AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
J	1 | 13

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
0001	27-Jul-2004	W26GLG-4147-1804	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
USA ENGINEER DISTRICT, NORFOLK CONTRACTING OFFICE 803 FRONT STREET NORFOLK VA 23510-1096	W91236	**See Item 6**	

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		
	X	9A. AMENDMENT OF SOLICITATION NO. W91236-04-B-0018
	X	9B. DATED (SEE ITEM 11) 29-Jun-2004
		10A. MOD. OF CONTRACT/ORDER NO.
		10B. DATED (SEE ITEM 13)
CODE / FACILITY CODE		

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

[X] The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer [X] is extended, [ ] is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning 1 copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

[ ] A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

[ ] B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

[ ] C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

[ ] D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor [ ] is not, [ ] is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Subject solicitation for Maintenance and Ne Work Dredging Inbound and Outbound Elements of Norfolk Harbor Channel and New Work Dredging of South Terminal at Norfolk International Terminals, Hampton Roads, Virginia is modified as follows:

REFER TO CONTINUATION SHEET

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) TEL: EMAIL:	
15B. CONTRACTOR/OFFEROR (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (Signature of Contracting Officer)	16C. DATE SIGNED 27-Jul-2004

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

The following items are applicable to this modification:

W9123604B0018 0001

A. STANDARD FORM 1442, SOLICITATION, OFFER, AND AWARD: Bid Opening Date is changed to 05 AUG 2004. The time remains unchanged. Item A, change date from "29 JUL 2004" to "05 AUG 2004".

B. SECTION 00010, SOLICITATION CONTRACT FORM, BID SCHEDULE: DELETE Pages 3 through 6 and ADD New Bid Schedule provided as Attachment A to this amendment.

C. SECTION 00100, BIDDING SCHEDULE/INSTRUCTIONS TO BIDDERS:

(1) DELETE the following clauses in their entirety:

252.236-7007, Additive or Deductive Items
E4LC CONSTR 21, Solicitation Documents and Information

(2) ADD the following clauses:

E4LC02, Award to Responsible Offeror
E4LC09, Basis of Award
E4LC 30, Contractor Performance and Banking Information
52.219-4, Notice of Price Evaluation Preferences for Hubzone Small Business Concerns (JAN 1999)

D. SECTION 00700, CONTRACT CLAUSE:
Refer to Page 122; MOVE Clause 52.232-5001, Continuing Contracts (MAR 1995)—EFARS to Section 00800, Special Contract Requirements.

E. SECTION 00800, SPECIAL CONTRACT REQUIREMENTS:
Clause 52.217-7, Option for Increased Quantity—Separately Price Line Item (MAR 1989)

F. TECHNICAL CHANGES:

PART 1 - MAINTENANCE AND NEW WORK DREDGING INBOUND AND OUTBOUND ELEMENTS OF NORFOLK HARBOR CHANNEL

1. SECTION 01005:

A. Page 01005-5, delete paragraph 1.3.2 and substitute therefore the following:

"1.3.2 Special Requirements at Craney Island Dredged Material Management Area

"All activities at Craney Island Dredged Material Management Area shall be conducted in accordance with Norfolk District Regulation DR 1130-2-4 which is available for review at the Craney Island Reservation Office. Point of contact for review of the Regulation or to visit the site is Samuel E. McGee III, telephone (757) 484-1021. The government retains ownership of all materials deposited within the disposal area. The removal of scrap iron, steel, or any other material for personal use is prohibited. The Contractor is informed there will be a large volume of dredging placement by others at Craney Island during this contract and only one cell of the Dredged Material Management Area will be available at a time for use during this contract. The average daily inflow into the Dredged Material Management Area shall not exceed 22,000 cubic yards of insitu dredged material, and will be computed by dividing the cubic yards of insitu material dredged by the actual number of active dredging (pumping) days. The average daily inflow value may be increased if the contractor can

demonstrate to the satisfaction of the Contracting Officer, that planned production and procedural methods will not violate the specified water quality requirements."

B. Page 01005-8, paragraph 1.6.1, delete the third sentence and substitute therefore the following: "The Government will establish two tide gauges for two areas between 10+00 to 233+00. The Government utilizes the NOAA automatic gauge at Sewells Point between 234+00 to 406+00; therefore, the Contractor shall be responsible for obtaining tide gauge readings from this location."

2. SECTION 02881

A. Page 02881-4, paragraph 1.3, line 7, after "work dredging area" insert "are included at the end of this SECTION.

B. Page 02881-5, delete paragraph 3.1.2 and substitute therefore the following:

"3.1.2 Water Quality Monitoring Controls

"In addition to the requirements specified in paragraph "Control of Dredging Area and Placement Area Effluent", the Contractor shall take all precautions that in the opinion of the Contracting Officer may be necessary to minimize the escape of dredged material into receiving waters. It is the contractor's responsibility to operate the spill boxes in a manner which helps achieve the goal of releasing only clarified supernatant (water) from the spill boxes into the river. Effluent shall be visually checked a minimum of four times per day at each operating spillbox. If at any time it is visually apparent that effluent other than clarified water is being released from Craney Island Dredged Material Management Area, immediate action shall be taken by the Contractor to stop the release. Effluent total suspended solids (TSS) samples shall be taken at least twice daily at the weir crest of each operating spillbox, once approximately every twelve hours. When settled solids are present in samples taken from the spillbox effluent, the sample is considered to have failed and immediate action shall be taken by the Contractor to stop the release."

C. Page 02881-6, delete paragraph 3.1.2.1 and substitute therefore the following:

"3.1.2.1 Effluent Total Suspended Solids Tests

"Total Suspended Solids tests shall be performed on all effluent samples as outlined in paragraph titled "Control of Dredging Area and Placement Area Effluent". The Contractor shall record all effluent sampling events and the sampling results will be included on his Daily CQC Report. The following effluent quality criteria supersedes the effluent quality criteria and water quality monitoring controls as outlined in District Regulation 1130-2-4 "Deposition of Dredged Material into the Craney Island Dredged Material Area, Norfolk Harbor, Virginia", dated 26 April 2002. Dredged material placement operations shall be managed to meet the following effluent quality criteria:

The Contractor must maintain a daily average TSS concentration of less than 500 mg/l. The 'less than' 500 mg/l TSS concentration is a threshold limit and is not a TSS target or goal. If at any time, the daily average of effluent sampling from a spillbox equals or exceeds 500 mg/l, the Contractor shall take immediate action to stop the flow from that spill box. The release of effluent from the spill box can resume after there is a sufficient depth of clarified ponded water in front of the spill box to meet the TSS limit of less than 500 mg/l. The Contractor will immediately retest the effluent; a measurement to determine if the TSS concentration is less than 500 mg/l will be used as an indicator to continue effluent release from the spillbox. If the effluent TSS concentration cannot be maintained below the 500 mg/l, the contractor must cease inflow into Craney Island. For ponding and freeboard requirements, refer to paragraphs titled "Government

Furnished Placement Area" and "Placement Area Use and Maintenance During Placement Operations". "

D. Page 02881-8, delete paragraph 3.2.2 and substitute therefore the following:

"3.2.2 Control of Dredging Area and Placement Area Effluent

"The TSS concentration of the effluent samples taken in accordance with paragraph titled "Water Quality Monitoring Controls" shall be determined by a photometric method using a Hach 850/DR Colorimeter model #48450-00, program 94 "Suspended Solids", or approved equal. Effluent water samples shall be taken with a 1000 ml wide-mouth polyethylene bottle (Nalgene 2104-0032 or equal). The specified equipment provides for real time measurement of TSS concentration; therefore, the contractor shall perform the TSS measurement in the field immediately after each effluent sampling is accomplished."

PART 2 - NEW WORK DREDGING OF SOUTH TERMINAL AT NORFOLK INTERNATIONAL TERMINALS

1. SECTION 01005:

A. Page 01005-5, delete paragraph 1.3.2 and substitute therefore the following:

"1.3.2 Special Requirements at Craney Island Dredged Material Management Area

"All activities at Craney Island Dredged Material Management Area shall be conducted in accordance with Norfolk District Regulation DR 1130-2-4 which is available for review at the Craney Island Reservation Office. Point of contact for review of the Regulation or to visit the site is Samuel E. McGee III, telephone (757) 484-1021. The government retains ownership of all materials deposited within the disposal area. The removal of scrap iron, steel, or any other material for personal use is prohibited. The Contractor is informed there will be a large volume of dredging placement by others at Craney Island during this contract and only one cell of the Dredged Material Management Area will be available at a time for use during this contract. The average daily inflow into the Dredged Material Management Area shall not exceed 22,000 cubic yards of insitu dredged material, and will be computed by dividing the cubic yards of insitu material dredged by the actual number of active dredging (pumping) days. The average daily inflow value may be increased if the contractor can demonstrate to the satisfaction of the Contracting Officer, that planned production and procedural methods will not violate the specified water quality requirements."

B. Page 01005-8, paragraph 1.6.1, delete the third, fourth and fifth sentences and substitute therefore the following: "The Government will establish a tide gauge in the vicinity of the work areas."

2. SECTION 01270:

A. Throughout the SECTION, change all references for "Additive" to "Optional".

B. Page 01270-2, paragraph 1.2.1, in the first line paragraph header, change "Base Bid Item No. 0001" to read "Base Bid Item No. 0004".

C. Page 01270-3, paragraph 1.3.1, in the first and second line paragraph header, change "Base Bid Payment Item No. 0002 (and Additive Item No. 0002 and Additive Item No. 0003)" to read "Base Bid Payment Item No. 0005 (and Optional Item No. 0006 and Optional Item No. 0007".

3. SECTION 02881

A. Page 02881-4, paragraph 3.1, line 6, after “available” delete the remainder of the sentence and insert “at the end of this SECTION.”.

B. Page 02881-5, delete paragraph 3.1.2 and substitute therefore the following:

“3.1.2 Water Quality Monitoring Controls

“In addition to the requirements specified in paragraph “Control of Dredging Area and Placement Area Effluent”, the Contractor shall take all precautions that in the opinion of the Contracting Officer may be necessary to minimize the escape of dredged material into receiving waters. It is the contractor’s responsibility to operate the spill boxes in a manner which helps achieve the goal of releasing only clarified supernatant (water) from the spill boxes into the river. Effluent shall be visually checked a minimum of four times per day at each operating spillbox. If at any time it is visually apparent that effluent other than clarified water is being released from Craney Island Dredged Material Management Area, immediate action shall be taken by the Contractor to stop the release. Effluent total suspended solids (TSS) samples shall be taken at least twice daily at the weir crest of each operating spillbox, once approximately every twelve hours. When settled solids are present in samples taken from the spillbox effluent, the sample is considered to have failed and immediate action shall be taken by the Contractor to stop the release.”

C. Page 02881-6, delete paragraph 3.1.2.1 and substitute therefore the following:

“3.1.2.1 Effluent Total Suspended Solids Tests

“Total Suspended Solids tests shall be performed on all effluent samples as outlined in paragraph titled “Control of Dredging Area and Placement Area Effluent”. The Contractor shall record all effluent sampling events and the sampling results will be included on his Daily CQC Report. The following effluent quality criteria supersedes the effluent quality criteria and water quality monitoring controls as outlined in District Regulation 1130-2-4 “Deposition of Dredged Material into the Craney Island Dredged Material Area, Norfolk Harbor, Virginia”, dated 26 April 2002. Dredged material placement operations shall be managed to meet the following effluent quality criteria:

> The Contractor must maintain a daily average TSS concentration of less than 500 mg/l. The ‘less than’ 500 mg/l TSS concentration is a threshold limit and is not a TSS target or goal. If at any time, the daily average of effluent sampling from a spillbox equals or exceeds 500 mg/l, the Contractor shall take immediate action to stop the flow from that spill box. The release of effluent from the spill box can resume after there is a sufficient depth of clarified ponded water in front of the spill box to meet the TSS limit of less than 500 mg/l. The Contractor will immediately retest the effluent; a measurement to determine if the TSS concentration is less than 500 mg/l will be used as an indicator to continue effluent release from the spillbox. If the effluent TSS concentration cannot be maintained below the 500 mg/l, the contractor must cease inflow into Craney Island. For ponding and freeboard requirements, refer to paragraphs titled “Government Furnished Placement Area” and “Placement Area Use and Maintenance During Placement Operations”. “

D. Page 02881-8, delete paragraph 3.2.2 and substitute therefore the following:

“3.2.2 Control of Dredging Area and Placement Area Effluent

“The TSS concentration of the effluent samples taken in accordance with paragraph titled “Water Quality Monitoring Controls” shall be determined by a photometric method using a Hach 850/DR Colorimeter model #48450-00, program 94 “Suspended Solids”, or approved equal. Effluent water samples shall be taken with a 1000 ml wide-mouth polyethylene bottle (Nalgene 2104-0032 or equal). The specified

equipment provides for real time measurement of TSS concentration; therefore, the contractor shall perform the TSS measurement in the field immediately after each effluent sampling is accomplished.“

4. REVISED DRAWINGS: Sheets 3 and 4 for NEW WORK DREDGING OF SOUTH TERMINAL AT NORFOLK INTERNATIONAL TERMINALS, change all references for “Additive” to “Optional”.

SECTION 00010 - SOLICITATION CONTRACT FORM
W9123604B0018 0001
Section 00010 - Solicitation Contract Form

SCHEDULE I – NORFOLK HARBOR CHANNEL – BASE BID

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001		1	Lump Sum	Job	

FFP
Mobilization and Demobilization
PURCHASE REQUEST NUMBER: W26GLG-4147-1804

NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0002		166,400	Cubic Yard	$_____	

FFP
Maintenance Dredging Norfolk Harbor Channel to required depths of 51 feet MLLW and 52 feet MLLW with one foot of allowable overdepth at each dredging depth, complete, including all associated work as indicated and specified. **THIS IS AN ESTIMATED QUANTITY.**

NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0003		2,021,900	Cubic Yard	$_____	

FFP
New Work Dredging Norfolk Harbor Channel to required depths of 51 feet MLLW and 52 feet MLLW with one foot of allowable overdepth at each dredging depth, complete, including all associated work as indicated and specified. **THIS IS AN ESTIMATED QUANTITY.**

NET AMT

FOB: Destination

Total Estimated Amount of Base Bid Schedule I: $_____

SCHEDULE II – SOUTH TERMINAL OF NORFOLK INTERNATIONAL TERMINALS CHANNEL - BASE BID

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0004		1	Lump Sum	Job	

FFP
Mobilization and Demobilization

NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0005		1,395,300	Cubic Yard	$ _____	

FFP
New Work Dredging South Terminal of Norfolk International Terminals to required depths of 25 feet MLW and 50 feet MLW with two feet of allowable overdepth at each dredging depth, complete, including all associated work as indicated and specified. **THIS IS AN ESTIMATED QUANTITY.**

NET AMT

FOB: Destination

Total Estimated Amount of Base Bid Schedule II: $_____

OPTIONAL BID ITEMS

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0006		257,700	Cubic Yard	$_____	

FFP
OPTIONAL ITEM NO. 1
New Work Dredging South Terminal of Norfolk International Terminals to required depths of 25 feet MLW and 50 feet MLW with two feet of allowable overdepth at each dredging depth, complete, including all associated work as indicated and specified. **THIS IS AN ESTIMATED QUANTITY.**

NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0007		468,000	Cubic Yard	$_____	

FFP
OPTIONAL ITEM NO. 2
New Work Dredging South Terminal of Norfolk International Terminals to required depths of 25 feet MLW and 50 feet MLW with two feet of allowable overdepth at each dredging depth, complete, including all associated work as indicated and specified. **THIS IS AN ESTIMATED QUANTITY.**

NET AMT

FOB: Destination

TOTAL ESTIMATED AMOUNT BID (BASE BID PLUS ALL OPTIONS):
$_____

SECTION 00100 - BIDDING SCHEDULE/INSTRUCTIONS TO BIDDERS

E4LC02 AWARD TO RESPONSIBLE OFFEROR

Responsibility will be determined, prior to award, by the Contracting Officer, either by performing a pre-award survey or conclusions based on a previous pre-award survey and/or any performance data available. A pre-award survey will be performed and the offeror will be required to show that he has the necessary capital, experience, and owns or can procure the necessary plant or other resources to commence the work at the time prescribed in the specifications and thereafter to prosecute and complete the work safely and satisfactorily within the time specified.

E4LC09 BASIS OF AWARD

All blanks must be filled in by the bidder. A single award will be made to the lowest responsible, responsive bidder on the basis of the total price bid. Prior to making an award, a pre-award survey will be made and the low bidder will be required to show that he has the necessary capital, experience, and owns or can procure the necessary plant to commence the work at the time prescribed in the specifications and thereafter to prosecute and complete the work safely and satisfactorily within the time specified.

E4LC 30 CONTRACTOR PERFORMANCE AND BANKING INFORMATION

1. Prior to awarding a contract, the Government must conduct a PRE-AWARD SURVEY of the firm selected for award. In order for us to minimize delays in conducting the survey and awarding the contract, you are requested to provide the following information with your offer:

a. BANK: Branch/Location
Point-of-Contact
Telephone Number/Fax Number
Please contact the bank in advance so they will release the necessary information regarding average balances in your operating accounts, lines of credit, and credit history.

b. 3 CURRENT PROJECTS OF SIMILAR SCOPE AND SIZE:
Project Title/Contract Number
Customer
Point-of-Contact
Telephone Number/Fax Number
$ Value
% Complete
Scheduled Completion Date

c. 3 COMPLETED PROJECTS OF SIMILAR SCOPE AND SIZE:
Same as CURRENT PROJECTS; however, in lieu of "% Complete" and "Scheduled Completion Date," provide "Completion Date."

d. DO NOT PROVIDE VOLUMINOUS LISTINGS OF YOUR FIRM'S CONTRACTING HISTORY.

2. If you wish to shield this information from public view at the bid opening, the information may be placed in an envelope with the following legend:
PRE-AWARD SURVEY INFORMATION
SOLICITATION NO._____
<YOUR FIRM'S NAME>

52.217-5 EVALUATION OF OPTIONS (JUL 1990)

Except when it is determined in accordance with FAR 17.206(b) not to be in the Government's best interests, the Government will evaluate offers for award purposes by adding the total price for all options to the total price for the basic requirement. Evaluation of options will not obligate the Government to exercise the option(s).

(End of provision)

52.219-4 NOTICE OF PRICE EVALUATION PREFERENCE FOR HUBZONE SMALL BUSINESS CONCERNS (JAN 1999)

(a) Definition. HUBZone small business concern, as used in this clause, means a small business concern that appears on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration.

(b) Evaluation preference. (1) Offers will be evaluated by adding a factor of 10 percent to the price of all offers, except--

(i) Offers from HUBZone small business concerns that have not waived the evaluation preference;

(ii) Otherwise successful offers from small business concerns;

(iii) Otherwise successful offers of eligible products under the Trade Agreements Act when the dollar threshold for application of the Act is exceeded (see 25.402 of the Federal Acquisition Regulation (FAR)); and

(iv) Otherwise successful offers where application of the factor would be inconsistent with a Memorandum of Understanding or other international agreement with a foreign government.

(2) The factor of 10 percent shall be applied on a line item basis or to any group of items on which award may be made. Other evaluation factors described in the solicitation shall be applied before application of the factor.

(3) A concern that is both a HUBZone small business concern and a small disadvantaged business concern will receive the benefit of both the HUBZone small business price evaluation preference and the small disadvantaged business price evaluation adjustment (see FAR clause 52.219-23). Each applicable price evaluation preference or adjustment shall be calculated independently against an offeror's base offer.

These individual preference amounts shall be added together to arrive at the total evaluated price for that offer.

(c) Waiver of evaluation preference. A HUBZone small business concern may elect to waive the evaluation preference, in which case the factor will be added to its offer for evaluation purposes. The agreements in paragraph (d) of this clause do not apply if the offeror has waived the evaluation preference.

___ Offeror elects to waive the evaluation preference.

(d) Agreement. A HUBZone small business concern agrees that in the performance of the contract, in the case of a contract for

(1) Services (except construction), at least 50 percent of the cost of personnel for contract performance will be spent for employees of the concern or employees of other HUBZone small business concerns;

(2) Supplies (other than procurement from a nonmanufacturer of such supplies), at least 50 percent of the cost of manufacturing, excluding the cost of materials, will be performed by the concern or other HUBZone small business concerns;

(3) General construction, at least 15 percent of the cost of the contract performance incurred for personnel will be will be spent on the concern's employees or the employees of other HUBZone small business concerns; or

(4) Construction by special trade contractors, at least 25 percent of the cost of the contract performance incurred for personnel will be spent on the concern's employees or the employees of other HUBZone small business concerns.

(e) A HUBZone joint venture agrees that in the performance of the contract, the applicable percentage specified in paragraph (d) of this clause will be performed by the HUBZone small business participant or participants.

(f) A HUBZone small business concern nonmanufacturer agrees to furnish in performing this contract only end items manufactured or produced by HUBZone small business manufacturer concerns. This paragraph does not apply in connection with construction or service contracts.

(End of clause)

SECTION 00800 - SPECIAL CONTRACT REQUIREMENTS

52.217-7 OPTION FOR INCREASED QUANTITY--SEPARATELY PRICED LINE ITEM (MAR 1989)

The Government may require the delivery of the numbered line item, identified in the Schedule as an option item, in the quantity and at the price stated in the Schedule. The Contracting Officer may exercise the option by written notice to the Contractor within 120 calendar days from award. Delivery of added items shall continue at the same rate that like items are called for under the contract, unless the parties otherwise agree.

(End of clause)

Schnabel Schnabel Engineering Associates, Inc. — **TEST BORING LOG**

Project: VPA - NIT North Redevelopment
Norfolk International Terminal
Norfolk, Virginia

Boring Number: **C-1**
Contract Number: 02132013
Sheet: 1 of 2

Boring Contractor: Fishburne Drilling, Inc.
Chesapeake, Virginia
Boring Foreman: E. Hester
Drilling Method: 2 7/8" O.D. Tri-cone Roller Bit (Mud Rotary)
Drilling Equipment: CME-45C (Track Mounted ATV)
SEA Representative: J. Hollowell
Dates Started: 2/8/02 Finished: 2/8/02
Location: See Location Plan, Figure A1

Ground Surface Elevation: 0.0± (feet)

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	2/8	--	---	---	---
Completion	2/8	10:35	---	---	---
Casing Pulled	2/8	10:42	---	---	---

DEPTH (ft)	STRATA DESCRIPTION	CLASS.	ELEV. (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	Water				5			JAMES RIVER
9.0	Fine to medium silty sand, contains clayey sand pockets, wet - dark gray	SM	-9.0		10	WOR/24" SPT		
						WOR+2+1+1 SPT		
15.0	Fine to medium clayey sand, contains shell fragments, wet - dark gray	SC	-15.0	B2	15	WOR/24" SPT		NORFOLK FORMATION
					20	WOH/24" SPT		
24.0	Fine to medium silty sand, wet - brown	SM	-24.0		25	7+8+7+8 SPT		
29.0	Fine to coarse poorly graded sand with silt, contains shell fragments, wet - brown	SP-SM	-29.0		30			

continued on next page

Comments:

TEST BORING LOG 2132013.GPJ SCHNABEL.GDT 11/18/03

Schnabel Engineering Associates, Inc.

TEST BORING LOG

Project: VPA - NIT North Redevelopment
Norfolk International Terminal
Norfolk, Virginia

Boring Number: C-1
Contract Number: 02132013
Sheet: 2 of 2

DEPTH (ft)	STRATA DESCRIPTION	CLASS	ELEV. (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	Fine to coarse poorly graded sand with silt, contains shell fragments, wet - brown *(continued)*	SP-SM				7+17+15+14 SPT		
34.0			-34.0					
	Fine to medium silty sand, contains decayed wood fragments, wet - dark gray	SM		B2	35	11+11+11+12 SPT		
39.0			-39.0					
	Fat clay, trace sand, wet - dark gray	CH		B1	40	2+3+3+2 SPT		NORFOLK FORMATION
					45	2+2+2+3 SPT		
					50	3+2+3+3 SPT		
					55	3+5+6+8 SPT		
57.0	Boring Terminated at 57.0 ft		-57.0					

TEST BORING LOG 2132013.GPJ SCHNABEL.GDT 4/9/13

Comments:

Schnabel Engineering Associates, Inc.

TEST BORING LOG

Project: VPA - NIT North Redevelopment
Norfolk International Terminal
Norfolk, Virginia

Boring Number: C-2
Contract Number: 02132013
Sheet: 1 of 2

Boring Contractor: Fishburne Drilling, Inc.
Chesapeake, Virginia
Boring Foreman: E. Hester
Drilling Method: 2 7/8" O.D. Tri-cone Roller Bit (Mud Rotary)
Drilling Equipment: CME-45C (Track Mounted ATV)
SEA Representative: J. Hollowell
Dates Started: 2/8/02 Finished: 2/8/02
Location: See Location Plan, Figure A1

Ground Surface Elevation: 0.0± (feet)

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	2/8	--	---	---	---
Completion	2/8	12:45	---	---	---
Casing Pulled	2/8	1:14	---	---	---

DEPTH (ft)	STRATA DESCRIPTION	CLASS.	ELEV. (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	Water							
13.0	Shell fragments, contains elastic silt layers, wet - dark gray	GP	-13.0			WOR/24" SPT; 2-1-1/12" SPT; WOR/24" SPT		JAMES RIVER
19.0	Fat clay, trace sand, contains shell fragments, wet - dark gray	CH	-19.0	B1		WOH/24" SPT		NORFOLK FORMATION
	do, contains shell fragments					WOH/24" SPT; WOR/12+9"		
	continues on next page							

TEST BORING LOG 2132013.GPJ SCHNABEL.GDT 1/30/03

Comments:
1. Reference elevation equals pier surface elevation of El 9.0.

Schnabel Engineering Associates, Inc.

TEST BORING LOG

Project: VPA - NIT North Redevelopment
Norfolk International Terminal
Norfolk, Virginia

Boring Number: C-2
Contract Number: 02132013
Sheet: 2 of 2

DEPTH (ft)	STRATA DESCRIPTION	CLASS.	ELEV. (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
31.0	Fine to medium clayey sand, contains shell fragments, wet - dark gray	SC	-31.0			SPT		
34.0	Fine to medium silty sand, contains shell fragments, wet - dark brown	SM	-34.0	B2	35	1-1-5-5 SPT		
39.0	Fat clay, trace sand, wet - dark gray		-39.0		40	WOH-2-3-2 SPT		NORFOLK FORMATION
	do, contains clayey sand lenses	CH		B1	45	1-3-2-2 SPT		
					50	1-2-2-3 SPT		
					55	2-2-2-3 SPT		
57.0	Boring Terminated at 57.0 ft		-57.0					

Comments:
1. Reference elevation equals pier surface elevation of El 9.0.

APPENDIX C - VOLUME 1

GEOLOGY AND SOILS
SUBSURFACE INVESTIGATION
NORFOLK HARBOR CHANNEL
NORFOLK HARBOR AND CHANNELS, VIRGINIA

PREPARED BY:

W. JERRY SWEAN, P.G.

GEOTECHNICAL ENGINEERING SECTION
U.S. ARMY CORPS OF ENGINEERS
NORFOLK DISTRICT
803 FRONT STREET
NORFOLK, VIRGINIA 23510-1096

JUNE 1986

SUMMARY

In May 1983, August 1984 and July 1985, the Norfolk District supervised subsurface investigations of the Norfolk Harbor Channel located in the Elizabeth River and Hampton Roads Harbor, Virginia. The work was performed in support of the Norfolk Harbor and Channels, Deepening Project, Virginia. The purpose was to determine sediment type characteristics to a depth of minus 58 feet mean low water, to determine the natural angle of repose for the materials encountered, and to determine areas within the project which have sediments suitable for engineering construction.

Results of the vibracore sampling program indicate the presence of very, soft saturated, plastic marine-estuarine clay (CL, CH) and silts (ML, MH) in much of the channel. Patches of dense silty, fine to coarse calcareous sands (SM) were encountered in some areas. Vibracore penetration into this material was difficult with penetration refusal occurring in each area.

The calcareous sands identified in this exploration program are suitable for beach restoration projects and engineering fill. Cohesive sediments encountered in this study will stand initially at a slope as steep as 1V on 2H. With time, these greater slopes are expected to degrade. The non-cohesive sediments will satisfactorily maintain slopes between 1V to 3H and 1V to 5H.

TABLE OF CONTENTS

APPENDIX C - VOLUME 1

GEOLOGY AND SOILS
SUBSURFACE INVESTIGATION
NORFOLK HARBOR CHANNEL
NORFOLK HARBOR AND CHANNELS, DEEPENING PROJECT, VIRGINIA

1. INTRODUCTION. In May 1983, August 1984, and July 1985, the Norfolk District supervised subsurface investigations for the Norfolk Harbor Channel, Norfolk Harbor and Channels, Deepening Project, Virginia. The scope of work was fourfold:

a. To determine substrata conditions to a minimum depth of minus 58 feet below mean low water. Detail was given to identifying areas where sediment changes occurred both vertically and horizontally.

b. To perform laboratory soil identification tests, moisture contents, natural density tests, and soil strength tests.

c. To determine the side slopes for the channel.

d. Identify areas within the project area which may have sand texturally suitable and available in appreciable quantities for mining.

The purpose was to provide specific data to determine the dredgeability of the materials encountered.

2. SITE DESCRIPTION.

2.1 Project Site. The Norfolk Harbor Channel consist of the Entrance Reach, Norfolk Harbor Channel and Craney Island Reach. The channels are located in the Elizabeth River and the area known as the Hampton Roads Harbor where the Elizabeth River, James River, and Nansemond River converge. The channel is bounded on the north side by the City of Hampton and splits Craney Island Disposal Area to the west and the City of Norfolk to the east. These three channels combine to be approximately 7.4 nautical miles long. A location map for Norfolk Harbor Channel is shown in Appendix 1A, Sheet 1A-1.

2.2 General Geology. The study area is located in the Coastal Plain Physiograhic Province. The subaerial morphology is dominated by a series of plains and scarps. These plains and scarps are deposited erosional features which were formed during the Pleistocene glacial and interglacial periods. Underlying the Coastal Plain is a seaward thickening wedge of unconsolidated sediments dating from at least earliest Cretaceous time to recent. The basement rock is pre-Cambrian crystalline rock and underlies the area at depths greater than 2000 feet. The Chesapeake Bay is the most prominent physiograhic feature in the Virginia Coastal Plain. It is an ancient drainage system which was drowned by a later rise in sea level.

3. EXPLORATION. Exploration programs were conducted during May 1983, August 1984, and July 1985. Ocean Seismic and Survey, Inc. of Norwood, New Jersey, Carpenter Construction Company, Inc., and Exploratory Marine, Inc., both of Virginia Beach, Virginia performed the exploration programs. Confirmation of the material comprising the seafloor and shallow subbottom was made by physically sampling the sediment with a vibracore. The vibracore is an underwater sampler, which is activated by a pneumatic or hydraulic vibrator and supported by either a barge-mounted crane or a ship mounted crane. The vibracore drives a long slender casing into the underwater sediment deposits. The casing incorporates a clear plastic 3 to 3-1/2 inch inside diameter liner tube and is supported by a quadripod assembly at the underwater sediment surface. After adequate bearing is obtained for the quadripod basepods on the bottom, the casing is vibrated into the underlying soils. A vibrator attached to the top of the casing supplies the driving force. An umbilical conduit carries power to the vibrator and either exhausts freely to the atmosphere or recirculates through the barge-mounted compressor. A penetrometer was used to record the rate of penetration in feet per second.

The vibracore was required to obtain eighty percent of all material penetrated. Refusal of penetration was defined as less than 1-foot of penetration for five minutes of vibration. Jetting was then required to advance the boring if necessary. Cores were cut in 5 to 7 foot sections, sealed at the ends, and stored upright. Later the cores were transported to a processing center where sections of the cores were cut out and sent to a soil laboratory for testing. The remaining core was set up for splitting on a metal trough. A power router mounted on a base which is designed to ride along the top of the trough is set to cut just through the liner. A cut is made on the core and the core is then rotated 180-degrees and another cut is made. One half of the core liner is then discarded and the other is logged and sampled as necessary. The retained portion of the core is sealed in clear polyethylene sleeving and is stored in a core depository. A total of 66 twenty foot vibracores were performed in the study area. Boring logs with boring notes are provided in Appendix 1B. Boring locations are shown in Appendix 1A, sheets 1A-2 through 1A-9.

4. HORIZONTAL AND VERTICAL CONTROL. The horizontal control used for the positioning and locations of the subbottom sampling was based on the North American Datum (NAD). The coordinates of the horizontal control are expressed in feet and referr to the Virginia State Grid (South Zone). Specifically, three different electronic survey systems were utilized. Following is a brief description of each:

The 1983 exploration program, conducted by Ocean Seismic and Survey, Inc., relied on a Del Norte Trisponder RO2 Distance Measuring Unit (DMU), interfaced with a Hewlett Packard 9825 computer and 7245B plotter printer. Three Del Norte transponders were placed at selected shore points whose coordinates were precisely evaluated in the Virginia State Coordinate System. The DMU measures range from the control antenna aboard the vessel to the shore transponders.

For mooring the vessel into position for coring, two ranges were used. Then, once the vessel was set up on the core site, three ranges were used to verify the position and to compute a level of accuracy. Three ranges will yield three positions for the vessel, all very close together. The computed location is the centroid of these three positions. (The centroid also turns out to be the least squares location). The mean deviation of the three points from the centroid is computed as a measure of accuracy.

Carpenter Construction Company, Inc. in 1984 utilized a Hastings-Raydist model ZA-75C navigator and model GA-50 position indicator. The Hastings-Raydist navigation system is a hyperbolic phase comparison method operated by signals sent by permanently installed shore stations. The hyperbolic mode system uses a minimum of three shore stations and a receiver onboard the boat. The shore stations generate a unique pattern of intersecting lines that allows the survey boat position to be calculated. Each hyperbola is a line of position. The receiver on the survey boat detects and compares the phase difference of the transmitted signals to determine the position of the boat.

Positioning was provided by Bieker Associates, Inc. from Lynne, Connecticut, in 1985. Bieker Associates operated a Motorola Mini Ranger III which is a microwave, range/range positioning system. The master receiver/transmitter unit aboard the survey boat integrates two reference station units set up on known survey markers on the Virginia Grid System. The range from each reference station to the coordinate of the site is computed and later converted to the Virginia Grid System.

Vertical control was maintained by measuring and recording the water depth at the sample location. Water depths were measured with an electronic fathometer. Fathometers were periodically bar checked for accuracy. The time of the day was noted and at a later date the elevations were corrected to mean low water utilizing the tide prediction tables published by the National Ocean Service. The elevations were corrected using the tidal information at the nearest subordinate station found in the tide table publication.

5. SUBBOTTOM PROFILING. Seismic reflection profiling was used to delineate subbottom structures, bedding planes, and lateral and horizontal density variations between different lithologies encountered during the vibracore exploration program. Continuous reflections were obtained by generating repetitive high energy sound pulses near the water surface and recording echoes reflected from the sediment-water interface, and subbottom interfaces between acoustically dissimilar materials.

5.1 Equipment. A Raytheon RTT-1000A-1 portable survey system consisting of a dual low-frequency (3.5 and 7.0 KHZ) transducer coupled with a high-frequency (200 KHZ) transducer was used for seismic profiling. The power source for the acoustical signal and transceiver chart recorder was supplied by the U.S. Army Corps of Engineers boat, "ADAMS" or "LYNNHAVEN".

5.1.1 Area of Coverage. Seismic survey tracklines were laid out in two line patterns: a profile line on each side of the centerline of the channel and running parallel to the centerline, and 23 cross section tracklines running perpendicular to the centerline of the channel. Seismic reflection records are on file in the Geotechnical Engineering Section, Norfolk District, Corps of Engineers.

5.1.2 Discussion of Subbottom Profiling. Many subbottom acoustic reflectors were seen on the seismic reflection records. However, most of all the acoustic reflectors encountered were below project depth. Two areas encountered show geologic structures such as erosional surface features or sedimentary depositional features near the surface. These structures were delinated due to variation in acoustic impedence within the sediment column. This change is normally attributed to some lithologic change such as grain size, matrix content, degree of cemetation, water content, etc. It is also possible that reflectivity is enhanced or diminished by the relative angles between the survey track and the dip of the beds. The two zones where strong reflectors are near the surface occur in areas between station numbers 160+00 to 185+00 and 253+00 to 273+00. These areas correlate well with results obtained from the vibracore exploration program. Inspection of the isometric drawing shown in Appendix 1D show that horizontal and vertical sediment changes occur near these areas. However, it should be noted the boundaries shown on the diagrams in Appendix 1D are only estimated. Both of these zones contained areas where the sediments are stiffer than surrounding materials. These areas are discussed more in Section 7 of this report.

6. LABORATORY SOIL TESTING. A total of 170 samples were removed from the vibracores for laboratory testing. These section samples were generally 1 to 1.5 feet long. The samples were sealed at both ends and sent to laboratory firms. Century Engineering, Inc., of Towson, Maryland, Schnabel Engineering Associates of Richmond, Virginia, and Law Engineering Testing Company of Norfolk, Virginia, performed the laboratory testing on the sediment samples. Laboratory testing was performed to determine sediment classification and geotechnical characteristics. Tests included moisture contents, Atterburg limits, specific gravities, natural densities, percent fines, Unified Soil Classifications, gradation analyses, torvane tests, unconsolidated-undrained triaxial tests, consolidation tests, and consolidated quick direct shear tests. Consolidation tests were ran to assist in determining void ratios of the in-situ material. Test results are indicated on the logs in Appendix 1B and found in tabular form in Appendix 1C. In addition, Old Dominion University (O.D.U.), Norfolk, Virginia, conducted standard x-ray radiograph tests on seventeen samples. Four of these samples were from Norfolk Harbor Channel. The results of this study are provided in Appendix 1E. The tests were performed to assist in determining an estimate of the degree of disturbance to the sample. The vibratory sampler obtains a 20-foot long continuous sample in a few minutes, therefore, the samples are generally considered to be disturbed. The degree of disturbance is related to the sediment size. In general, the fine grain soils (silt and clay) illustrated a less amount of disturbance than coarser size soils (sand).

Because disturbance of the sediments does occur, the shear strength values presented in this report are only relative values and cannot characterize actual in-situ soil strength parameters. O.D.U. also ran sedimentological studies on four samples. These studies included particle roundness, particle hardness, mineralogy of sand and silt size fractions, clay mineralogy and relative abundance. This report is also included in Appendix 1E.

7. SUBSURFACE CONDITIONS. Soil samples are classified according to the Unified Soils Classification System and described according to Burmister's Method of Material Proportions. Elevations shown on the logs are approximate and based on mean low water (MLW).

7.1 Soil Profile. Results of the vibracore sampling indicate the presence of very, soft saturated, plastic marine-estuarine clay (CL, CH) and silts (ML, MH) in much of the channel. Three areas within the project area consist of dense, silty fine to coarse calcareous sands (SM). These areas are in the vicinity of station numbers 166+00, 266+00, and 306+00. These areas are shown by the dashed lines in the boring location plans in Appendix 1A of this report. The inferred boundaries are only meant to indicate the areas where the material was encountered during the exploration programs described in this report. The material may possibly be found outside the inferred boundary. Vibracore penetration into this material was difficult with penetration refusal occurring in each area. Dredging performed in the past around the area of station 296+00 has encountered sedimentary rock. The rock was identified as coquina which is considered a limestone consisting of shell fragments, coral, and other organic debris. Coquina was not encountered during the exploration programs described in this report. However, maintenance dredging performed during this time did encounter this material. Specimens collected from discharge pipelines into Craney Island Disposal Area are stored at the Norfolk District, Corps of Engineers.

Discussion of the laboratory analyses performed on the sediment samples report is restricted to the material above minus 58 feet elevation (MLW). A total of 127 samples of the original 170 samples are described here. Of the 127 samples, nineteen classified as sandy material (SM, SC, SP) and 112 classified as silts and clays (ML, MH, CL, CH). The natural dry density of the sediment varied from 24.0 to 113.7 pounds per cubic feet (PCF) and averaged approximately 57.5 PCF. Specific gravity values ranged from 2.53 to 2.76 and averaged 2.68. Natural moisture contents ranged from 6.5 to 191.5 percent and averaged 77.9 percent. Saturation averaged 94.3 percent. Liquid limit values ranged from 24 to 148 and averaged 79. Plastic limits varied between 14 and 92 and averaged 30. Void ratios ranged from 0.61 t0 5.89 and averaged 2.23. The percent fines ranged from 3.7 to 100 and averaged 80.7 percent.

The dry unit weight of the coarse grained sediments tested ranged from 68.5 to 113.7 pcf and averaged 92.2 pcf. The percent fines ranged from 3.7 to 41.0 percent and averaged 24.0 percent. The liquid limit varied from 33 - 87 and averaged 52. The plastic limit ranged from 14 to 32 and averaged 22. Moisture contents varied between 6.5 to 52.9 percent and averaged 30.4 percent. The specific gravity varied from 2.60 to 2.77 and averaged 2.68.

The dry unit weight of the cohesive sediments ranged from 24.0 to 97.7 pcf and averaged 53.2 pcf. The percent fines varied from 51.0 to 100.00 percent and averaged 90.0 percent. The liquid limits varied from 24 to 148 and averaged 79.5. The plastic limits ranged from 17 to 92 and averaged 30. The natural moisture ranged from 26.0 to 191.5 and averaged 87.1. The specific gravity ranged from 2.53 and 2.76 and averaged 2.66.

Twenty-four unconsolidated-undrained (UU) tests were performed. Strength values ranged from 0.06 to 1.90 tons per square foot (TSF) and averaged 0.19 TSF. Four unconfined compression tests were ran with strength values ranging from 0.05 to 0.215 TSF and averaged 0.11 TSF. Four direct shear tests were ran with phi angles varying from 28 degrees to 49 degrees. A total of 35 tovane tests were performed with shear values ranging from 0.06 to 0.5 TSF with an average of 0.19 TSF.

8. SIDE SLOPES. Slope stability analyses were not conducted for the channel. Experience has established that the softer sediments consisting of clays and silts in the south end area of the project will initially stand at 1 on 3 slopes. Because the channel banks consist of firm clay in areas, slopes as great as 1 on 2 should be obtainable. With time these greater angles will degrade. For the non-cohesive silty fine to coarse sands, side slopes of 1 on 3 to 1 on 5 are recommended.

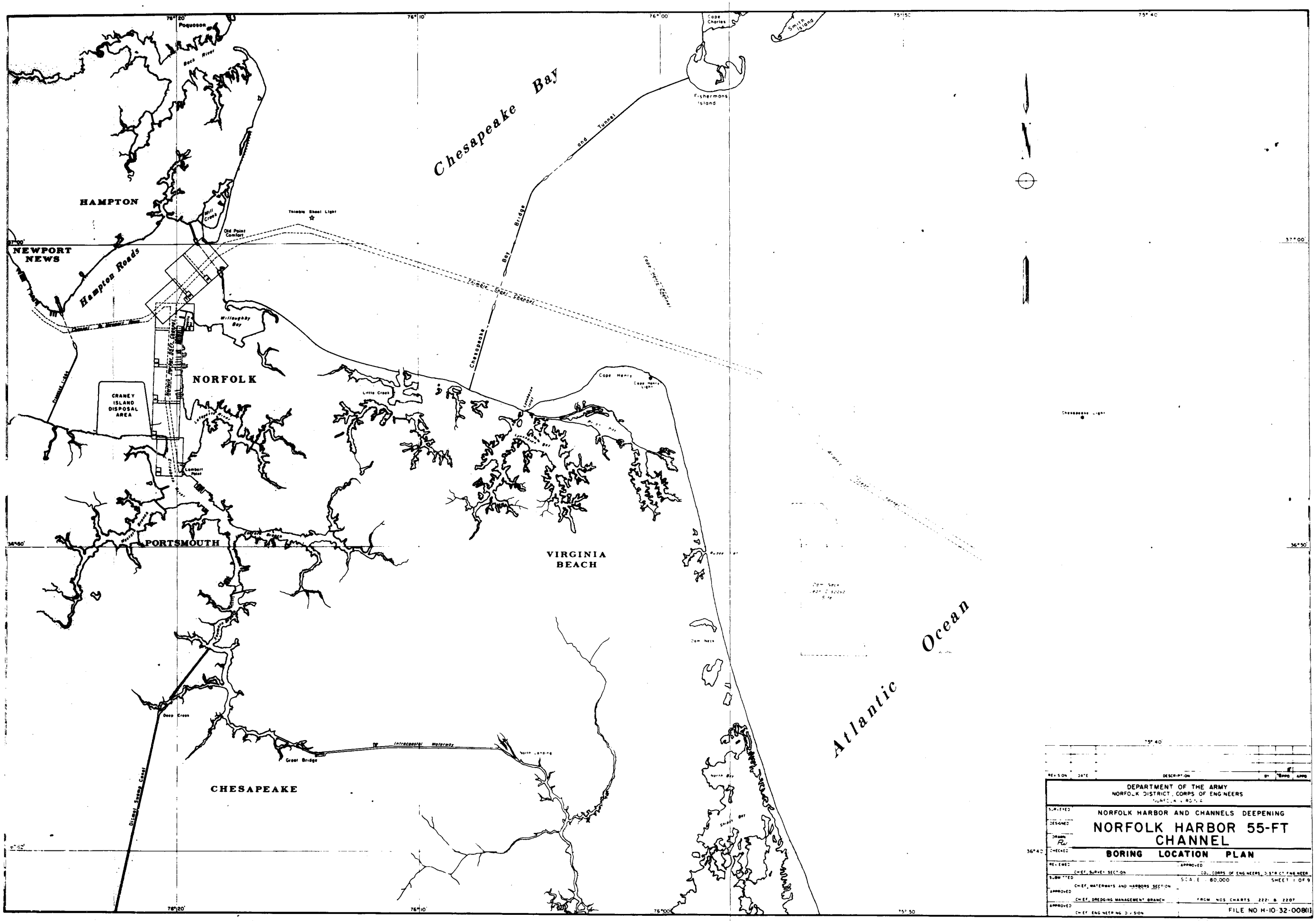
9. MINERAL RESOURCES. Areas within the channel project which contain material which may be suitable for construction fills are stations 32+00 to 42+00; 150+00 to 185+00 and 250+00 to 254+00. These areas contained appreciable amounts of sand size material which in the past has been used for beach restoration and engineering fill.

APPENDIX 1A

NORFOLK HARBOR CHANNEL
BORING LOCATION PLANS

SHEET	TITLE
1A-1	General Sheet Layout
1A-2	Stations 2+50 to 79+00
1A-3	Stations 79+00 to 154+50.35
1A-4	Stations 154+50.35 to 225+30
1A-5	Stations 225+30 to 300+00
1A-6	Stations 300+00 to 348+82.65
1A-7	Stations 348+82.65 to 389+02.65
1A-8	Stations 389+02.65 to 437+40
1A-9	Stations 437+40 to 481+00

Denotes vibracore boring location.



