Hollow Stem Auger

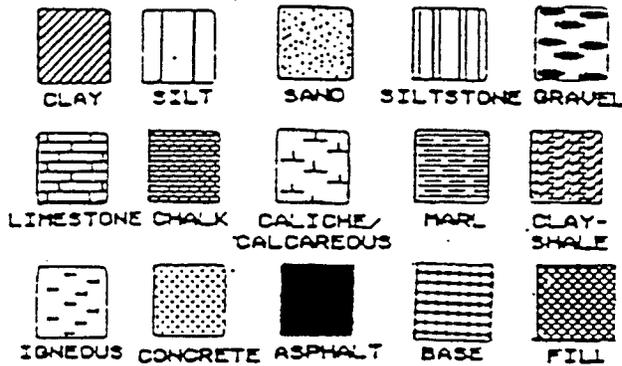
LOCATION: N6818604.24 / E2450134.68

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	⊗ COHESION, TON/SQ FT ⊙							X-200	
						0.3	0.6	0.9	1.2	1.5	1.8	2.1		
						PLASTIC LIMIT		WATER CONTENT			LIQUID LIMIT			
			SURFACE ELEVATION: 744.36'											
			ASPHALT 0.05'											
			BASE: Clay, Gravelly (medium to fine river gravel) 0.5'											
5			CLAY, Silty, Stiff, Plastic, Brown, Moist 2.4'											
10			LIMESTONE, Weathered, Medium Hard, Light Tan with argillaceous seams softer at 4'											
15			START: 9:45 AM END: 10:00 AM											
20			GEOLOGIST: MICHAEL A. GILES											
25			DRILL CREW: LARRY TAYLOR JAMES STUBBS JOHN SALMON											
30														
35														
40														
45														
50														

DEPTH DRILLED: 4.5'	DEPTH TO WATER: Dry	PROJ. No. ASA91-020-00
DATE DRILLED: 5-18-91	DATE MEASURED: 5-18-91	PLATE 6

SYMBOLS AND TERMS USED ON BORING LOGS

SOIL OR ROCK TYPES (shown in symbols column)



SAMPLER TYPES (shown in sample column)



STRENGTH TEST RESULTS

- Pocket Penetrometer
- Torvane
- Unconfined Compression

TRIAxIAL COMPRESSION

- Unconsolidated-undrained
- Consolidated-undrained
- C** Cohesion (Total)
- ϕ Angle of Internal Friction (Total)
- c** Cohesion (Effective)
- ϕ Angle of Internal Friction (Effective)

NOTE: Values symbolized on boring logs represent shear strengths unless otherwise noted.

TERMS DESCRIBING CONSISTENCY, CONDITION OR TEXTURE

Terms used in this report to describe soils with regard to their consistency or conditions are in general accordance with the discussion presented in Article 45 of SOIL MECHANICS IN ENGINEERING PRACTICE, Terzaghi and Peck, John Wiley & Sons, Inc. 1967, using the most reliable information available from the field and laboratory investigations. Terms used for describing soils according to their texture or grain size distribution are in accordance with the UNIFIED SOIL CLASSIFICATION SYSTEM, as described in Technical Memorandum No. 3-357, Waterways Experiment Station, March 1953.

TERMS CHARACTERIZING SOIL STRUCTURE

Slickensided	having inclined planes of weakness that are slick and glossy in appearance
Fissured	containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical
Laminated	composed of thin layers of varying colors and texture
Interbedded	composed of alternate layers of different soil types
Calcareous	containing appreciable quantities of calcium carbonate
Well graded	having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Poorly graded	predominantly of one grain size, or having a range of sizes with some intermediate size missing

TERMS DESCRIBING CONSISTENCY OR CONDITION

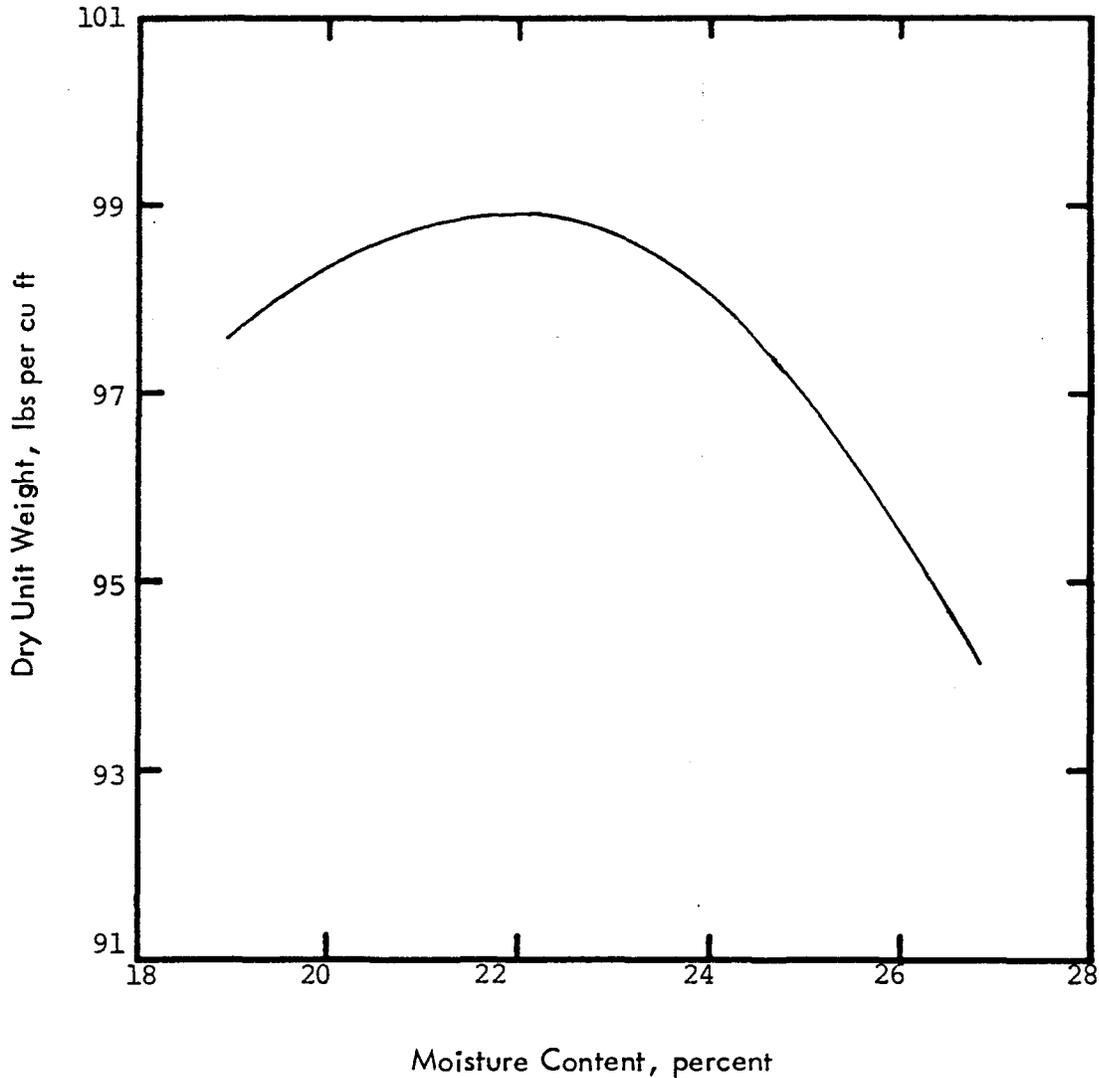
RELATIVE DENSITY		COHESIVE STRENGTH			PLASTICITY	
Penetration Resistance, blows per ft	Relative Density	Penetration Resistance, blows per ft	Consistency	Cohesion TSF	Plasticity Index	Degree of Plasticity
0-4	Very loose	0-2	Very Soft	0-0.125	0-5	None
4-10	Loose	2-4	Soft	0.125-0.25	5-10	Low
10-30	Medium Dense	4-8	Firm	0.25-0.5	10-20	Moderate
30-50	Dense	8-15	Stiff	0.5-1.0	20-40	Plastic
>50	Very Dense	15-30	Very Stiff	1.0-2.0	>40	Highly Plastic
		>30	Hard	>2.0		

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above because of planes of weakness or cracks in the soil. The consistency ratings of such soils are based on penetrometer readings.