REVISION	DATE	DESCRIPTION	BY / APPD

DEPARTMENT OF THE ARMY
NORFOLK DISTRICT, CORPS OF ENGINEERS
NORFOLK, VIRGINIA

NORFOLK HARBOR AND CHANNELS DEEPENING

NORFOLK HARBOR 55-FT CHANNEL

BORING LOCATION PLAN

SURVEYED
DESIGNED
DRAWN RW
CHECKED
REVISED
SUBMITTED
APPROVED
APPROVED
APPROVED

APPROVED
CHIEF, SURVEY SECTION
CHIEF, WATERWAYS AND HARBORS SECTION
CHIEF, DREDGING MANAGEMENT BRANCH
CHIEF, ENGINEERING DIVISION

CO., CORPS OF ENGINEERS, 5TH DIST. ENGINEER

SCALE - 80,000 SHEET 1 OF 9

FROM NOS CHARTS 222 & 220

FILE NO H-10-32-00811

1A-1

THIS DRAWING HAS BEEN REDUCED TO HALF SIZE

E L I Z A B E T H R I V E R

CITY OF NORFOLK WATER MAINS - ONE 30 - INCH MAIN AT APPROX ELEVATION - 52 FT M L W AND ONE 36 - INCH MAIN AT APPROX ELEVATION - 60 FT M L W ADDITIONAL INFORMATION REGARDING THESE LINES SHOULD BE OBTAINED FROM CITY OF NORFOLK

NSRY PIER NO 5

NSRY PIER NO 6

LAMBERTS PT

HRSD SEWER OUTFALL 84" CONCRETE PIPE

Black Buoy No 21 (Fl W) Esc

Red Buoy No 20 (Fl R) Esc

Green Buoy No 27 (Fl G) Sscs

Black Buoy No 23 (Fl G) Fscs

83VC-73
84VC-142
83VC-28
85VC-232
84VC-143
83VC-27
83VC-29
84VC-144
83VC-23
83VC-130
83VC-131

U.S. NAVAL SUPPLY CENTER

CRANEY ISLAND

Ruins
Trees
Bldg
Tank
Earth Parking
Dike

CE PIER C, 1970

N-211,000 N-210,000 N-209,000 N-208,000 N-207,000 N-206,000 N-205,000 N-204,000

E-2,835,000 E-2,834,000 E-2,833,000 E-2,832,000 E-2,831,000

69+00 10+00

REVISION	DATE	DESCRIPTION	BY	APPROVED

DEPARTMENT OF THE ARMY
NORFOLK DISTRICT, CORPS OF ENGINEERS
NORFOLK, VIRGINIA

NORFOLK HARBOR AND CHANNELS DEEPENING

NORFOLK HARBOR 55-FT CHANNEL

BORING LOCATION PLAN

DESIGNED	DRAWN	SCALE 1" = 200'	SHEET 2 OF 9
REVIEWED	CHECKED		FILE NO. H-10-32-008(2)

IA-2

MATCH TO SHEET 4

MATCH TO SHEET 2

N-218,000 N-217,000 N-216,000 N-215,000 N-214,000 N-213,000 N-212,000 N-211,000

E-2,634,000 E-2,633,000 E-2,632,000 E-2,631,000 E-2,630,000 E-2,629,000

GRID NORTH
TRUE NORTH

— CABLE AREA —
6 - VE & P CO. SUBMARINE CABLES
AUTHORIZED DEPTH 75 FT. BELOW MLW IN OS
800 CHANNEL

B 83VC-247 83VC-1 83VC-22 83VC-233 B

A 84VC-140 83VC-25 84VC-138A A

83VC-72 83VC-24 84VC-139 83VC-23 84VC-138

136+65.05

154+50.35

Green Buoy No 17 (FI W) Ebb

Black Buoy No 9 (FI W) Ebb

Red Buoy No 8 (FI R) Ebb

APPROACH AND MOORING AREA FOR HOPPER DREDGE

MOORING AREA FOR SUMP REHANDLER

HAMPTON ROADS

TRANSITION LINE SUPPORT STRUCTURE

SUBMERGED PIPE LINE

DREDGING RANGE ☆

☆ DREDGING RANGE

DREDGING RANGE ☆

CHANNEL TO REHANDLING BASIN

ACCESS CHANNEL TO REHANDLING BASIN

REHANDLING BASIN

SPUR LEVEE

Submerged Breakwater

Pier in Ruins

CRANEY ISLAND

REVISIONS	DATE	DESCRIPTION	BY	APPD	APPD

DEPARTMENT OF THE ARMY
NORFOLK DISTRICT, CORPS OF ENGINEERS
NORFOLK, VIRGINIA

NORFOLK HARBOR AND CHANNELS DEEPENING

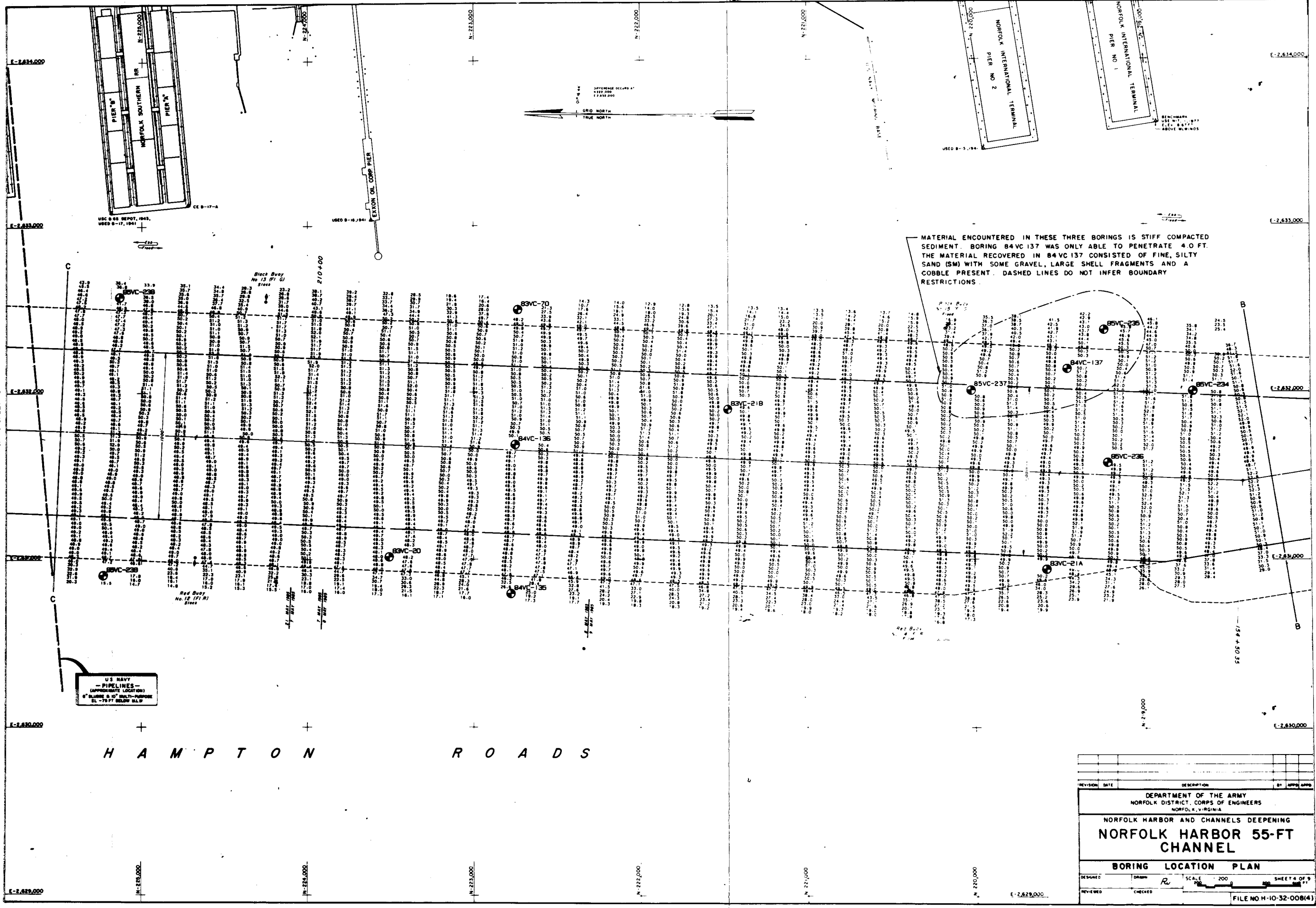
NORFOLK HARBOR 55-FT CHANNEL

BORING LOCATION PLAN

DESIGNED	DRAWN	SCALE 1" = 200'	SHEET 3 OF 9
REVISED	CHECKED		FILE NO H-10-32-008(3)

IA-3

THIS DRAWING HAS BEEN REDUCED TO HALF-SIZE



REVISION | DATE | DESCRIPTION | BY | APPD | APPD

DEPARTMENT OF THE ARMY
NORFOLK DISTRICT, CORPS OF ENGINEERS
NORFOLK, VIRGINIA

NORFOLK HARBOR AND CHANNELS DEEPENING

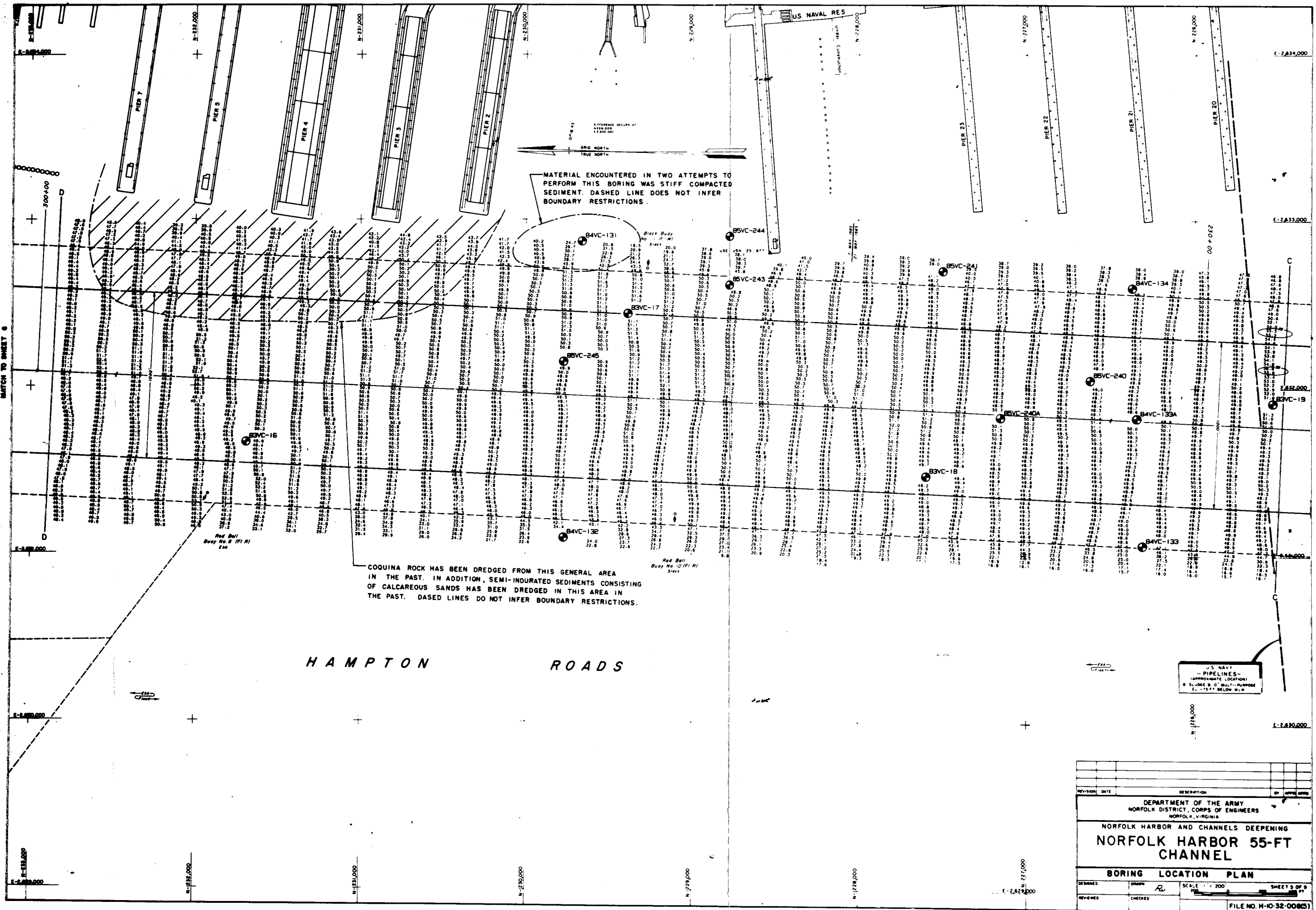
NORFOLK HARBOR 55-FT CHANNEL

BORING LOCATION PLAN

DESIGNED | DRAWN Rc | SCALE 1" = 200' | SHEET 4 OF 9
REVIEWED | CHECKED | FILE NO H-10-32-008(4)

IA-4

THIS DRAWING HAS BEEN REDUCED TO ___ OF ORIGINAL SIZE



REVISION	DATE	DESCRIPTION	BY	APPD	APPD

DEPARTMENT OF THE ARMY
NORFOLK DISTRICT, CORPS OF ENGINEERS
NORFOLK, VIRGINIA

NORFOLK HARBOR AND CHANNELS DEEPENING

NORFOLK HARBOR 55-FT CHANNEL

BORING LOCATION PLAN

DESIGNED	DRAWN	SCALE 1" = 200'	SHEET 5 OF 9 SHEETS
REVIEWED	CHECKED		FILE NO. H-10-32-008(5)

1A-5

MATCH TO SHEET 7

HAMPTON ROADS

CHANNEL TO NEWPORT NEWS

ANCHORAGES

NAVAL MANEUVERING AREA

CABLE AREA

U.S. NAVAL DEGAUSSING RANGE

APPROXIMATE LIMITS OF CABLE AREA

83VC-13

83VC-99

83VC-98

83VC-14

84VC-129

83VC-15

85VC-242

85VC-246

348+82.65

330+00

300+00

1000'

Black Buoy No 5 (F W)

Black Buoy No 7 (F G)

Stone Breakwater

USE "SEWELLS, 1977"

Open Storage Area

SEWELLS POINT

PIER NO 12

USE "CARRIER, 1977"

Parking Area

NORFOLK SOUTHERN

U S NAVAL BASE

PIER NO 11

PIER NO 10

USC&GS "SUB, 1943"

BENCHMARK USC&GS "SUB, 1943" ELEV 10.07' ABOVE MLW(NGS)

BORINGS ENCOUNTERED STIFF COMPACTED SEDIMENTS IN THIS AREA. DASHED LINES DO NOT INFER BOUNDARY RESTRICTIONS.

N-238,000 N-237,000 N-236,000 N-235,000 N-234,000 N-233,000

E-2,630,000 E-2,632,000 E-2,634,000 E-2,636,000 E-2,638,000

REVISION	DATE	DESCRIPTION	BY	APPD	APPD

DEPARTMENT OF THE ARMY
NORFOLK DISTRICT, CORPS OF ENGINEERS
NORFOLK, VIRGINIA

NORFOLK HARBOR AND CHANNELS DEEPENING

NORFOLK HARBOR 55-FT CHANNEL

BORING LOCATION PLAN

DESIGNED | DRAWN R | CHECKED | REVIEWED | SCALE 1:200 | SHEET 6 OF 9

FILE NO. H-10-32-0066(6)

IA - 6

THIS DRAWING HAS BEEN PREPARED

MATCH TO SHEET 5

IA-7

FILE NO H-10-32-00871

BORING LOCATION PLAN

NORFOLK HARBOR 55-FT CHANNEL

NORFOLK HARBOR AND CHANNELS DEEPENING

DEPARTMENT OF THE ARMY
NORFOLK DISTRICT, CORPS OF ENGINEERS
NORFOLK, VIRGINIA

MATCH TO SHEET 6

MATCH TO SHEET 8

THIS DRAWING HAS BEEN REDUCED

NAVAL MANEUVERING AREA

ANCHORAGES

APPROXIMATE LIMITS OF CABLE AREA

U.S. NAVAL DEGAUSSING RANGE

CABLE AREA

CHANNEL TO NEWPORT NEWS

HAMPTON ROADS

B3VC-14
B3VC-99
B4VC-126
B3VC-13
B4VC-128
B4VC-145
B3VC-33A
B3VC-33B
B4VC-146

E 2,631,000
N 238,000

TRUE NORTH
GRID NORTH
1° 49' 39"

MATCH TO SHEET 9

POTOMAC RIVER

95CP-260
83DH-1
83VC-201
83DH-4
83VC-204
95CP-259
83DH-7
83VC-207
88VC-33
63VC-32
84VC-147
CABLE AREA
APPROXIMATE LIMITS OF PROPOSED NAVY DEGAUSSING RANGE
DIFFERENCE OCCURS AT N243,000 E 2 635 000
431+00
393+00
Sensor 6
4 DEC 1985

DEPARTMENT OF THE ARMY
NORFOLK DISTRICT, CORPS OF ENGINEERS
NORFOLK, VIRGINIA

NORFOLK HARBOR AND CHANNELS DEEPENING

NORFOLK HARBOR 55-FT CHANNEL

BORING LOCATION PLAN

DESIGNED | DRAWN R | SCALE 1:200 | SHEET 8 OF 9
REVIEWED | CHECKED

FILE NO. H-10-32-008(8)

MATCH TO SHEET 7

Old Point Comfort

CHANNEL FROM THIMBLE SHOAL

NORTH ISLAND

FORT WOOL

SOUTH ISLAND

NORTHBOUND TUNNEL

SOUTHBOUND TUNNEL

THIMBLE SHOAL CHANNEL

485+27

381+00

441+00

6 DEC 1985

5 DEC 1985

4 DEC 1985

83VC-31

83VC-30

83VC-209

83VC-208

83VC-207

83VC-206

83VC-205

83VC-204

83VC-203

83VC-202

83DH-9

83DH-8

83DH-6

83DH-5

83DH-3

83DH-2

85CP-258

85CP-257

1500

G

N247,000

N246,000

N245,000

N244,000

E2,637,000

E2,638,000

E2,639,000

E2,640,000

E2,641,000

E2,642,000

E2,643,000

E2,644,000

E2,645,000

E2,646,000

DIFFERENCE OCCURS AT
N246,000
E2,639,000

REVISION DATE DESCRIPTION BY APPD APPD

DEPARTMENT OF THE ARMY
NORFOLK DISTRICT, CORPS OF ENGINEERS
NORFOLK, VIRGINIA

NORFOLK HARBOR AND CHANNELS DEEPENING

NORFOLK HARBOR 55-FT CHANNEL

BORING LOCATION PLAN

DESIGNED DRAWN R2 CHECKED REVIEWED

SCALE 1:200

SHEET 9 OF 9

FILE NO H-10-32-0089

MATCH TO SHEET 8

IA-9

THIS DRAWING HAS BEEN REDUCED TO

APPENDIX 1B

BORING LOGS

BORING NOTES

1. The soil was classified according to the "Unified Soil Classification System" (ML, CL, SP, etc) and described utilizing the "Burmister's Method of Material Proportions." (See page B-2 for classification system.)

2. The penetration scale indicates the number of seconds required for vibracorer to penetrate each foot of material. If more than 40 seconds was necessary, the total number of seconds was written on the scale for each foot of penetration.

3. All elevations and locations are approximate.

4. For location of borings, see Sheets 1A-1 through 1A-9.

5. Dates shown on logs are completion dates.

6. Samples are stored at the Norfolk District, Corps of Engineers and are available for inspection.

7. Abbreviations:

blk - black
brn - brown
BOH - Bottom of Hole
crs, c - coarse
cly - clayey
e - void ratio
fn, f - fine
frag - fragments (fragmented)
G - Specific gravity of solids
gry - gray
HP - High Plasticity
LL - Liquid Limit
LP - Low Plasticity
med, m - medium
MP - Medium Plasticity
mst - moist
PI - Plastic Index
PL - Plastic Limit
plast - plastic, plasticity
S% - Saturation percent
sdy - sandy
sat - saturated
sft - soft
sly - silty
tr - trace
TV - Torvane
v - very
v.f. - very fine
W% - Natural water content percent
w/ - with
yel - yellow
PCF - Dry density, pounds per cubic foot

8. The symbol (*) denotes that the soil parameter was calculated based on given laboratory results and equations presented on page C-1 of this report.

UNIFIED SOIL CLASSIFICATION
(Including Identification and Description)

Major Divisions		Group Symbols	Symbol: Hatching	Symbol: Color	Typical Names	Field Identification Procedures (Excluding particles larger than 3 inches and basing fractions on estimated weights)			Information Required for Describing Soils	Laboratory Classification Criteria
1	2	3	4	5	6	7			8	9
Coarse-grained Soils: More than half of material is larger than No. 200 sieve size.	Gravels: More than half of coarse fraction is larger than No. 4 sieve size. (For visual classification, the 1/4-in. size may be used as equivalent to the No. 4 sieve size) — Clean Gravels (Little or no fines)	GW		Red	Well-graded gravels, gravel-sand mixtures, little or no fines.	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.			For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics.	Determine percentages of gravel and sand from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse-grained soils are classified as follows: Less than 5% — GW, GP, SW, SP. More than 12% — GM, GC, SM, SC. 5% to 12% — Borderline cases requiring use of dual symbols.
		GP			Poorly-graded gravels, gravel-sand mixtures, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.				
		GM		Yellow	Silty gravels, gravel-sand-silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).			Give typical name; indicate approximate percentages of sand and gravel; max. size; angularity, surface condition, and hardness of the coarse grains, local or geologic name and other pertinent descriptive information; and symbol in parentheses.	$C_u = \frac{D_{60}}{D_{10}}$ Greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between one and 3. Not meeting all gradation requirements for GW. Atterberg limits below "A" line or PI less than 4 / Atterberg limits above "A" line with PI greater than 7. Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols.
		GC			Clayey gravels, gravel-sand-clay mixtures.	Plastic fines (for identification procedures see CL below).				
	Sands: More than half of coarse fraction is smaller than No. 4 sieve size. — Clean Sands (Little or no fines)	SW		Red	Well-graded sands, gravelly sands, little or no fines.	Wide range in grain size and substantial amounts of all intermediate particle sizes.				
		SP			Poorly-graded sands, gravelly sands, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.				
		SM		Yellow	Silty sands, sand-silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).			Example: Silty sand, gravelly; about 20% hard, angular gravel particles 1/2-in. maximum size, rounded and subangular sand grains coarse to fine; about 15% nonplastic fines with low dry strength; well compacted and moist in place, alluvial sand; (SM).	$C_u = \frac{D_{60}}{D_{10}}$ Greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between one and 3. Not meeting all gradation requirements for SW. Atterberg limits below "A" line or PI less than 4 / Atterberg limits above "A" line with PI greater than 7. Limits plotting in hatched zone with PI between 4 and 7 are borderline cases requiring use of dual symbols.
		SC			Clayey sands, sand-clay mixtures.	Plastic fines (for identification procedures see CL below).				
Fine-grained Soils: More than half of material is smaller than No. 200 sieve size. The No. 200 sieve size is about the smallest particle visible to the naked eye.						Identification Procedures on Fraction Smaller than No. 40 Sieve Size				
						Dry Strength (Crushing characteristics)	Dilatancy (Reaction to shaking)	Toughness (Consistency near PL)		
Silts and Clays: Liquid limit less than 50		ML		Green	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.	None to slight	Quick to slow	None	Give typical name, indicate degree and character of plasticity, amount and maximum size of coarse grains, color in wet condition, odor if any, local or geologic name, and other pertinent descriptive information; and symbol in parentheses.	Plasticity Chart: Comparing Soils at Equal Liquid Limit — Toughness and Dry Strength Increase with Increasing Plasticity Index. Plasticity Index vs. Liquid Limit. CH & MH; CL; ML; CL-ML. Use grain-size curve in identifying the fractions as given under field identification.
		CL			Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	Medium to high	None to very slow	Medium		
		OL			Organic silts and organic silty clays of low plasticity.	Slight to medium	Slow	Slight		
Silts and Clays: Liquid limit greater than 50		MH		Blue	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	Slight to medium	Slow to none	Slight to medium	For undisturbed soils add information on structure, stratification, consistency in undisturbed and remolded states, moisture and drainage conditions.	
		CH			Inorganic clays of high plasticity, fat clays.	High to very high	None	High		
		OH			Organic clays of medium to high plasticity, organic silts.	Medium to high	None to very slow	Slight to medium	Example: Clayey silt, brown, slightly plastic, small percentage of fine sand, numerous vertical root holes, firm and dry in place, loess, (ML).	
Highly Organic Soils		Pt		Orange	Peat and other highly organic soils.	Readily identified by color, odor, spongy feel and frequently by fibrous texture.				

(1) Boundary classifications: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example SW-GC, well-graded gravel-sand mixture with clay binder. (2) All sieve sizes on this chart are U. S. standard.

FIELD IDENTIFICATION PROCEDURES FOR FINE-GRAINED SOILS OR FRACTIONS

These procedures are to be performed on the minus No. 40 sieve size particles, approximately 1/64 in. For field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests.

Dilatancy (Reaction to shaking)

After removing particles larger than No. 40 sieve size, prepare a pat of moist soil with a volume of about one-half cubic inch. Add enough water if necessary to make the soil soft but not sticky.

Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens, and finally it cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil.

Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, show a moderately quick reaction.

Dry Strength (Crushing characteristics)

After removing particles larger than No. 40 sieve size, mold a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun, or air drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity.

High dry strength is characteristic for clays of the CH group. A typical inorganic silt possesses only very slight dry strength. Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen. Fine sand feels gritty, whereas a typical silt has the smooth feel of flour.

Toughness (Consistency near plastic limit)

After removing particles larger than the No. 40 sieve size, a specimen of soil about one-half inch cube in size, is molded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. Then the specimen is rolled out by hand on a smooth surface or between the palms into a thread about one-eighth inch in diameter. The thread is then folded and rerolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.

After the thread crumbles, the pieces should be lumped together and a slight kneading action continued until the lump crumbles.

The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil. Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay of low plasticity, or materials such as kaolin-type clays and organic clays which occur below the A-line.

Highly organic clays have a very weak and spongy feel at the plastic limit.

Adopted by Corps of Engineers and Bureau of Reclamation, January 1952

For laboratory classification of fine-grained soils

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-14
COORDINATES: N 235,658.00
E 2,631,722.00

DATE: 6 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -53.8 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 16.4 /20.0 82.0 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-53.8	0.0			(OH) CLAY, little Silt, tr. fine Sand, H.P., saturated, black																					
						A	-56.0	2.2																	
-57.0	3.2						-57.0	3.2			53.4		36.0	20.0	16.0	66.0			67.3	103.3					
				(CL) CLAY & SILT, tr. fine Sand, tr. shell frag., M.P., moist, grey																					
	5																								5
-60.0	6.2						-60.0	6.2																	
				(CH) CLAY, tr. fine Sand, tr. Silt, tr. shell frag., H.P., moist, grey		B	-61.0	7.2			75.4		68.0	33.0	35.0	98.0			55.3	96.9					
	10																								10
	15						-69.2	15.4																	15
						C					72.0		78.0	34.0	44.0	98.0			57.5	98.8					
-70.2	16.4		Bot.				-70.2	16.4																	
	20																								20

0 10 20 30 40

BORING NO. 83VC-14
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-15
COORDINATES: N 233,752.00
E 2,632,371.00

DATE: 6 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -52.5 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 20 /20.0 100 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-52.5	0.0			(SM) SAND fine & SILT, N.P., moist, grey																					
-53.5	1.0			(CH) CLAY, some fine Sand, H.P., moist, grey		A	-53.5	1.0																	
							-54.5	2.0			64.4		64.0	31.0	33.0	72.0			56.5	92.9					
-56.5	4.0			large oyster shell	Penetration Recorder Broken																				
-57.8	5.3			(CH) CLAY, little Silt, little fine Sand, H.P., compacted, moist, grey		B	-57.8	5.3																	
							-58.8	6.3			86.4	*106.5	80.0	34.0	46.0	84.0	2.71	*2.19	52.9	98.6					
-62.9	10.4			(CH) CLAY, same as above, tr. fine Sand		C	-62.9	10.4																	
							-63.9	11.4			91.9		90.0	31.0	59.0	99.0			47.1	90.4					
-68.0	15.5			(CH) CLAY, same as above, tr. Peat																					
-72.5	20		Bot.		0 10 20 30 40																				

BORING NO. 83VC-15
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-16
COORDINATES: N 231,690.00
E 2,631,663.00

DATE: 6 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -51.3 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 18.5 /20.0 92.5 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-51.3	0.0																								
-51.5	0.2			(CL) CLAY & SILT, some very fine Sand, M.P., very moist, grey																					
-52.5	1.2			(CL) CLAY, same as above, tr. fine sand, tr. shell frag., black																					
-54.1	2.8			(CL) CLAY & SILT, tr. fine Sand, tr. shell frag., M.P., moist, grey			-54.1	2.8																	
				(CH) CLAY, tr. silt, tr. fine Sand, tr. shell frag., H.P., moist, grey		A	-55.1	3.8			90.0		72.0	21.0	51.0	99.0			49.4	93.8					
	5						-57.3	6.0																	
						B	-58.3	7.0			83.3		80.0	29.0	51.0	99.0			50.7	93.0					
	10																								
							-65.2	13.9																	
	15					C	-66.2	14.9			82.7		90.0	34.0	56.0	99.0			50.6	92.5					
-69.8	18.5			Bot.																					
	20																								

0 10 20 30 40

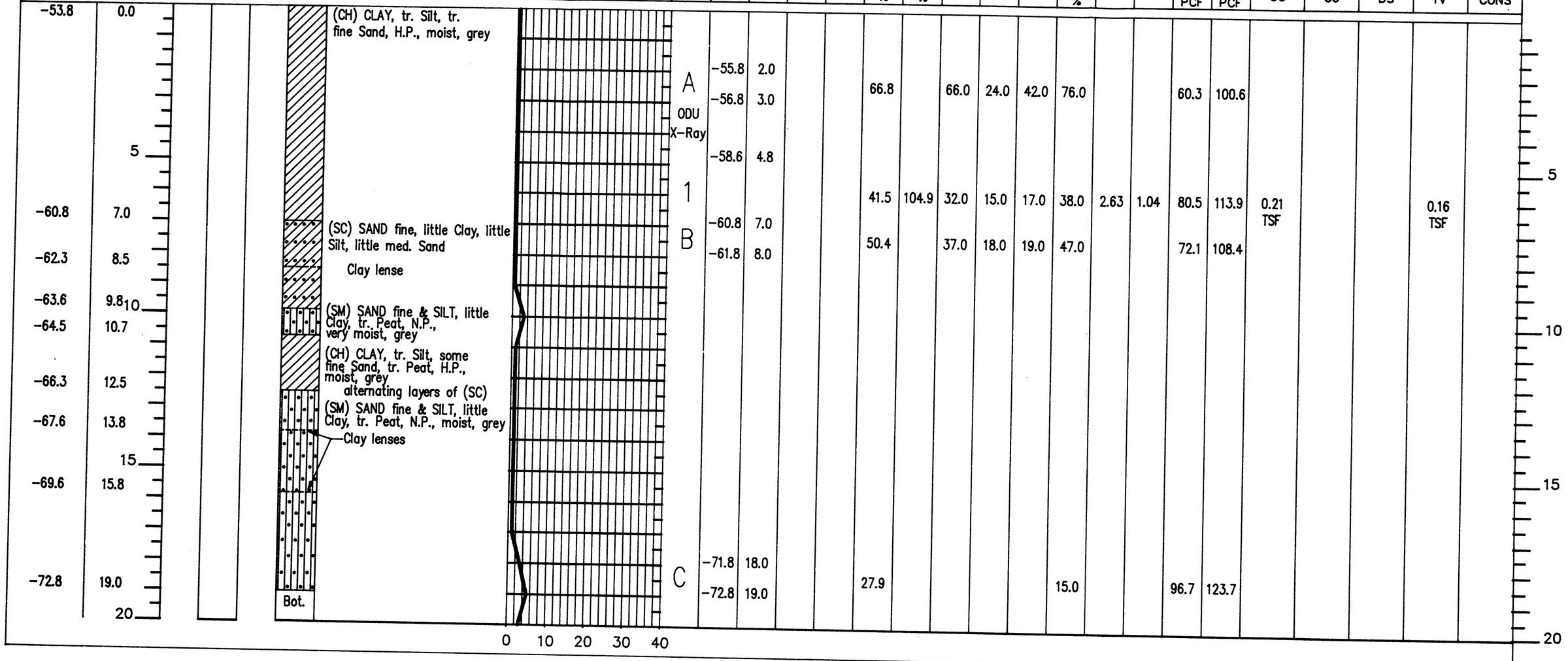
BORING NO. 83VC-16
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-17
COORDINATES: N 229,389.00
E 2,632,439.00

DATE: 5 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -53.8 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 19.0 /20.0 95.0 %



ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-55.8	2.0																	
-56.8	3.0			66.8		66.0	24.0	42.0	76.0			60.3	100.6					
-58.6	4.8																	
				41.5	104.9	32.0	15.0	17.0	38.0	2.63	1.04	80.5	113.9	0.21 TSF			0.16 TSF	
-60.8	7.0																	
-61.8	8.0			50.4		37.0	18.0	19.0	47.0			72.1	108.4					
-71.8	18.0																	
-72.8	19.0			27.9					15.0			96.7	123.7					

BORING NO. 83VC-17
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-18
COORDINATES: N 227,596.00
E 2,631,469.00

DATE: 5 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -50.5 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 15.0 /20.0 75.0 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-50.5	0.0			(OH) CLAY & SILT, H.P., saturated, black																				
-51.5	1.0			(MH) CLAYEY SILT, tr. fine Sand, H.P., saturated, black	A	-51.5	1.0			159.0	*94.3	70.0	40.0	30.0	98.0	2.63	4.4	30.2	78.1					
						-52.5	2.0																	
-52.8	3.5			(CH) CLAY, tr. Silt, H.P., grey																				
-55.8	5.3			(CH) CLAY, same as above, tr. fine Sand, tr. shell frag.	B	-55.8	5.3			81.5		90.0	30.0	60.0	99.0			51.2	92.9					
						-56.8	6.3																	
-60.9	10.4			(CH) CLAY, same as above, no shell frag.																				
					C	-64.5	14.0			78.1		79.0	49.0	30.0	100.0			50.6	90.1					
-65.5	15			Bot.		-65.5	15.0																	
	20																							

0 10 20 30 40

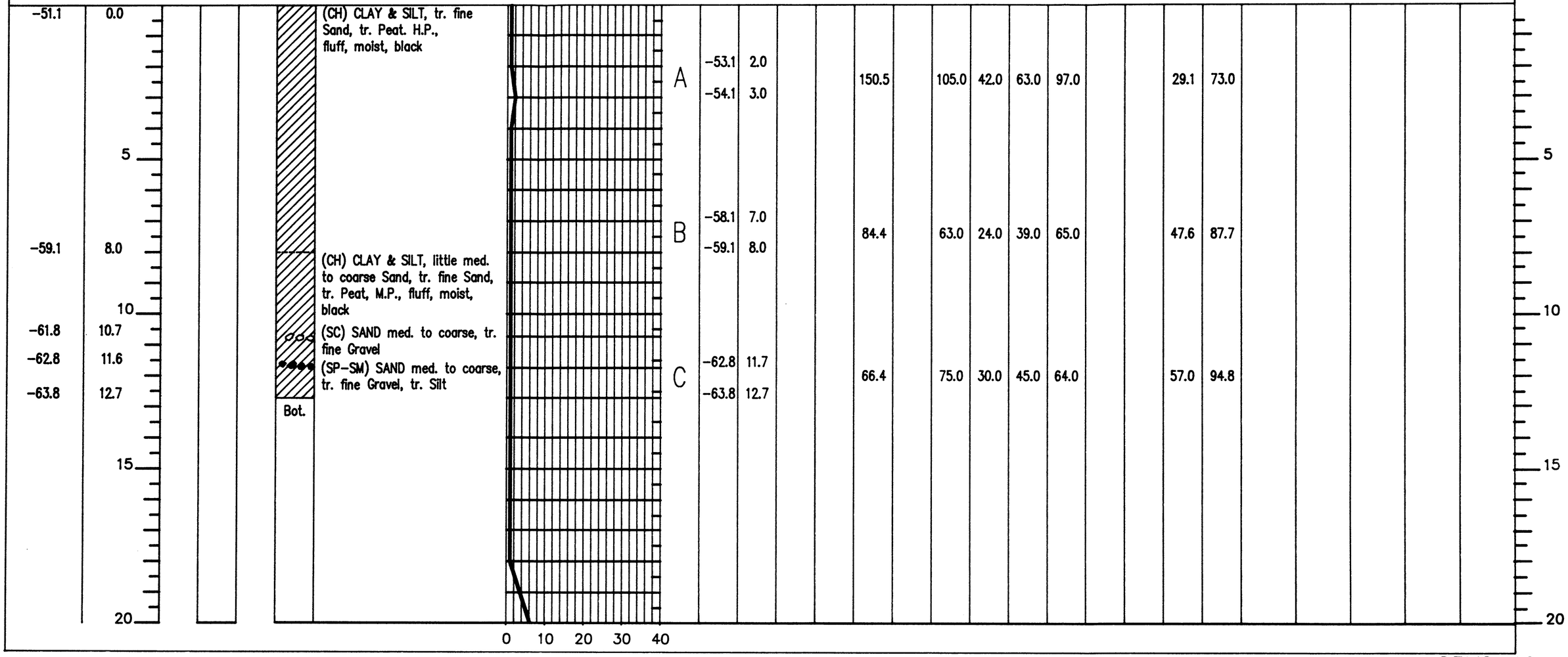
BORING NO. 83VC-18
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-19
COORDINATES: N 225,542.00
E 2,631,917.00

DATE: 5 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -51.1 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 12.7 /20.0 63.5 %



ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-53.1	2.0																	
-54.1	3.0			150.5		105.0	42.0	63.0	97.0			29.1	73.0					
-58.1	7.0																	
-59.1	8.0			84.4		63.0	24.0	39.0	65.0			47.6	87.7					
-62.8	11.7			66.4		75.0	30.0	45.0	64.0			57.0	94.8					
-63.8	12.7																	

BORING NO. 83VC-19
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-20
COORDINATES: N 223,505.00
E 2,631,018.00

DATE: 5 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -47.6 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 8.3 /20.0 41.5 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-47.6	0.0			(CH) CLAY & SILT, M.P., fluff, saturated, black																					
						A	-50.4	2.8																	
-51.4	3.8			(CH) CLAY & SILT, tr. fine Sand, H.P., moist, grey			-51.4	3.8			90.3		99.0	27.0	72.0	99.0			47.4	90.2					
-53.1	5.5			oyster shell bed																					
-53.5	5.9																								
-54.9	7.3					B	-54.9	7.3			70.9		71.0	28.0	43.0	97.0			58.3	99.5					
-55.9	8.3			Bot.			-55.9	8.3																	

0 10 20 30 40

BORING NO. 83VC-20
NAO FM-103

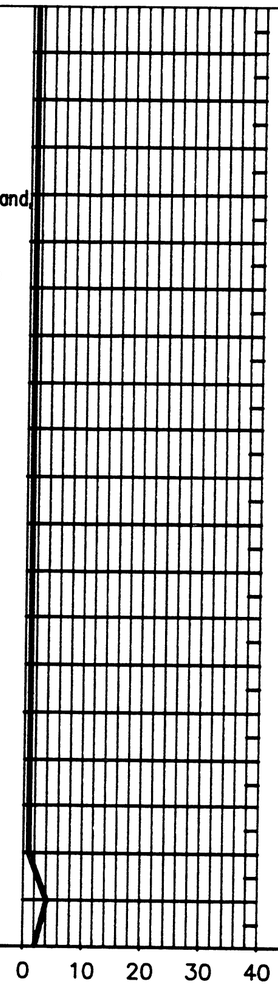
PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

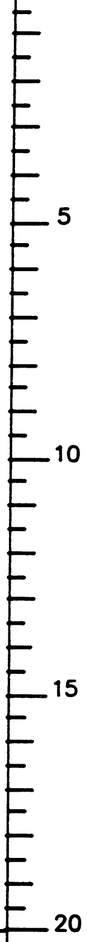
HOLE NO. 83VC-21A
COORDINATES: N 219,578.00
E 2,630,942.00

DATE: 5 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -50.0 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 16.0 /20.0 80.0 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-50.0	0.0			(OH) CLAY & SILT, tr. fine Sand, H.P., fluff, saturated, black	A	-51.0	1.0																	
						-52.0	2.0			167.2		122.0	60.0	62.0	100.0			29.9	79.8					
-53.4	3.4			oyster shell bed																				
-53.7	3.7			(CH) CLAY & SILT, tr. fine Sand, H.P., moist, grey																				
-55.3	5.3			(CL) CLAY & SILT, some fine to very fine Sand, M.P., moist, grey	B	-55.3	5.3																	
						-56.3	6.3			53.2	100.7	39.0	24.0	15.0	70.0	2.64	1.39	68.8	105.4					
					C	-61.4	11.4																	
-62.4	12.4			(CL) CLAY & SILT, tr. fine Sand, tr. shell frag., M.P., moist, grey		-62.4	12.4			61.7		49.0	27.0	22.0	98.0			62.0	100.2					
-66.0	16.0		Bot.																					





BORING NO. 83VC-21A
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-21B
COORDINATES: N 221,473.00
E 2,631,895.00

DATE: 5 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -50.1 FT. MLW
DEPTH: 17.5 FT.
CORE RECOVERY: 20.0 /17.5 114 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS
-50.1	0.0			(CL) CLAY & SILT, some fine Sand, L.P., compacted, moist grey
-50.9	0.8			(CL) CLAY & SILT, same as above, little fine sand
-53.1	3.0			(SC) SAND fine & CLAY, little med. Sand, L.P., moist, grey
-55.6	5.5			(GC) GRAVEL fine to med. rounded to subrounded, some med. to coarse Sand, some Clay L.P., moist, grey
-56.1	6.0			(SC) SAND fine & CLAY, some fine to coarse Gravel, subrounded, some med. to coarse Sand, L.P., very compacted, moist, green
-57.1	7.0			(SM) SAND very fine & SILT, tr. shell frag., N.P., moist, grey
-67.6	17.5	BOH		Expanded Material

PENETRATION SECS.: 42 Sec.

SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
A	-54.3	4.2			31.7		33.0	14.0	19.0	26.0			86.7	114.1					
	-55.3	5.2																	
B	-59.1	9.0			35.9		39.0	31.0	8.0	31.0			86.0	116.9					
	-60.1	10.0																	
C	-66.0	15.9			31.9		41.0	31.0	10.0	29.0			89.2	117.6					
	-67.0	16.9																	

NOTE! Material Recovered Expanded 2.5 Feet.

BORING NO. 83VC-21B
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-22
COORDINATES: N 217,723.00
E 2,631,826.00

DATE: 5 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -49.9 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 18.4 /20.0 92.0 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-49.9	0.0			(SC) SAND fine, little Silt, L.P.,																					
-50.8	0.9			moist, semiclean, grey																					
-51.3	1.4			oyster shell layer																					
				(CH) CLAY & SILT, little Peat, tr. fine Sand, H.P., moist, brown			-52.7	2.8																	
-53.7	3.8					A	-53.7	3.8			62.7		77.0	30.0	47.0	98.0			60.5	98.4					
				(CH) CLAY & SILT, same as above, little fine Sand, tr. Peat																					
-55.2	5.3	5					-55.4	5.5																	
				(CH) CLAY & SILT, same as above, some fine Sand		1					34.5	91.5				41.0	2.60	0.97	82.0	110.3	0.12 TSF			0.12 TSF	
-57.5	7.6			(SM) SAND very fine & SILT, N.P., moist, grey		B	-57.5	7.6			27.4					28.0			94.7	120.6					
-59.0	9.1						-58.5	8.6																	
	10			(CH) CLAY, tr. Peat, tr. fine Sand, H.P., moist, grey																					
-62.6	12.7			(ML) SILT & very fine SAND, N.P., moist, grey		C	-62.7	12.8			27.0		22.0	19.0	3.0	62.0			95.1	120.8					
-64.1	14.2						-63.7	13.8																	
				(ML) SILT, same as above, little med. Sand																					
-65.1 -65.4	15.2 15.5	15		(SM) SAND med., some Silt, tr. Peat, N.P., moist, grey																					
				Clay lense																					
-66.7	16.8			(SP-SM) SAND med. to coarse, tr. Peat, N.P., moist, grey																					
-67.1	17.2			(SP-SM) SAND, same as above, tr. fine Gravel, tr. Silt, N.P., moist, lt. grey																					
-68.3	18.4			(SM) SAND fine, little Silt, N.P., moist, grey																					
			Bot.																						
	20																								

0 10 20 30 40

5 10 15 20

BORING NO. 83VC-22
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-23
COORDINATES: N 215,673.00
E 2,631,702.00

DATE: 5 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -50.2 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 15.0 /20.0 75.0 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-50.2	0.0																								
-50.9	0.7			(SC) SAND fine & CLAY, N.P., moist, grey (CL) CLAY & fine SAND, M.P., moist, grey																						
						A	-53.9	3.7																					
							-54.9	4.7			55.6	85.4	35.0	20.0	15.0	56.0	2.76	1.79	61.6	95.9					
-55.4	5.2			(SC) SAND med. to fine, little shell frag., tr coarse Sand, L.P., moist, grey																					
-56.6	6.4			(CH) CLAY, some fine Sand, little Peat, H.P., moist, grey																					
						B	-58.2	8.0																			
-59.2	9.0						-59.2	9.0			85.1		95.0	40.0	55.0	96.0			47.5	87.9					
				(CH) CLAY, same as above, tr. fine Sand																					
						C	-64.2	14.0																			
-65.2	15						-65.2	15.0			64.9		92.0	29.0	93.0	98.0			48.6	80.2					
	20			Bot.																					