Project Name: Hoyt Road, SSC
Project Number: ASA91-020-00
Liquid Limit: 58
Plasticity Index: 34
Material Description: CLAY, Plastic, Dark Brown; (CH)

Date Sampled: 5/18/91
Sampled By: Mike Giles
Date Completed: 5/31/91

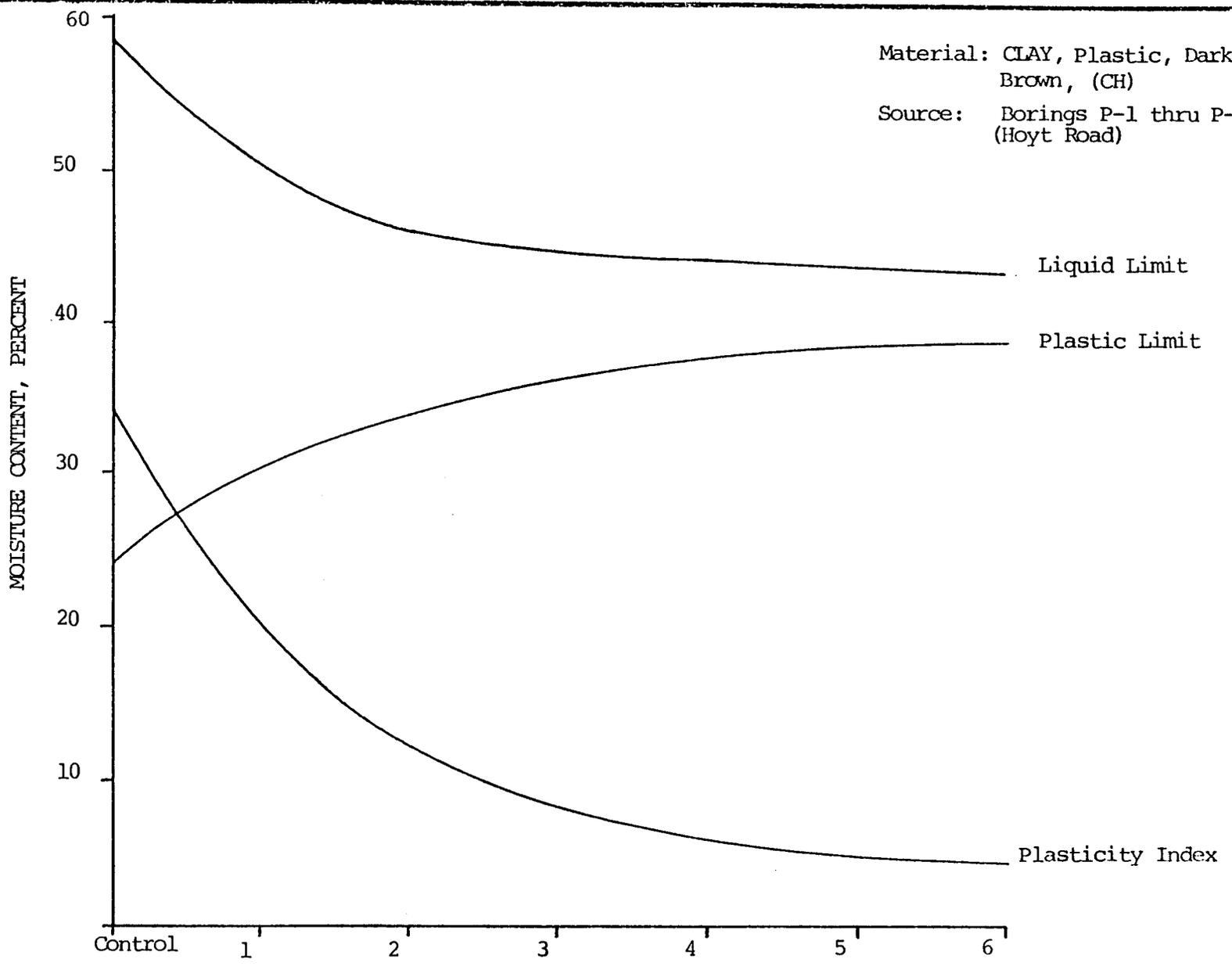
ATTERBERG LIMITS AND COMPACTION TEST RESULTS



THD TEX-113-E (6.63 ft lbs/cu.in.)

Maximum Dry Density at Optimum Moisture	98.9 lbs./cu. ft.
Optimum Moisture	22.0 %
CBR (Remolded to 96.9% Maximum Dry Density at 22.3% moisture content and soaked for 96 hours)	1.6 %
Percent Swell	3.0%

Material: CLAY, Plastic, Dark Brown, (CH)
Source: Borings P-1 thru P-5 (Hoyt Road)



Raba-Kistner Consultants, Inc

Proj. No. ASA91-020-00
Plate 9

HYDRATED LIME, PERCENT
LIME SERIES CURVE