0 10 20 30 40

BORING NO. 83VC-23
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-24
COORDINATES: N 214,181.00
E 2,632,277.00

DATE: 5 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -51.0 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 5.4 /20.0 27.0 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-51.0	0.0			(CH) CLAY & large shell frag., little fine Sand, tr. Silt H.P., saturated, grey																					
-52.0	1.0						-52.0	1.0																	
-53.0	2.0			(CL-ML) CLAYEY SILT & fine SAND, some shell frag., L.P., L.P., moist, grey		A	-53.0	2.0			75.9		24.0	17.0	7.0	51.0			52.2	91.9					
	5			(CH) CLAY, some large shell frag., Very H.P., moist, grey			-55.4	4.4			26.0		84.0	35.0	49.0	96.0			97.7	123.0					
-56.4	5.4			Bot.		B	-56.4	5.4																	
	10																								
	15																								
	20				0 10 20 30 40																				

BORING NO. 83VC-24
NAO FM-103

DLE NO. 83VC-25
OORDINATES: N 211,683.00
E 2,632,346.00

DATE: 4 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -49.7 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 20.0 /20.0 100.0 %

ATION CS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
T, little fine rag., H.P.,		ODU X-Ray																			
			-52.2	2.5																	
		1					79.5	105.6	56.0	20.5	35.5	84.5	2.62	1.97	55.0	98.7	0.15 TSF			0.14 TSF	
			-54.2	4.5																	
		A					84.1		73.0	35.0	38.0	95.0			52.2	96.1					
T, same as Sand, tr. Peat			-55.2	5.5																	
			-59.2	9.5																	
T, same as Sand		B					67.1	101.5	60.0	28.0	32.0	75.0	2.64	1.74	60.0	100.2					
			-60.2	10.5																	
			-68.7	19.0																	
T, same as Sand		C					75.9		68.0	32.0	36.0	88.0			49.7	87.4					
			-69.7	20.0																	

0 10 20 30 40

5 10 15 20

BORING NO. 83VC-25
NAO FM-103

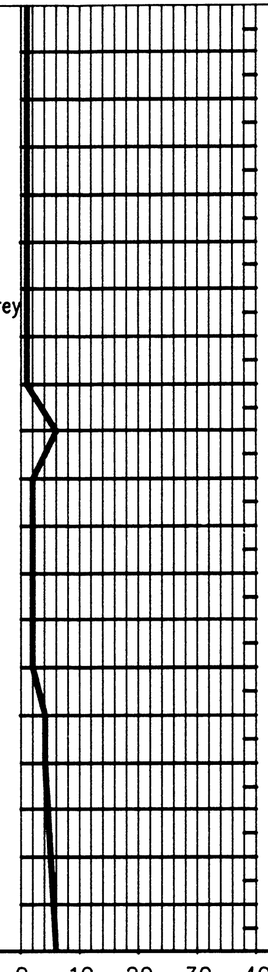
PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-26
COORDINATES: N 209,726.00
E 2,633,001.00

DATE: 4 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -51.4 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 14.2 /20.0 71.0 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-51.4	0.0			(MH) CLAYEY SILT, tr. fine Sand, Very H.P., moist, black	A	-52.4	1.0			129.1		92.0	43.0	49.0	95.0			65.7	84.8					
						-53.4	2.0																	
-55.0	3.6			(MH) CLAYEY SILT, same as above, tr. Peat, grey	B	-55.9	4.5					148.0	92.0	56.0	97.0									
-56.9	5.5			(MH) CLAYEY SILT, same as above, little Peat, brownish-grey		-56.9	5.5																	
					C	-64.6	13.2			76.3		86.0	40.0	46.0	99.0			47.6	83.9					
-65.6	14.2		Bot.			-65.6	14.2																	



BORING NO. 83VC-26
NAO FM-103

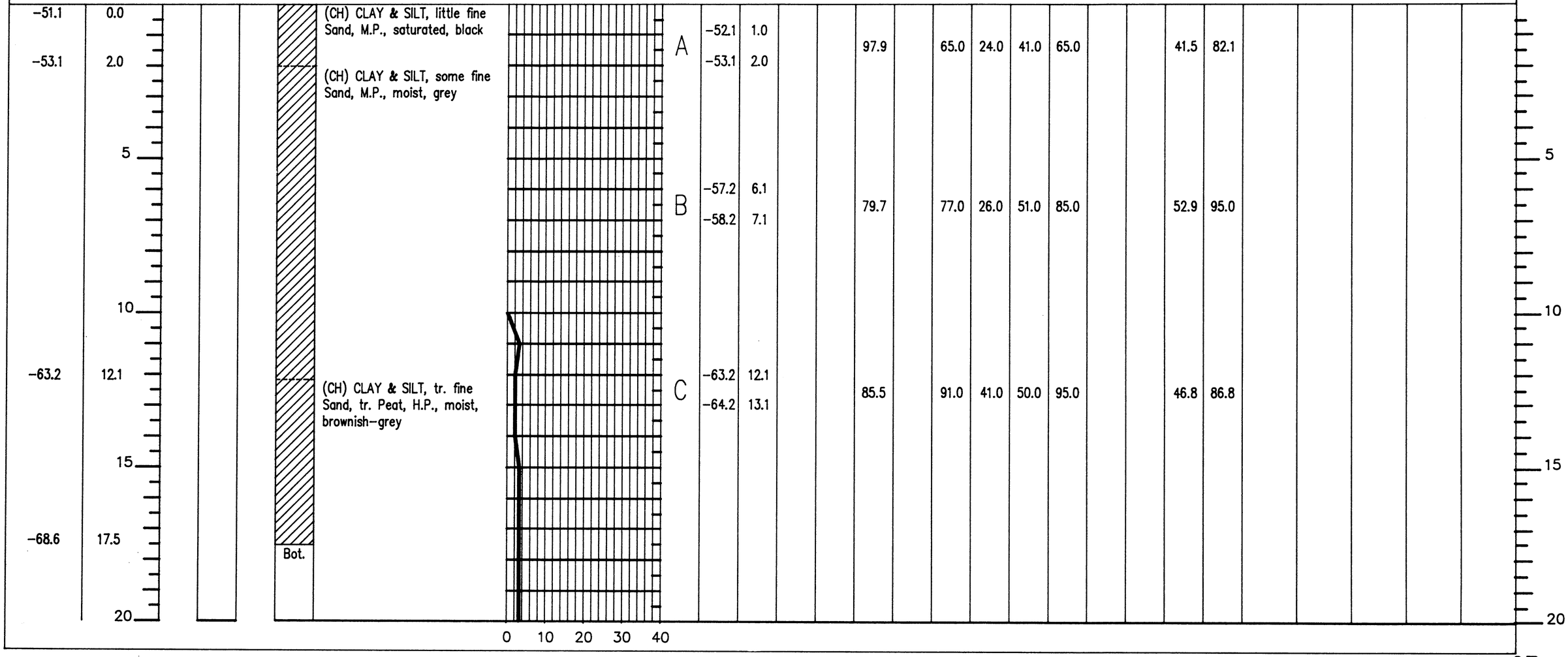
PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-27
COORDINATES: N 207,716.00
E 2,632,548.00

DATE: 4 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -51.1 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 17.2 /20.0 88 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-51.1	0.0			(CH) CLAY & SILT, little fine Sand, M.P., saturated, black		A	-52.1	1.0			97.9		65.0	24.0	41.0	65.0			41.5	82.1					
-53.1	2.0			(CH) CLAY & SILT, some fine Sand, M.P., moist, grey			-53.1	2.0																	
						B	-57.2	6.1			79.7		77.0	26.0	51.0	85.0			52.9	95.0					
							-58.2	7.1																	
-63.2	12.1			(CH) CLAY & SILT, tr. fine Sand, tr. Peat, H.P., moist, brownish-grey		C	-63.2	12.1			85.5		91.0	41.0	50.0	95.0			46.8	86.8					
							-64.2	13.1																	
-68.6	17.5		Bot.																						



BORING NO. 83VC-27
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-28
COORDINATES: N 205,809.00
E 2,633,683.00

DATE: 4 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -51.3 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 19.4 /20.0 97.0 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-51.3	0.0			(MH) CLAYEY SILT, tr. shell frag., tr fine Sand, H.P., compacted, moist, grey																				
					A	-53.3	2.0																		
						-54.3	3.0			84.2		102.0	45.0	57.0	98.0			50.2	92.5					
-56.3	5			(MH) CLAYEY SILT, little Peat, tr. Silt, tr. fine Sand, H.P., compacted, moist, brown																				
-58.4	7.1			(PT) PEAT, spongy, brown																				
-58.8	7.5			(MH)CLAYEY SILT, same as abv.																				
-59.1	7.8			(CH) CLAY & SILT, some Peat,																				
-59.8	8.5			little fine sand,M.P.,moist, brown		-59.8	8.5																		
				(CH) CLAY & SILT, little Peat, little fine Sand, H.P., compacted moist, grey	B					43.7		142.0	57.0	85.0	35.0			84.0	58.8					
	10					-61.0	9.7																	
						-66.0	14.7																	
	15				C					62.8		102.0	36.0	66.0	96.0			54.6	89.0					
-67.3	16.0			(CH) CLAY & SILT, same as above, tr. Peat, grey		-67.3	16.0																	
-70.7	19.4		Bot.																					
	20																							

PENETRATION SECS.: 0 10 20 30 40

BORING NO. 83VC-28
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-29
COORDINATES: N 203,611.00
E 2,633,715.00

DATE: 4 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -42.1 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 20 /20.0 100 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-42.1	0.0			(OH) ORGANIC CLAY & SILT, tr. fine Sand, M.P., very moist, black																					
-44.1	2.0			(CH) CLAY & SILT, tr. shell frag., tr. fine Sand, Very H.P., moist, grey																					
						A	-46.1	4.0																			
-47.2	5.1 5						-47.2	5.1			79.4		95.0	30.0	65.0	99.0			51.2	91.9					
				(CH) CLAY & SILT, same as above, no shell frag., no fine Sand																					
							-49.6	7.5																	
						1					91.5	101.8	81.0	0.27	54.0	98.5	2.58	2.32	48.5	92.8	0.13 TSF			0.15 TSF	
	10						-51.8	9.7																	
						B					91.0		93.0	31.0	62.0	100.0			49.0	93.4					
							-53.0	10.9																	
							-56.3	14.2																	
-57.3	15.2 15					C					69.6		91.0	33.0	58.0	99.0			53.2	90.2					
				(CH) CLAY & SILT, tr. fine Sand, tr. Peat, Very H.P., moist, grey			-57.3	15.2																	
-62.1	20																								

0 10 20 30 40

5 10 15 20

BORING NO. 83VC-29
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-30
COORDINATES: N 244,373.00
E 2,263,368.00

DATE: 7 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -51.2 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 16.6 /20.0 83 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-51.2	0.0			(CL) CLAY & SILT, some fine Sand, L.P., moist, grey																					
						A	-53.2	2.0			39.7		41.0	18.0	23.0	67.0			79.0	110.4					
							-54.2	3.0																	
						1					40.0	91.7	28.0	21.0	7.0	67.0	2.68	1.17	77.1	107.9	1.6 PSI			0.09 TSF	
	5						-56.2	5.0																	
						B																			
-58.0	6.8			(CH) CLAY, tr. Silt, tr. fine Sand, tr. shell frag., H.P., compacted, moist, grey			-58.0	6.8			58.2		62.0	30.0	32.0	94.0			66.3	104.9					
	10																								
-62.0	10.8			(MH) CLAYEY SILT, tr. shell frag. tr. fine Sand, H.P., moist, grey		C	-62.0	10.8			69.4		76.0	36.0	40.0	98.0			59.5	100.8					
							-63.0	11.8																	
	15																								
-67.8	16.6			Bot.																					
	20																								

PENETRATION SECS. scale: 0 10 20 30 40

BORING NO. 83VC-30
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-31
COORDINATES: N 246,320.00
E 2,639,385.00

DATE: 7 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -58.3 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 16.0 /20.0 80 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-58.3	0.0			(SP-SM) SAND fine to med., tr. Silt, tr. coarse Sand, tr. fine Gravel, tr. shell frag. N.P., moist, grey																					
-59.3	1.0			Clay lenses																					
-59.6	1.3																								
-60.3	2.0			(SM) SAND fine to med., little Silt, N.P., moist, grey																					
				(CL) CLAY & SILT, some fine Sand, H.P., moist, grey			-63.3	5.0																	
5						A					57.7	*66.6	48.0	21.0	27.0	89.0	2.67	*2.31	50.3	79.4					
-64.5	6.2						-64.5	6.2																	
				(CL) CLAY & SILT, same as above, little fine Sand																					
-66.8	8.5			(CL) CLAY & SILT, same as above, some fine Sand			-63.7	9.0																	
						B					64.2		48.0	20.0	28.0	92.0			62.4	102.5					
-68.3	10						-68.3	10.0																	
				(CL) CLAY & SILT, same as above, tr. shell frag.																					
-69.5	11.2			(CL) CLAY & SILT, same as above,little fine Sand, no shell frag.																					
-72.3	14.0																								
				(CH) CLAY, tr. Silt, tr. fine Sand, Very H.P., moist, grey			-73.3	15.0																	
15						C					76.6		71.0	25.0	46.0	98.0			55.9	98.7					
-74.3	16.0			BOH			-74.3	16.0																	
	20																								

0 10 20 30 40

5 10 15 20

BORING NO. 83VC-31
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-32
COORDINATES: N 241,788.20
E 2,635,441.70

DATE: 7 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -53.6 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 16.2 /20.0 81 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-53.6	0.0			(CH) CLAY & SILT, little fine Sand, H.P., compacted, moist, grey																				
-54.4 -54.6	0.8 1.0			(PT) PEAT & shell frag., spongy, brown																				
				(CH) CLAY & SILT, same as above	A	-59.1	5.5			79.8		85.0	34.0	51.0	99.0			54.6	98.1					
-60.1	6.5					-60.1	6.5																	
				(CH) CLAY & SILT, same as above, tr. fine Sand, Very H.P.	B	-61.6	8.0			73.7		87.0	36.0	51.0	99.0			54.4	94.5					
						-62.6	9.0																	
					C	-68.8	15.2			81.5		73.0	34.0	39.0	99.0			53.9	97.8					
-69.8	16.2			Bot.		-69.8	16.2																	

0 10 20 30 40

BORING NO. 83VC-32
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-33
COORDINATES: N 243,665.00
E 2,636,359.00

DATE: 7 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -51.9 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 17.2 /20.0 86 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-51.9	0.0			(CH) CLAY & SILT, little very fine Sand, tr. shell frag., Very H.P., very moist, grey		A	-52.9	1.0																	
-53.9	2.0			(CH) CLAY & SILT, same as above, little very fine Sand			-53.9	2.0			54.4		68.0	22.0	46.0	86.0			66.4	102.6					
-58.5	6.6			(CH) CLAY & SILT, little fine Sand, H.P., compacted, moist grey		B	-85.5	6.6			47.9	*107.9	34.0	18.0	16.0	72.0	2.72	*1.21	76.9	113.7					
							-59.5	7.6																	
-63.5	11.6			(CH) CLAY, tr. fine Sand, Very H.P., moist, grey		C	-63.5	11.6			75.2		77.0	29.0	48.0	95.0			57.1	100.0					
							-64.5	12.6																	
-69.1	17.2			Bot.																					

0 10 20 30 40

BORING NO. 83VC-33
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-33A
COORDINATES: N 240,431.00
E 2,633,870.00

DATE: 7 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -54.1 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 16.0 /20.0 80 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-54.1	0.0			(CH) CLAY & SILT, little fine Sand, tr. shell frag., tr. Peat, Very H.P., moist, grey																					
						1	-56.4	2.3			51.9	98.8	41.0	21.0	20.0	79.0	2.72	1.43	69.9	106.2	2.0 PSI			0.12 TSF	
-58.1	4.0			(CH) CLAY, tr. Silt, little fine Sand, tr. Peat, Very H.P., compacted, moist, grey		A	-58.1	4.0			51.5		61.0	31.0	30.0	91.0			67.6	102.4					
	5					ODU X-Ray	-59.1	5.0																	
							-60.7	6.6																	
-62.4	8.3			lense fine Sand																					
	10						-64.1	10.0																	
						B					56.7		68.0	22.0	46.0	95.0			67.5	105.8					
-65.5	11.4			(CH) CLAY, same as above, no fine Sand, no Peat			-65.5	11.4																	
							-68.1	14.0																	
						C					64.8			77.0	30.0	47.0	100.0		58.6	96.6					
	15						-69.1	15.0																	
-70.1	16.0			Bot.																					
	20																								

0 10 20 30 40

BORING NO. 83VC-33A
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-33B
COORDINATES: N 239,098.00
E 2,632,507.00

DATE: 7 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -54.6 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 17.8 /20.0 89 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	δd PCF	δm PCF	UU	CU	DS	TV	CONS
-54.6	0.0			(CH) CLAY, tr. Silt, tr. fine Sand, Very H.P., moist, grey																					
						A	-58.2	3.6																	
							-59.2	4.6			87.7		79.0	28.0	51.0	99.0			49.3	92.5					
	5																								
-60.4	5.8			lense fine Sand																					
							-63.2	8.6																	
						B					82.9		70.0	28.0	42.0	96.0			51.9	94.9					
	10						-64.6	10.0																	
-65.8	11.2			lense fine Sand																					
-66.3 -66.1	11.7 11.5			lense fine Sand																					
-66.6	12.0			(SC) SAND fine, some Clay, L.P., moist, grey																					
				(CH) CLAY, same as above																					
-68.2	13.6			(CH) CLAY, same as above, tr. Silt, M.P., moist, grey																					
	15																								
-70.6	16.0			(SC) SAND fine, some Clay, L.P., moist, grey																					
-71.0	16.4			(CL) CLAY, some fine Sand, H.P., moist, grey			-71.4	16.8																	
						C					62.1		47.0	22.0	25.0	79.0			63.5	102.9					
-72.4	17.8						-72.4	17.8																	
				Bot.																					
	20																								

0 10 20 30 40

BORING NO. 83VC-33B
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-70
COORDINATES: N 222,732.00
E 2,632,496.00

DATE: 5 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -23.4 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 19.6 /20.0 98 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-23.4	0.0			(CH) CLAY, tr. Silt, tr. shell frag., H.P., moist, grey		A	-24.4	1.0			99.9		78.0	27.0	51.0	98.0			45.8	91.5					
							-25.4	2.0																	
							-26.9	3.5																	
	5					1					87.0	101.9	68.5	45.5	23.0	97.5	2.62	2.23	50.5	94.4	0.08 TSF			0.06 TSF	
-28.9	5.5			(CH) CLAY, same as above, fine Sand, Very H.P.		B	-28.9	5.5			84.7		86.0	30.0	56.0	89.0			50.9	94.1					
							-29.9	6.5																	
							-31.9	8.5																	
	10					2					77.5	102.7	68.5	22.5	46.0	87.5	2.63	1.98	55.0	97.6	0.1 TSF			0.11 TSF	
							-33.0	10.6																	
-36.4	13.0			(CH) CLAY, same as above, some fine Sand, H.P., fine Sand laminations																					
	15					C	-37.8	14.5			70.8		57.0	21.0	36.0	74.0			58.0	99.0					
							-38.8	15.5																	
-41.5	18.1			(SM) SAND fine, some Silt, tr. shell frag., N.P., moist grey																					
-43.0	19.6			Bot.																					
	20																								

0 10 20 30 40

5 10 15 20

BORING NO. 83VC-70
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-71
COORDINATES: N 218,053.00
E 2,632,064.00

DATE: 5 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -50.9 FT. MLW
DEPTH: 15.8 FT.
CORE RECOVERY: 20.0 /15.8 126 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	δd PCF	δm PCF	UU	CU	DS	TV	CONS
-50.9	0.0			(CH) CLAY, little Silt, little very fine Sand, H.P., well compacted, moist		1	-51.9	1.0			37.0	≈109.3	53.5	21.0	32.5	97.0	2.60	0.88	86.5	118.5	0.46 TSF			0.50 TSF	
-53.9	3.0			(CH) CLAY, same as above, tr. fine Sand		A	-53.9	3.0																	
							-54.9	4.0			40.1		55.0	26.0	29.0	98.0			79.4	111.3					
	5						-56.4	5.5																	
						B	-57.4	6.5			48.8	100.9	65.0	26.0	39.0	99.0	2.66	1.28	72.6	108.1					
						2					53.0	≈109.5	60.0	19.5	40.5	99.0	2.57	1.24	71.5	109.4	0.3 TSF			0.34 TSF	
	10						-59.4	8.5																	
	15																								
-66.7	15.8			BOH																					
				Expanded Material			-69.9	19.0																	
	20					C	-70.9	20.0			54.2		65.0	28.0	37.0	99.0			66.0	101.8					
				Bot.																					

0 10 20 30 40

NOTE! Material Recovered Expanded 4.2 Feet.

BORING NO. 83VC-71
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-72
COORDINATES: N 214,664.00
E 2,632,531.00

DATE: 5 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -40.8 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 19.4 /20.0 97 %

ELEVATION MWL	DEPTH FT.	CLASSIFICATION USCS	SAMP.
-40.8	0.0	(MH) CLAYEY SILT, tr. fine Sand, Very H.P., fluff, saturated, black	A
-44.7	3.9	(MH) CLAYEY SILT, same as above, moist, grey	
-46.8	6.0	(SC) SAND fine & CLAY, little med. Sand, tr. shell frag., compacted, moist, grey	
-48.3	7.5	(SC) SAND med. & CLAY, some fine to med. Gravel, little coarse Sand, tr. shell frag., M.P., fluff, saturated, grey	
-48.8	8.0	oyster shell layer	
-49.5	8.7	(SM) SAND med., some fine Sand, some Silt, little coarse Sand little shell frag., N.P., moist, grey	B
-52.3	11.5	(SM) SAND, same as above, med. to coarse Gravel, subrounded to rounded	
-53.0	12.2	(SM-SW) SAND med., some Silt little fine Sand, little coarse Sand, little fine to med. Gravel, little shell frag., N.P., moist, grey	C
-59.2	18.4	(SM) SAND fine, little med. Sand, little fine to med. Gravel little Silt, N.P., moist, black	
-59.7	18.9	(SM) SAND, same as above, some black heavy mineral Sand	
-60.2	19.4	Bot.	

PENETRATION SECS. 0 10 20 30 40

ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-41.8	1.0																	
-42.8	2.0			118.6		97.0	56.0	41.0	96.0			34.9	76.4					
-49.5	8.7																	
-50.5	9.7			17.7					20.0			113.7	133.8					
-56.6	15.8																	
-57.6	16.8			6.5					10.0			112.9	120.2					

BORING NO. 83VC-72
NAO FM-103

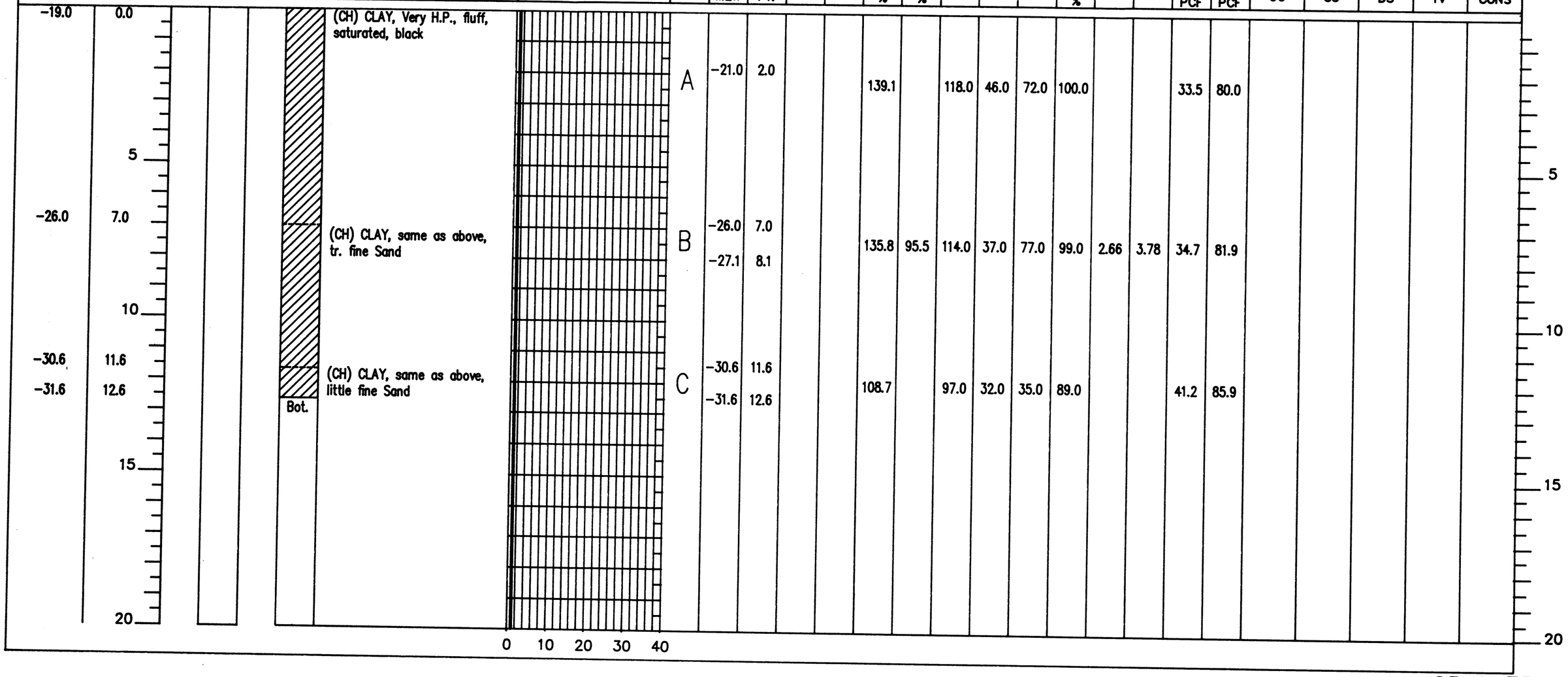
PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-73
COORDINATES: N 208,580.00
E 2,633,655.00

DATE: 4 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -19.0 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 12.6 /20.0 63 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-19.0	0.0			(CH) CLAY, Very H.P., fluff, saturated, black		A	-21.0	2.0			139.1		118.0	46.0	72.0	100.0			33.5	80.0					
-26.0	7.0			(CH) CLAY, same as above, tr. fine Sand		B	-26.0	7.0			135.8	95.5	114.0	37.0	77.0	99.0	2.66	3.78	34.7	81.9					
							-27.1	8.1																	
-30.6	11.6			(CH) CLAY, same as above, little fine Sand		C	-30.6	11.6			108.7		97.0	32.0	35.0	89.0			41.2	85.9					
-31.6	12.6			Bot.			-31.6	12.6																	



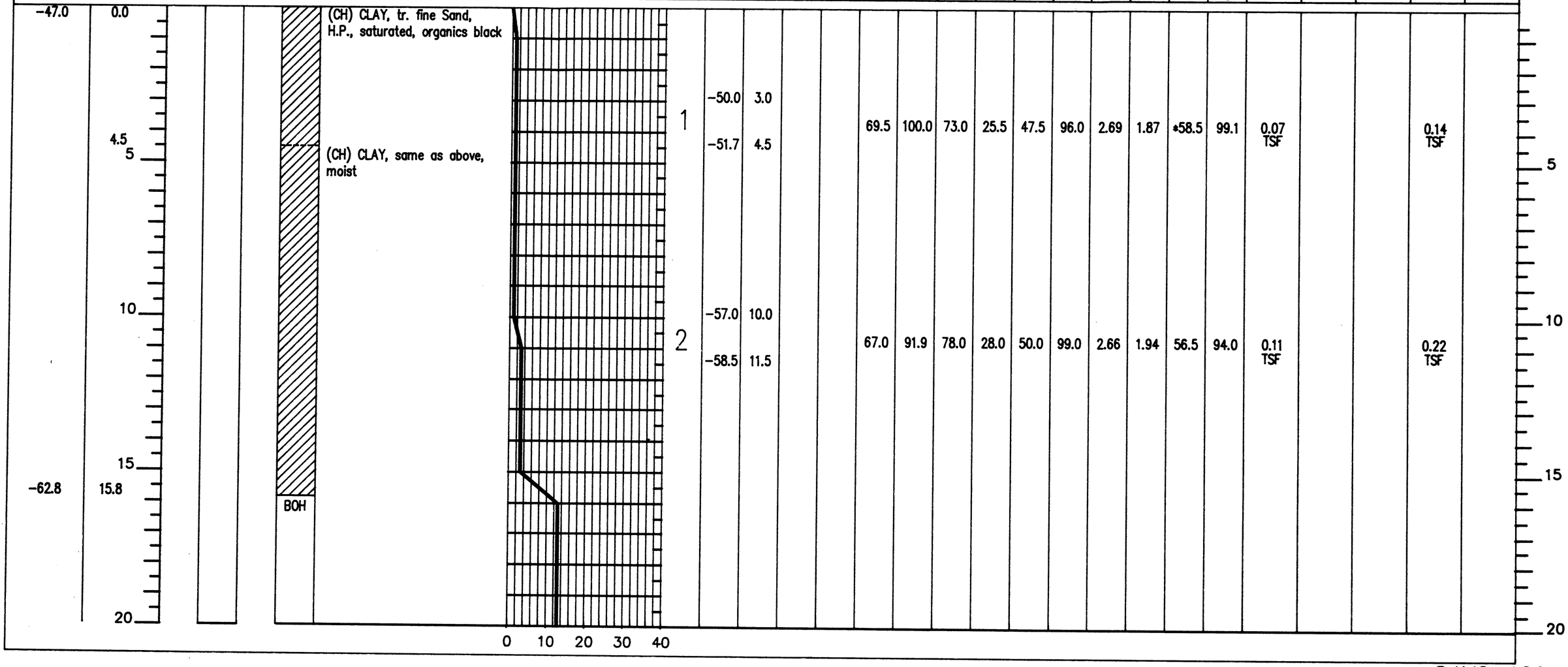
BORING NO. 83VC-73
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-129
COORDINATES: N 233,840.01
E 2,631,274.91

DATE: 27 Sept. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: J. Swean

ELEVATION: -47.0 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 15.8 /20.0 79.0 %



ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	δd PCF	δm PCF	UU	CU	DS	TV	CONS
-50.0	3.0																	
-51.7	4.5			69.5	100.0	73.0	25.5	47.5	96.0	2.69	1.87	*58.5	99.1	0.07 TSF			0.14 TSF	
-57.0	10.0																	
-58.5	11.5			67.0	91.9	78.0	28.0	50.0	99.0	2.66	1.94	56.5	94.0	0.11 TSF			0.22 TSF	

BORING NO. 84VC-129
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-130
COORDINATES: N 204,755.00
E 2,632,389.00

DATE: 4 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -29.5 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 16.5 /20.0 83 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	δd PCF	δm PCF	UU	CU	DS	TV	CONS
-29.5	0.0			(CH) CLAY, some fine to med. Sand, Very H.P., fluff, saturated, black		A	-31.5	1.8																	
							-32.3	2.8			137.0		95.5	32.0	63.5	75.0			38.5	91.2					
	5																								
-36.3	6.8			(CH) CLAY, same as above, little fine Sand, increasing compaction, moist		B	-36.3	6.8																	
							-37.3	7.8	8.0		128.0	98.9	99.5	32.5	67.0	82.5	2.55	3.3	37.0	84.4					
-39.4	9.9 10			(CH) CLAY, little fine Sand, Very H.P., increasing compaction, moist, grey																					
-41.4	11.9			(CH) CLAY, same as above, tr. fine Sand, tr. shell frag. — Peat (decomposed tree branch)																					
	15					C	-45.0	15.5																	
-46.0	16.5			Bot.			-46.0	16.5			93.5		78.0	27.5	50.5	98.0			43.0	83.2					
	20																								

0 10 20 30 40

5 10 15 20

BORING NO. 83VC-130
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 83VC-131
COORDINATES: N 205,683.00
E 2,631,864.00

DATE: 4 May 1983
DRILLER: Ocean Seismic Survey
INSPECTOR: J. Swean

ELEVATION: -29.1 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 13.9 /20.0 70 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-29.1	0.0			(CH) CLAY, little fine Sand, tr. Peat, H.P., fluff, saturated, black																					
-31.5	2.4			lense of med. to fine Sand																					
						A	-32.7	3.6																		
-33.7	4.6			(CH) CLAY, same as above, increasing compaction laminations of very fine Sand			-33.7	4.6			136.0		94.5	28.5	66.0	89.5			36.5	86.1					
-38.0	8.9						-37.8	8.7																	
				(CH) CLAY, same as above, tr. fine Sand		B	-38.8	9.7			105.0		97.0	32.0	65.0	97.5			43.0	88.1					
-40.7	11.6			(CH) CLAY, same as above, grey single large oyster shell																					
							-42.0	12.9																	
-43.0	13.9			Bot.		C	-43.0	13.9			80.5		78.0	25.5	52.5	95.0			54.5	98.4					

0 10 20 30 40

BORING NO. 83VC-131
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-131
COORDINATES: N 229,661.68
E 2,632,873.70

DATE: 25 Sept. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: J. Swean

ELEVATION: -24.6 FT. MLW
DEPTH: 15.5 FT.
CORE RECOVERY: 14.3 /15.5 92.2 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.
-24.6	0.0			(CH) CLAY & very fine SAND, H.P., moist, grey		1
-27.0	2.4			(CH) CLAY, same as above, tr. fine Sand, tr. shell frag.		
-28.7	4.1			(CH) CLAY, same as above, no shell frag.		
-31.6	7.0			(CH) CLAY, some fine Sand, H.P., moist, grey		
-35.4	10.8			(SM) SAND fine, some Silt, tr. shell frag., N.P., moist, grey	4 Min.	2
-38.9	14.3		BOH			

ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-24.6	0.0			73.0	92.9	61.5	21.0	40.5	99.0	2.70	3.65	54.0	93.0					
-26.1	1.5																	
-37.4	12.8																	
-38.9	14.3			26.5	93.2	NP			60.5	2.71	0.77	95.5	121.0	1.90 TSF			0.16 TSF	

0 10 20 30 40

BORING NO. 84VC-131
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-132
COORDINATES: N 229,774.84
E 2,631,098.87

DATE: 25 Sept. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: J. Swean

ELEVATION: -25.9 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 19.4 /20.0 97.0 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-25.9	0.0			(CH) CLAY, tr. fine Sand, tr. shell frag., H.P., moist, grey	1	-25.9	0.0																	
						-27.4	1.5			86.0	94.6	69.0	24.5	44.5	94.5	2.65	2.41	48.5	90.0					
-30.5	4.6			(CH) CLAY, same as above, no shell frag.																				
	5																							
						-34.1	8.2																	
					2					83.5	98.5	84.0	26.5	57.5	99.0	2.72	2.29	51.5	94.5	0.06 TSF			0.15 TSF	
	10					-35.6	9.7																	
	15																							
						-44.0	18.1																	
					3					74.5	97.5	74.0	26.5	47.5	99.5	2.70	2.06	55.0	96.0	0.08 TSF			0.15 TSF	
-45.3	19.4					-45.3	19.4																	
	20		BOH																					

PENETRATION SECS.: 0 10 20 30 40

BORING NO. 84VC-132
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-133
COORDINATES: N 226,309.53
E 2,631,063.34

DATE: 24 Sept. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: J. Swean

ELEVATION: -18.3 FT. MLW
DEPTH: 24.0 FT.
CORE RECOVERY: 13.7 /24.0 57.1 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-18.3	0.0						-18.3	0.0																	
-19.0	0.75			(CH) CLAY, little fine Sand, H.P., saturated, grey		1	-19.0	0.75			118.5		60.5	20.0	40.5	86.5	2.67		50.5	92.5					
-20.2	1.9			(SM) SAND fine, some Silt, some large Gravel (coal), N.P., moist, grey			-19.8	1.5			49.5		NP	NP	NP	33.0									
-21.5 -21.3	3.2 3.0			(CH) CLAY, little fine Sand, H.P., moist, grey																					
				(SM) SAND fine, some Silt, N.P., moist, grey																					
	5			(CH) CLAY, same as above,																					
-26.6	8.3			Peat layer with oyster shell			-30.5	12.2																	
	10					2					73.5	96.8	76.0	25.0	51.0	99.0	2.74	2.08	55.5	96.5	0.09 TSF			0.20 TSF	
-32.0	13.7			BOH			-32.0	13.7																	
	15																								
	20																								

0 10 20 30 40

BORING NO. 84VC-133
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-133A
COORDINATES: N 226,342.25
E 2,631,820.78

DATE: 24 Sept. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: J. Swean

ELEVATION: -54.0 FT. MLW
DEPTH: 23.0 FT.
CORE RECOVERY: 18.3 /23.0 79.5 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-54.0	0.0			(CH) CLAY, tr. fine Sand, tr. shell frag., H.P., moist, grey	1	-54.0	0.0			93.0	82.0	87.5	29.5	58.0	97.0	2.74	3.07	42.0	81.5					
						-55.5	1.5																	
-61.4	7.4			(CH) CLAY, some fine Sand, H.P., moist, grey																				
-62.6	8.6			(CH) CLAY, same as above, litt;e fine Sand																				
-64.5	10.5			(CH) CLAY, same as above, tr. fine Sand	2	-64.5	10.5			56.5	95.6	60.5	24.5	36.0	97.5	2.71	1.60	65.0	102.0	0.09 TSF			0.15 TSF	
						-66.0	12.0																	
-69.3	15.3			(CH) CLAY, little fine Sand, H.P., moist, grey																				
-72.3	18.3			BOH																				

0 10 20 30 40

BORING NO. 84VC-133A
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-134
COORDINATES: N 226,371.47
E 2,632,599.08

DATE: 24 Sept. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: J. Swean

ELEVATION: -49.5 FT. MLW
DEPTH: 22.0 FT.
CORE RECOVERY: 16.0 /22.0 72.7 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-49.5	0.0			(CH) CLAY, tr. fine Sand, tr. shell frag., H.P., moist, brown & grey mottling		1	-49.9	0.0			191.5	90.4	130.0	36.5	93.5	96.5	2.64	5.58	25.0	73.5					
							-51.0	1.5																	
-55.5	6.0			(CH) CLAY, same as above, little fine Sand		2	-55.5	6.0			56.5	94.2	55.5	19.5	36.0	89.5	2.72	1.63	64.5	101.0			0.05 TSF 0=29.0°		
-57.7	8.2			(CH) CLAY, tr. fine sand, tr. shell frag., H.P., moist, grey			-57.0	7.5																	
-60.5	11.0			(CH) CLAY, little very fine Sand, H.P., moist, grey intermixed with thin layers (SM) SAND very fine, little Silt, N.P., moist, lt. brown																					
-65.5	16.0			BOH																					

0 10 20 30 40

BORING NO. 84VC-134
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-135
COORDINATES: N 222,776.82
E 2,630,798.23

DATE: 24 Sept. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: J. Swean

ELEVATION: -24.7 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 9.0 /20.0 45 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-24.7	0.0			(CH) CLAY, tr. fine Sand, tr. shell frag., H.P., moist, grey		1	-24.7	0.0			178.0	100.1	110.0	33.0	77.0	96.0	2.67	4.74	29.0	81.0					
							-25.7	1.0																	
							-32.4	7.7																	
						2					79.5	97.7	88.0	27.5	60.5	99.5	2.75	2.24	53.0	95.0	0.08 TSF				
-33.7	9.0			BOH			-33.7	9.0																	
	10																								
	15																								
	20																								

0 10 20 30 40

BORING NO. 84VC-135
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-136
COORDINATES: N 222,749.88
E 2,631,686.34

DATE: 24 Sept. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: J. Swean

ELEVATION: -46.9 FT. MLW
DEPTH: 20.5 FT.
CORE RECOVERY: 14.7 /20.5 71.7 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-46.9	0.0			(CH) CLAY, tr. fine Sand, H.P., moist, grey	1	-46.9	0.0			182.5	86.1	126.0	36.5	89.5	98.5	2.65	5.61	25.0	71.0					
						-48.4	1.5																	
					2	-54.1	7.2			84.0	92.5	85.5	28.5	57.0	91.5	2.74	2.49	49.0	90.0	0.11 TSF				
-55.6	8.7			(CH) CLAY, same as above, tr. shell frag.		-55.6	8.7																	
-61.6	14.7			BOH																				

0 10 20 30 40

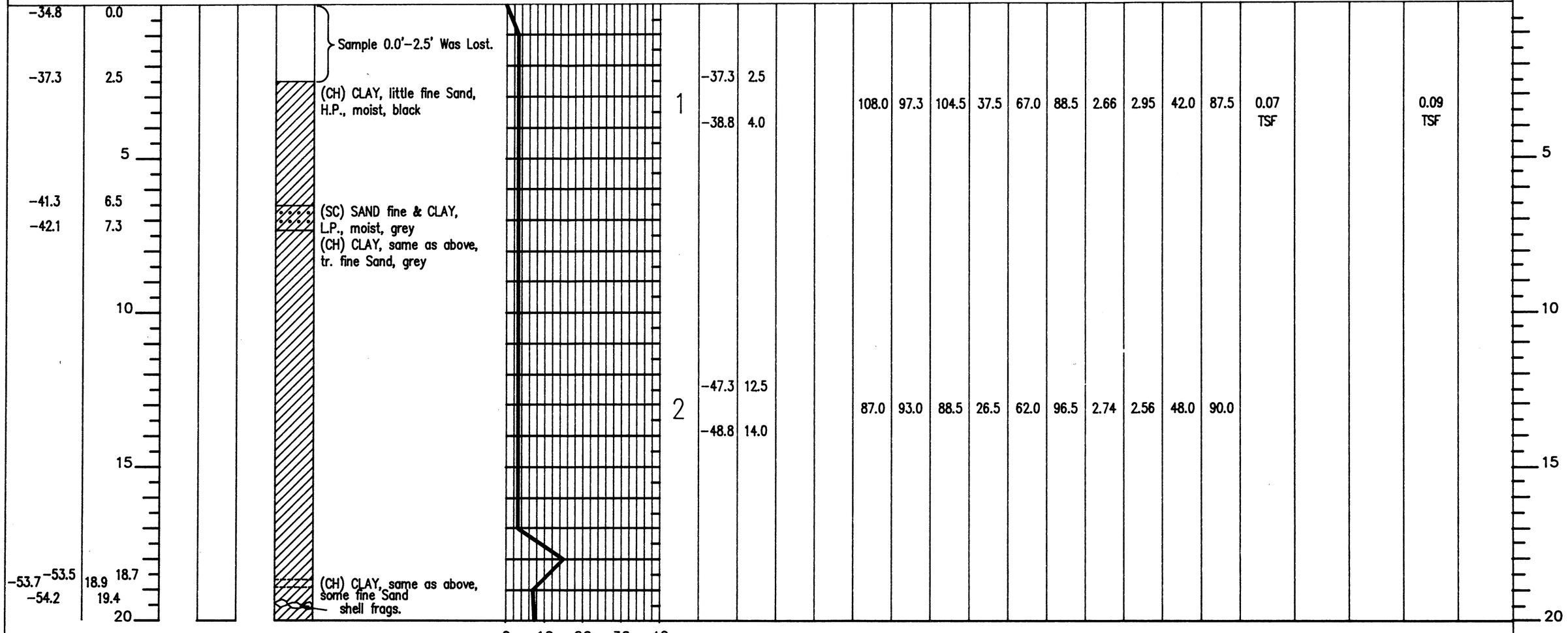
BORING NO. 84VC-136
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-138
COORDINATES: N 214,479.35
E 2,631,658.70

DATE: 20 Sept. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: J. Swean

ELEVATION: -34.8 FT. MLW
DEPTH: 23.0 FT.
CORE RECOVERY: 22.0 /23.0 95.6 %



ELEVATION MWL	DEPTH FT.	SAMP.	ELEV. MLW	DEPT. FT.	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	TV
-34.8	0.0															
-37.3	2.5	1	-37.3	2.5	108.0	97.3	104.5	37.5	67.0	88.5	2.66	2.95	42.0	87.5	0.07 TSF	0.09 TSF
			-38.8	4.0												
-41.3	6.5															
-42.1	7.3															
		2	-47.3	12.5	87.0	93.0	88.5	26.5	62.0	96.5	2.74	2.56	48.0	90.0		
			-48.8	14.0												
-53.7 -53.5	18.9 18.7															
-54.2	19.4															
	20															

BORING NO. 84VC-138
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-138
COORDINATES: N 214,479.35
E 2,631,658.70

DATE: 20 Sept. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: J. Swean

ELEVATION: -34.8 FT. MLW
DEPTH: 23.0 FT.
CORE RECOVERY: 22.0 /23.0 95.6 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-55.3 -54.8	20.5 20.0			(CH) CLAY, tr. fine sand, H.P., moist, grey																					
-55.7	20.9			(SC) SAND fine & CLAY, tr. shell frag., H.P., moist, grey																					
-56.5	21.7			(CH) CLAY, same as above																					
-56.8	22.0			BOH (SC) SAND, same as above																					

0 10 20 30 40

BORING NO. 84VC-138 CONT.
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-138A
COORDINATES: N 211,531.80
E 2,632,094.60

DATE: 20 Aug. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: J. Swean

ELEVATION: -26.1 FT. MLW
DEPTH: 22.0 FT.
CORE RECOVERY: 23.3 /22.0 116.5 %

NO DATA SHEET

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-26.1	0.0			(CH) CLAY, little fine Sand H.P., moist, black		1	-26.1	0.0			60.0	84.6	78.0	29.5	48.5	74.0	2.66	1.88	57.5	92.0					
							-27.6	1.5																	
-29.5	3.4			seam of (SM)																					
-30.5	4.4			(CH) CLAY, same as above, some fine Sand																					
-30.9	4.8			(CH) CLAY, same as above, tr. fine Sand																					
-31.8	5.7			(SC) SAND fine & CLAY, L.P., moist, grey																					
-32.3	6.2			(CH) CLAY, same as above																					
-33.1	7.0			(PT) PEAT, some fine Sand, spongy, moist, black																					
-33.5	7.4			(CH) CLAY, little fine Sand, tr. med. Sand, N.P., moist, grey																					
-36.3	10.2			(SP-SM) SAND fine, little Silt, N.P., moist, yellow																					
-36.5	10.4			(CH) CLAY, tr. fine Sand, H.P., moist, grey																					
-37.4	11.3			(SP-SM) SAND, same as above																					
-37.7	11.6			(CH) CLAY, same as above																					
-38.9	12.8			(SC) SAND fine, some Clay, H.P., moist, grey																					
-39.3	13.2			(CH) CLAY, same as above																					
-40.3	14.2			(SM) SAND fine, little Silt, N.P., moist, lt. grey																					
-43.8	17.7			(SC) SAND fine, some Clay, M.P., moist, grey																					
-44.7	18.6			(CL) CLAY & fine SAND, H.P., moist, grey																					

0 10 20 30 40

5 10 15 20

BORING NO. 84VC-138A
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-138A
COORDINATES: N 211,531.80
E 2,632,094.60

DATE: 20 Aug. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: J. Swean

ELEVATION: -26.1 FT. MLW
DEPTH: 22.0 FT.
CORE RECOVERY: 23.3 /22.0 116.5 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-48.1	22.0	BOH		(CL) CLAY & fine SAND, H.P. moist, grey		2	-47.1	21.0			39.0	100.0	45.0	22.0	23.0	61.0	2.66	1.03	81.5	113.0	0.09 TSF			0.16 TSF	
	23.3			Expanded Material			-49.4	23.3																	

NOTE! Material Recovered Expanded 1.3 Feet.

0 10 20 30 40

BORING NO. 84VC-138A CONT.
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-139
COORDINATES: N 214,636.35
E 2,632,075.14

DATE: 24 Sept. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: J. Swean

ELEVATION: -48.3 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 16.5 /20.0 82.5 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-48.7-48.3	0.4			(SP-SM) SAND fine, tr. Silt, N.P., moist, lt. grey																					
	0.0			(CH) CLAY, tr. fine Sand, H.P., moist, grey																					
							-51.8	3.5																	
						1					83.0	98.7	91.5	28.5	63.0	96.0	2.70	2.27	51.5	94.5					
	5						-53.3	5.0																	
							-56.8	8.5																	
						2					78.0	92.0	82.0	29.5	52.5	96.0	2.66	2.25	51.0	90.5					
	10						-58.3	10.0																	
-63.6	15.3																								
	15																								
-64.8	16.5			BOH																					
					45 Sec.																				
	20																								
					0 10 20 30 40																				

BORING NO. 84VC-139
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-140
COORDINATES: N 211,710.80
E 2,633,011.67

DATE: 20 Sept. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: J. Swean

ELEVATION: -25.3 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 16.4 /20.0 82.0 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-25.3	0.0			(CH) CLAY, tr. fine Sand, H.P., moist, grey pockets of sandy Clay with tr. shell frag.																					
							-28.8	3.5																	
						1					91.0	99.0	85.0	27.0	58.0	99.0	2.72	2.5	48.5	92.5					
	5						-30.3	5.0																	
	10						-35.4	10.1																	
						2					82.5	94.8	89.5	28.5	61.0	98.5	2.74	2.38	50.5	92.5	0.09 TSF			0.17 TSF	
							-36.9	11.6																	
	15																								
-41.7	16.4			BOH																					
	20																								

0 10 20 30 40

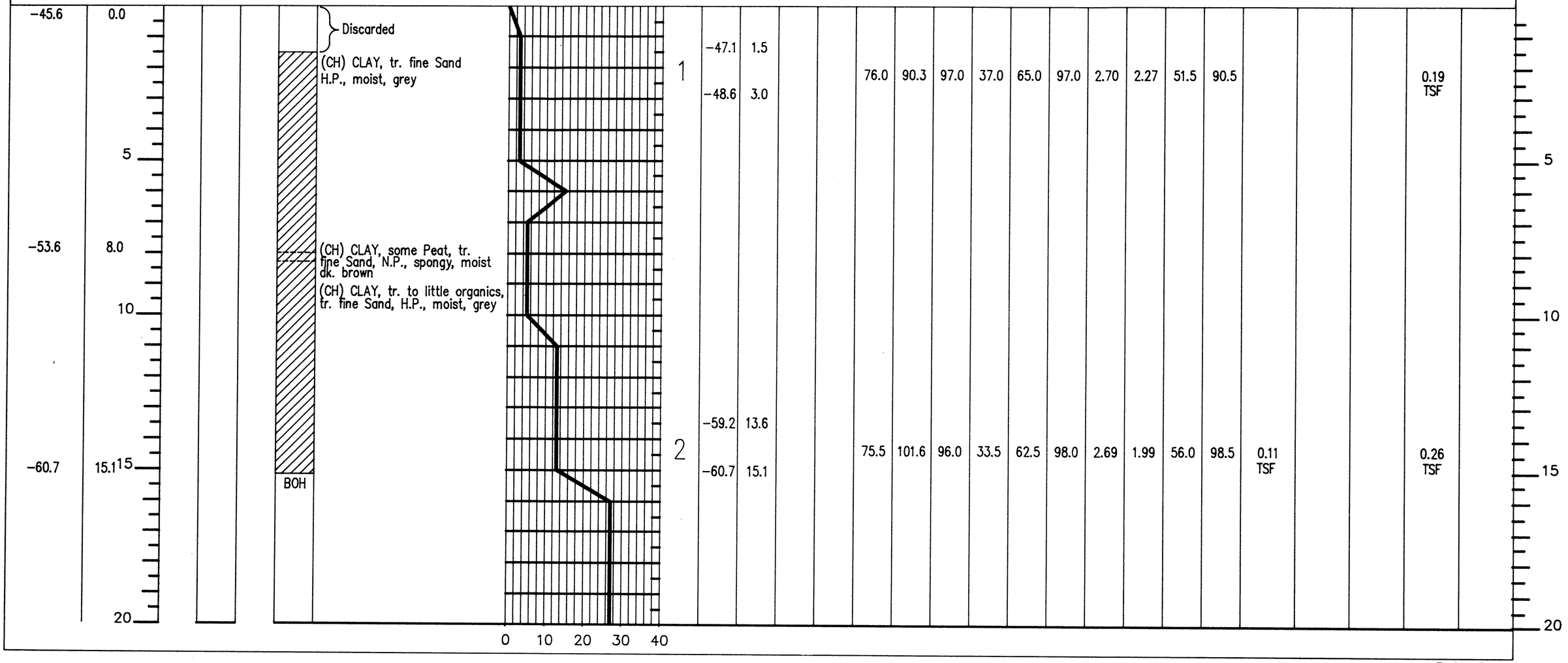
BORING NO. 84VC-140
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-142
COORDINATES: N 208,423.63
E 2,633,052.54

DATE: 20 Sept. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: J. Swean

ELEVATION: -45.6 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 15.1 /20.0 75.5 %



ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-47.1	1.5																	
-48.6	3.0			76.0	90.3	97.0	37.0	65.0	97.0	2.70	2.27	51.5	90.5				0.19 TSF	
-59.2	13.6																	
-60.7	15.1			75.5	101.6	96.0	33.5	62.5	98.0	2.69	1.99	56.0	98.5	0.11 TSF			0.26 TSF	

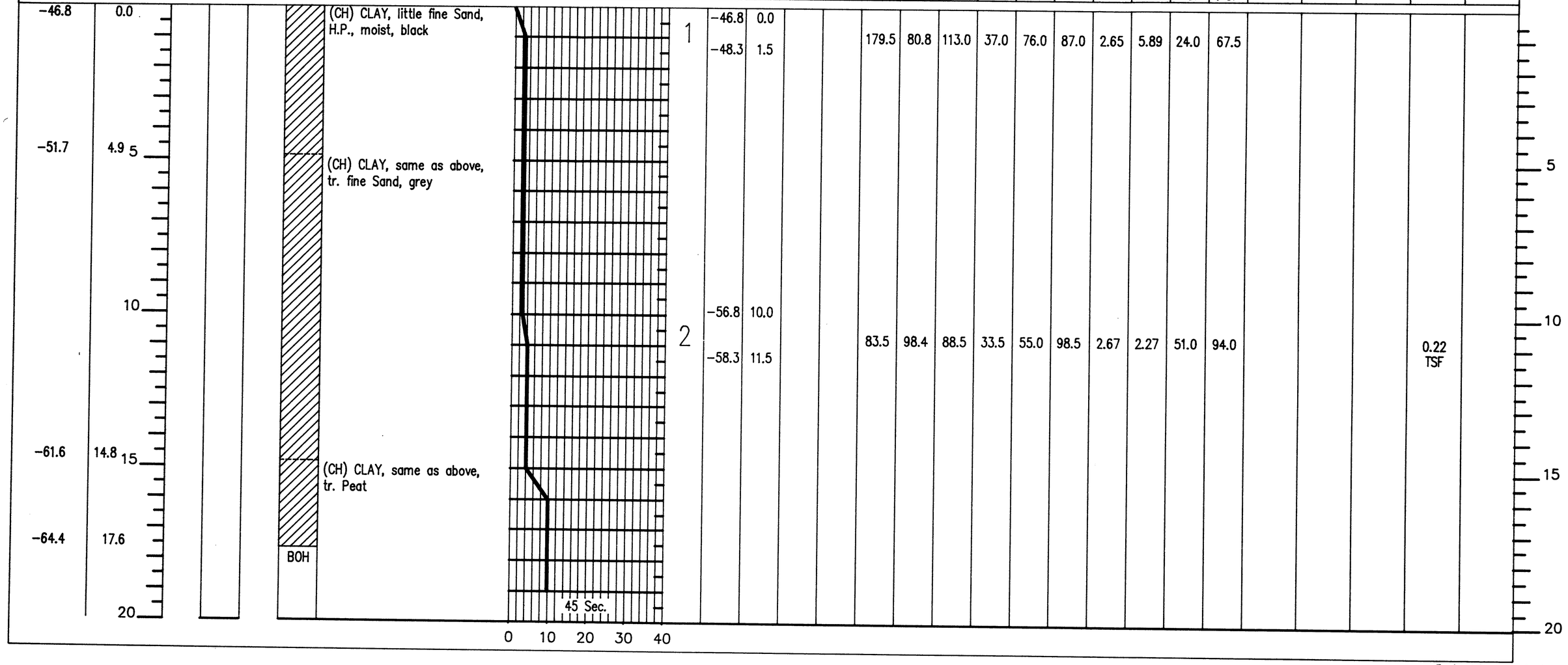
BORING NO. 84VC-142
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-143
COORDINATES: N 208,337.97
E 2,632,559.85

DATE: 24 Sept. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: J. Swean

ELEVATION: -46.8 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 17.6 /20.0 88.0 %



ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-46.8	0.0																	
-48.3	1.5			179.5	80.8	113.0	37.0	76.0	87.0	2.65	5.89	24.0	67.5					
-56.8	10.0																	
-58.3	11.5			83.5	98.4	88.5	33.5	55.0	98.5	2.67	2.27	51.0	94.0				0.22 TSF	

BORING NO. 84VC-143
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-144
COORDINATES: N 205,658.28
E 2,633,036.47

DATE: 24 Sept. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: J. Swean

ELEVATION: -45.0 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 16.1 /20.0 80.5 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-45.0	0.0			(CH) CLAY & fine SAND, H.P., moist, grey		1	-45.0	0.0			54.0	70.9	72.5	22.5	50.0	64.5	2.68	2.04	55.0	84.5					
-46.0	1.0			(CH) CLAY, tr. fine Sand, H.P., moist, grey																					
	5																								
							-52.0	7.0																	
-53.0	8.0			(CH) CLAY, same as above, tr. Peat		2	-53.0	8.0			88.0	95.0	94.0	34.0	60.0	91.5	2.68	2.48	48.0	90.0	0.11 TSF			0.22 TSF	
	10																								
	15																								
-61.1	16.1			BOH																					
	20																								

PENETRATION SECS. scale: 0 10 20 30 40

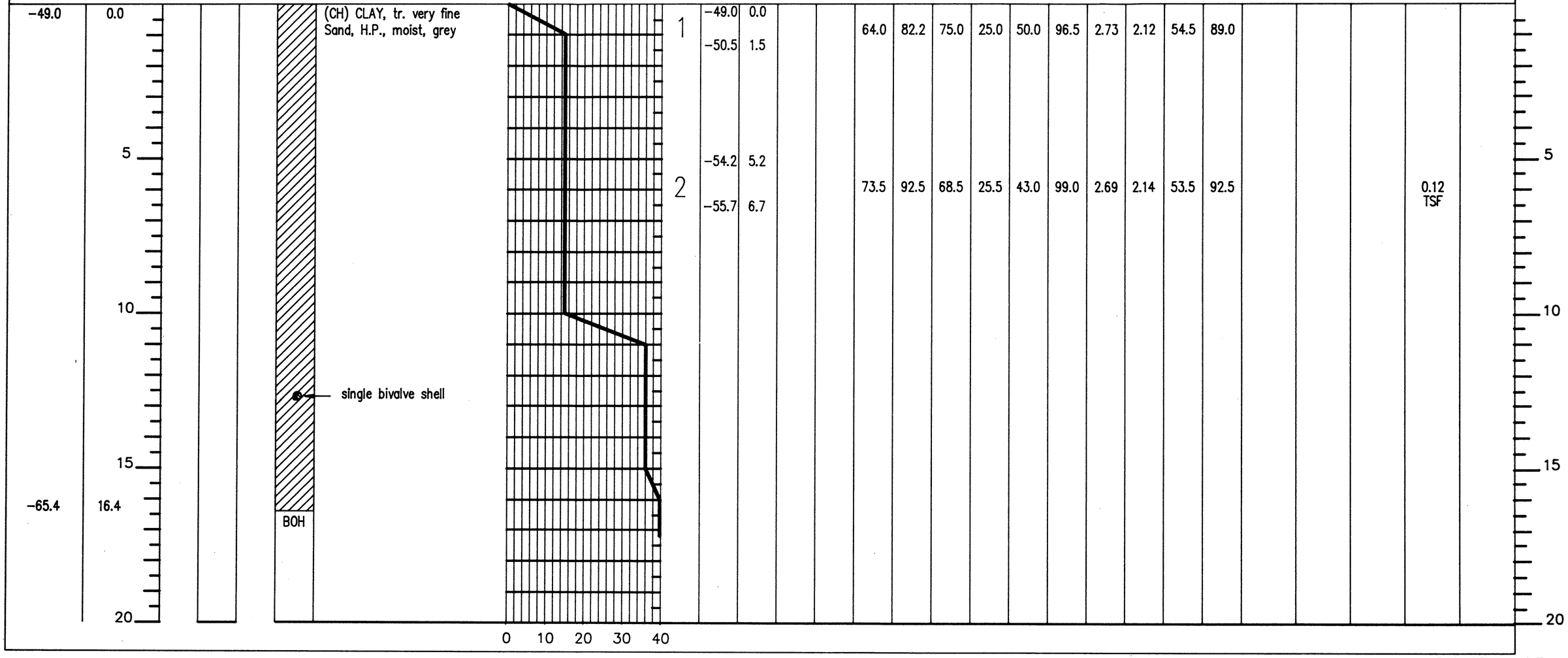
BORING NO. 84VC-144
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-145
COORDINATES: N 238,097.61
E 2,631,947.24

DATE: 25 Sept. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: J. Swean

ELEVATION: -49.0 FT. MLW
DEPTH: 17.0 FT.
CORE RECOVERY: 16.4 /17.0 96.4 %



ELEVATION MWL	DEPTH FT.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-49.0	0.0	1	-49.0	0.0			64.0	82.2	75.0	25.0	50.0	96.5	2.73	2.12	54.5	89.0					
			-50.5	1.5																	
	5																				
		2	-54.2	5.2			73.5	92.5	68.5	25.5	43.0	99.0	2.69	2.14	53.5	92.5				0.12 TSF	
			-55.7	6.7																	
	10																				
	15																				
-65.4	16.4																				
	20																				

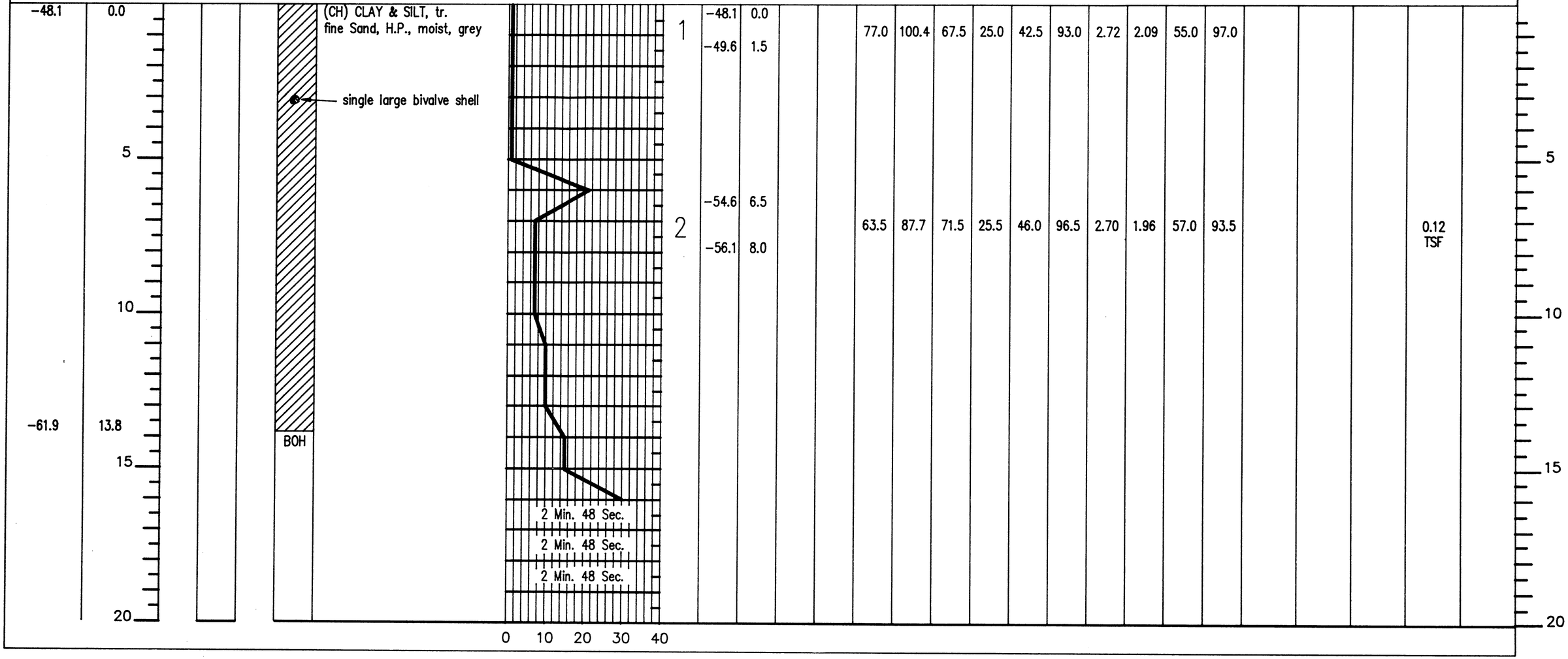
BORING NO. 84VC-145
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-146
COORDINATES: N 240,196.66
E 2,632,368.02

DATE: 27 Sept. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: Jones

ELEVATION: -48.1 FT. MLW
DEPTH: 19.0 FT.
CORE RECOVERY: 13.8 /19.0 72.6 %



ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-48.1	0.0																	
				77.0	100.4	67.5	25.0	42.5	93.0	2.72	2.09	55.0	97.0					
-49.6	1.5																	
-54.6	6.5																	
				63.5	87.7	71.5	25.5	46.0	96.5	2.70	1.96	57.0	93.5				0.12 TSF	
-56.1	8.0																	

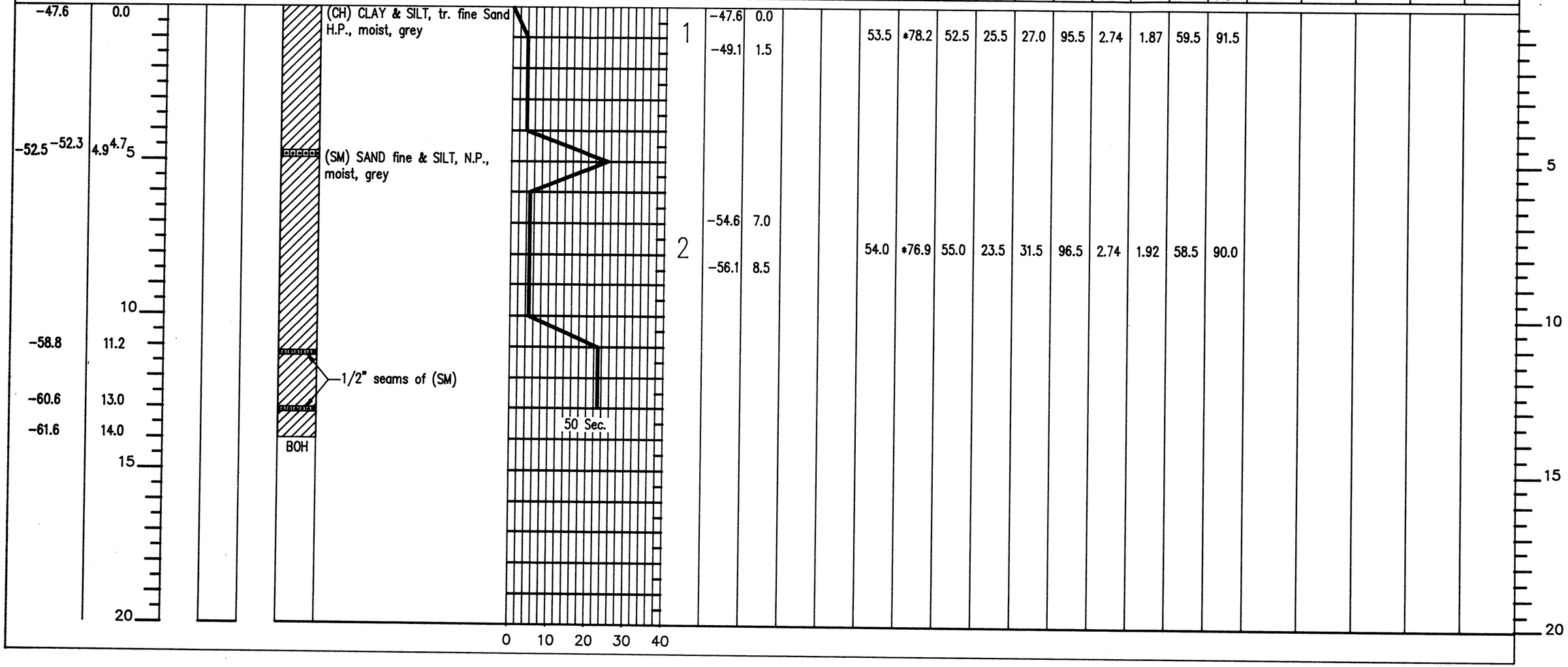
BORING NO. 84VC-146
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 84VC-147
COORDINATES: N 241,369.31
E 2,634,017.39

DATE: 27 Sept. 1984
DRILLER: Carpenter Const. Co.
INSPECTOR: Jones

ELEVATION: -47.6 FT. MLW
DEPTH: 14.0 FT.
CORE RECOVERY: 14.0 /14.0 100.0 %



ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-47.6	0.0																	
-49.1	1.5			53.5	*78.2	52.5	25.5	27.0	95.5	2.74	1.87	59.5	91.5					
-54.6	7.0																	
-56.1	8.5			54.0	*76.9	55.0	23.5	31.5	96.5	2.74	1.92	58.5	90.0					

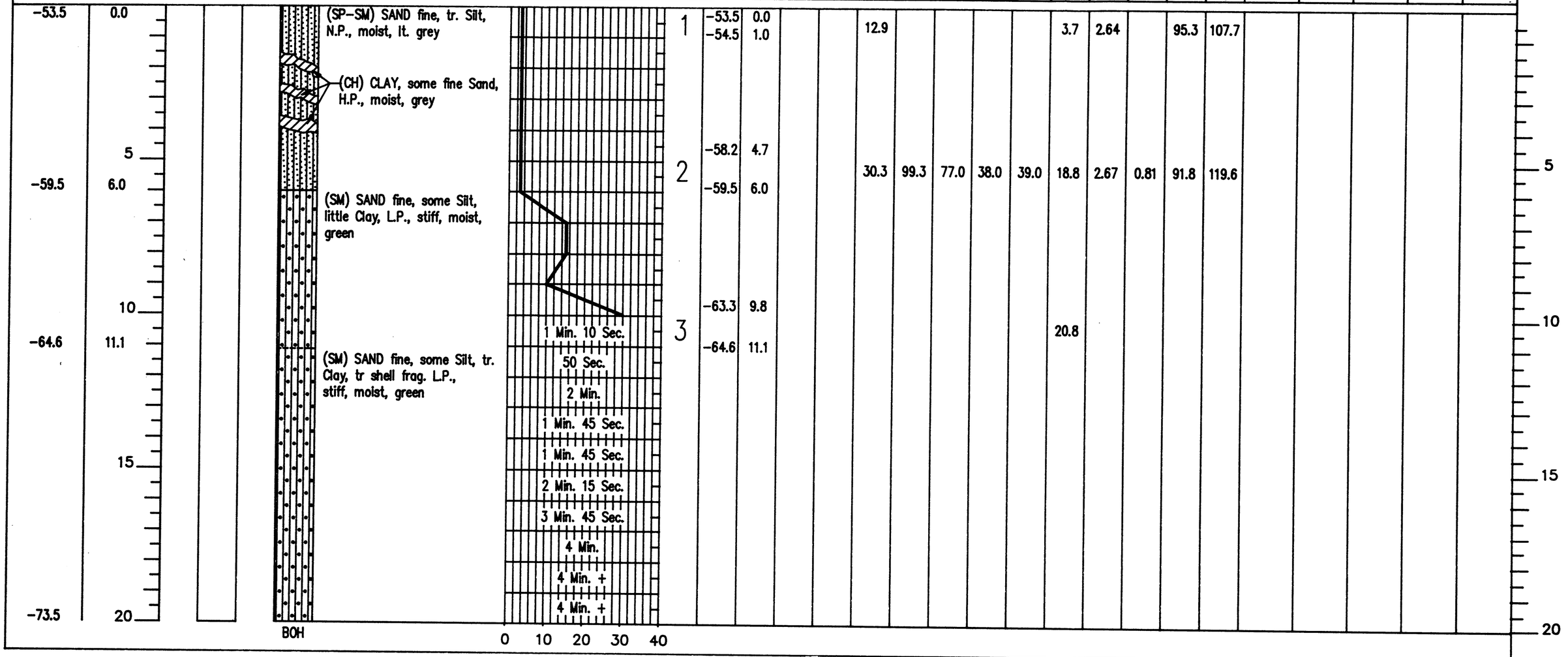
BORING NO. 84VC-147
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 85VC-231
COORDINATES: N 206,496.80
E 2,632,925.30

DATE: 26 July 1985
DRILLER: Exmar
INSPECTOR: Jones

ELEVATION: -53.5 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 20 /20.0 100 %



ELEVATION MWL	DEPTH FT.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-53.5	0.0	1	-53.5	0.0																	
			-54.5	1.0			12.9					3.7	2.64		95.3	107.7					
	5		-58.2	4.7																	
-59.5	6.0	2	-59.5	6.0			30.3	99.3	77.0	38.0	39.0	18.8	2.67	0.81	91.8	119.6					
	10		-63.3	9.8																	
-64.6	11.1	3	-64.6	11.1								20.8									
	15																				
-73.5	20																				

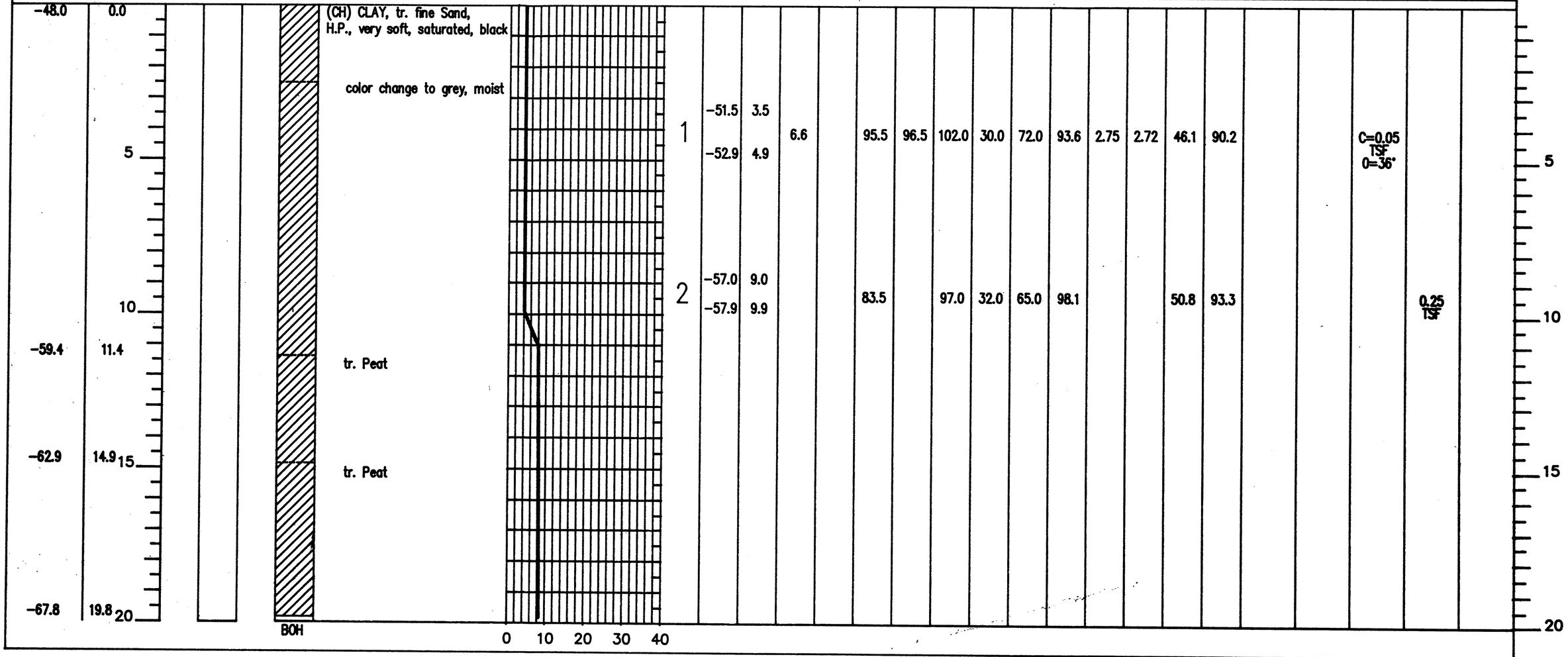
BORING NO. 85VC-231
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 85VC-232
COORDINATES: N 208,506.00
E 2,632,655.30

DATE: 26 July 1985
DRILLER: Exmar
INSPECTOR: Jones

ELEVATION: -48.0 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 19.8 /20.0 99 %



ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+#200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-51.5	3.5	6.6		95.5	96.5	102.0	30.0	72.0	93.6	2.75	2.72	46.1	90.2			C=0.05 TSF Φ=36°		
-52.9	4.9																	
-57.0	9.0			83.5		97.0	32.0	65.0	98.1			50.8	93.3				0.25 TSF	
-57.9	9.9																	

BORING NO. 85VC-232
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 85VC-233
COORDINATES: N 217,732.30
E 2,631,242.30

DATE: 24 July 1985
DRILLER: Exmar
INSPECTOR: J. Swean

ELEVATION: -50.5 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 18.7 /20.0 93.5 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-50.5	0.0			(CH) CLAY, H.P., very soft, saturated, black																					
-52.1	1.6			(CH) CLAY, tr. fine Sand, H.P., soft, moist, grey																					
						1	-55.8	5.3																	
							-56.8	6.3			68.0	98.9	69.0	26.0	43.0	75.3	2.73	1.87	59.2	99.6				0.22 TSF	
							-60.8	10.3																	
						2	-61.8	11.3			68.8	99.5	74.0	31.0	43.0	93.2	2.72	1.88	58.9	99.4				0.26 TSF	
-63.6	13.1			tr. Peat 13.1 to 14.4																					
-64.9	14.4			no Peat																					
-69.2	18.7			BOH																					

0 10 20 30 40

BORING NO. 85VC-233
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 85VC-234
COORDINATES: N 218,710.30
E 2,632,005.60

DATE: 24 July 1985
DRILLER: Exmar
INSPECTOR: J. Swean

ELEVATION: -49.0 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 18 /20.0 90 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-49.0 -49.4	0.0 0.4			(CH) CLAY, tr. fine Sand, H.P., soft, moist, black																					
				(SP-SM) SAND fine to med., little Clay/Silt, N.P., moist, grey																					
-51.8	2.8						-51.8	2.8																	
-52.8	3.8			(CH) CLAY & PEAT, H.P., soft, moist, brown		1	-52.8	3.8	13.6		84.9	*89.6				84.9	2.73	*2.58	47.5	89.6					
-54.1	5.1 5																								
-54.9	5.9			(SP-SM) SAND fine to med., little Clay/Silt, N.P., moist, grey																					
-55.4	6.4			(SC) SAND fine & CLAY, little Peat, H.P., moist, brown																					
				(SM) SAND fine, little Silt, N.P., moist		2	-55.8	6.8			25.5					18.5			103.9	130.5					
							-56.8	7.8																	
-57.5	8.5			(SM) SAND with some Silt, little Peat, L.P.																					
-58.2	9.2																								
	10			(SP-SM) SAND fine, tr. Silt, N.P., saturated, lt. grey																					
-62.4	13.4																								
-63.0	14.0			(CH) CLAY, some fine Sand, H.P., moist, grey																					
	15			(SM) SAND fine, some Clay/Silt, L.P., moist, lt. grey																					
-67.0	18.0			BOH																					
	20																								

0 10 20 30 40

BORING NO. 85VC-234
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 85VC-235
COORDINATES: N 219,232.80
E 2,632,370.50

DATE: 22 July 1985
DRILLER: Exmar
INSPECTOR: Jones

ELEVATION: -44.5 FT. MLW
DEPTH: 15.5 FT.
CORE RECOVERY: 17.5 /15.5 113 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-44.5	0.0			(CH) CLAY, tr. fine Sand, H.P., very soft, moist, black		1	-44.5	0.0			125.3	98.0	127.0	38.0	89.0	97.9	2.58	3.3	37.2	83.8	qu= 0.1 TSF				
							-46.0	1.5																	
See Note On Log	3.4			color change to grey																					
	5					2	-50.5	6.0			63.6		66.0	20.0	46.0	98.5			62.5	102.1				0.45 TSF	
							-51.5	7.0																	
	10																								
	12.7			alternating lenses of (CH) above & (SM) SAND fine, little Silt N.P., moist, grey, 12.7-14.2	5 Min. 10 Sec.																				
	14.2			(GP) GRAVEL fine to med., some fine to coarse Sand, some Silt	2 Min.																				
	15				5 Min.																				
-60.0 Actual BOH	15.5			(SM) SAND fine, some Silt, N.P., moist, grey																					
	17.5																								
	20				0 10 20 30 40																				

NOTE: This Log Is Based On Recovered Sample. No Correction For Dilation Of Sample Has Been Made. Sample Expanded Approximately 2.0 Feet.

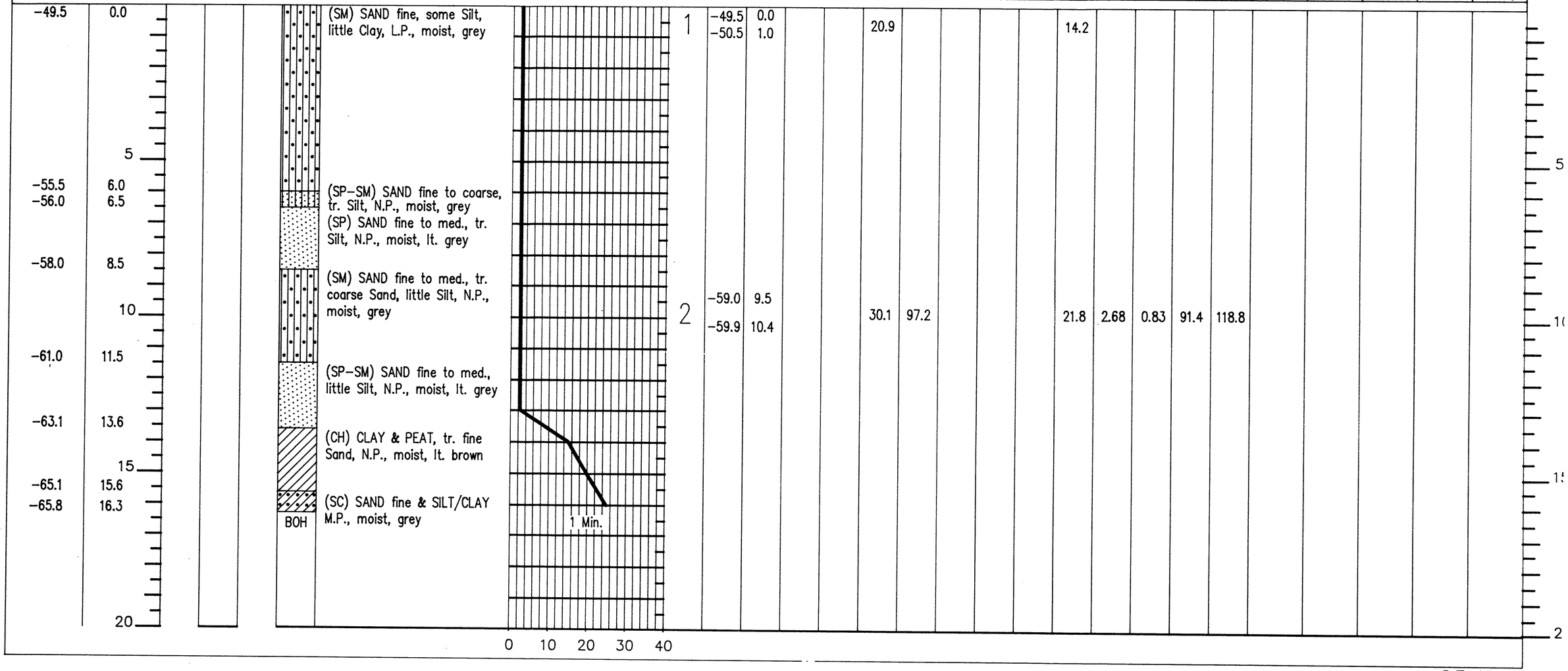
BORING NO. 85VC-235
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 85VC-236
COORDINATES: N 219,215.50
E 2,631,577.20

DATE: 19 July 1985
DRILLER: Exmar
INSPECTOR: Jones

ELEVATION: -49.5 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 16.3 /20.0 81.5 %



SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
1	-49.5	0.0																	
	-50.5	1.0			20.9					14.2									
2	-59.0	9.5																	
	-59.9	10.4			30.1	97.2				21.8	2.68	0.83	91.4	118.8					

BORING NO. 85VC-236
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 85VC-237
COORDINATES: N 220,019.00
E 2,632,008.20

DATE: 23 July 1985
DRILLER: Exmar
INSPECTOR: J. Swean

ELEVATION: -50.5 FT. MLW
DEPTH: 17.5 FT.
CORE RECOVERY: 17.5 /17.5 100 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-50.5	0.0			(SM) SAND fine & SILT, tr. shell frag., N.P., stiff moist, grey	AVERAGE 2 Min. 12 Sec. Per Foot	1	-50.5	0.0			32.9	93.1				33.9	2.73	0.97	86.7	115.2					
							-52.0	1.5																	
-68.0	17.5			BOH																					

0 10 20 30 40

BORING NO. 85VC-237
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 85VC-238
COORDINATES: N
E 2,632,576.50

DATE: 23 July 1985
DRILLER: Exmar
INSPECTOR: J. Swean

ELEVATION: -44.5 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 15.1 /20.0 75.5 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-44.5	0.0			(CH) CLAY, H.P., very soft, saturated, black																					
-50.1	5.6			(SC) SAND fine & CLAY, M.P., moist, grey		1	-50.1	5.6			39.8					23.9									
							-51.1	6.6																	
-54.1	9.6			(SM) SAND fine, some Silt, N.P., moist, grey																					
						2	-57.6	13.1			24.3	*91.5				14.0	2.67	*0.7	97.5	121.3					
							-58.6	14.1																	
-59.6	15.1			BOH																					
	20				0 10 20 30 40																				

BORING NO. 85VC-238
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 85VC-239
COORDINATES: N 225,233.30
E 2,630,907.60

DATE: 19 July 1985
DRILLER: Exmar
INSPECTOR: Jones

ELEVATION: -50.0 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 17.3 /20.0 86.5 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-50.0	0.0			(CH) CLAY, tr. fine Sand, tr. shell frag., tr. organics, very soft, moist, black		1	-50.0	0.0			103.7	100.7	80.0	20.0	60.0	96.0	2.53	2.60	43.8	89.2					
							-51.5	1.5																	
-54.4	4.4			color change to grey large oyster shell at 5.0																					
	5					2	-55.6	5.6																	
							-56.6	6.6			80.1		66.0	32.0	34.0	98.5			52.4	94.4				0.11 TSF	
	10						-60.0	10.0																	
-61.2	11.2			no shell		3	-61.2	11.2			79.4		82.0	26.0	56.0				50.3	92.9				0.19 TSF	
	15																								
-67.3	17.3			BOH																					
	20																								

0 10 20 30 40

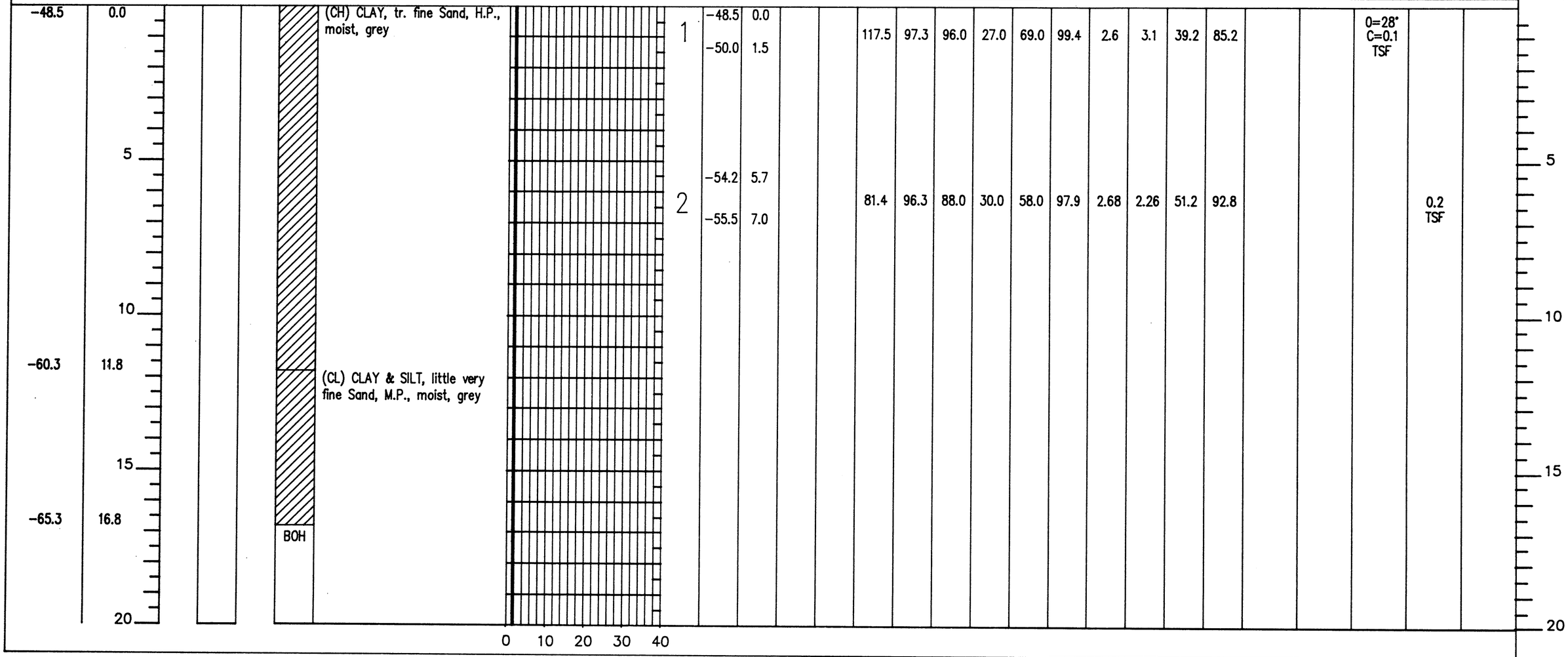
BORING NO. 85VC-239
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 85VC-240
COORDINATES: N 226,618.90
E 2,632,048.10

DATE: 23 July 1985
DRILLER: Exmar
INSPECTOR: J. Swean

ELEVATION: -48.5 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 16.8 /20.0 84.0 %



ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-48.5	0.0																	
-50.0	1.5			117.5	97.3	96.0	27.0	69.0	99.4	2.6	3.1	39.2	85.2			0=28° C=0.1 TSF		
-54.2	5.7																	
-55.5	7.0			81.4	96.3	88.0	30.0	58.0	97.9	2.68	2.26	51.2	92.8				0.2 TSF	

BORING NO. 85VC-240
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 85VC-240A
COORDINATES: N 227,150.10
E 2,631,820.20

DATE: 23 July 1985
DRILLER: Exmar
INSPECTOR: J. Swean

ELEVATION: -48.0 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 18.7 /20.0 93.5 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-48.0	0.0			(CH) CLAY, tr. fine Sand, H.P., soft, moist, grey																					
-54.2	6.2					1	-54.2	6.2			88.9	106.8	80.0	27.0	53.0	97.4	2.57	2.20	51.1	92.8	qu= 0.215 TSF				
-55.7	7.7						-55.7	7.7																	
-60.8	12.8			large oyster shells																					
-61.2	13.2			(CL) CLAY & SILT, some fine Sand, M.P., moist, grey																					
-66.7	18.7			BOH																					
	20																								

0 10 20 30 40

5 10 15 20

BORING NO. 85VC-240A
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 85VC-241
COORDINATES: N 227,496.20
E 2,632,695.00

DATE: 24 July 1985
DRILLER: Exmar
INSPECTOR: J. Swean

ELEVATION: 39.0 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 19.5 /20.0 97.5 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-39.0	0.0			(CH) CLAY, tr. fine Sand, H.P., moist, grey	1	-39.0	0.0			68.9	99.5	77.0	25.0	52.0	83.5	2.71	1.87	58.8	99.4				0.25 TSF	
						-40.0	1.0																	
-42.1	3.1			(SC) SAND fine & CLAY, little shell frag. N.P., moist, grey																				
-43.0	4.0			(CH) CLAY, tr. fine Sand, H.P., moist, grey																				
	5																							
-48.5	9.5			(SC) SAND fine & CLAY, saturated, grey																				
	10																							
-52.6	13.6			(CH) CLAY, tr. fine Sand, H.P., moist, grey	2	-52.6	13.6			52.9	98.6	87.0	32.0	55.0	32.4	2.68	1.44	68.6	104.9				0.28 TSF	
	15					-53.6	14.6																	
-58.5	19.5			BOH																				
	20																							

0 10 20 30 40

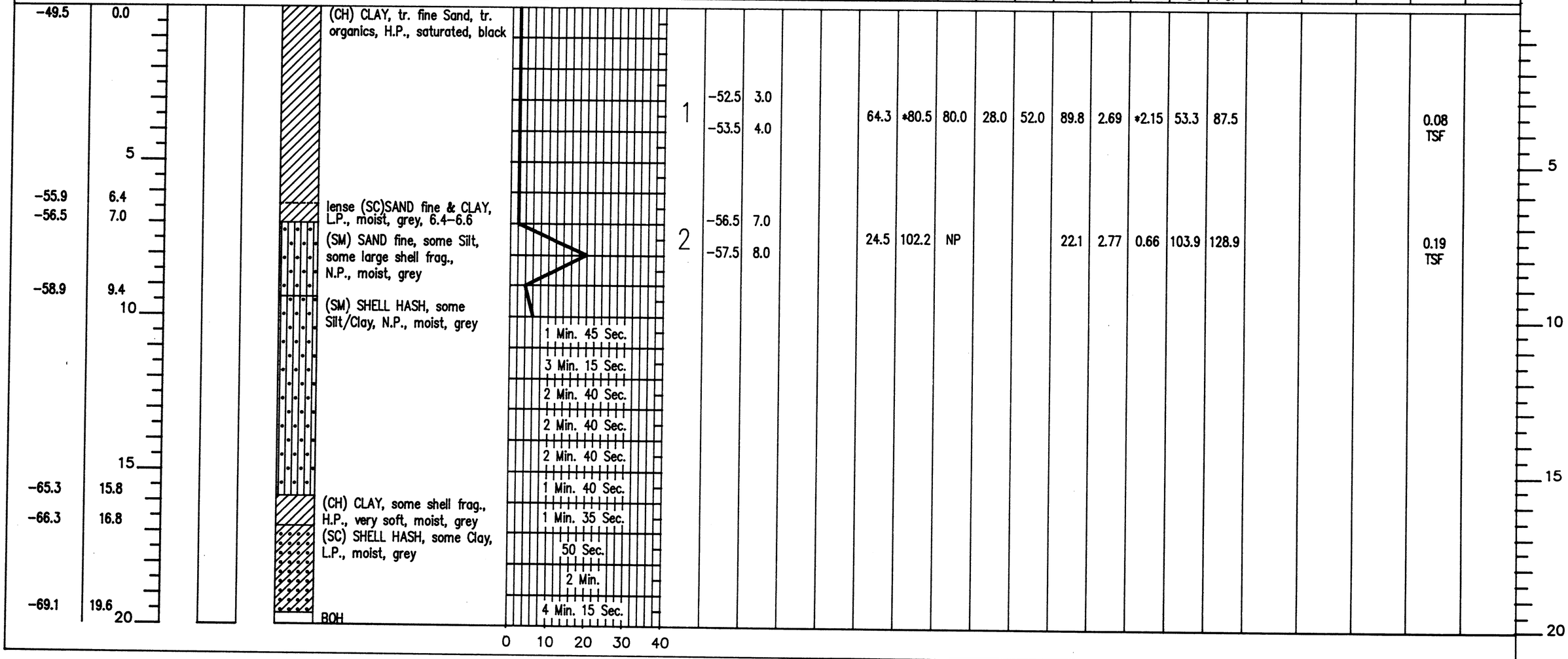
BORING NO. 85VC-241
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 85VC-242
COORDINATES: N 233,752.00
E 2,632,572.70

DATE: 19 July 1985
DRILLER: Exmar
INSPECTOR: Jones

ELEVATION: -49.5 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 19.6 /20.0 98.0 %



ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-52.5	3.0																	
-53.5	4.0			64.3	*80.5	80.0	28.0	52.0	89.8	2.69	*2.15	53.3	87.5				0.08 TSF	
-56.5	7.0																	
-57.5	8.0			24.5	102.2	NP			22.1	2.77	0.66	103.9	128.9				0.19 TSF	

BORING NO. 85VC-242
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 85VC-243
COORDINATES: N 228,776.60
E 2,632,611.00

DATE: 23 July 1985
DRILLER: Exmar
INSPECTOR: J. Swean

ELEVATION: -50.0 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 19.1 /20.0 95.5 %

ELEVATION MWL	DEPTH FT.	LEG.	CLASSIFICATION USCS	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-50.0	0.0		(SM) SAND fine, some Silt N.P., moist, grey	1	-50.0	0.0			23.7	104.2	NP			21.3	2.68	0.61	103.9	128.6					
					-51.5	1.5																	
			(CH) CLAY, some fine Sand, H.P., moist, grey																				
-54.0	4.0				-54.0	4.0																	
	5		(SC) SAND fine, some med. Sand, L.P., moist, grey	2	-55.0	5.0			39.4	96.0	36.0	19.0	17.0	30.3	2.65	1.08	79.2	110.3					
	10																						
-61.2	11.2		fine to coarse Sand, little fine Gravel, 11.2-11.9																				
-64.0	14.0		(SC-SM) SAND fine, little silty Clay, N.P., saturated, grey																				
	15																						
-66.4	16.4		piece of water soaked wood																				
-69.1	19.1	BOH																					
	20																						

PENETRATION SECS.: 0 10 20 30 40

BORING NO. 85VC-243
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 85VC-244
COORDINATES: N 228,776.60
E 2,632,902.00

DATE: 23 July 1985
DRILLER: Exmar
INSPECTOR: J. Swean

ELEVATION: -30.5 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 15.8 /20.0 79 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	PENETRATION SECS.	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-30.5	0.0			(CH) CLAY, some fine Sand, H.P., very soft, saturated, black		1	-30.5	0.0			145.8	98.2	65.0	25.0	40.0	91.6	2.53	3.8	33.2	81.6					
							-32.0	1.5																	
-38.5	8.0			(SM) SAND fine, little Silt, N.P., moist, lt. grey																					
-39.2	8.7			(CH) CLAY & fine Sand, N.P., moist, lt. grey		2	-39.5	9.0			69.6		54.0	17.0	37.0	66.5			61.8	101.7					
-40.6	10.1			(SM) SAND fine, some Silt, tr. shell frag., N.P., stiff, moist, grey	45 Sec.		-40.5	10.0																	
					2 Min. 20 Sec.																				
					4 Min.	3	-45.3	14.8			39.2	96.8				32.9	2.66	1.07	79.9	111.3					
-46.3	15.8			BOH	5 Min. 5 Sec.		-46.3	15.8																	

0 10 20 30 40

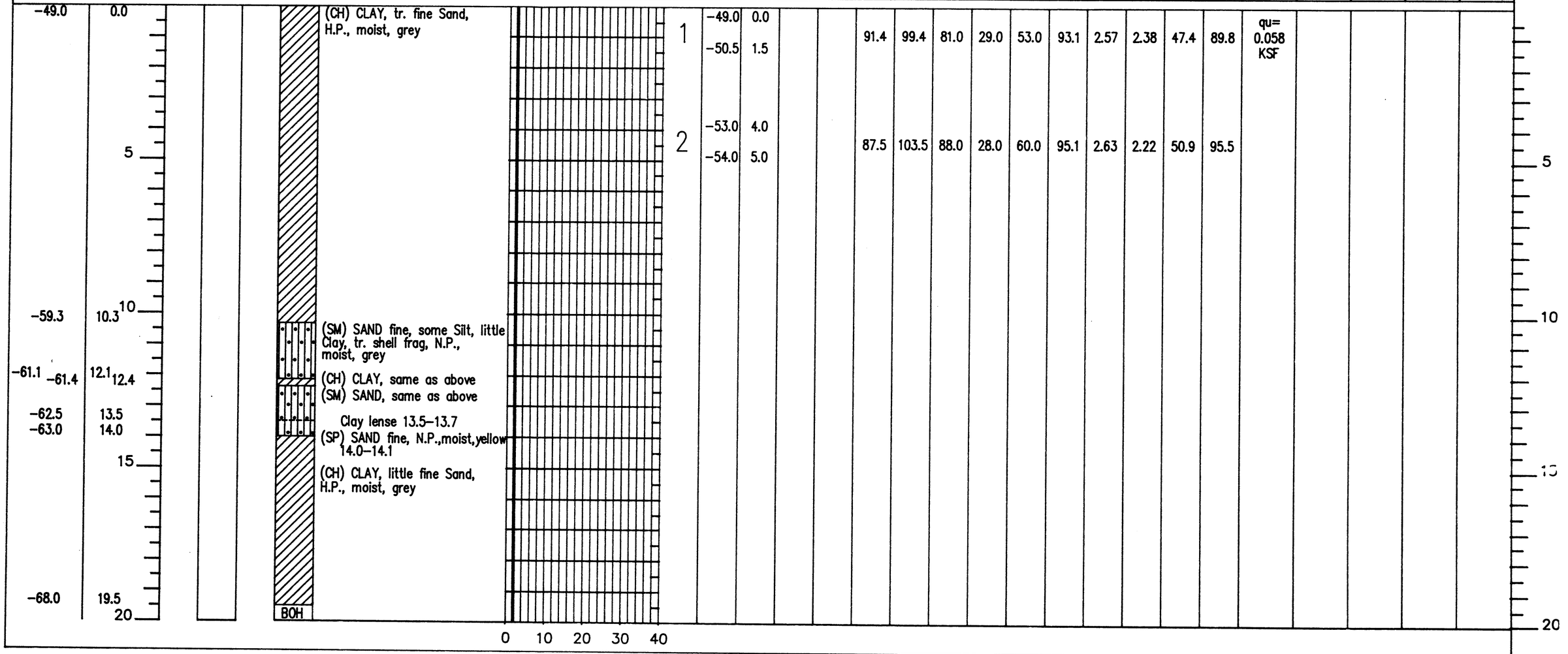
BORING NO. 85VC-244
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 85VC-245
COORDINATES: N 229,775.30
E 2,632,151.30

DATE: 23 July 1985
DRILLER: Exmar
INSPECTOR:

ELEVATION: -49.0 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 19.0 /20.0 95.0 %



ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-49.0	0.0																	
-50.5	1.5			91.4	99.4	81.0	29.0	53.0	93.1	2.57	2.38	47.4	89.8	qu= 0.058 KSF				
-53.0	4.0																	
-54.0	5.0			87.5	103.5	88.0	28.0	60.0	95.1	2.63	2.22	50.9	95.5					

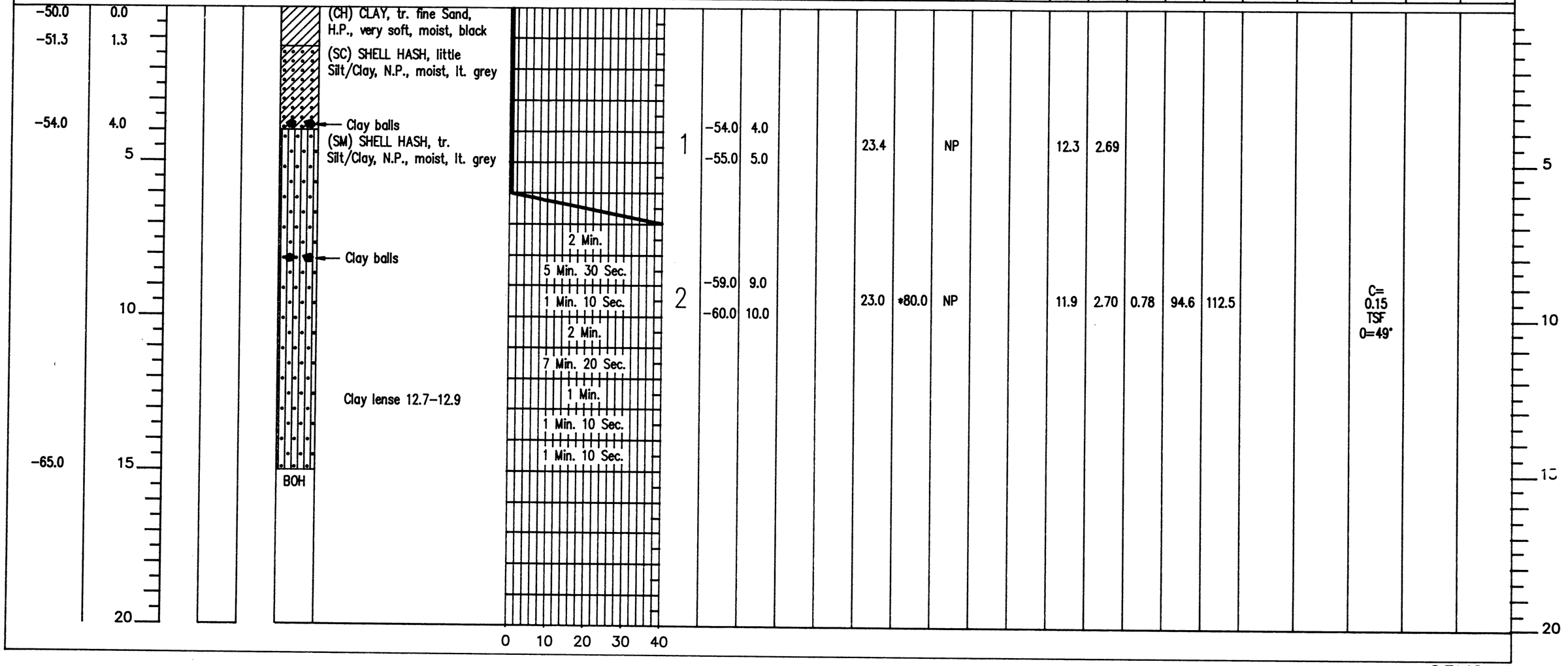
BORING NO. 85VC-245
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 85VC-246
COORDINATES: N 233,696.80
E 2,633,032.00

DATE: 24 July 1985
DRILLER: Exmar
INSPECTOR: J. Swean

ELEVATION: -50.0 FT. MLW
DEPTH: 17.0 FT.
CORE RECOVERY: 15.0 /17.0 88.2 %



ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-54.0	4.0																	
-55.0	5.0			23.4		NP			12.3	2.69								
-59.0	9.0																	
-60.0	10.0			23.0	*80.0	NP			11.9	2.70	0.78	94.6	112.5			C= 0.15 TSF Ø=49°		

BORING NO. 85VC-246
NAO FM-103

PROJECT: Norfolk Harbor and Channels Deepening Project
Norfolk Harbor Channel, Va.

HOLE NO. 85VC-247
COORDINATES: N 218,358.80
E 2,632,152.60

DATE: 24 July 1985
DRILLER: Exmar
INSPECTOR: J. Swean

ELEVATION: -48.5 FT. MLW
DEPTH: 20.0 FT.
CORE RECOVERY: 18.9 /20.0 95.3 %

ELEVATION MWL	DEPTH FT.	SAMPLING SEQUENCE	LEG.	CLASSIFICATION USCS	SAMP.	ELEV. MLW	DEPT. FT.	OC	PH	W %	S %	LL	PL	PI	+No200 %	G	e	8d PCF	8m PCF	UU	CU	DS	TV	CONS
-48.5	0.0			(CH) CLAY, tr. fine Sand, H.P., moist, grey	1	-48.5	0.0			84.9	91.3	77.0	29.0	48.0	86.5	2.57	2.39	47.3	87.5					
						-50.0	1.5																	
						-57.5	9.0																	
					2					62.0	102.9	73.0	31.0	43.0	92.7	2.66	1.60	63.8	103.4					
						-58.5	10.0																	
				tr. shell frag. 13.5																				
-64.5	16.0			(SC) SAND fine & CLAY, tr. shell frag., M.P., moist, grey																				
-65.3	16.8			(CH) CLAY, little fine Sand, tr. shell frag., H.P., moist, grey																				
-67.4	18.9			BOH																				
	20																							

45 Sec.

0 10 20 30 40

BORING NO. 85VC-247
NAO FM-103

APPENDIX 1C

LABORATORY DATA

LABORATORY TEST NOTES

1. The moisture content (w) was performed according to ASTM D 2216. Natural or Moist Unit Weights (γ_m) and Dry Unit Weights (γ_d) were determined from the test used for moisture contents by using wet and dry samples of known volume.

2. The Specific Gravity (G) was performed according to ASTM D 854.

3. The Liquid Limit (LL) and Plastic Limit (PL) were performed according to ASTM D 4318. Samples were prepared according to ASTM D 2217, the wet method. The Plastic Index (PI) is the difference between the LL and PL.

4. The Void Ratio (e) was calculated based on the following equation:

$$e = G \frac{\gamma_w}{\gamma_d} = 1$$

Where γ_w = Unit Weight of Water

5. The Saturation (S) was calculated based on the following equation:

$$S = \frac{wG}{e}$$

6. The gradation analysis on coarse soils (+ No. 200), such as sand, were performed according to ASTM D 422. For predominantly fine soils (- No. 200), such as clay and silt, the sand fraction was determined by washing specific gravity test samples through the No. 200 (75-mm) sieve. The retained portion is that portion of the sample that was sand.

7. The direct shear tests were performed according to ASTM D 3080.

8. Unconsolidated - undrained triaxial tests were performed according to ASTM D 2850.

9. Consolidation tests were performed according to ASTM D 2435.

TEST DATA SUMMARY

PROJECT Norfolk Harbor Channe

BORING NO.	SAM. NO.	DEPTH OR ELEV. OF SAMPLE	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS				ATTERBERG LIMITS		SPECIFIC GRAVITY G	NAT. WATER CONT. %	NATURAL DRY DENSITY LBS/CU FT	COMPACTION DATA		SHEAR DATA											PERMEABILITY		CONSOLIDATION DATA				REMARKS
				GRAVEL %	SAND %	FINES %	D_{10}	LL	PL				OPT. WATER %	MAXIMUM DRY DENSITY LBS/CU FT	INITIAL e	DRY DENSITY LBS/CU FT	W_1 %	W_F %	S_1 %	TYPE TEST	SPECIMEN SIZE INCHES	TEST	σ_m T/SQ FT	σ_1 T/SQ FT	c T/SQ FT	ϕ DEGREES	e	K FT/MIN.	P_O T/SQ FT	P_C T/SQ FT	C_C	t_{50}	
83VC14	A	2.2-3.2	OH			66		36	20		53.4	67.3																				
	B	6.2-7.2	CH			98		68	33		25.4	55.3																				
	C	15.4-16.4	CH			98		78	34		72.0	57.5																				
83VC15	A	1.0-2.0	CH			72		64	31		64.4	56.5																				
	B	5.3-6.3	CH			84		80	34	2.71	86.4	52.9			2.19				106.5												
	C	10.4-11.4	CH			99		90	31		91.9	47.1																				
83VC16	A	2.8-3.8	CH			99		72	21		90.0	49.4																				
	B	6.0-7.0	CH			99		80	29		83.3	50.7																				
	C	13.9-14.9	CH			99		90	34		82.7	50.6																				
83VC17	A	2.0-3.0	CH			76		66	24		66.8	60.3																				
	1	4.8-7.0	SC			38.0		32.0	15.0	2.63	41.5	80.5			1.04				104.9	Q/TV	2.8 X 6.0				0.21	0.16						
	B	7.0-8.0	SC			47		37	18		50.4	72.1																				
	C	18.0-19.0	SM			15					27.9	96.7																				
83VC18	A	1.0-2.0	MH			98		70	40	2.63	159.0	30.2			4.43				94.3												
	B	5.3-6.3	CH			99		90	30		81.5	51.2																				
	C	14.0-15.0	CH			100		79	49		78.1	50.6																				
83VC19	A	2.0-3.0	CH			97		105	42		150.5	29.1																				
	B	7.0-8.0	CH			65		63	24		84.4	47.6																				
	C	11.7-12.7	CH			36		75	30		66.4	57.0																				
83VC20	A	2.8-3.8	CH			99		99	27		90.3	47.4																				
	B	7.3-8.3	CH			97		71	28		70.9	58.3																				
83VC21A	A	1.0-2.0	OH			100		122	60		167.2	29.9																				
	B	5.3-6.3	CL			70		39	24	2.64	53.2	68.8			1.39				100.2												
	C	11.4-12.4	CL			98		49	27		61.7	62.0																				
83VC21B	A	4.2-5.2	SC			26		33	14		31.7	86.7																				
	B	9.0-10.0	SM			31		39	31		35.9	86.0																				
	C	15.9-16.9	SM			29		41	31		31.9	89.2																				
83VC22	A	2.8-3.8	CH			98		77	30		62.7	60.5																				
	1	5.5-7.6	SC			41				2.60	34.5	82.0			0.97				91.5	Q/TV	2.8 X 6.0				0.12	0.12						
	B	7.6-8.6	SM			28					27.4	94.7																				
	C	12.8-13.8	ML			62		22	3		27.0	95.1																				

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1 JAN 73

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TV – Torvane

DS– DIRECT SHEAR
Q – UNCONSOLIDATE UNDRAINED

S – CONSOLIDATED DRAINED
R – CONSOLIDATED UNDRAINED

TEST DATA SUMMARY

PROJECT Norfolk Harbor Channel

BORING NO.	SAM. NO.	DEPTH OR ELEV. OF SAMPLE	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS				ATTERBERG LIMITS		SPECIFIC GRAVITY G	NAT. WATER CONT. %	NATURAL DRY DENSITY LBS/CU FT	COMPACTION DATA		SHEAR DATA											PERMEABILITY		CONSOLIDATION DATA				REMARKS
				GRAVEL %	SAND %	FINES %	D_{10}	LL	PL				OPT. WATER %	MAXIMUM DRY DENSITY LBS/CU FT	INITIAL e	DRY DENSITY LBS/CU FT	W_1 %	W_F %	S_1 %	TYPE TEST	SPECIMEN SIZE INCHES	TEST	σ_m T/SQ FT	σ_1 T/SQ FT	c T/SQ FT	ϕ DEGREES	e	K FT/MIN.	P_O T/SQ FT	P_C T/SQ FT	C_C	t_{50}	
83VC23	A	3.7-4.7	CL			56		35	20	2.76	55.6	61.6			1.79				85.4													
	B	8.0-9.0	CH			96		95	40		85.1	47.5																				
	C	14.0-15.0	CH			98		92	29		64.9	48.6																				
83VC24	A	1.0-2.0	CL			51		24	17		75.9	52.2																				
	B	4.4-5.4	CH			96		84	35		26.0	97.7																				
83VC25	1	2.5-4.5	CH			84.5		56	20.5	2.62	79.5	55.0			1.97				105.6	Q/TV	2.8 X 6.0				0.15/0.14							
	A	4.5-5.5	CH			95		73	35		84.1	52.2																				
	B	9.5-10.5	CH			75		60	28	2.64	67.1	60.0			1.74				101.5													
	C	19.0-20.0	CH			88		68	32		75.9	49.7																				
83VC26	A	1.0-2.0	MH			95		92	43		129.1	65.7																				
	B	4.5-5.5	MH			97		148	92																							
	C	13.2-14.2	MH			99		86	40		76.3	47.6																				
83VC27	A	1.0-2.0	CH			65		65	24		97.9	41.5																				
	B	6.1-7.1	CH			85		77	26		79.7	32.9																				
	C	12.1-13.1	CH			95		91	41		85.5	46.8																				
83VC28	A	2.0-3.0	MH			98		102	45		84.2	50.2																				
	B	8.5-9.7	CH			95		142	57		43.7	84.0																				
	C	14.7-16.0	CH			96		102	36		62.8	54.6																				
83VC29	A	4.0-5.1	CH			99		95	30		79.4	51.2																				
	1	7.5-9.7	CH			98.5		81	27	2.58	91.5	48.5			2.32				101.8	Q/TV	2.8 X 6.0				0.13/0.15							
	B	9.7-10.9	CH			100		93	31		91.0	49.0																				
	C	14.2-15.2	CH			99		91	33		69.6	53.2																				
83VC30	A	2.0-3.0	CL			67		41	18		39.7	79.0																				
	1	3.0-5.0	CL			67		28	21	2.68	40.0	77.1			1.17				91.7	Q/TV	2.8 X 6.0				0.12/0.09							
	B	5.0-6.8	CL			94		62	30		58.2	66.3																				
	C	10.8-11.8	MH			98		76	36		69.4	59.5																				
83VC31	A	5.0-6.2	CL			89		48	21	2.67	57.7	50.3			2.31				66.6													
	B	9.0-10.0	CL			92		48	20		64.2	62.4																				
	C	15.0-16.0	CH			98		71	25		76.6	55.9																				

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TEST DATA SUMMARY

PROJECT Norfolk Harbor Channel

BORING NO.	SAM. NO.	DEPTH OR ELEV. OF SAMPLE	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS				ATTERBERG LIMITS		SPECIFIC GRAVITY G	NAT. WATER CONT. %	NATURAL DRY DENSITY LBS/CU FT	COMPACTION DATA		SHEAR DATA											PERMEABILITY		CONSOLIDATION DATA				REMARKS
				GRAVEL %	SAND %	FINES %	D_{10}	LL	PL				OPT. WATER %	MAXIMUM DRY DENSITY LBS/CU FT	INITIAL e	DRY DENSITY LBS/CU FT	W_1 %	W_F %	S_1 %	TYPE TEST	SPECIMEN SIZE INCHES	TEST	σ_m T/SQ FT	σ_1 T/SQ FT	c T/SQ FT	ϕ DEGREES	e	K FT/MIN.	P_O T/SQ FT	P_C T/SQ FT	C_C	t_{50}	
83VC32	A	5.5-6.5	CH			99		85	34		79.8	54.6																				
	B	8.0-9.0	CH			99		87	36		73.7	54.4																				
	C	15.2-16.2	CH			99		73	34		81.5	53.9																				
83VC33	A	1.0-2.0	CH			86		68	22		54.4	66.4																				
	B	6.6-7.6	CH			72		34	18	2.72	47.9	76.9			1.21				107.9												
	C	11.6-12.6	CH			95		77	29		75.2	57.1												0.14	0.12							
83VC33A	1	2.3-4.0	CH			79		41	21	2.72	51.9	69.9			1.43				98.8	Q/TV	2.8 X 6.0										
	A	4.0-5.0	CH			91		61	31		51.5	67.9																				
	B	10.0-11.4	CH			95		68	22		56.7	67.5																				
	C	14.0-15.0	CH			100		77	30		64.8	58.6																				
83VC33B	A	3.6-4.6	CH			99		79	28		87.7	49.3																				
	B	8.6-10.0	CH			96		70	28		82.9	51.9																				
	C	16.8-17.8	CL			79		47	22		62.1	63.5																				
83VC130	A	1.8-2.8	CH			75.0		95.5	32.0		137.0	38.5																				
	B	6.8-7.8	CH			82.5		99.5	32.5	2.55	128.0	37.0			3.30				98.9												
	C	15.5-16.5	CH			98		78	27.5		93.5	43.0																				
83VC131	A	3.6-4.6	CH			89.5		94.5	28.5		136.0	36.5																				
	B	8.7-9.7	CH			97.5		97	32.0		105.0	43.0																				
	C	12.9-13.9	CH			95		78	25.5		80.5	54.5																				
83VC70	A	1.0-2.0	CH			98		78	27		99.9	45.8																				
	1	3.5-5.5	CH			97.5		68.5	45.5	2.62	87.0	50.5			2.23				101.9	Q/TV	2.8 X 6.0				0.08/0.06						
	B	.5-6.5	CH			89		86	30		84.7	50.9																				
	2	8.6-10.6	CH			87.5		68.5	22.5	2.63	77.5	55.0			1.98				102.7	Q/TV	2.8 X 6.0				0.1/0.11						
	C	14.5-15.5	CH			74		57	21		70.8	58.0																				
83VC71	1	1.0-3.0	CH			97		53.5	21	2.60	37.0	86.5			0.88				109.3	Q/TV	2.8 X 6.0				0.46/0.5						
	A	3.0-4.0	CH			98		55	26		40.1	79.4																				
	B	5.5-6.5	CH			99		65	26	2.66	48.8	72.6			1.28				100.9												
	2	6.5-8.5	CH			99		60	19.5	2.57	53.0	71.5			1.24				109.5	Q/TV	2.8 X 6.0				0.13/0.34						
	C	19.0-20.0	CH			99		65	28		54.2	66.0																				

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TEST DATA SUMMARY

PROJECT Norfolk Harbor Channel

BORING NO.	SAM. NO.	DEPTH OR ELEV. OF SAMPLE	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS				ATTERBERG LIMITS		SPECIFIC GRAVITY G	NAT. WATER CONT. %	NATURAL DRY DENSITY LBS/CU FT	COMPACTION DATA		SHEAR DATA												PERMEABILITY		CONSOLIDATION DATA				REMARKS
				GRAVEL %	SAND %	FINES %	D_{10}	LL	PL				OPT. WATER %	MAXIMUM DRY DENSITY LBS/CU FT	INITIAL e	DRY DENSITY LBS/CU FT	W_1 %	W_F %	S_1 %	TYPE TEST	SPECIMEN SIZE INCHES	TEST	σ_m T/SQ FT	σ_1 T/SQ FT	c T/SQ FT	ϕ DEGREES	e	K FT/MIN.	P_O T/SQ FT	P_C T/SQ FT	C_C	t_{50}	
83VC72	A	1.0-2.0	MH			96		97	56		118.6	34.9																				
	B	8.7-9.7	SC			20					17.7	113.7																				
	C	15.8-16.8	SM			10					6.5	112.9																				
83VC73	A	2.0-3.0	CH			100		118	72		139.1	33.5																				
	B	7.0-8.1	CH			99		114	77	2.66	135.8	34.7			3.78				95.5													
	C	11.6-12.6	CH			89		97	35		108.7	41.2																				

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PROJECT Norfolk Harbor Channel

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				GRAVEL %	SAND %	FINES %	D_{10}	LL	PL				OPT. WATER %	MAXIMUM DRY DENSITY LBS/CU FT	INITIAL e	DRY DENSITY LBS/CU FT	W_1 %	W_F %	S_1 %	TYPE TEST	SPECIMEN SIZE INCHES	TEST	σ_m T/SQ FT	σ_1 T/SQ FT	c T/SQ FT	ϕ DEGREES	e	K FT/MIN.	P_O T/SQ FT	P_C T/SQ FT	C_C	t_{50}	
84VC129	1	3.0-4.5	CH			96.0		73.0	25.5	2.69	69.5	58.5			1.87				100.0	Q/TV	2.8 X 6.0				0.07/0.14							
	2	10.0-11.5	CH			99.0		78.0	28.0	2.66	67.0	56.5			1.94				91.9	Q/TV	2.8 X 6.0				0.11/0.22							
84VC131	1	0.0-1.5	CH			99.0		61.5	21.0	2.70	73.0	54.0							92.9													
	2	12.8-14.3	SM			24.5		NP	--	2.71	26.5	95.5			0.77				93.2	Q/TV	2.8 X 6.0				1.90/0.16							
84VC132	1	0.0-1.5	CH			94.5		69.0	24.5	2.65	86.0	48.5			2.41				94.6													
	2	8.2-9.7	CH			99.0		84.0	26.5	2.72	83.5	51.5			2.29				98.9	Q/TV	2.8 X 6.0				0.06/0.15							
	3	18.1-19.4	CH			99.5		74.0	26.5	2.70	74.5	55.0			2.06				97.5	Q/TV	2.8 X 6.0				0.08/0.15							
84VC133	1	0.0-0.75	CH			86.5		60.5	20.0	2.67	118.5	50.5																				
		0.75-1.5	SM			33.0		NP	NP		49.5																				
	2	12.2-13.7	CH			99.0		76.0	25.0	2.74	73.5	55.5			2.08				96.8	Q/TV	2.8 X 6.0				0.09/0.20							
84VC133A	1	0.0-1.5				97.0		87.5	29.5	2.74	93.0	42.0			3.07				82.8													
	2	10.5-12.0				97.5		60.5	24.5	2.71	56.5	65.0			1.60				95.6	Q/TV	2.8 X 6.0				0.09/0.15							
84VC134	1	0-1.5	CH			96.5		130.0	36.5	2.64	191.5	25.0			5.58				90.4													
	2	6.0-7.5	CH			89.5		55.5	19.5	2.72	56.5	64.5			1.63				94.2	DS	2.5 X 1.0				0.05	29.0°						
84VC135	1	0-1.0	CH			96.0		110.0	33.0	2.67	178.0	29.0			4.74				100.1													
	2	7.7-9.0	CH			99.5		88.0	27.5	2.75	79.5	53.0			2.24				97.7	Q	2.8 X 6.0				0.06							
84VC136	1	0.0-1.5	CH			98.5		126.0	36.5	2.65	182.5	25.0			5.61				86.1													
	2	7.2-8.7	CH			91.5		85.5	28.5	2.74	84.0	49.0			2.49				92.5	Q	2.8 X 6.0				0.11							
84VC138	1	2.5-4.0	CH			88.5		104.5	37.5	2.66	108.0	42.0			2.95				97.3	Q/TV	2.8 X 6.0				0.07/0.09							
	2	12.5-14.0	CH			96.5		88.5	26.5	2.74	87.0	48.0			2.56				93.0													
84VC138A	1	0-1.5	CH			74.0		78.0	29.5	2.66	60.0	57.5			1.88				84.6													
	2	21.0-23.3	CL			61.0		45.0	22.0	2.66	39.0	81.5			1.03				100.0	Q/TV	2.8 X 6.0				0.09/0.16							
84VC139	1	3.5-5.0	CH			96.0		91.5	28.5	2.70	83.0	51.5			2.27				98.7													
	2	8.5-10.0	CH			96.6		82.0	29.5	2.66	78.0	51.0			2.25				92.0													
84VC140	1	3.5-5.0	CH			99.0		85.0	27.0	2.72	91.0	48.5			2.50				99.0													
	2	10.1-11.6	CH			98.5		89.5	28.5	2.74	82.5	50.5			2.38				94.8	Q/TV	2.8 X 6.0				0.09/0.17							
84VC142	1	1.5-3.0	CH			97.0		97.0	37.0	2.70	76.0	51.5			2.27				90.3	TV					0.19							
	2	13.6-15.1	CH			98.0		96.0	33.5	2.69	75.5	56.0			1.99				101.6	Q/TV	2.8 X 6.0				0.11/0.26							

ENG FORM 2086 EDITION OF 1 MAR 58 IS OBSOLETE.
1 JAN 73

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R - CONSOLIDATED UNDRAINED

TEST DATA SUMMARY

PROJECT Norfolk Harbor Channel

BORING NO.	SAM. NO.	DEPTH OR ELEV. OF SAMPLE	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS				ATTERBERG LIMITS		SPECIFIC GRAVITY G	NAT. WATER CONT. %	NATURAL DRY DENSITY LBS/CU FT	COMPACTION DATA		SHEAR DATA											PERMEABILITY		CONSOLIDATION DATA				REMARKS
				GRAVEL %	SAND %	FINES %	D_{10}	LL	PL				OPT. WATER %	MAXIMUM DRY DENSITY LBS/CU FT	INITIAL e	DRY DENSITY LBS/CU FT	W_1 %	W_F %	S_1 %	TYPE TEST	SPECIMEN SIZE INCHES	TEST	σ_m T/SQ FT	σ_1 T/SQ FT	c T/SQ FT	ϕ DEGREES	e	K FT/MIN.	P_O T/SQ FT	P_C T/SQ FT	C_C	t_{50}	
84VC143	1	0.0-1.5	CH			87.0		113.0	37.0	2.65	179.5	24.0			5.89				80.8													
	2	10.0-11.5	CH			98.5		88.5	33.5	2.67	83.5	51.0			2.27				98.4	TV					0.22							
84VC144	1	0.0-1.0	CH			64.5		72.5	22.5	2.68	54.0	55.0			2.04				70.9													
	2	7.0-8.0	CH			91.5		94.0	34.0	2.68	88.0	48.0			2.48				95.0	Q/TV	2.8 X 6.0				0.11	0.22						
84VC145	1	0.0-1.5	CH			96.5		75.0	25.0	2.73	64.0	54.5			2.12				82.2													
	2	5.2-6.7	CH			99.0		68.5	25.5	2.69	73.5	53.5			2.14				92.5	TV					0.12							
84VC146	1	0.0-1.5	CH			93.0		67.5	25.0	2.72	77.0	55.0			2.09				100.4													
	2	6.5-8.0	CH			96.5		71.5	25.5	2.70	63.5	57.0			1.96				87.7	TV					0.12							
84VC147	1	0.0-1.5	CH			95.5		52.5	25.5	2.74	53.5	59.5			1.07				78.2													
	2	7.0-8.5	CH			96.5		55.0	23.5	2.74	54.0	58.5			1.92				76.9													
85VC231	1	0-1.0	SM			3.7				2.64	12.9	95.3								DS	1.25 X 2.5					46.5						
	2	4.7-6.0	SM			18.8		77	38	2.67	30.3	91.8			0.81				99.3													
	3	9.8-11.1	SM			20.8																										
85VC232	1	3.5-4.9	CH			93.6		102	30	2.75	95.5	46.1			2.72				96.5	DS	1.25 X 2.5				0.05	36						
	2	9.0-9.9	CH			98.1		97	32		83.5	50.8								TV					0.25							
85VC233	1	5.3-6.3	CH			75.3		69	26	2.73	68	59.2			1.87				98.9	TV					0.22							
	2	10.3-11.3	CH			93.2		74	31	2.72	68.8	58.9			1.88				99.5	TV					0.26							
85VC234	1	2.8-3.8	CH			84.9				2.73	84.9	47.5			2.58				89.6													
	2	6.8-7.8	SM			18.5					25.5	103.9																				
85VC235	1	0.0-1.5	CH			97.9		127	38	2.58	25.3	37.2			3.30				98.0	UC					0.1							
	2	6.0-7.0	CH			98.5		66	20		63.6	62.5								TV					0.45							
85VC236	1	0.0-1.0	SM			14.2					20.9																					
	2	9.5-10.4	SM			21.8				2.68	30.1	91.4			0.83				97.2													
85VC237	1	0.0-1.5	SM			33.9				2.73	32.9	86.7			0.97				93.1													
85VC238	1	5.6-6.6	SC			23.9					39.8																					
	2	13.1-14.1	SM			14.0				2.67	24.3	97.5			0.71																	

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TEST DATA SUMMARY

PROJECT Norfolk Harbor Channel

BORING NO.	SAM. NO.	DEPTH OR ELEV. OF SAMPLE	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS				ATTERBERG LIMITS		SPECIFIC GRAVITY G	NAT. WATER CONT. %	NATURAL DRY DENSITY LBS/CU FT	COMPACTION DATA		SHEAR DATA											PERMEABILITY		CONSOLIDATION DATA				REMARKS
				GRAVEL %	SAND %	FINES %	D_{10}	LL	PL				OPT. WATER %	MAXIMUM DRY DENSITY LBS/CU FT	INITIAL e	DRY DENSITY LBS/CU FT	W_1 %	W_F %	S_1 %	TYPE TEST	SPECIMEN SIZE INCHES	TEST	σ_m T/SQ FT	σ_1 T/SQ FT	c T/SQ FT	ϕ DEGREES	e	K FT/MIN.	P_O T/SQ FT	P_C T/SQ FT	C_C	t_{50}	
85VC239	1	0.0-1.5	CH			96		80	20	2.53	103.7	43.8			2.60					UC					0.05							
	2	5.6-6.6	CH			98.5		66	32		80.1	52.4							100.7	TV					0.11							
	3	10.0-11.2	CH					82	26		79.4	50.3								TV					0.19							
85VC240A	1	6.2-7.7	CH			97.4		80	27	2.57	88.9	51.1			2.14				106.8	UC					0.215							
85VC240	1	0.0-1.5	CH			99.4		96	27	2.60	117.5	39.2			3.10				97.3	DS	1.25 X 2.5				0.1	28						
	2	5.7-7.0	CH			97.9		88	30	2.68	81.4	51.2			2.26				96.3	TV					0.2							
85VC241	1	0.0-1.5	CH			83.5		77	25	2.71	68.9	58.8			1.87				99.5	TV					0.25							
	2	13.6-14.6	SC			32.4		87	32	2.68	52.9	68.5			1.44				98.6	TV					0.28							
85VC242	1	3.0-4.0	CH			89.8		80	28	2.69	64.3	53.3			2.15				80.5	TV					0.08							
	2	7.0-8.0	SM			22.1				2.77	24.5	103.9			0.66				102.2	TV					0.19							
85VC243	1	0.0-1.5	SM			21.3				2.68	23.7	103.9			0.61				104.2													
	2	4.0-5.0	SC			30.3		36	19	2.65	39.4	79.2			1.08				96.0													
85VC244	1	0.0-1.5	CH			91.6		65	25	2.53	145.8	33.2							98.2													
	2	9.0-10.0	CH			66.5		54	17		69.6	61.8																				
	3	14.8-15.8	SM			32.9				2.66	39.2	79.9							96.8													
85VC245	1	0.0-1.5	CH			93.1		81	29	2.57	91.4	47.4			2.38				99.4	UC					0.058							
	2	4.0-5.0	CH			95.1		88	28	2.63	87.5	50.9			2.22				103.5													
85VC246	1	4.0-5.0	SM			12.3				2.69	23.4																					
	2	9.0-10.0	SM			11.9				2.70	23.0	94.6			0.78				80.0	DS	1.25 X 2.5				0.15	49°						
85VC247	1	0.0-1.5	CH			86.5		77	29	2.57	84.9	47.3			2.39				91.3													
	2	9.0-10.0	CH			92.7		73	31	2.66	62.0	63.8			1.60				102.9													

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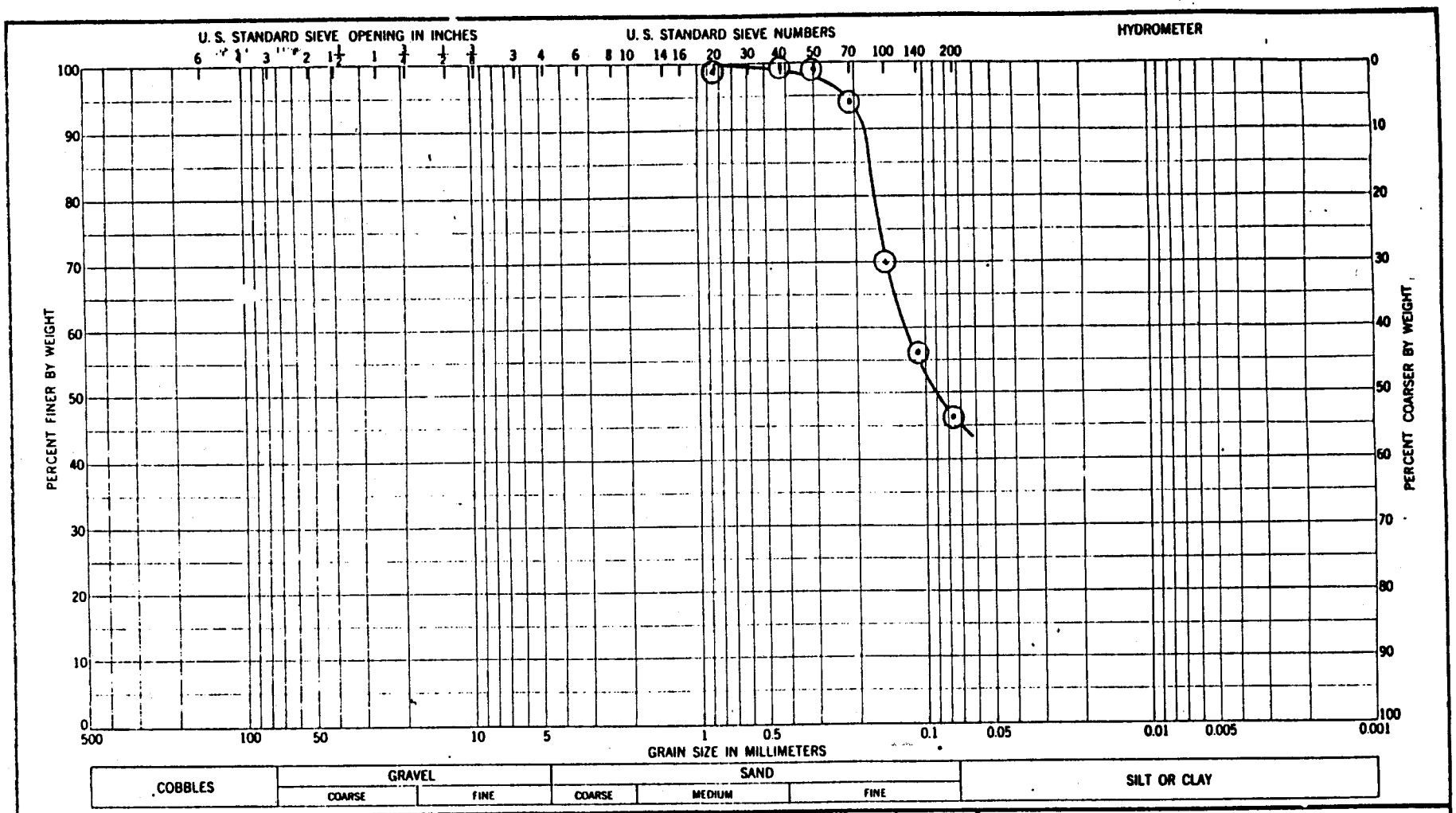


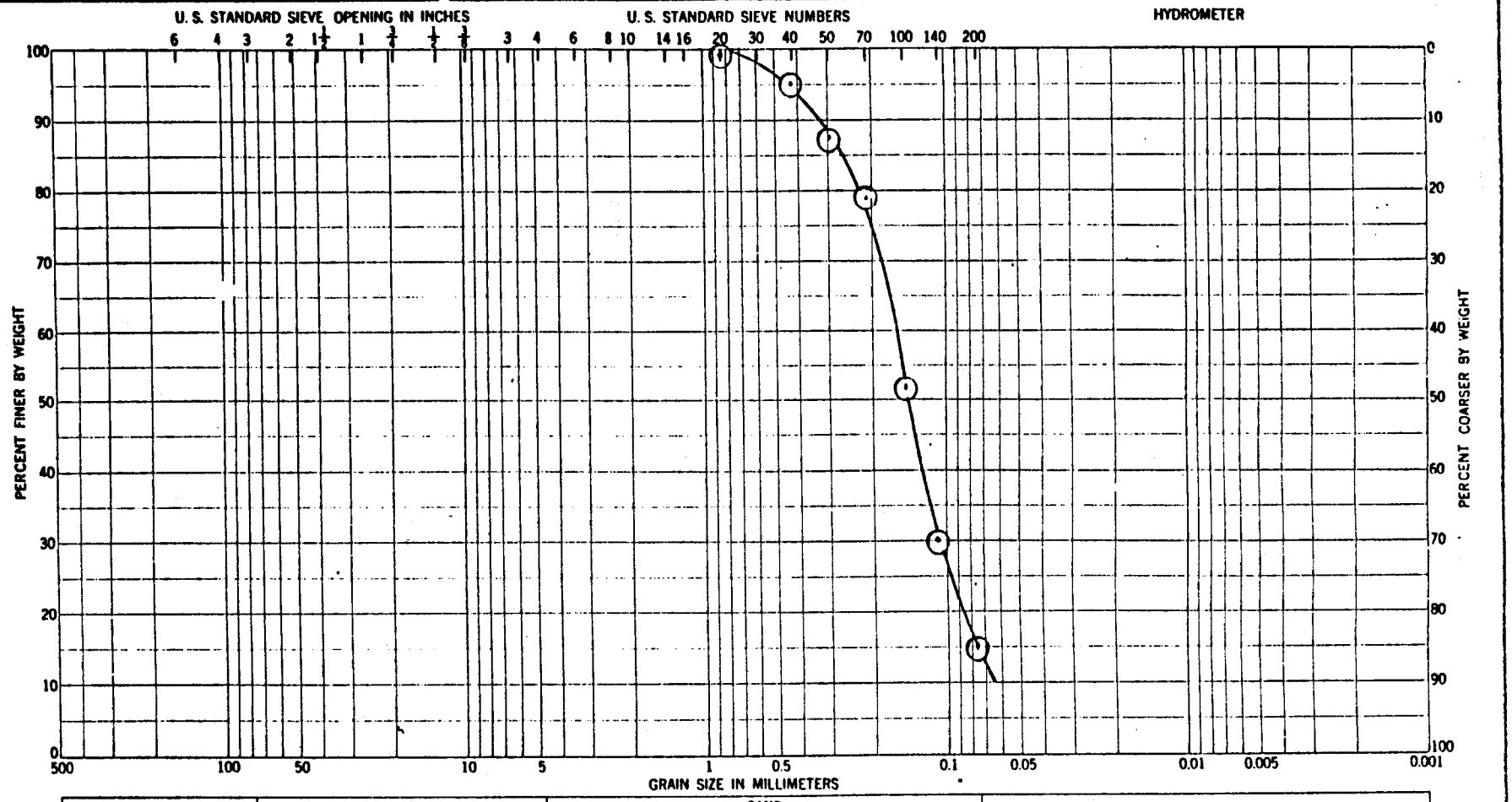
Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
17/B	7.0' – 8.0'	FINE SILTY CLAYEY SAND DARK GRAY (SC)	50.4	37	18	19

GRADATION CURVES

Project HARBOR DEEPENING
NORFOLK, VIRGINIA
Area Norfolk Harbor Channel
Boring No. 17
Date 9-30-83 V83157

C-9

ENG FORM 1 MAY 63 2087

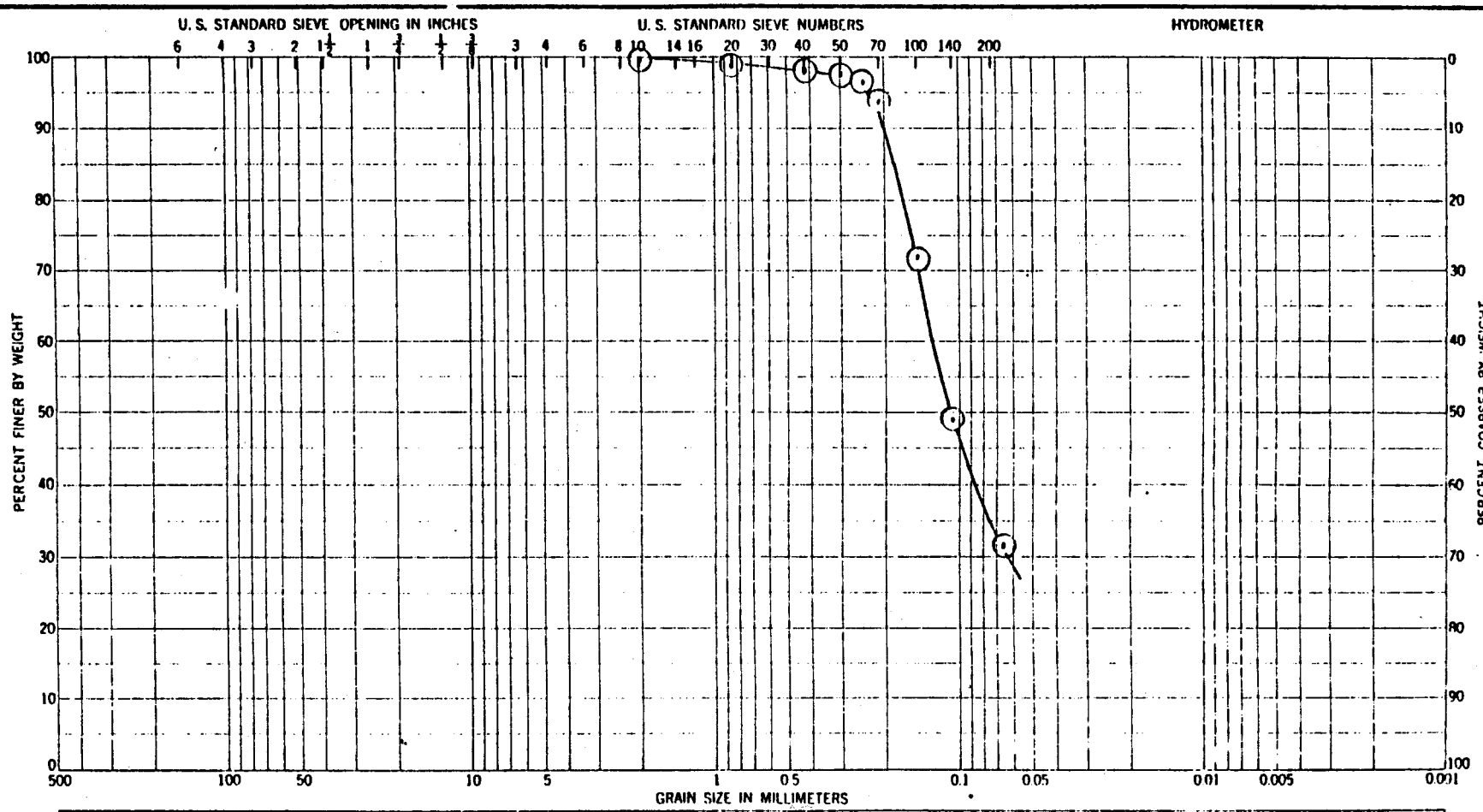


Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
17/C	18.0 - 19.0	FINE TO MEDIUM SAND, SOME SILT, WITH SHELL FRAGMENTS - DARK GRAY (SM)	27.9	NP	NP	NP

GRADATION CURVES

Project HARBOR DEEPENING
NORFOLK, VIRGINIA
Area Norfolk Harbor Channel
Boring No. 17
Date 9-30-83 V83157

ENG FORM 1 MAY 69 2087



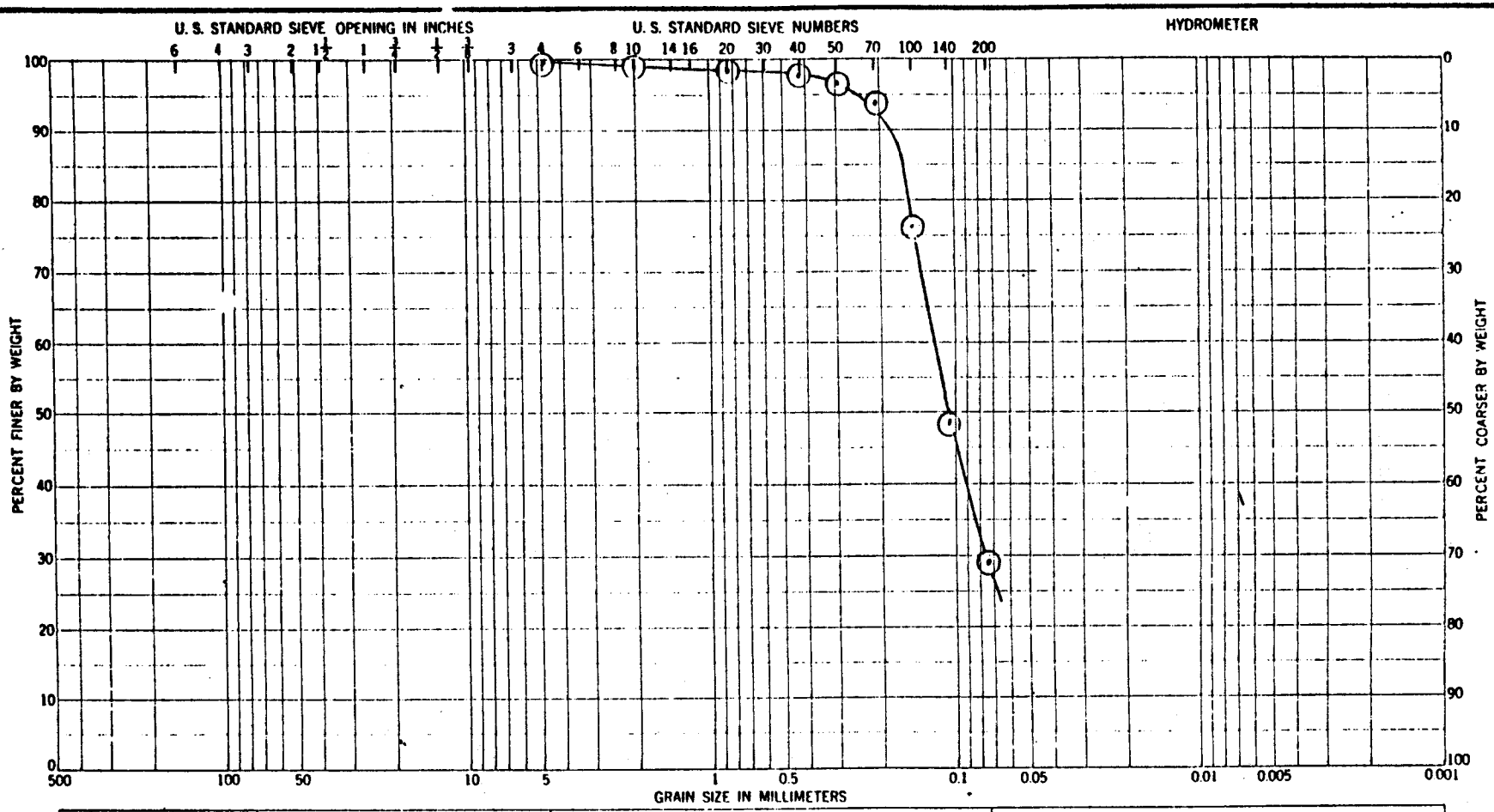
Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
21 B/B	9.0-10.0'	FINE SAND, SOME CLAYEY SILT, WITH SHELL FRAGMENTS – GRAY (SM)	35.9	39	31	8

GRADATION CURVES

Project HARBOR DEEPENING
NORFOLK, VIRGINIA
Area Norfolk Harbor Channel
Boring No 21 B
Date 11-20-82 V83157

C-11

ENG FORM 1 MAY 63 2087

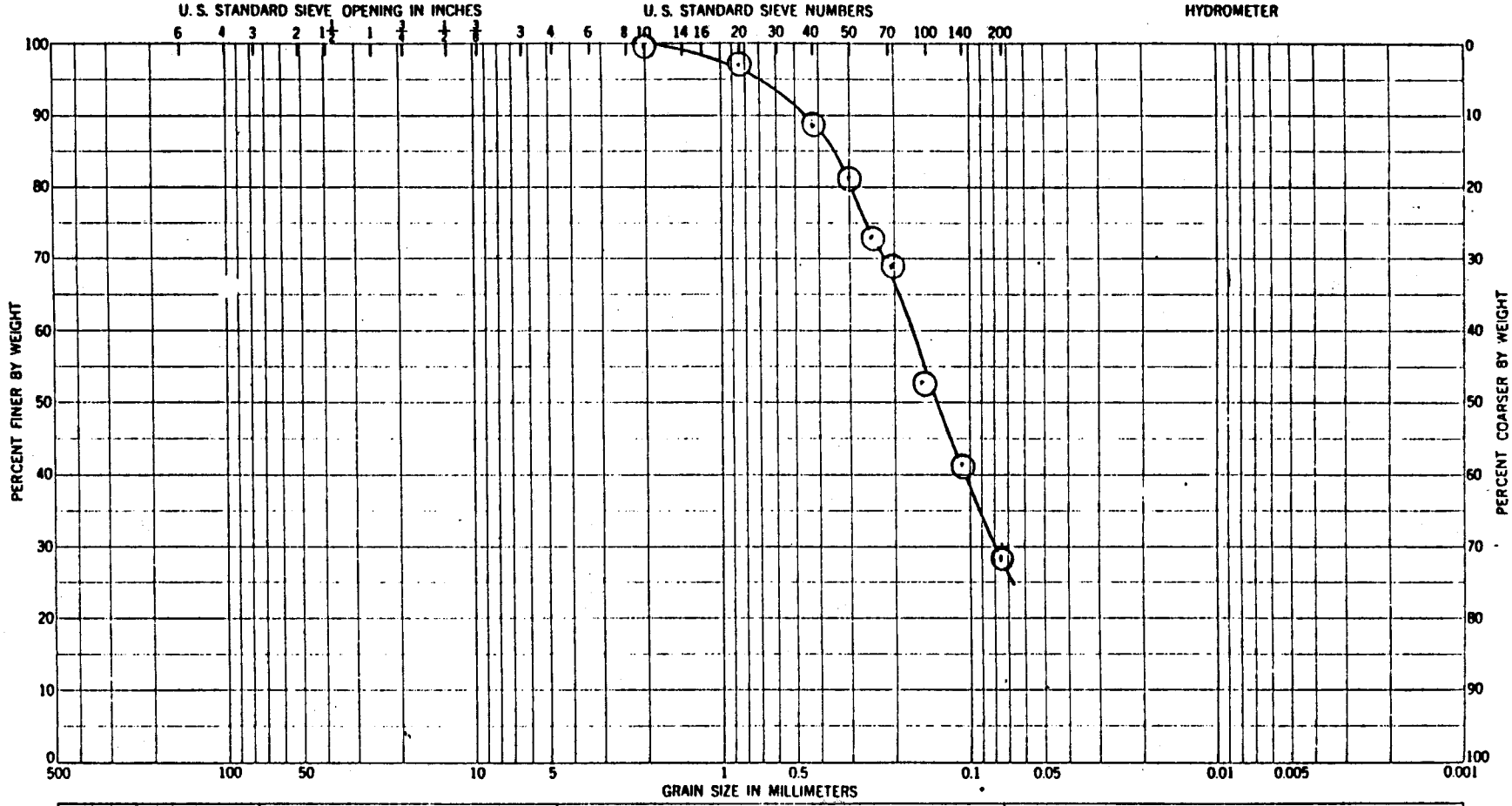


Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
21B/C	15.9' -16.9'	FINE SAND, SOME CLAYEY SILT, WITH SHELL FRAGMENTS -GRAY (SM)	31.9	41	31	10

GRADATION CURVES

Project HARBOR DEEPENING
NORFOLK, VIRGINIA
Area Norfolk Harbor Channel
Boring No. 21B
Date 4-30-83 V83157

ENG FORM 1 MAY 83 2087

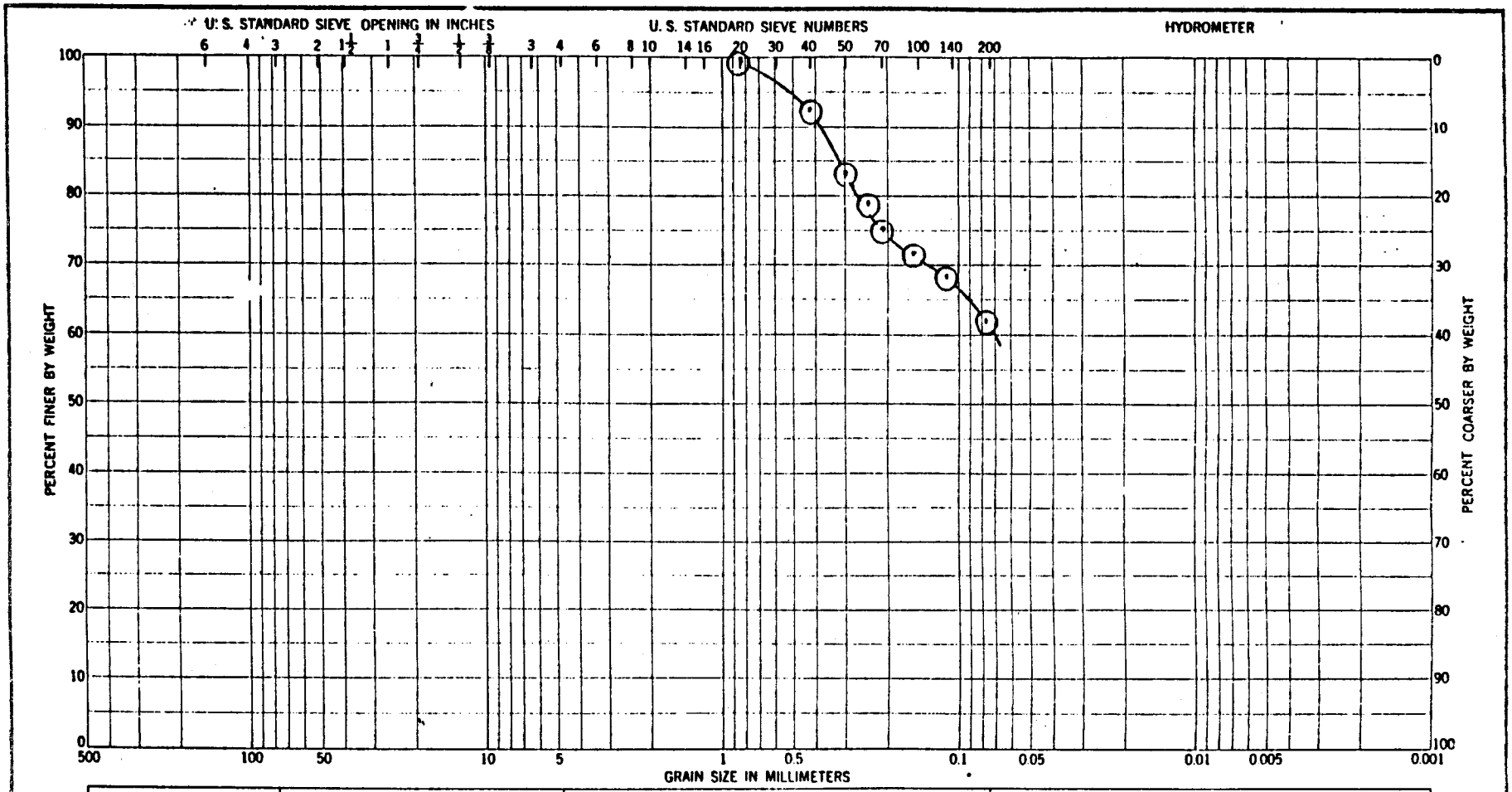


Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
22/B	7.6 — 8.6'	FINE TO MEDIUM SAND, SOME SILT — DARK GRAY (SM)	27.4	NP	NP	NP

GRADATION CURVES

Project HARBOR DEEPENING
NORFOLK, VIRGINIA
Area Norfolk Harbor Channel
Boring No. 22
Date 9-30-83 V83157

ENG FORM 1 MAY 63 2087

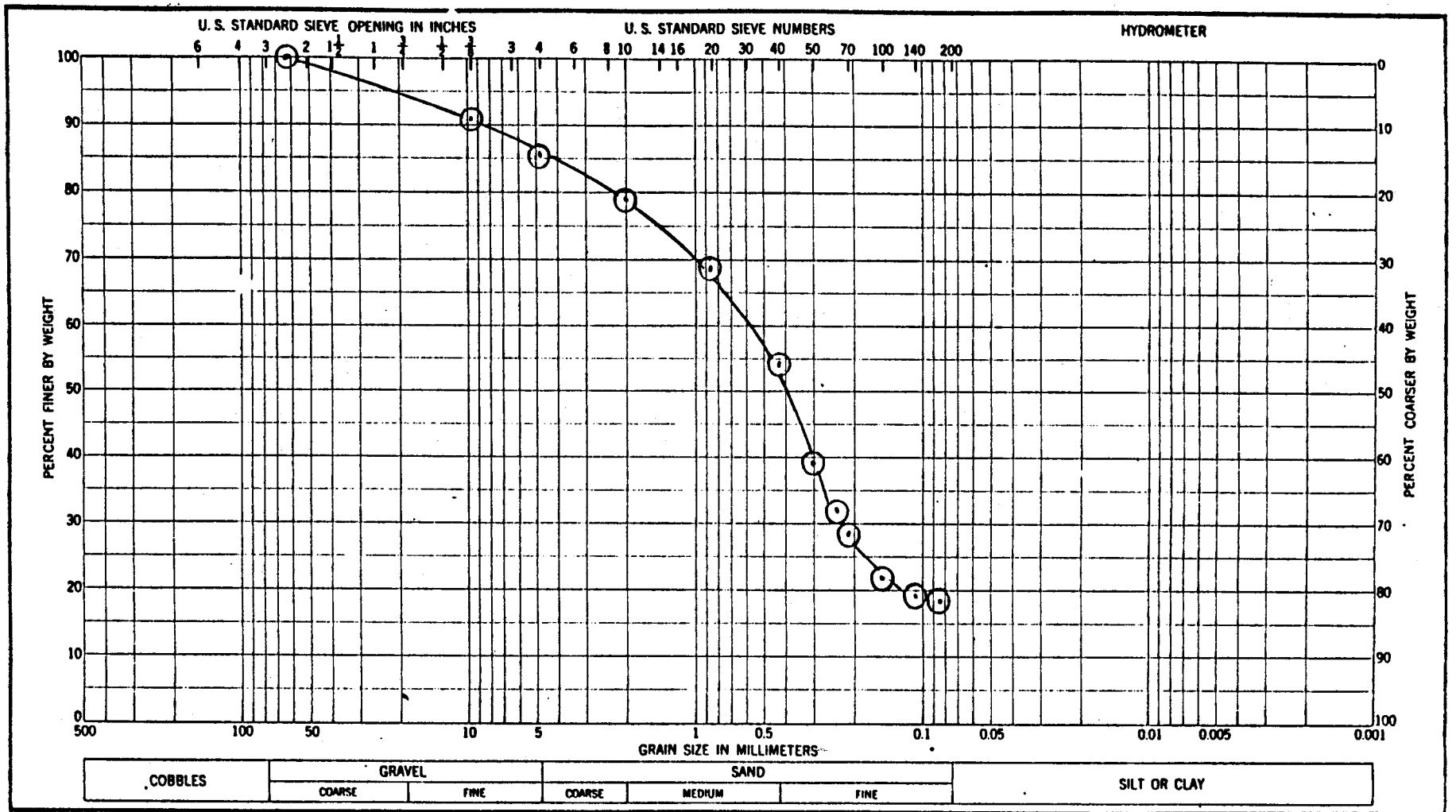


Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
22/C	12.8' - 13.8'	FINE TO MEDIUM SANDY SILT — DARK GRAY (SM)	27.0	22	19	3

GRADATION CURVES

Project HARBOR DEEPENING
NORFOLK, VIRGINIA
Area Norfolk Harbor Channel
Boring No. 22
Date 9-30-83 V83157

ENG FORM 1 MAY 63 2087

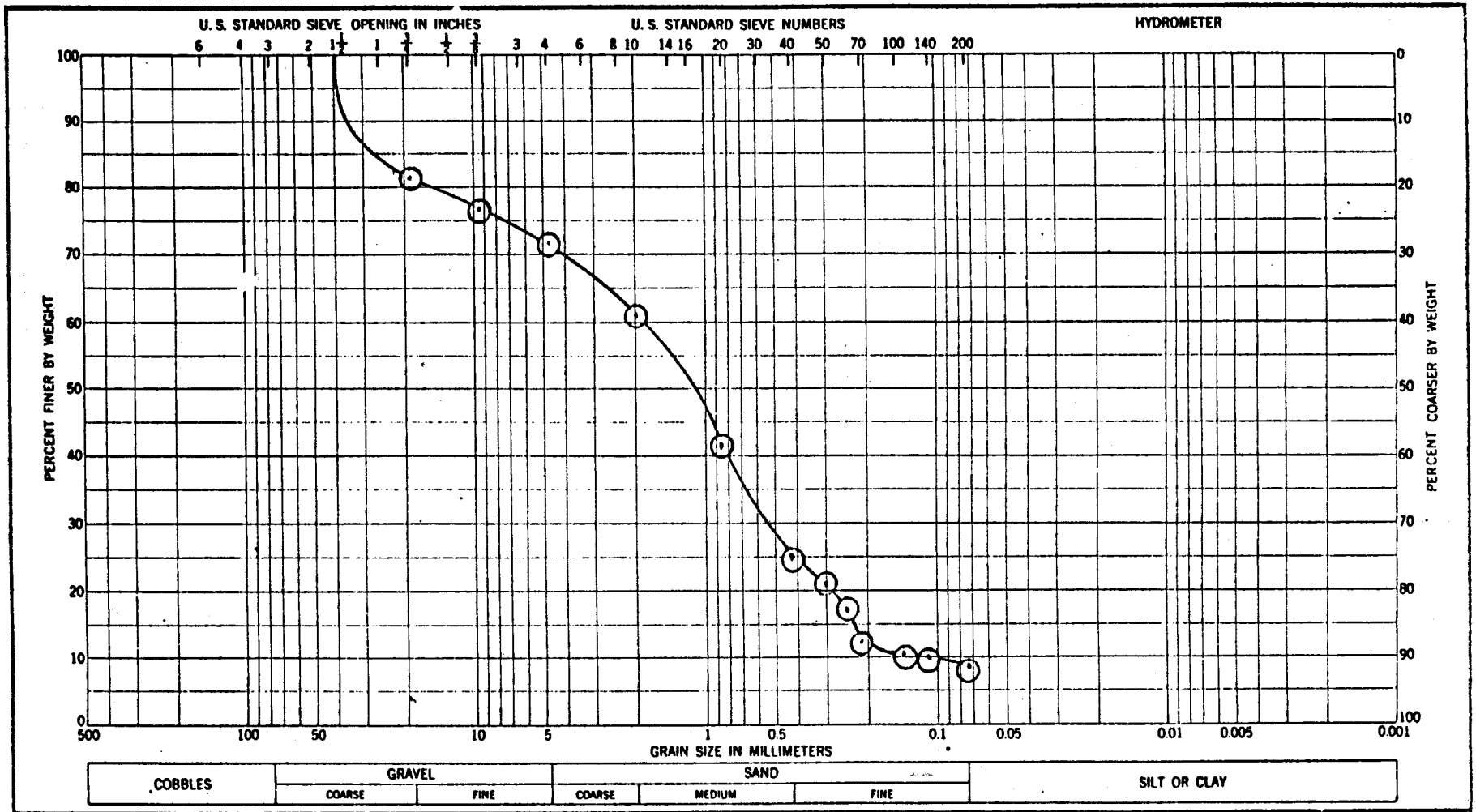


Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
72/ B	–	FINE TO COARSE SAND, SOME SILT, WITH FINE GRAVEL & SHELL FRAGMENTS- DARK GRAY (SM)	17.7	NP	NP	NP

GRADATION CURVES

Project HARBOR DEEPENING
NORFOLK, VIRGINIA
Area Norfolk Harbor Channel
Boring No. 72
Date 9-30-83 V83157

ENG FORM 1 MAY 69 2087



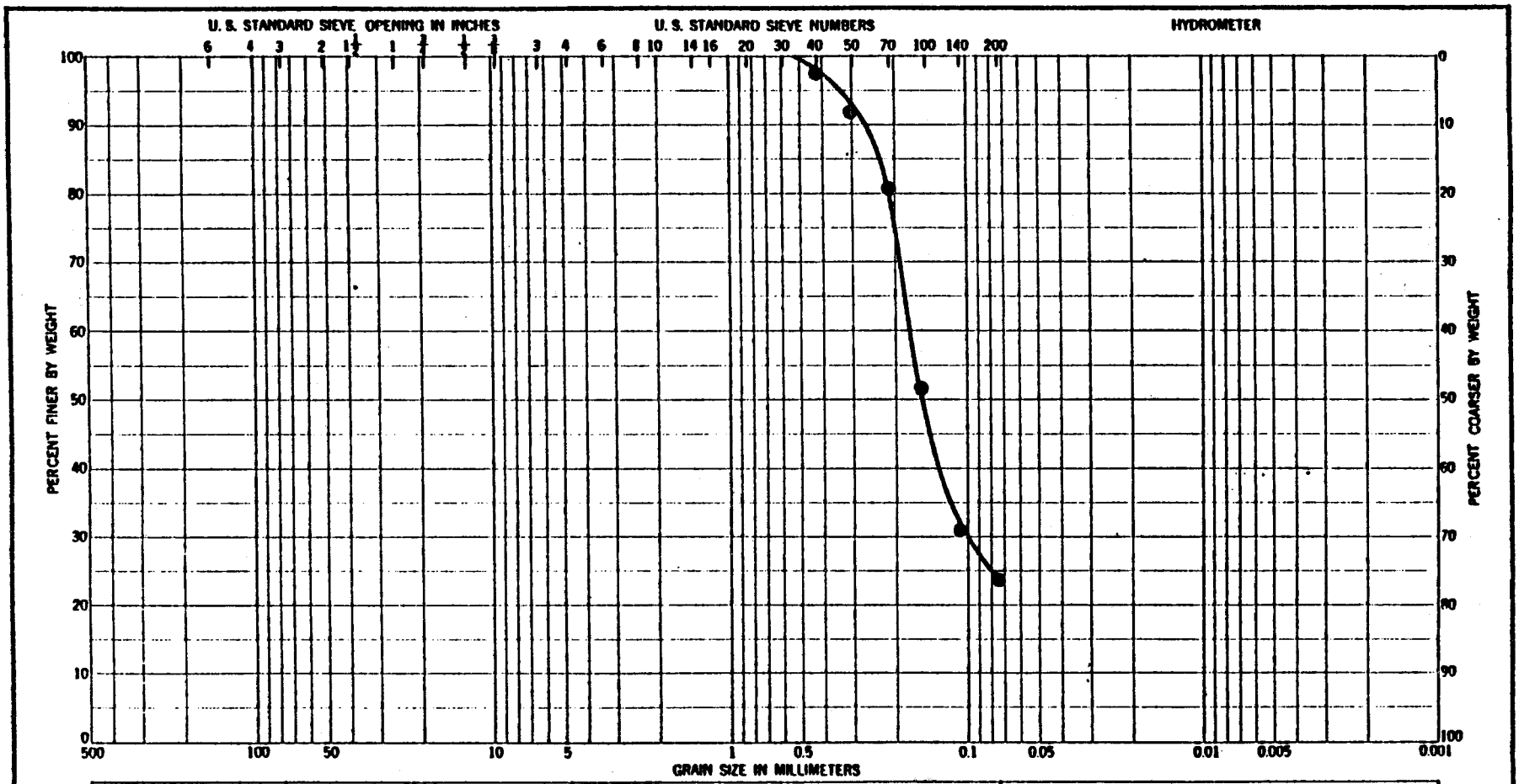
Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
72 C	15.8 - 16.8'	FINE TO COARSE SAND, TRACE SILT & FINE GRAVEL WITH SHELL FRAGMENTS - DARK GRAY (SM - SW)	6.45	—	—	—

GRADATION CURVES

Project HARBOR DEEPENING
NORFOLK, VIRGINIA
Area Norfolk Harbor Channel
Boring No. 72
Date 9-30-83 V83157

C-16

ENG FORM 1 MAY 63 2087



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
2	12.8-14.3	Gray silty SAND - SM	26.5	NP	NP	NP

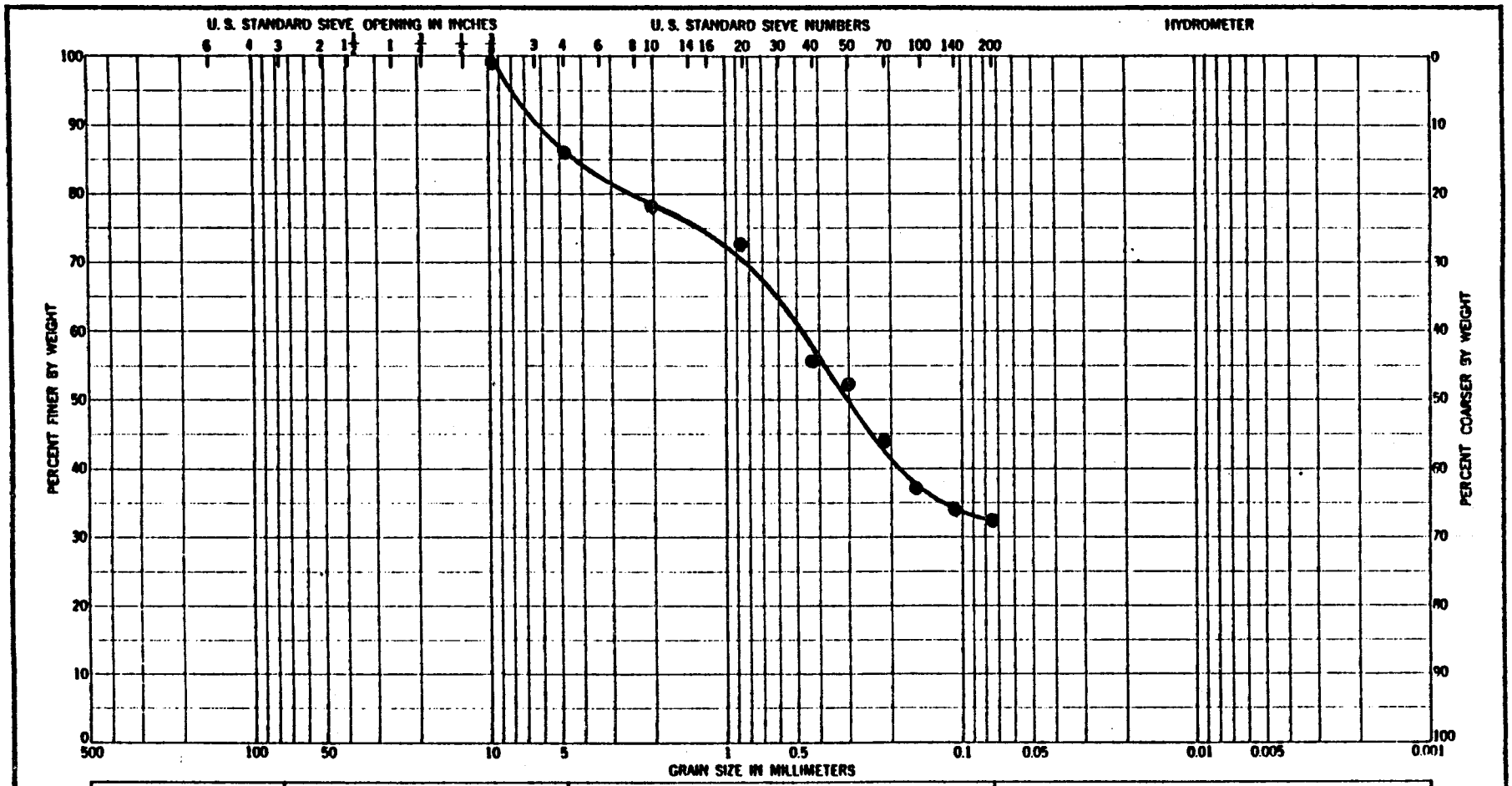
GRADATION CURVES

Project: Norfolk Harbor and Channels Deepening
Area: Norfolk, Virginia
Boring No.: 84VC-131
Date: 2/22/85

CENTURY ENGINEERING, INC.

CEI 83-1118

Norfolk Harbor Channel



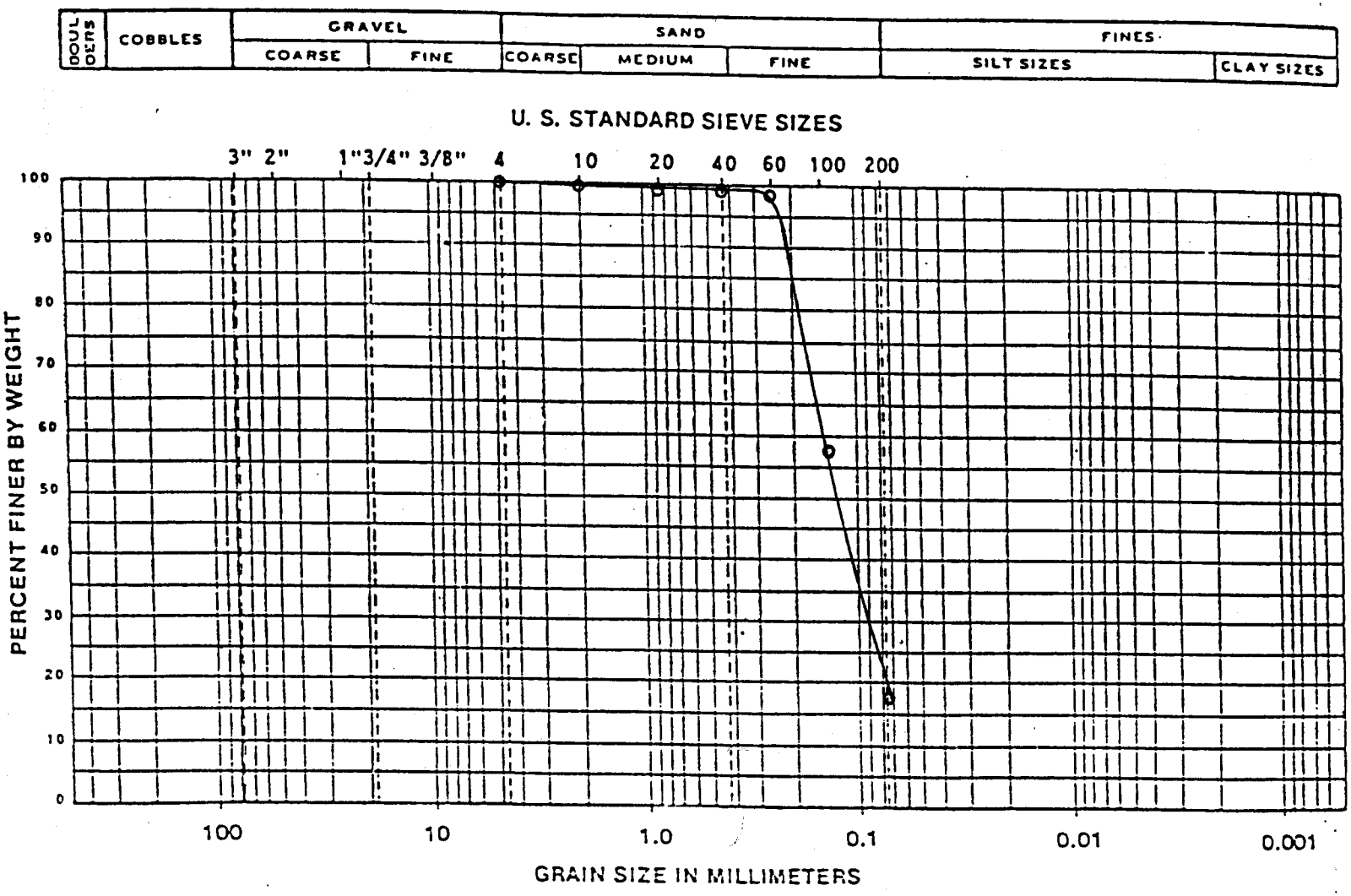
Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
1 (Bottom)	0.0-1.5	Gray silty SAND - SM	49.5	NP	NP	NP

GRADATION CURVES

Project: Norfolk Harbor and Channels Deepenign
Area: Norfolk, Virginia
Boring No.: 84VC-133
Date: 2/22/85

CENTURY ENGINEERING, INC.

CEI 83-1118
Norfolk Harbor Channel



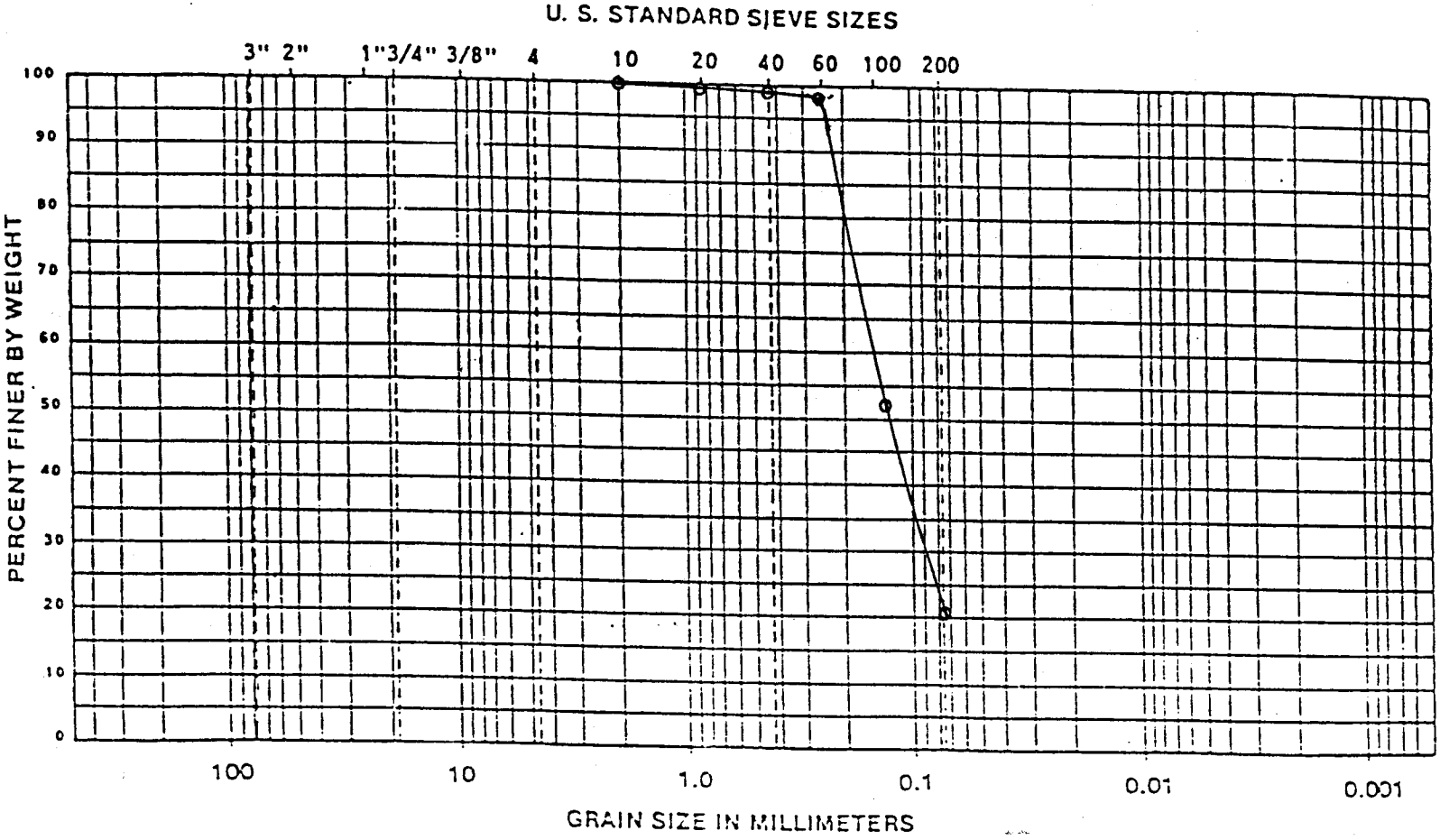
Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
231	4.7-6	30.3	77	38	39	Tan Fine Sand (SM) with Little Clay and Silt

JOB NO. 1175I

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

Grain Size Distribution

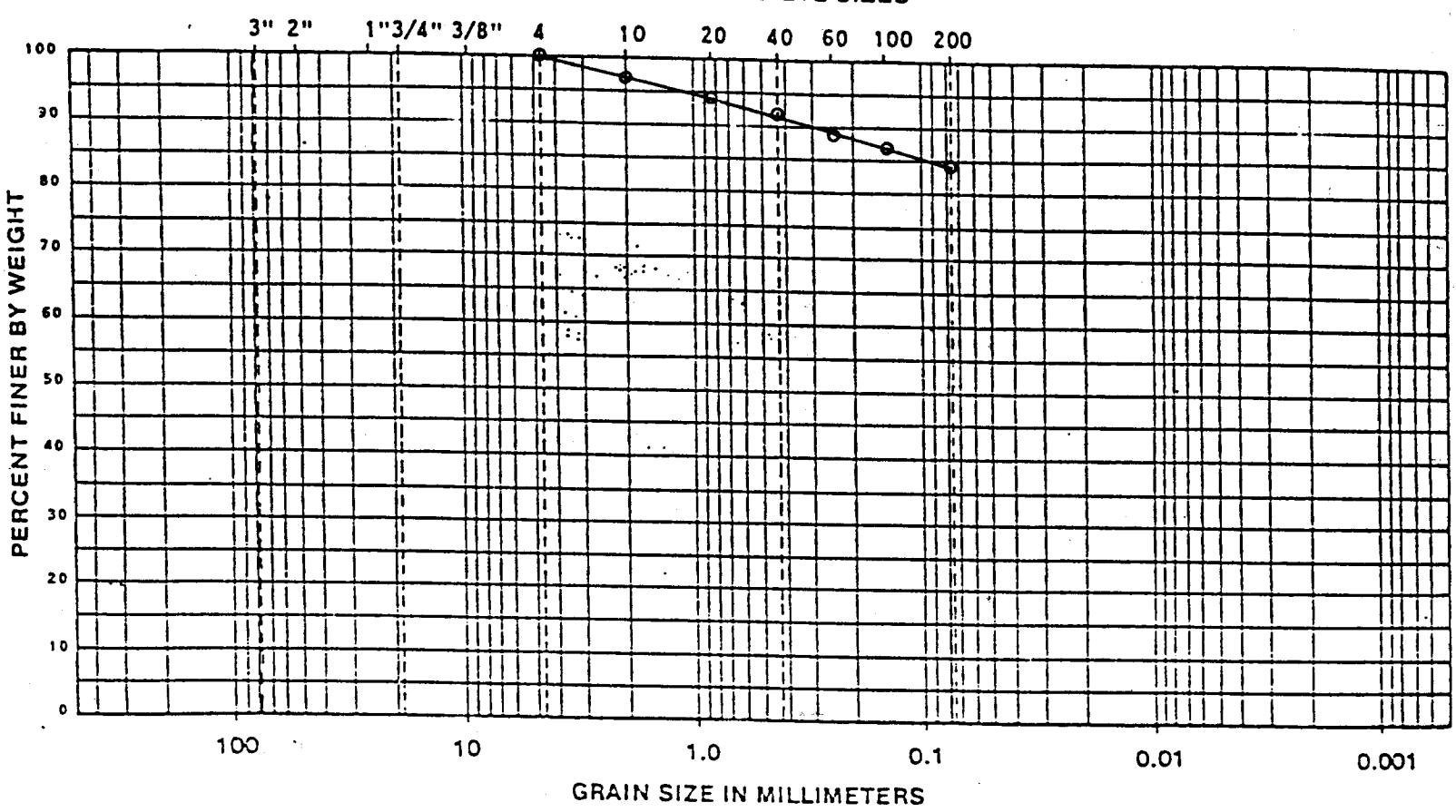
BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
231	9.8-11.1	-	-	-	-	Gray Fine Sand (SM) with Some Silt and Trace Medium Sand

JOB NO 1175I

1400061

Norfolk Harbor Channel

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



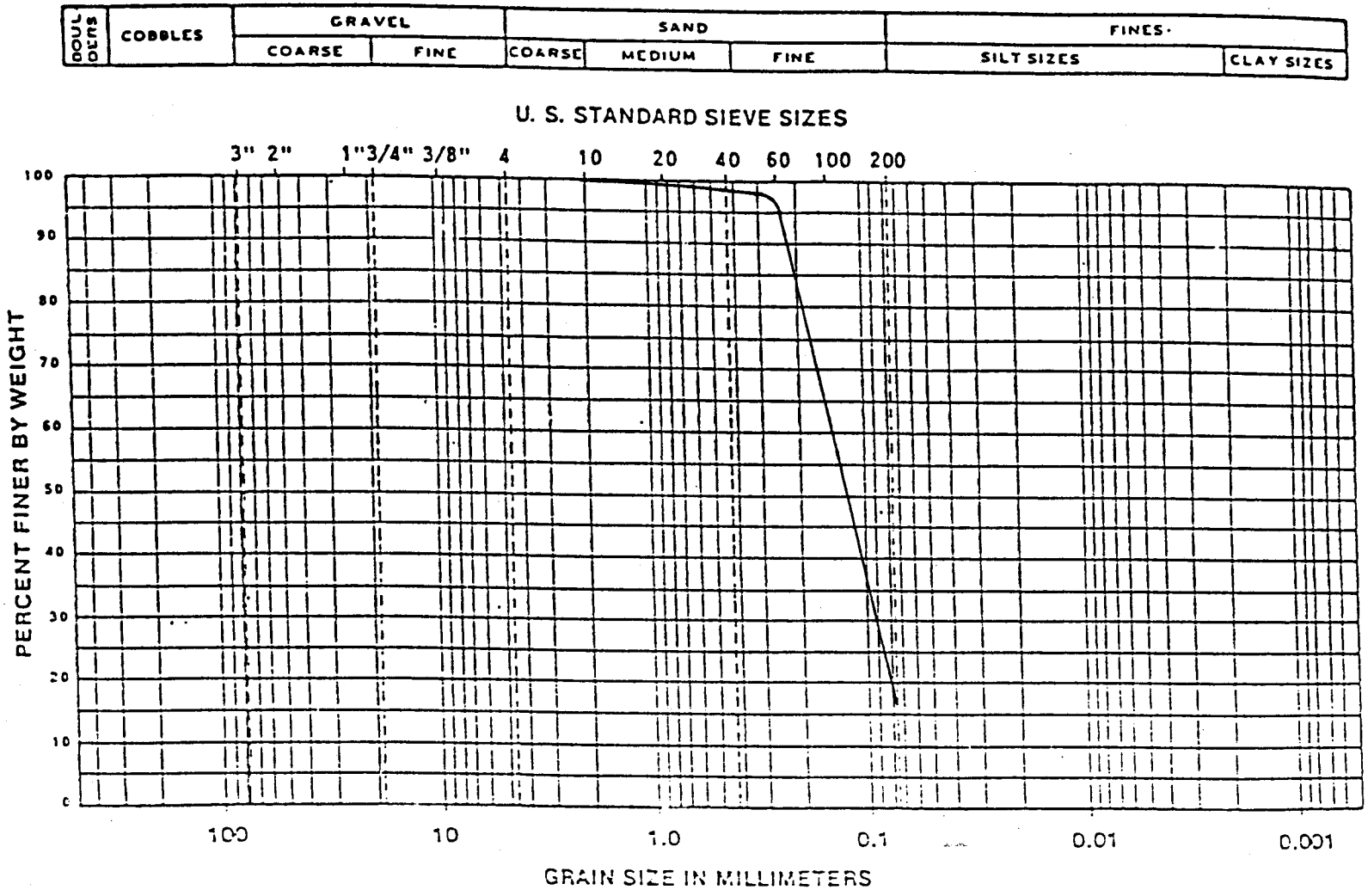
Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
234	2.8-3.8	88.4	-	-	-	Brown Clay (CH) with Trace Coarse Sand, Trace Medium Sand, Trace Fine Sand and Trace Organics
JOB NO. 11751						

1490003

Norfolk Harbor Channel



Law Engineering Testing Company

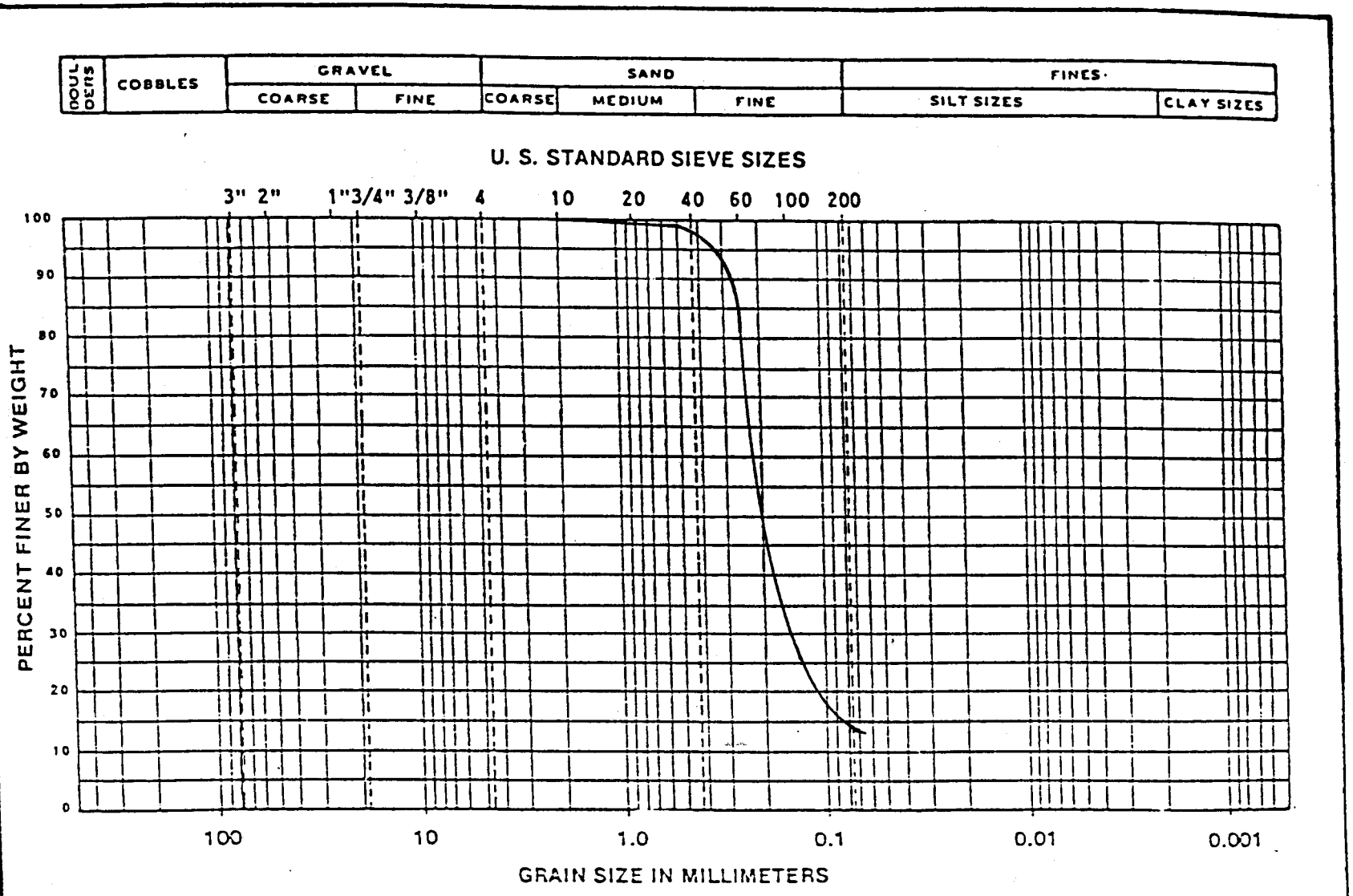
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
234	6.8-7.8	25.5	-	-	-	Gray Fine Sand (SM) with Little Silt and Trace Medium Sand

JOB NO 1175I

1400061

Norfolk Harbor Channel



Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
236	0-1	20.9	-	-	-	Gray Fine Sand (SM) with Little Silt and Trace Medium Sand

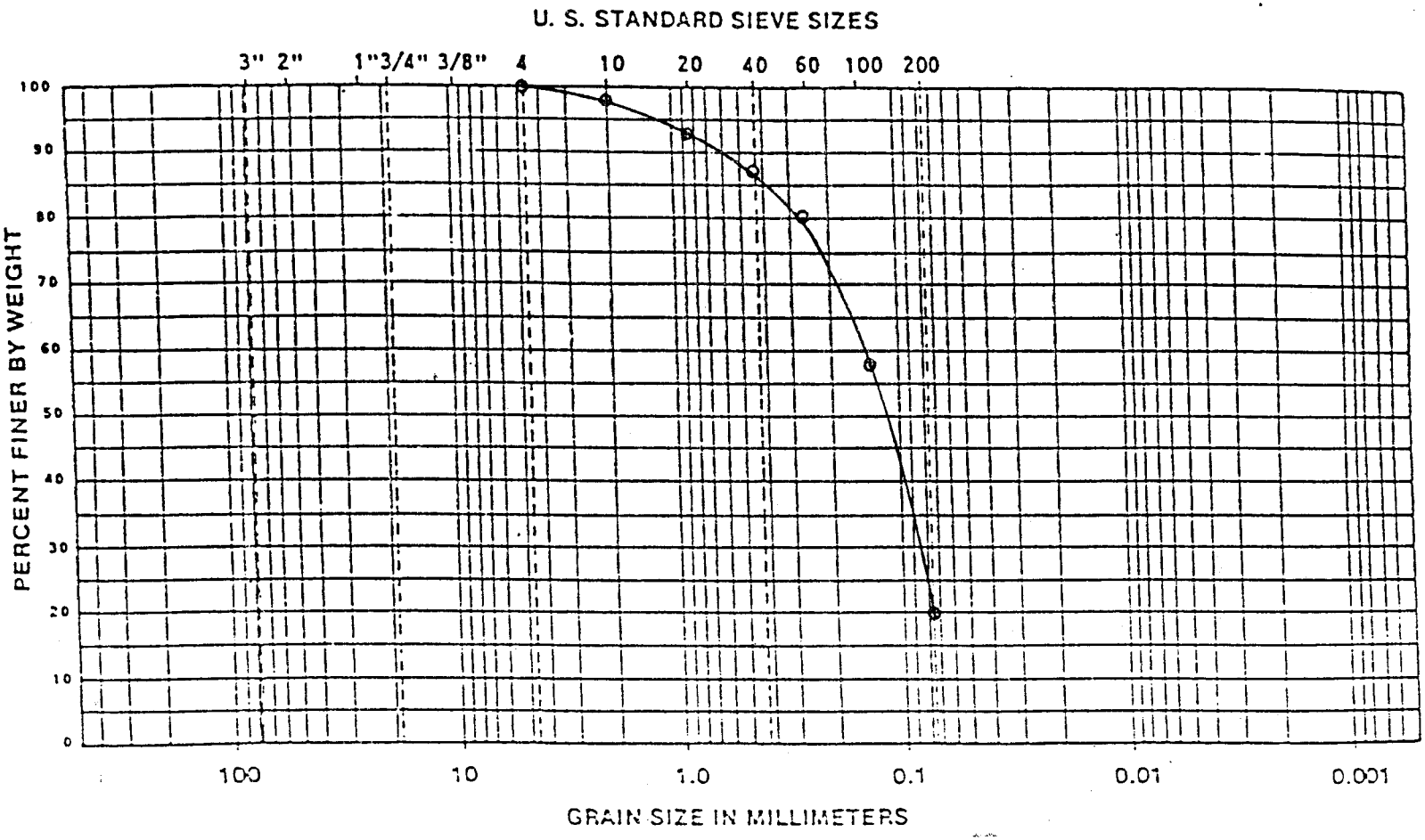
JOB NO. 1175I

Norfolk Harbor Channel

C=23

1400061

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

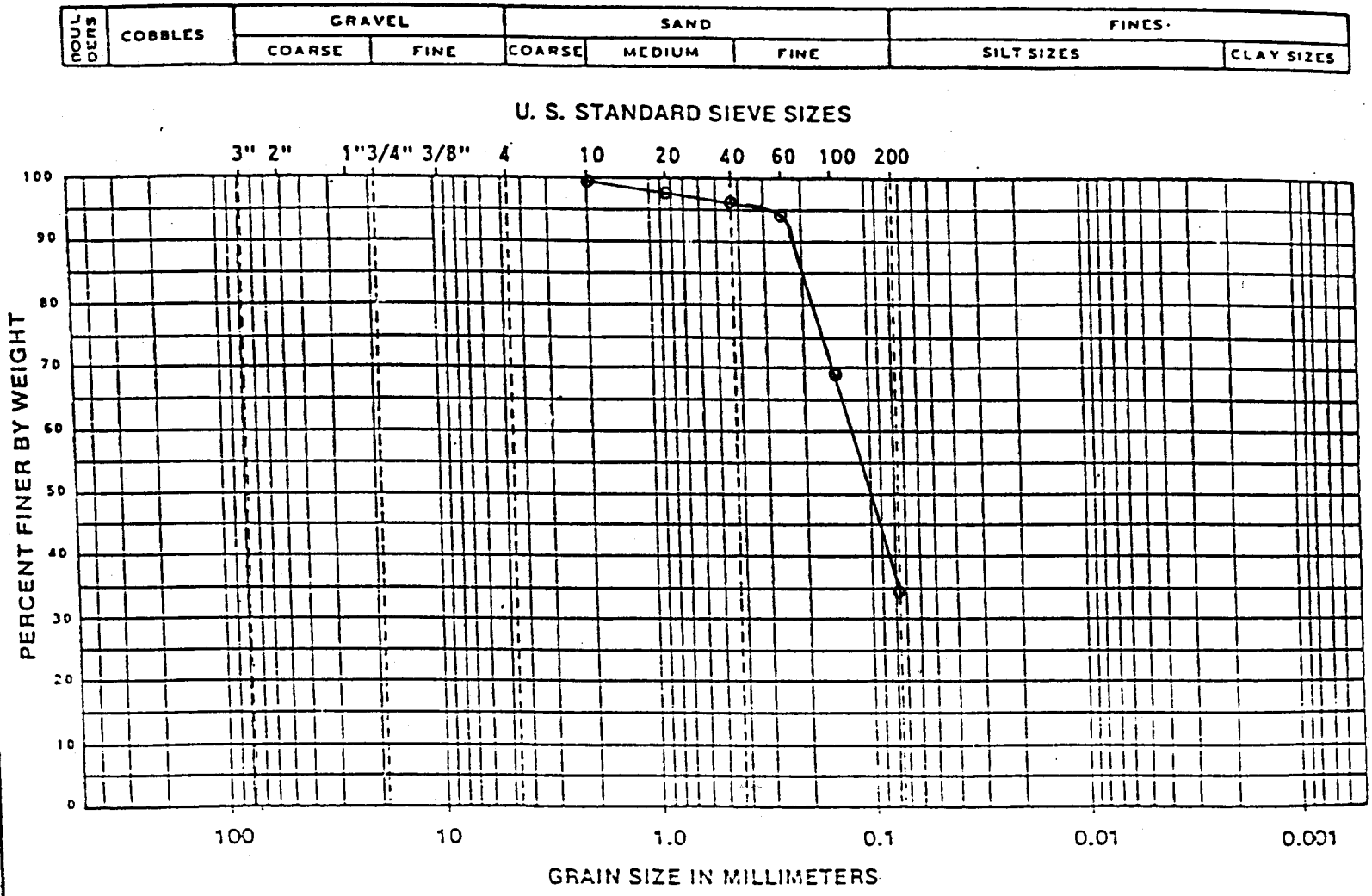
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
236	9.5-10.9	30.1	-	-	-	Tan Medium to Fine Sand (SM) with Some Silt and Trace Coarse Sand

JOB NO. 1175I

Norfolk Harbor Channel

1400061



Law Engineering Testing Company

Grain Size Distribution

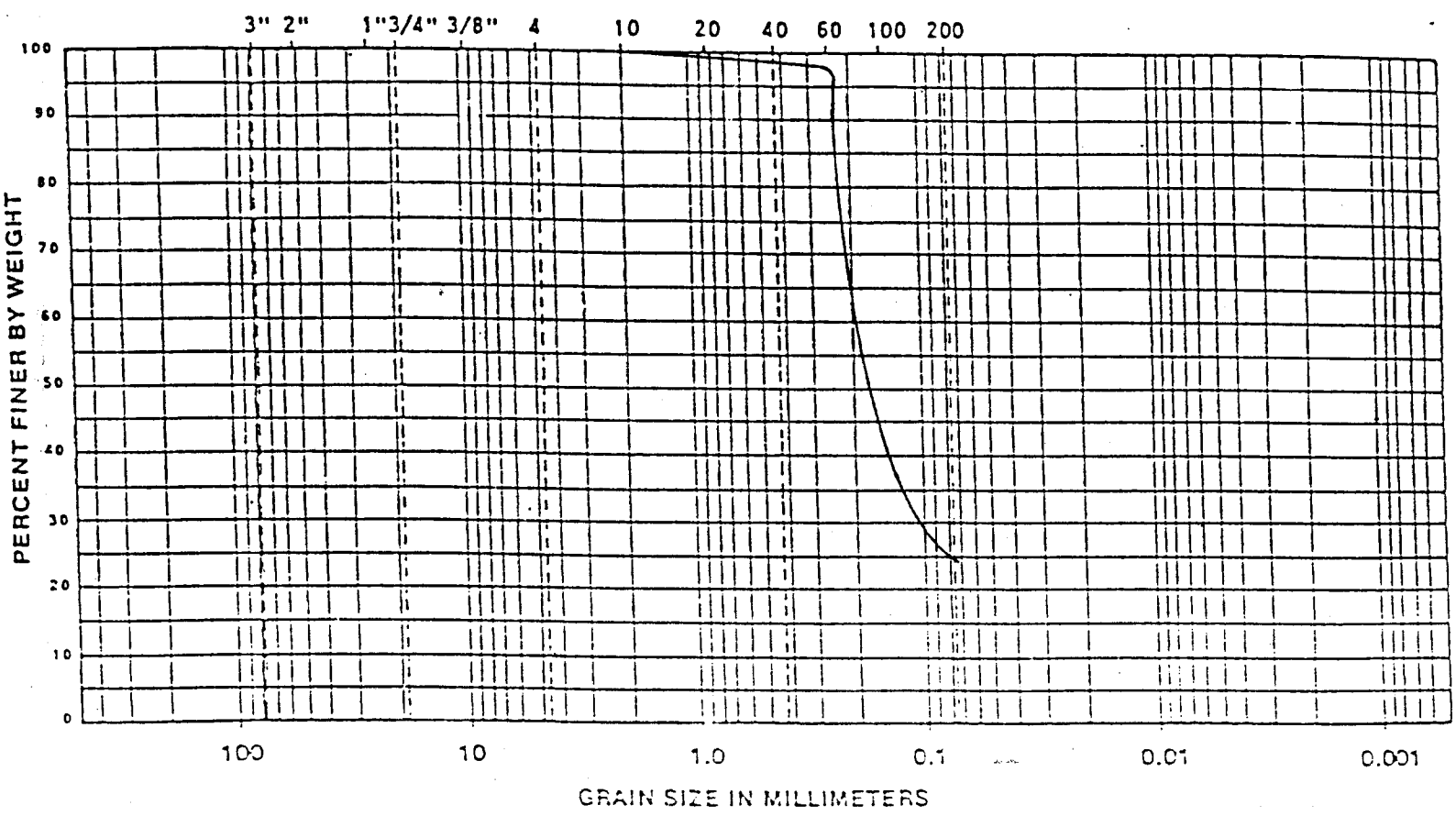
BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
237	0-1	32.9	-	-	-	Gray Fine Sand (SM) with Some Silt, Trace Coarse and Trace Medium Sand

JOB NO. 11751

Norfolk Harbor Channel

1400061

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

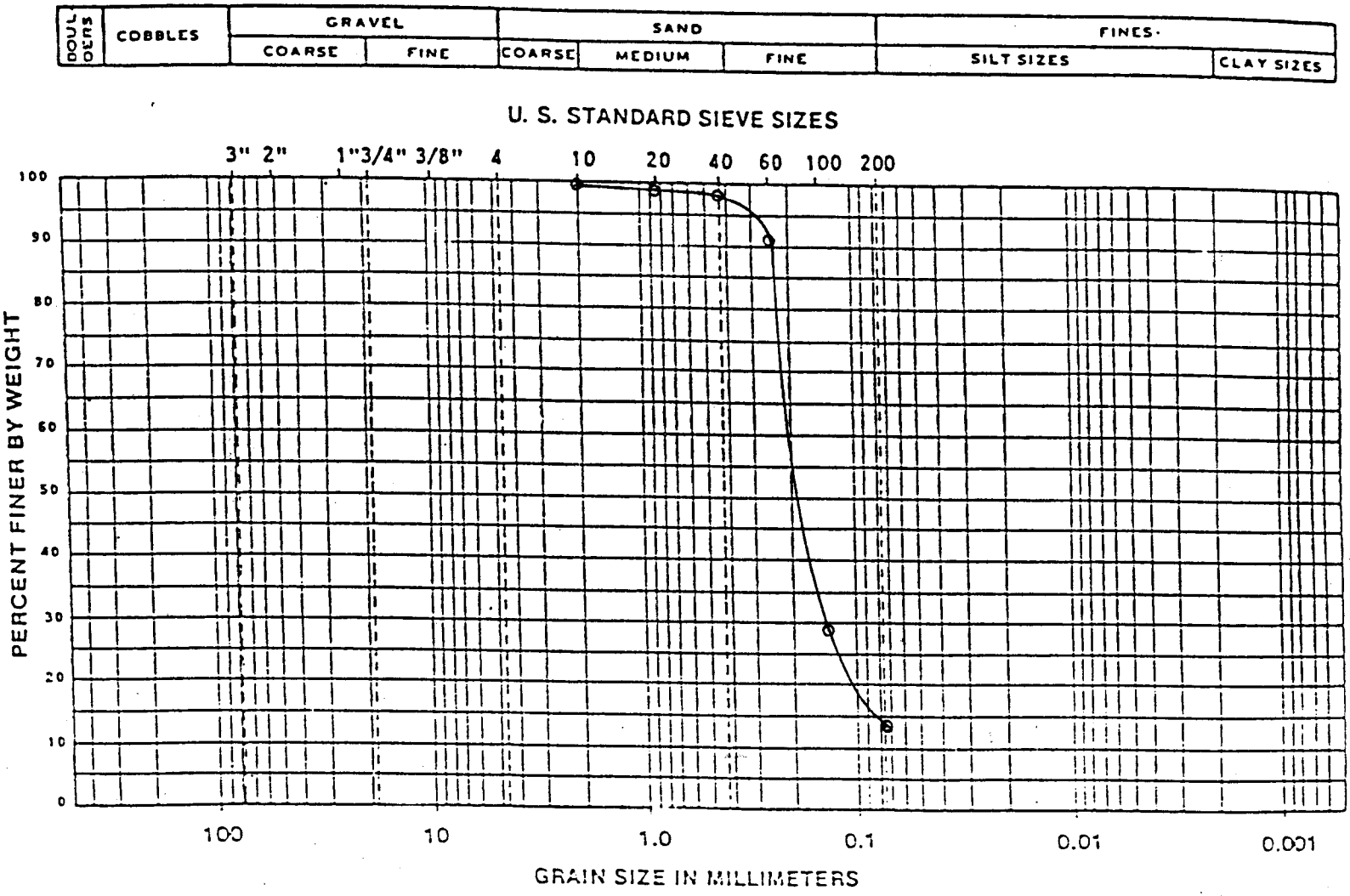
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
238	5.6 - 6.6	39.8	25	NP	NP	Gray Fine Sand (SM) with Some Silt

JOB NO 11751

1400001

Norfolk Harbor Channel



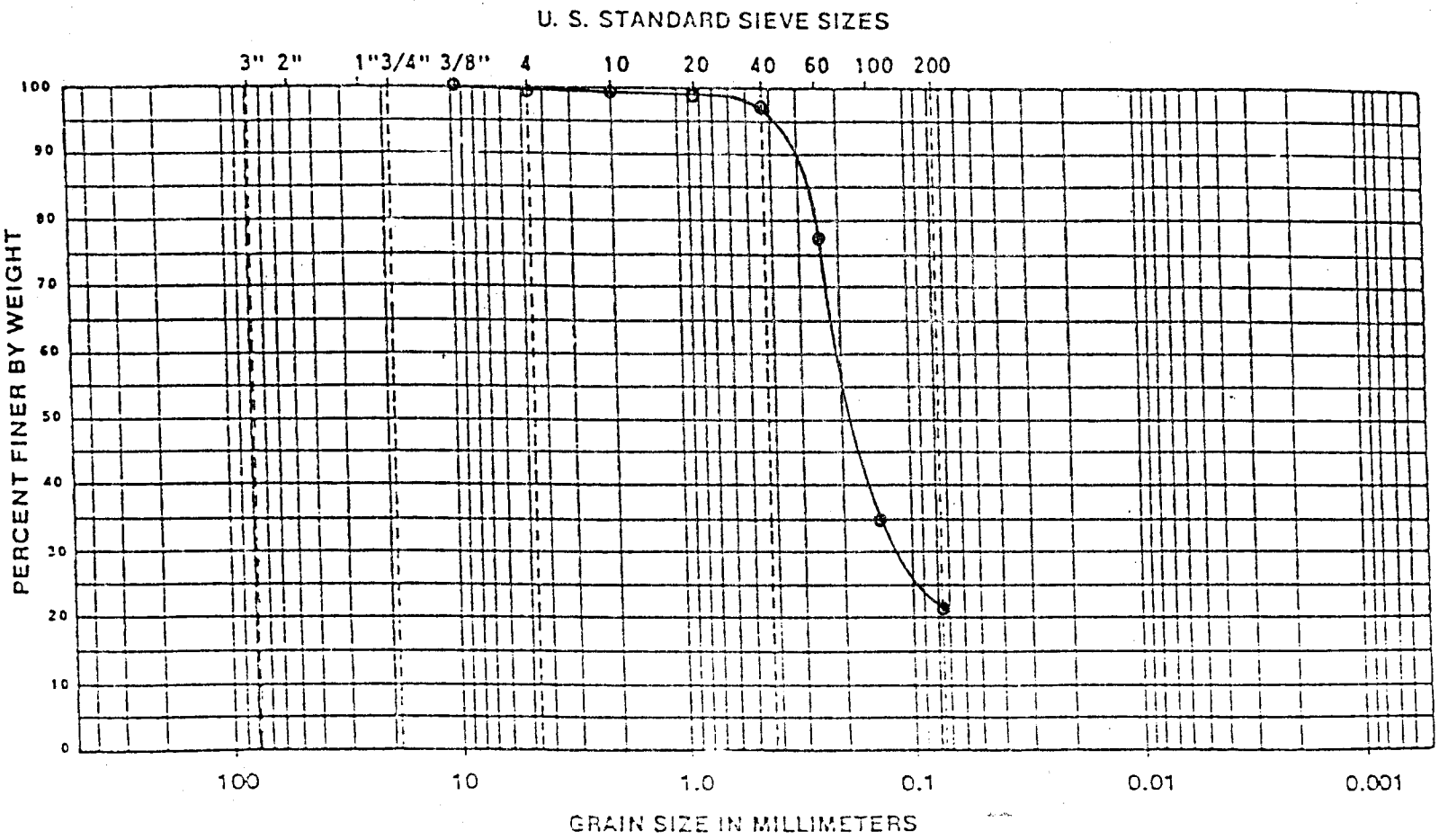
Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
238	13.1-14.1	24.3	-	-	-	Gray Fine Sand (SM) with Little Silt

JOB NO. 1175I

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

Grain Size Distribution

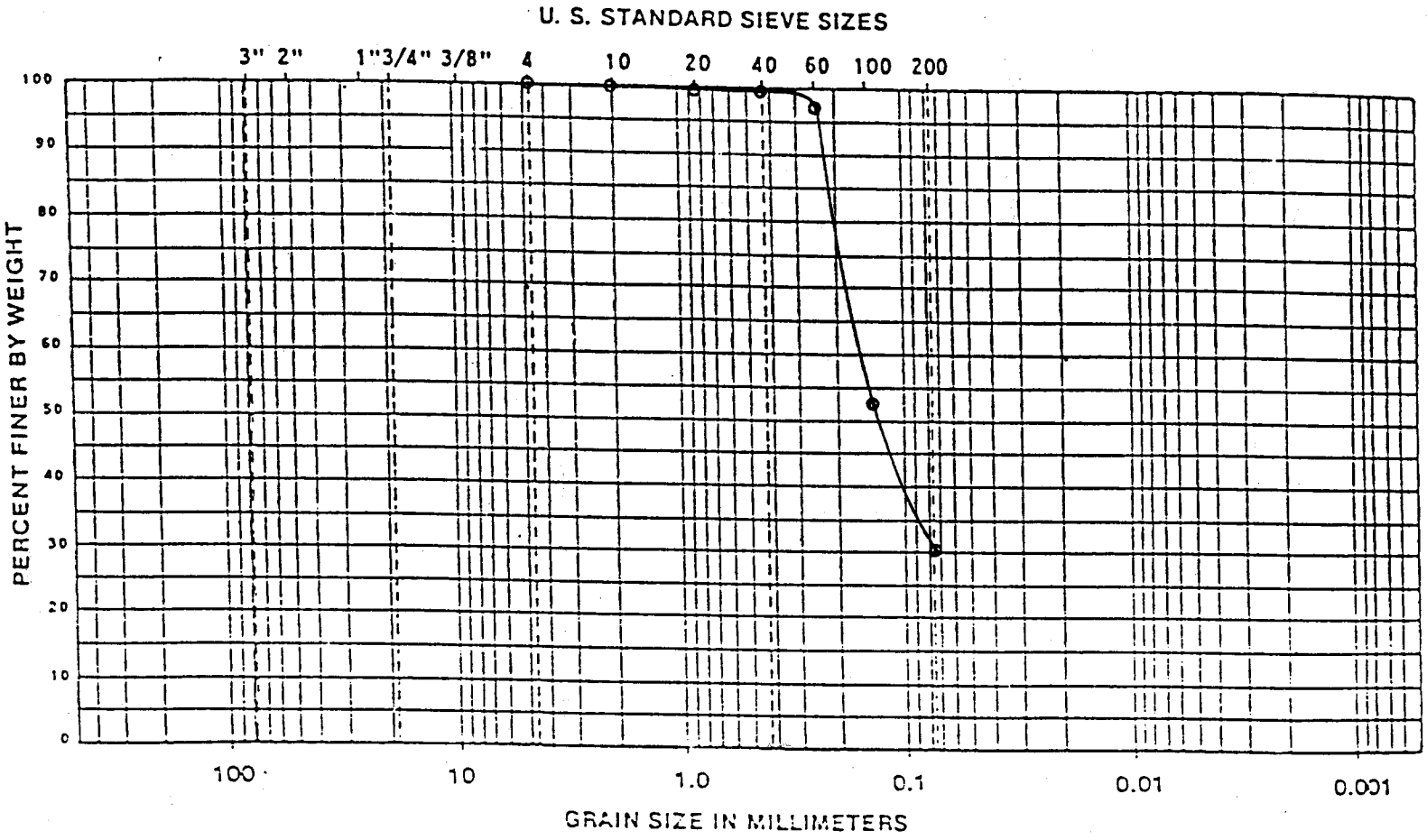
BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
243	0-1.5	23.7	-	-	-	Tan Fine Sand (SM) with Some Silt, Little Marine Shell Fragments, Trace Coarse Sand and Trace Medium Sand

JOB NO 11751

1400001

Norfolk Harbor Channel

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

Grain Size Distribution

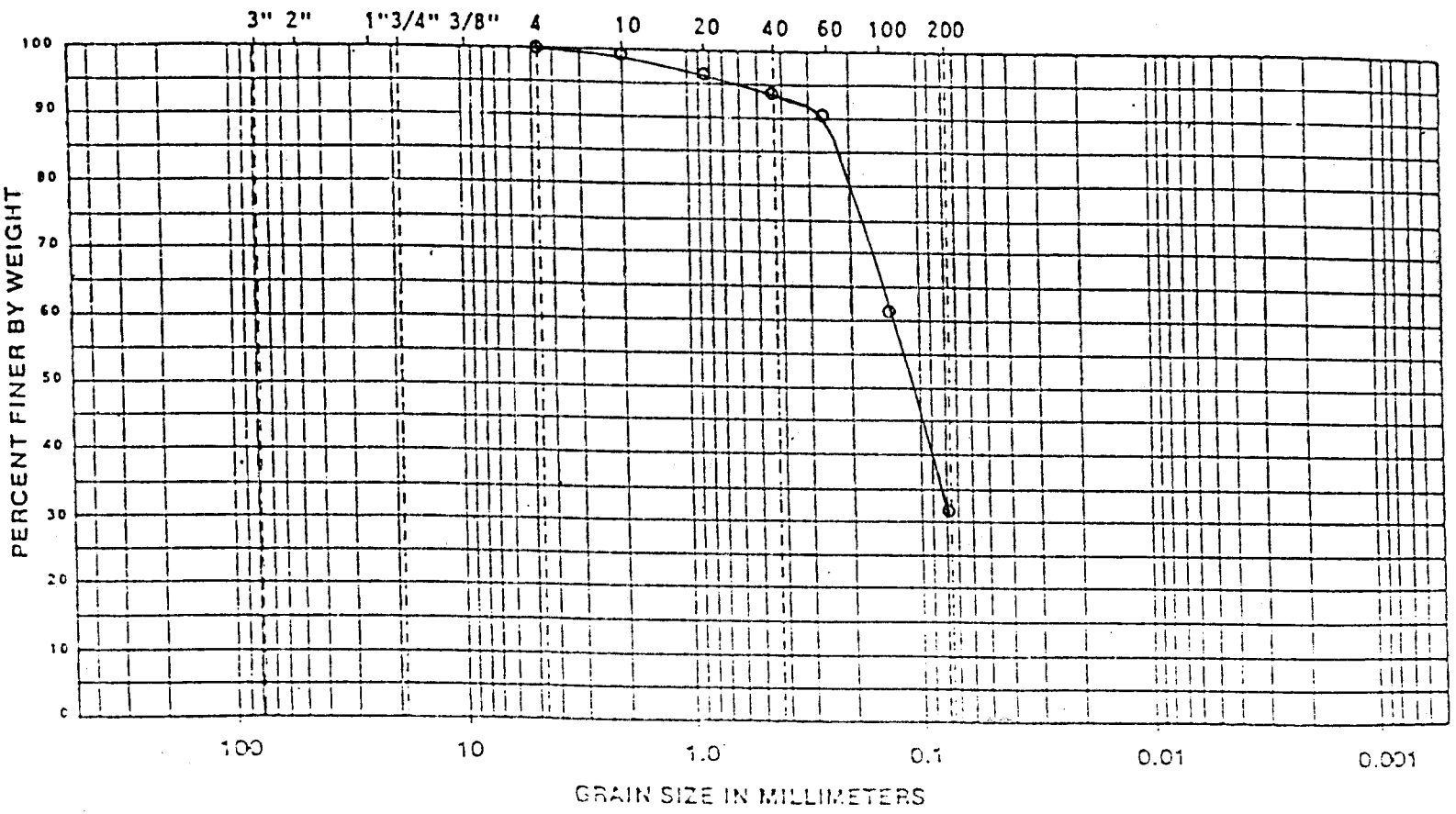
BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
243	4-5	39.4	36	19	17	Gray Fine Sand (SC) with Some Clay

JOB NO 11751

1400061

Norfolk Harbor Channel

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



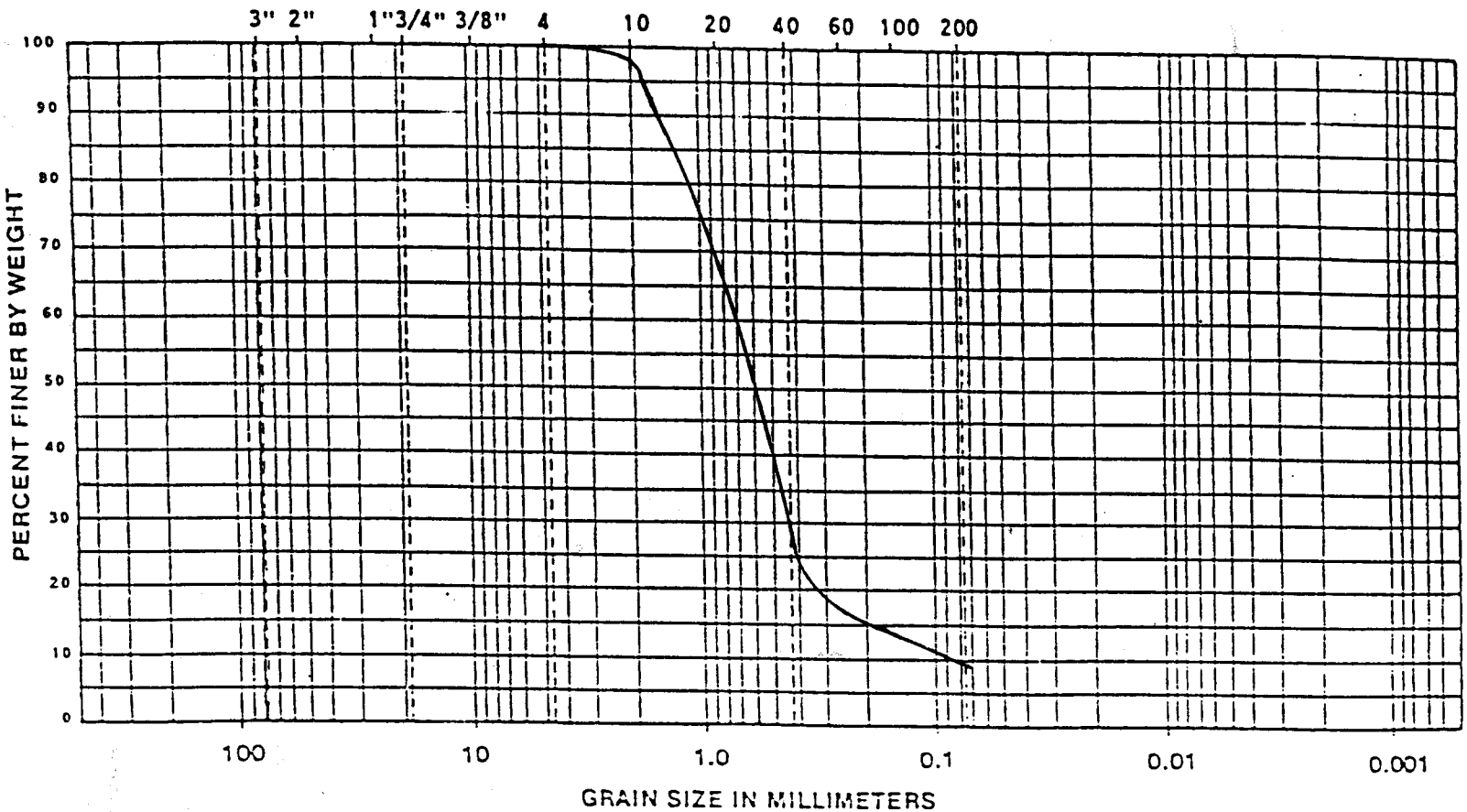
Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
244	14.8-15.8	39.2	-	-	-	Gray Fine Sand (SM) with Some Silt, Trace Coarse Sand and Trace Medium Sand
JOB NO.						
11751						Norfolk Harbor Channel

1400001

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

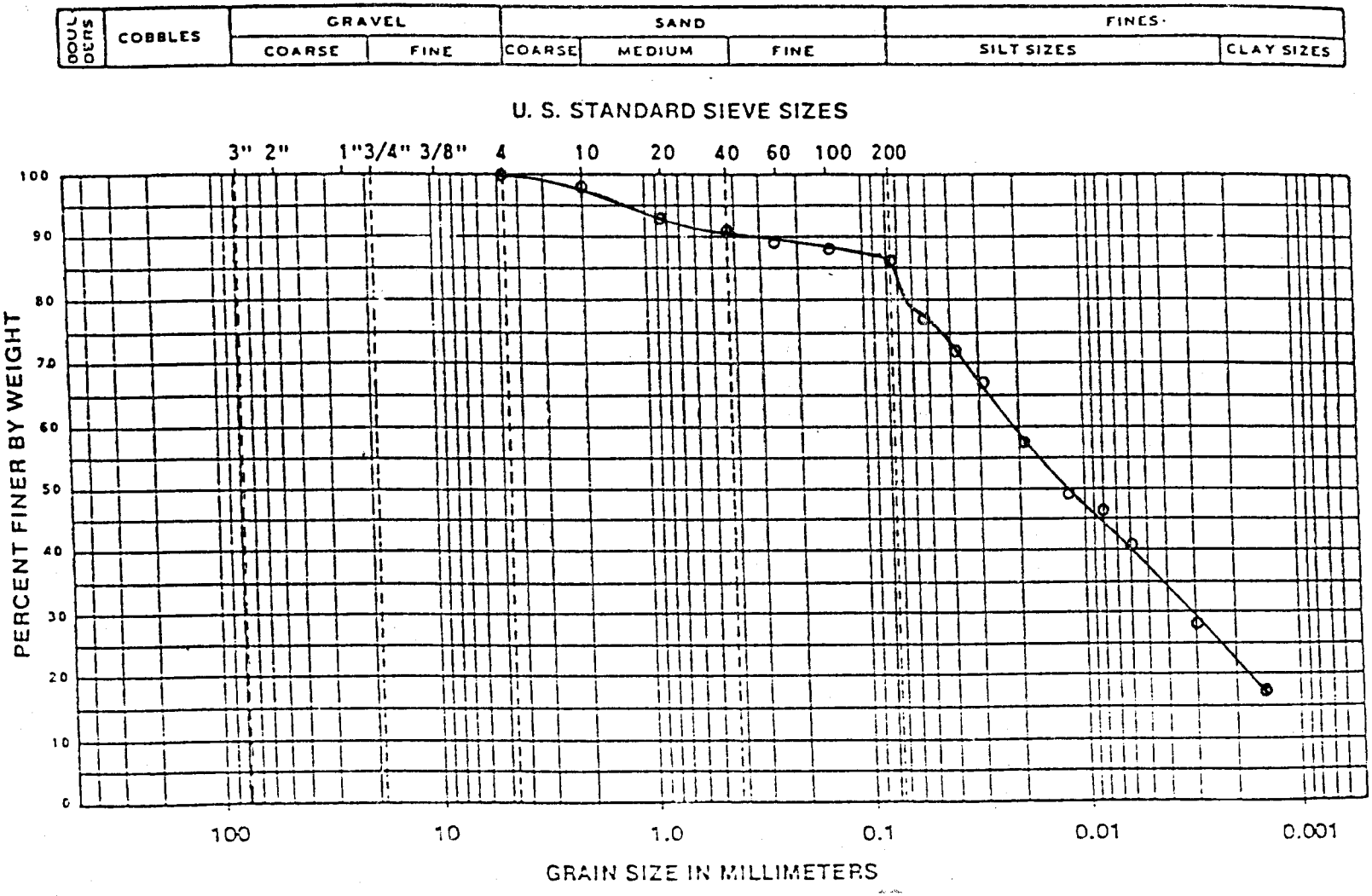


Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
246	9-10	-	-	-	-	Gray Medium to Fine Sand (SP-SM) with Little Silt and Trace Coarse Sand Norfolk Harbor Channel

JOB NO. 1175I



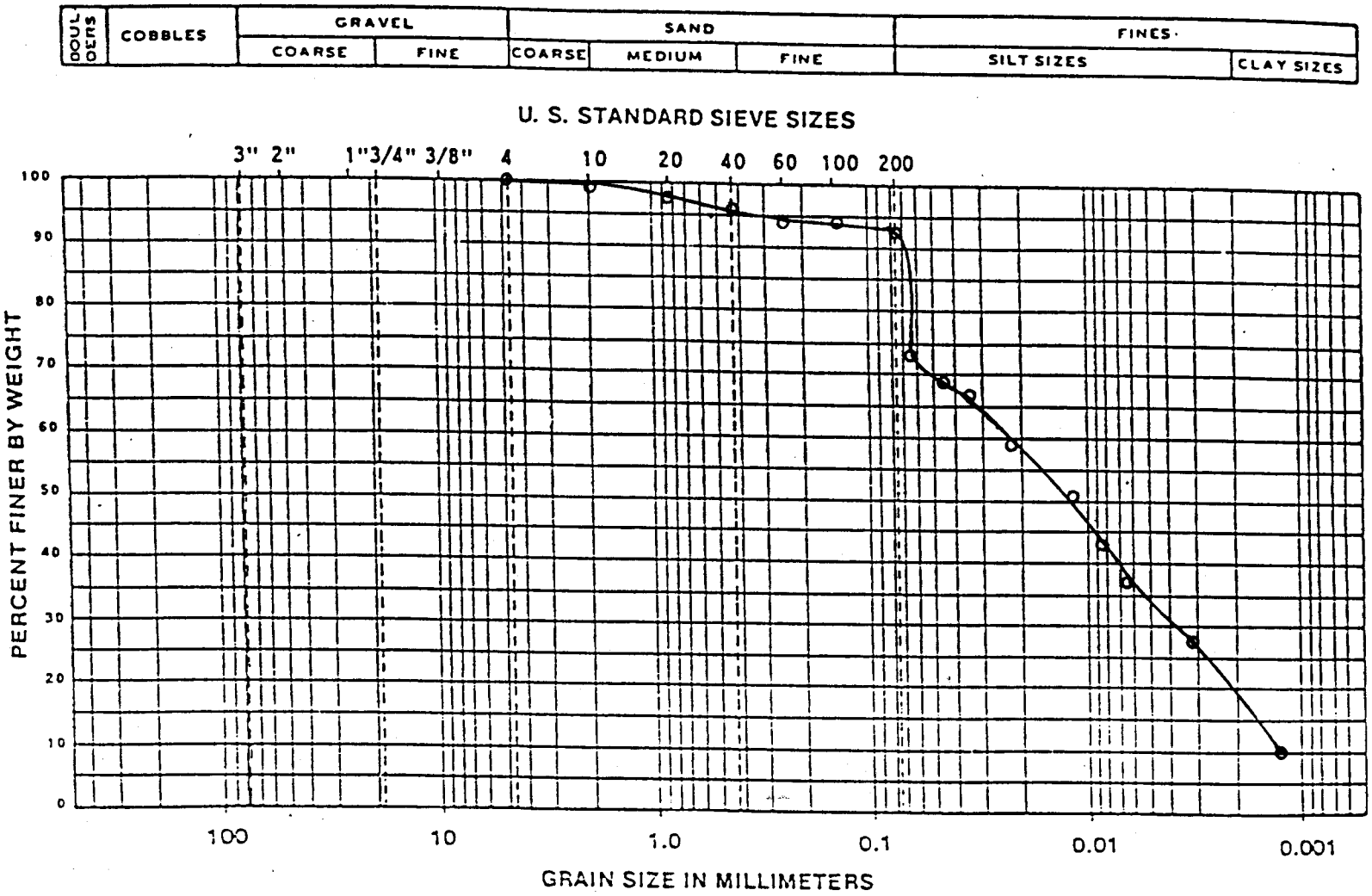
Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
247	0-1.5	79.8	77	29	48	Gray to Tan Clay (CH) with Trace Coarse, Trace Medium and Trace Fine Sand Norfolk Harbor Channel

JOB NO. 1175I

140006)

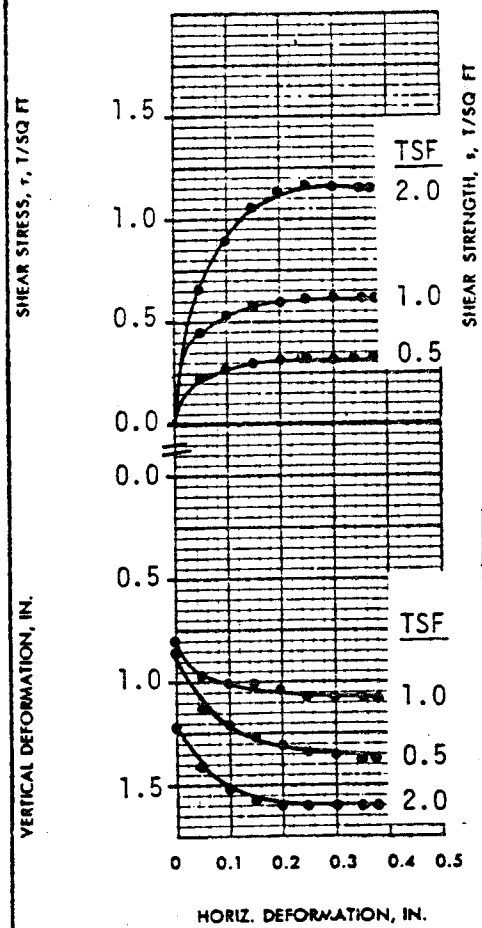


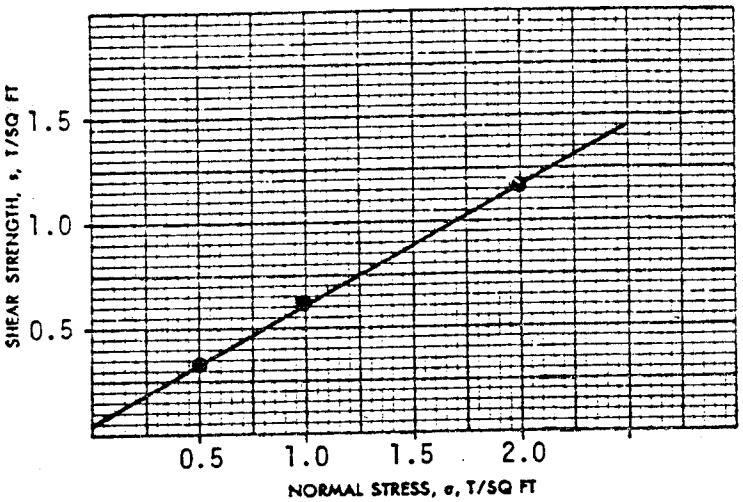
Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
247	9-10	62.0	73	31	43	Gray Clay (CH) with Trace Coarse Sand, Trace Medium Sand and Trace Fine Sand
JOB NO. 1175I						Norfolk Harbor Channel

3400061





Norfolk Harbor Channel

TEST NO.						
INITIAL	WATER CONTENT	w_o	35.5 %	31.5%	41.0%	%
	VOID RATIO	e_o	1.104	1.000	1.020	
	SATURATION	S_o	87.5 %	90.0%	100 %	%
	DRY DENSITY, LB/CU FT	γ_d	80.5	85.0	84.0	
VOID RATIO AFTER CONSOLIDATION		e_c	0.921	0.843	0.773	
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	-	-	-	
FINAL	WATER CONTENT	w_f	38.5 %	27.0%	31.0%	%
	VOID RATIO	e_f	0.810	0.787	0.696	
	SATURATION	S_f	100 %	100 %	100 %	%
NORMAL STRESS, T/SQ FT		σ	0.5	1.0	2.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.33	0.62	1.16	
ACTUAL TIME TO FAILURE, MIN		t_f	24.6	21.1	19.3	
RATE OF STRAIN, IN./MIN			.014	.013	.013	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}	0.33	0.61	1.15	

SHEAR STRENGTH PARAMETERS

ϕ' = 29.0

TAN ϕ' = 0.554

c' = 0.05 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TYPE OF SPECIMEN Undisturbed — 2.50 in.diam. — 1.00 IN. THICK

CLASSIFICATION Gray CLAY - CH

LL 55.5 | PL 19.5 | PI 36.0 | G_s 2.72

REMARKS

PROJECT Norfolk Harbor & Channels Deepening

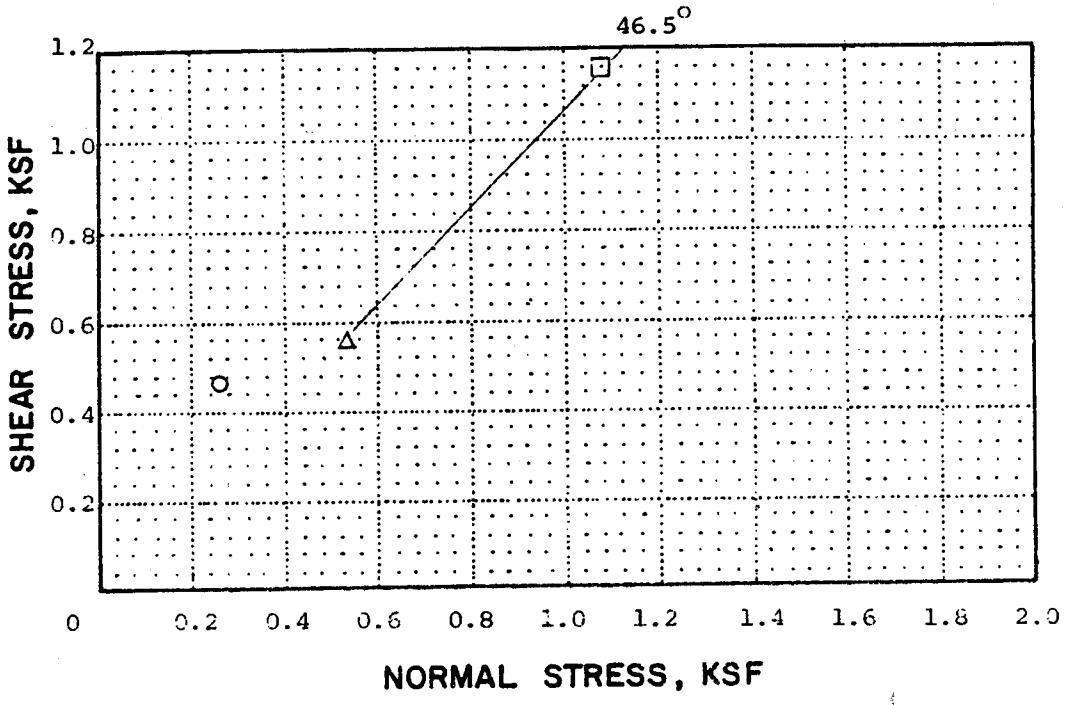
AREA Norfolk, Virginia

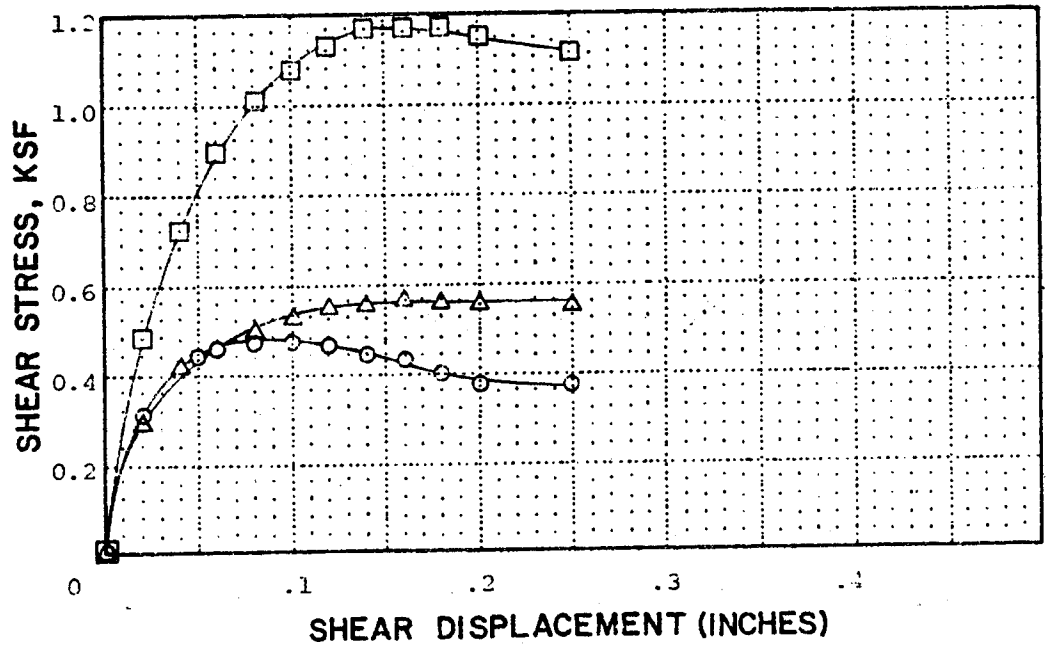
BORING NO. 134 | SAMPLE NO. S-2

DEPTH El 6.0-7.5 | DATE 2/20/85

DIRECT SHEAR TEST REPORT

CEI 83-1118





SAMPLE NUMBER	1 ○	2 △	3 □
Initial: Water Content (%)	12.9	16.0	16.3
Wet Density (pcf)	107.7	111.8	106.8
Dry Density (pcf)	95.3	96.4	91.5
Consolidation Pressure (ksf)	.25	.50	1.0

NOTES: Light Brown Medium to Fine Sand (SP) with Trace Coarse Sand and Trace Silt

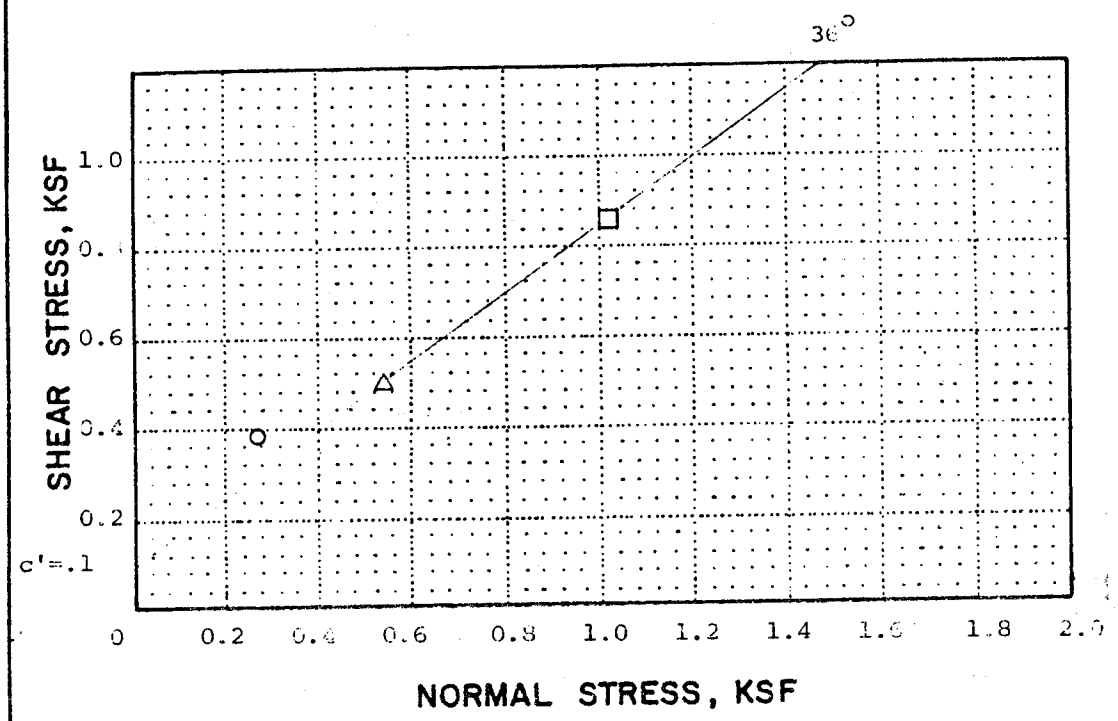
DIRECT SHEAR RESULTS

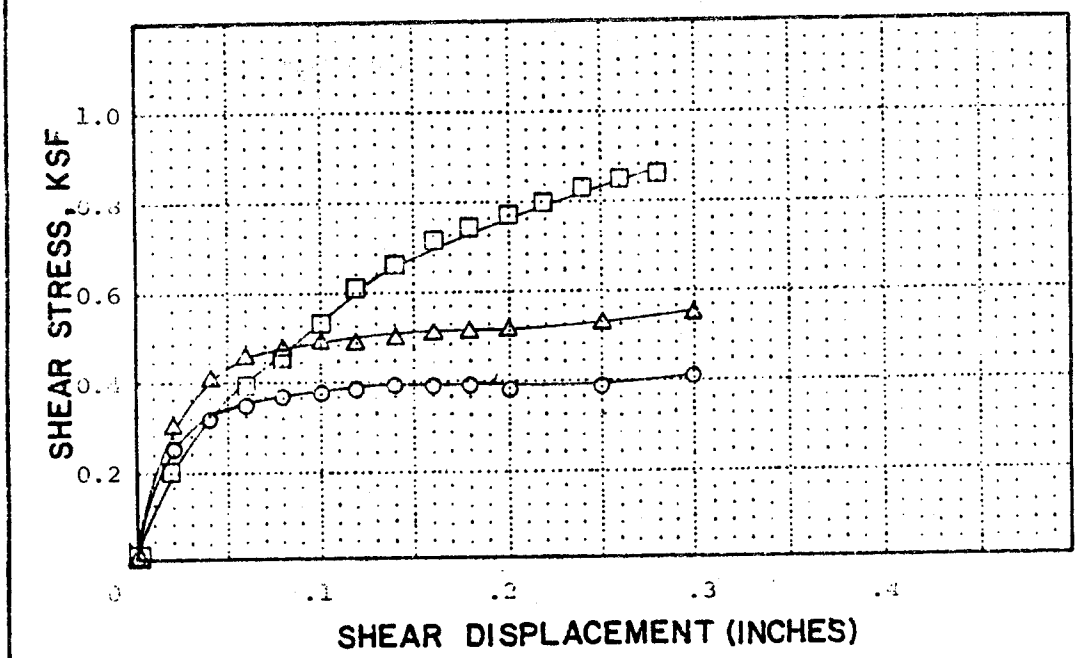
Norfolk Harbor Channel

Job No.
Drawn: FIF
Checked: PGK
Date: 11-28-85

SDVC231
0-1.0 ft.

US Army Corps of Engineers





SAMPLE NUMBER	1 ○	2 △	3 □
Initial: Water Content (%)	95.5	91.9	93.8
Wet Density (pcf)	90.2	89.9	89.3
Dry Density (pcf)	46.1	46.5	46.1
Consolidation Pressure (ksf)	0.25	0.50	1.00

NOTES: Gray Clay (CH) with Trace Medium and Trace Fine Sand

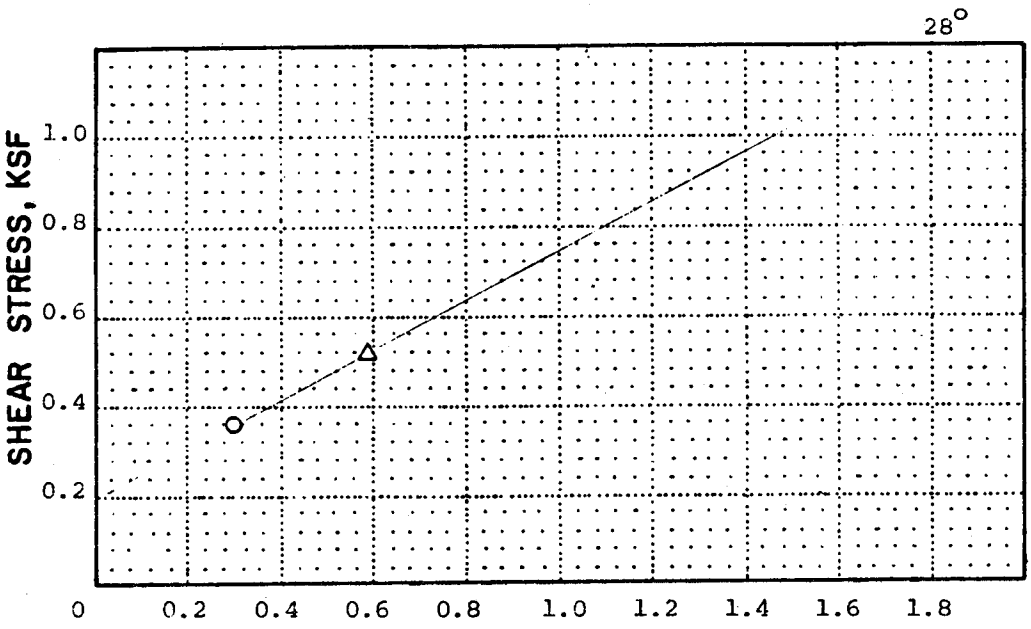
Job No.
Drawn: FMF
Checked: RGH
Date: 11-28-85

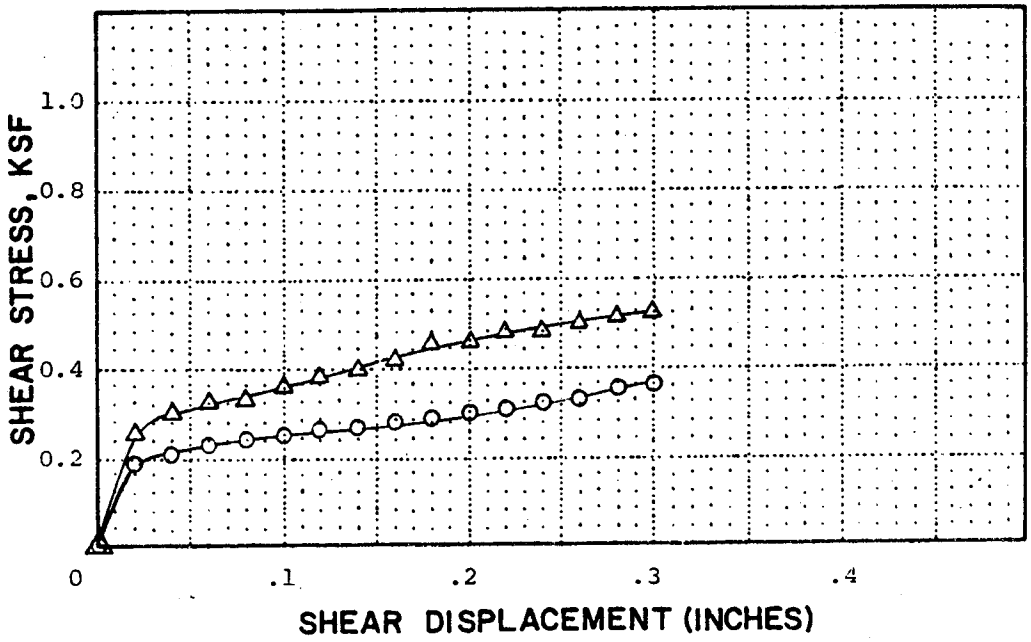
DIRECT SHEAR RESULTS

Norfolk Harbor Channel

NAE-1175
Corps of Engineers

BHVC232
3.0-4.0 ft.





SAMPLE NUMBER	1 ○	2 △	3
Initial: Water Content (%)	117.5	118.1	
Wet Density (pcf)	85.2	81.8	
Dry Density (pcf)	39.2	37.5	
Consolidation Pressure (ksf)	0.25	0.50	

NOTES: Dark Gray Clay (CH) with Trace Medium and Trace Fine Sand

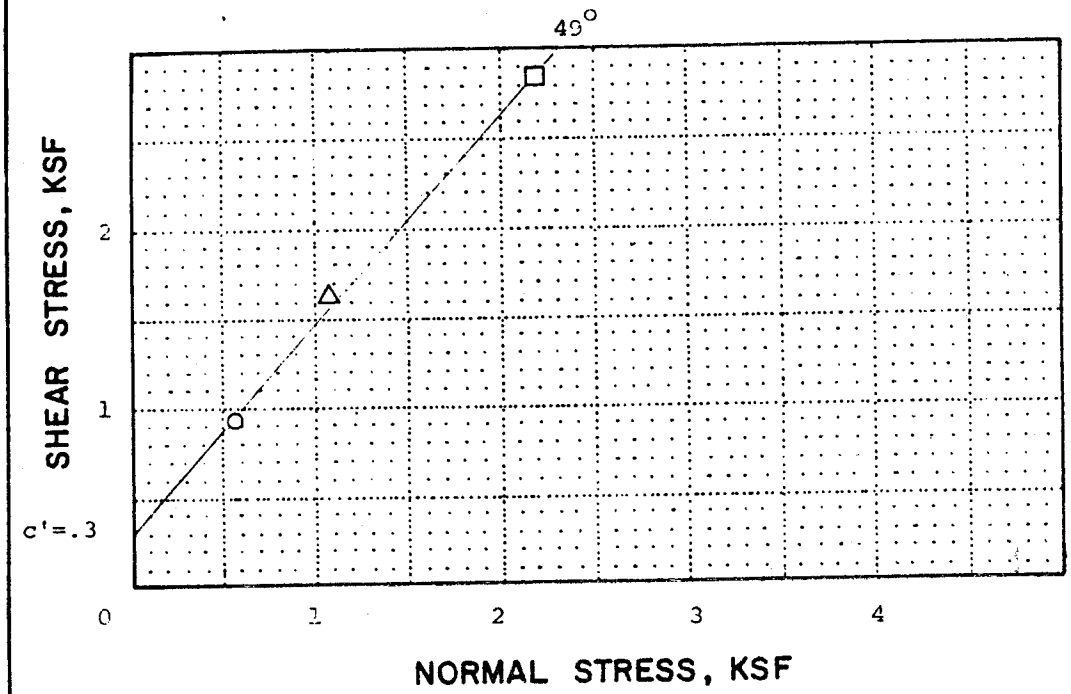
DIRECT SHEAR RESULTS

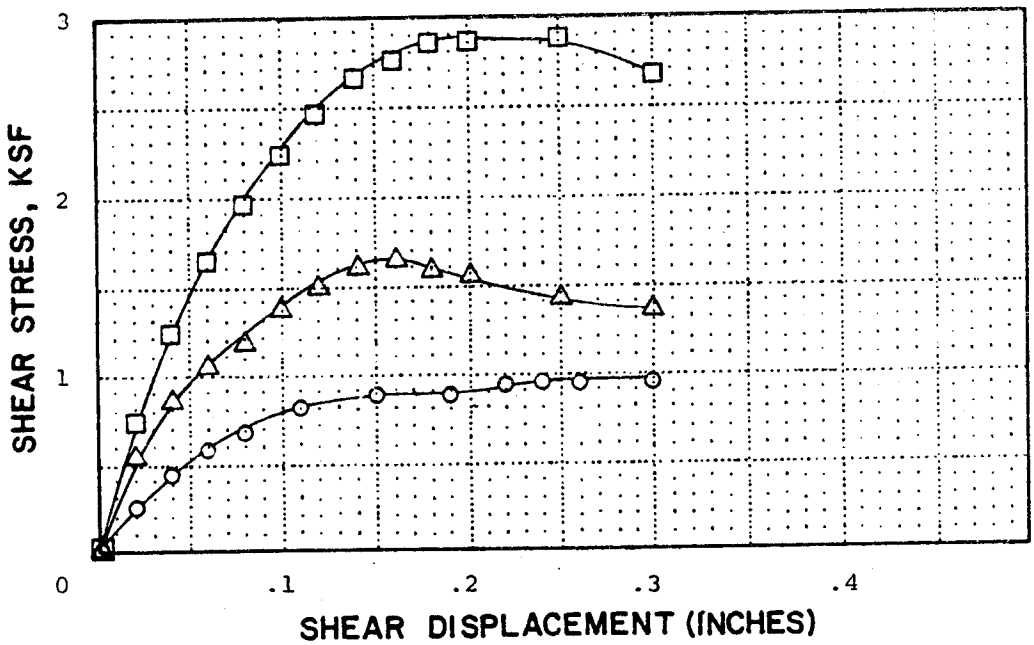
Norfolk Harbor Channel

Job No.
Drawn: TMF
Checked: RGH
Date: 11-28-85

89VC239
0-1.[illegible] ft.

NFS 1175
Corps of Engineers





SAMPLE NUMBER	1 ○	2 △	3 □
Initial: Water Content (%)	18.9	19.0	19.1
Wet Density (pcf)	112.5	113.1	112.3
Dry Density (pcf)	94.6	95.0	94.3
Consolidation Pressure (ksf)	0.5	1.0	2.0

NOTES: Gray Medium to Fine Sand (SP) with Trace Silt, Trace Coarse Sand and Little Marine Shell Fragments

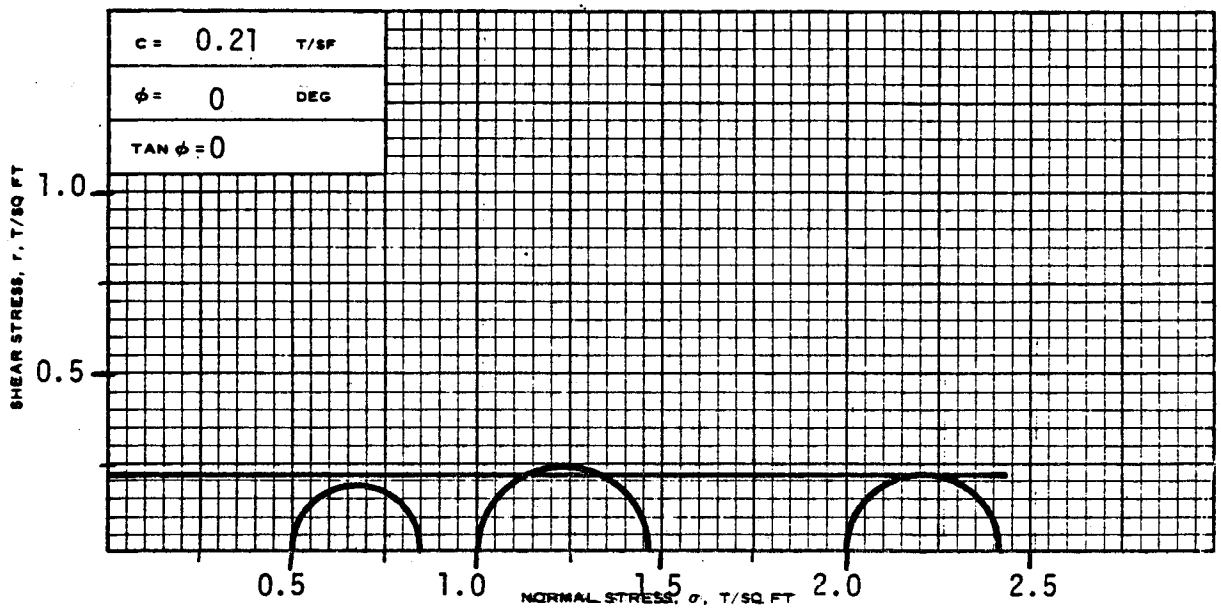
Job No.
Drawn: PMP
Checked: RGH
Date: 11-28-85

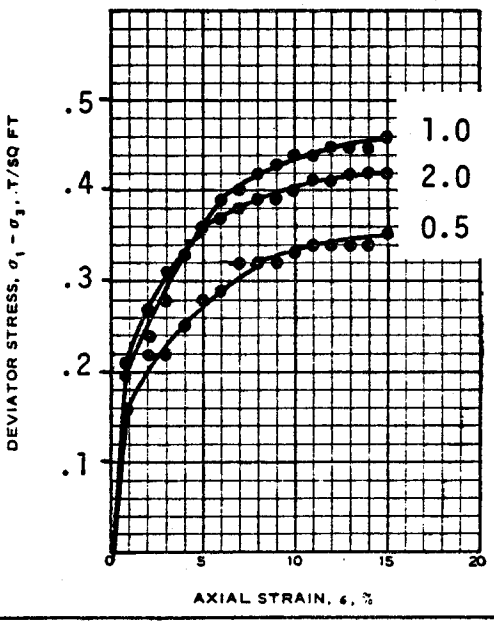
DIRECT SHEAR RESULTS

Norfolk Harbor Channel

85VC246
9-10 ft.

NK5-1175
Corps of Engineers





SPECIMEN NO.			1	2	3
INITIAL	WATER CONTENT, %	w_o	41.5	41.5	38.5
	DRY DENSITY LB/ CU FT	γ_{d_o}	80.5	83.0	83.5
	SATURATION, %	S_o	100+	100+	100+
	VOID RATIO	e_o	1.04	0.98	0.97
BEFORE SHEAR	WATER CONTENT, %	w_c			
	DRY DENSITY LB/CU FT	γ_{d_c}			
	SATURATION, %	S_c			
	VOID RATIO	e_c			
	FINAL BACK PRESSURE, T/SQ FT	u_b			
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.5	1.0	2.0
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.35	0.46	0.42
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	14:37	14:44	14:43
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$	0.35	0.46	0.42
INITIAL DIAMETER, IN.		D_o	2.8"	2.8"	2.8"
INITIAL HEIGHT, IN.		H_o	6.0"	6.0"	6.0"

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Gray clayey Sand - SC

LL 32.0	PL 15.0	PI 17.0	Gs 2.63	TYPE OF SPECIMEN Undisturbed	TYPE OF TEST UU

REMARKS:

PROJECT Norfolk Harbor and Channel Deepening

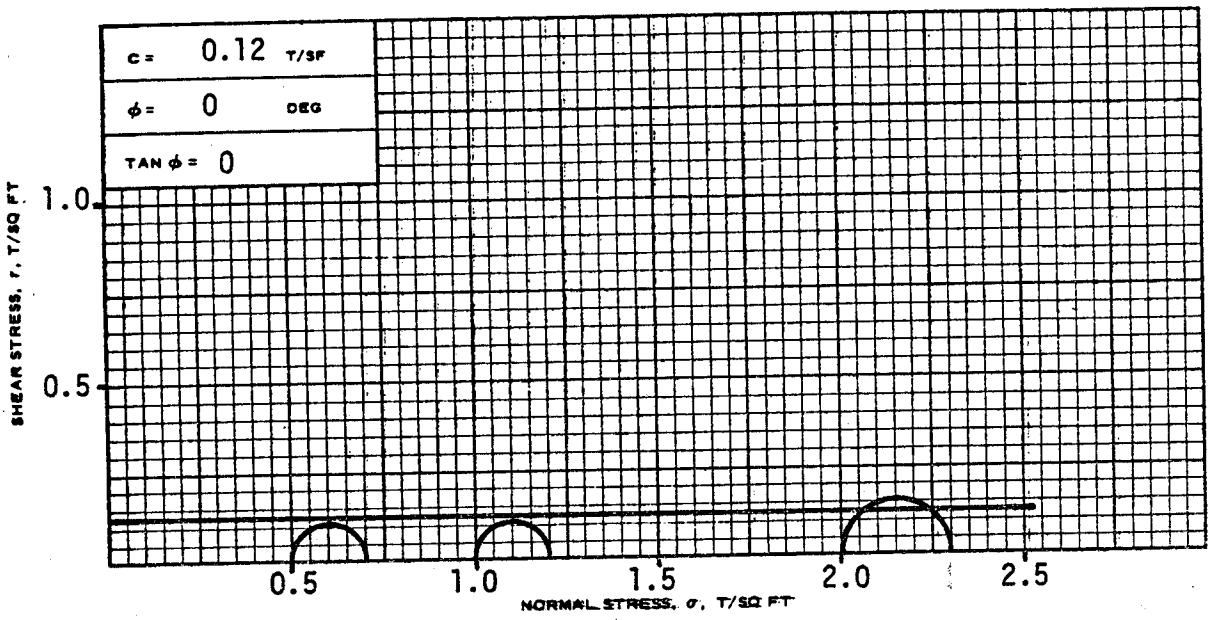
BORING NO. 17 SAMPLE NO. 1

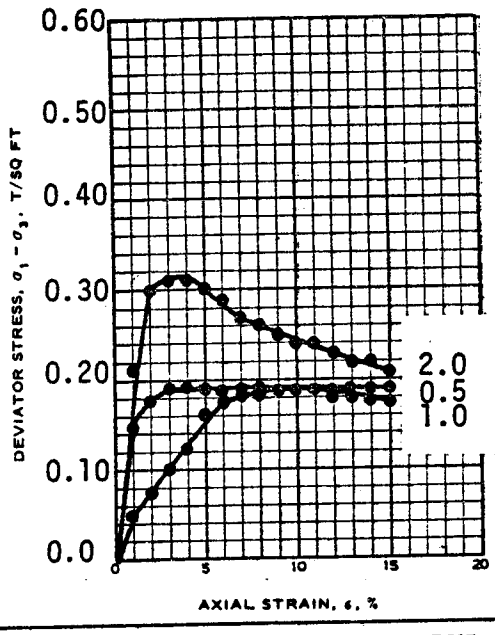
DEPTH/ELEV 4.7 - 7.0'

LABORATORY 83-1118 DATE 9/26/83

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT





SPECIMEN NO.			1	2	3
INITIAL	WATER CONTENT, %	w_o	34.5	24.5	25.0
	DRY DENSITY, LB/CU FT	γ_{d_o}	82.0	95.5	97.0
	SATURATION, %	S_o	91.5	91.5	98.0
	VOID RATIO	e_o	0.97	0.69	0.67
BEFORE SHEAR	WATER CONTENT, %	w_c			
	DRY DENSITY LB/CU FT	γ_{d_c}			
	SATURATION, %	S_c			
	VOID RATIO	e_c			
	FINAL BACK PRESSURE, T/SQ FT	u_b			
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.5	1.0	2.0
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.19	0.19	0.31
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	14:55	2:27	2:37
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$	0.19	0.18	0.21
INITIAL DIAMETER, IN.		D_o	2.8	2.8	2.8
INITIAL HEIGHT, IN.		H_o	6.0	6.0	6.0

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Gray clayey Sand - SC

LL	PL	PI	G_s
NP	NP		2.60

TYPE OF SPECIMEN Undisturbed | TYPE OF TEST UU

REMARKS:

PROJECT Norfolk Harbor and Channel Deepening

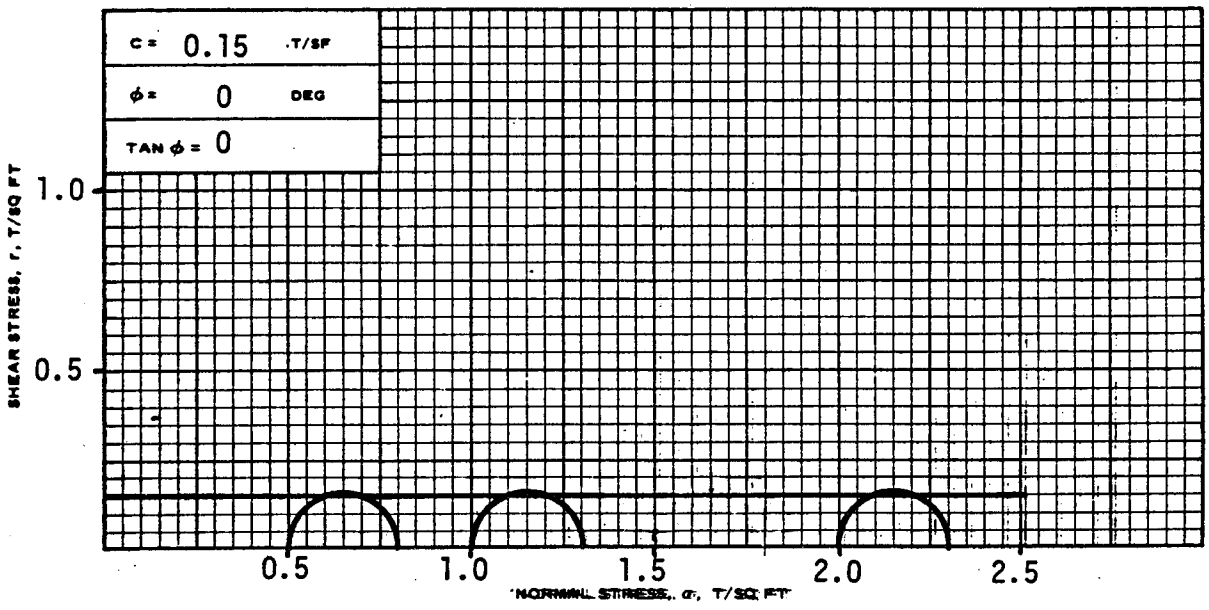
BORING NO. 22 | SAMPLE NO. 1

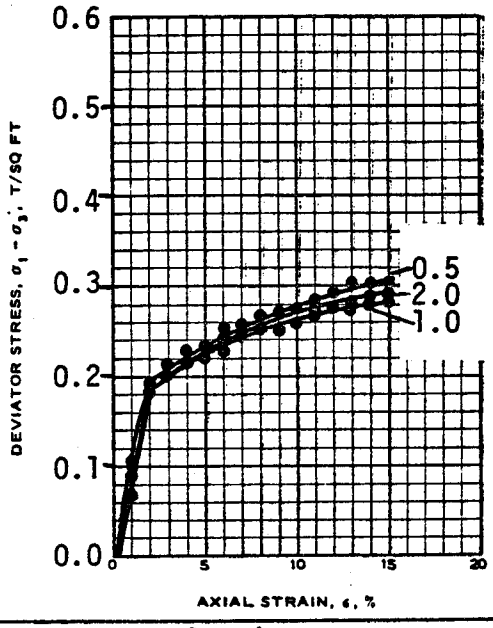
DEPTH/ELEV 5.5 - 7.7'

LABORATORY 83-1118 | DATE 9/26/83

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT





SPECIMEN NO.			1	2	3
INITIAL	WATER CONTENT, %	w_o	81.0	65.5	68.0
	DRY DENSITY LB/CU FT	γd_o	53.0	58.5	59.5
	SATURATION, %	S_o	100+	95.5	100+
	VOID RATIO	e_o	2.09	1.80	1.74
BEFORE SHEAR	WATER CONTENT, %	w_c			
	DRY DENSITY LB/CU FT	γd_c			
	SATURATION, %	S_c			
	VOID RATIO	e_c			
	FINAL BACK PRESSURE, T/SQ FT	u_b			
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.5	1.0	2.0
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.30	0.29	0.30
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	14:44	14:32	14:28
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$	0.30	0.29	0.30
INITIAL DIAMETER, IN.		D_o	2.8	2.8	2.8
INITIAL HEIGHT, IN.		H_o	6.0	6.0	6.0

CONTROLLED- Strain · TEST

DESCRIPTION OF SPECIMENS Gray Clay - CH

LL 56.0	PL 20.5	PI 35.5	Gs 2.62

TYPE OF SPECIMEN Undistrubed | TYPE OF TEST UU

REMARKS:

PROJECT Norfolk Harbor and Channel Deepening

BORING NO. 25 | SAMPLE NO. 1

DEPTH/ELEV 2.4'-4.5'

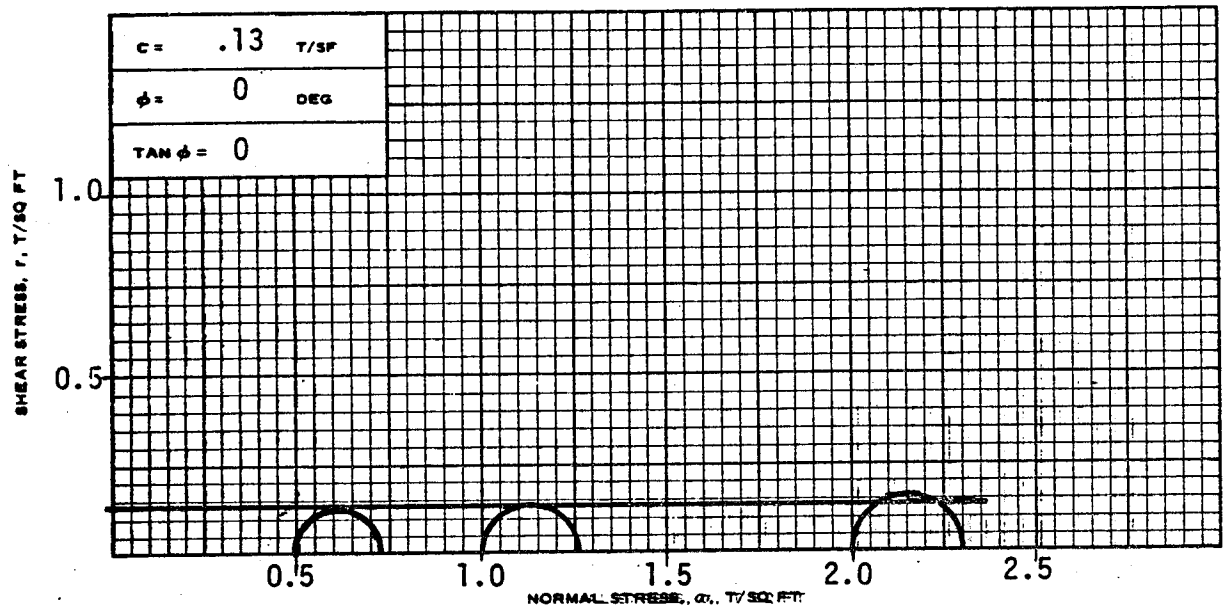
LABORATORY 83-1118 | DATE 9/26/83

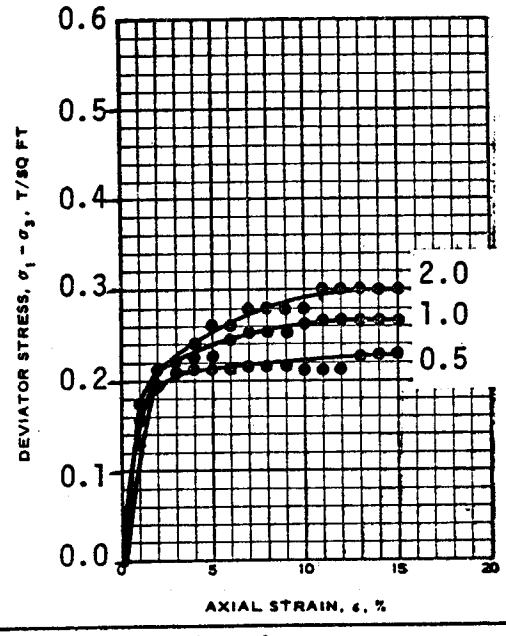
TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE

TRANSLUCENT

Norfolk Harbor Channel





SPECIMEN NO.			1	2	3
INITIAL	WATER CONTENT, %	w_o	91.5	91.5	93.0
	DRY DENSITY LB/CU FT	γd_c	48.5	48.5	48.0
	SATURATION, %	S_o	100+	100+	100+
	VOID RATIO	e_o	2.30	2.32	2.37
BEFORE SHEAR	WATER CONTENT, %	w_c			
	DRY DENSITY LB/CU FT	γd_c			
	SATURATION, %	S_c			
	VOID RATIO	e_c			
	FINAL BACK PRESSURE, T/SQ FT	u_o	0.5	1.0	2.0
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.23	0.27	0.30
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	14:47	12:49	14:29
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	0.23	0.26	0.30
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$	2.8	2.8	2.8
INITIAL DIAMETER, IN.		D_o	6.0	6.0	6.0
INITIAL HEIGHT, IN.		H_o			

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Gray Clay

LL 81.0 | PL 27.0 | PI 54.0 | Gs 2.58

TYPE OF SPECIMEN | TYPE OF TEST UU

REMARKS:

PROJECT Norfolk Harbor and Channel Deepening

BORING NO. 29 | SAMPLE NO. 1

DEPTH/ELEV 7.5-9.5'

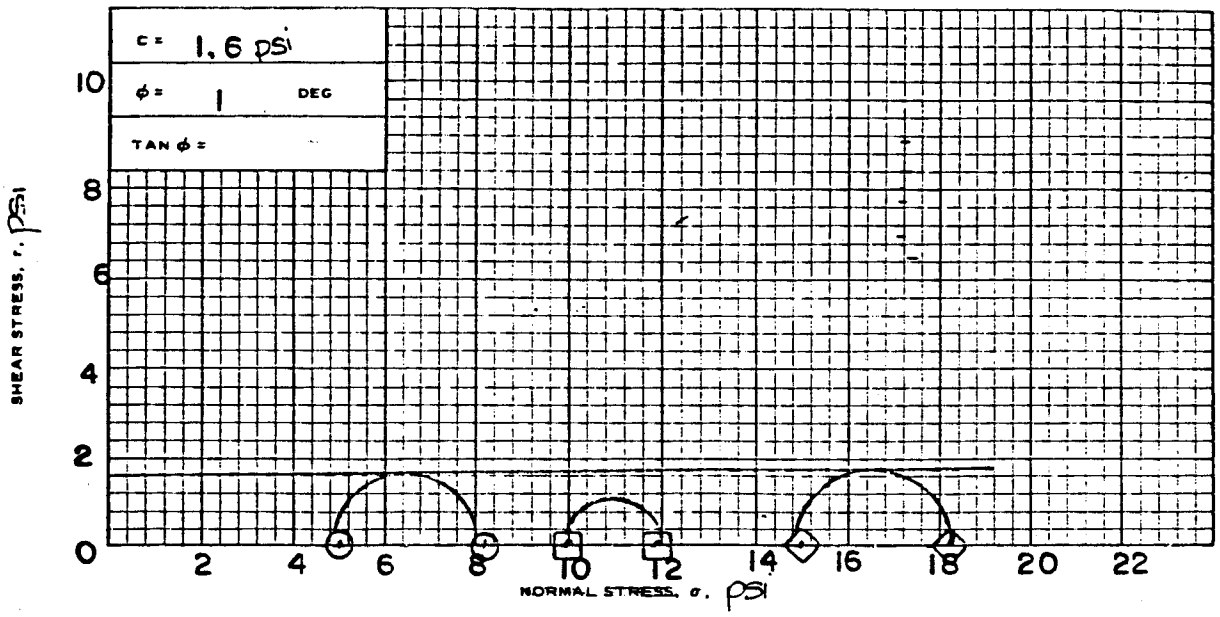
LABORATORY 83-1118 | DATE 9/26/83

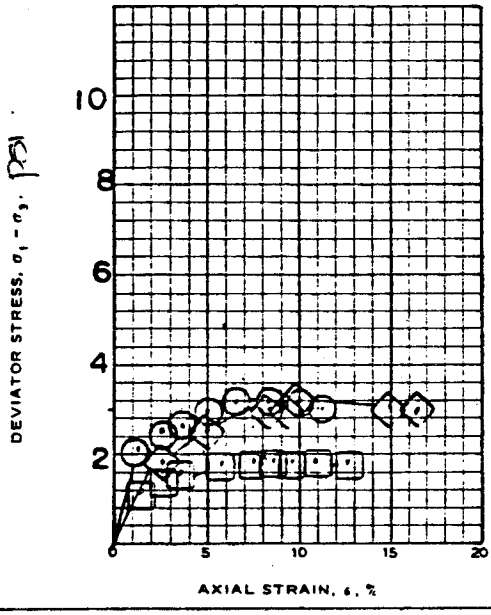
TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE

TRANSLUCENT

Norfolk Harbor Channel





SPECIMEN NO.			⊙	□	◇
INITIAL	WATER CONTENT, %	w_0	40.0	44.4	44.4
	DRY DENSITY LB/CU FT	γ_{d_0}	77.1	77.1	77.1
	SATURATION, %	S_0			
	VOID RATIO	e_0			
BEFORE SHEAR	WATER CONTENT, %	w_c			
	DRY DENSITY LB/CU FT	γ_{d_c}			
	SATURATION, %	S_c			
	VOID RATIO	e_c			
	FINAL BACK PRESSURE, T/SQ FT	u_b			
MINOR PRINCIPAL STRESS, PSI		σ_3	5	10	15
MAXIMUM DEVIATOR STRESS, PSI		$(\sigma_1 - \sigma_3)_{MAX}$	3.2	1.9	3.2
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f			
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$			
INITIAL DIAMETER, IN.		D_0	2.875	2.875	2.875
INITIAL HEIGHT, IN.		H_0	6.0	5.9375	6.0

CONTROLLED- TEST

DESCRIPTION OF SPECIMENS SILTY CLAY, SOME FINE SAND WITH SHELL FRAGMENTS - DARK GRAY (CL)

LL 28 | PL 21 | PI 7 | G_s 2.68

TYPE OF SPECIMEN 4" TUBE | TYPE OF TEST UU

REMARKS:

PROJECT HARBOR DEEPENING
NORFOLK, VIRGINIA

BORING NO. 30 | SAMPLE NO. 1

DEPTH/ELEV 3.0 — 5.0'

LABORATORY SCHNABEL | DATE 9.30.83

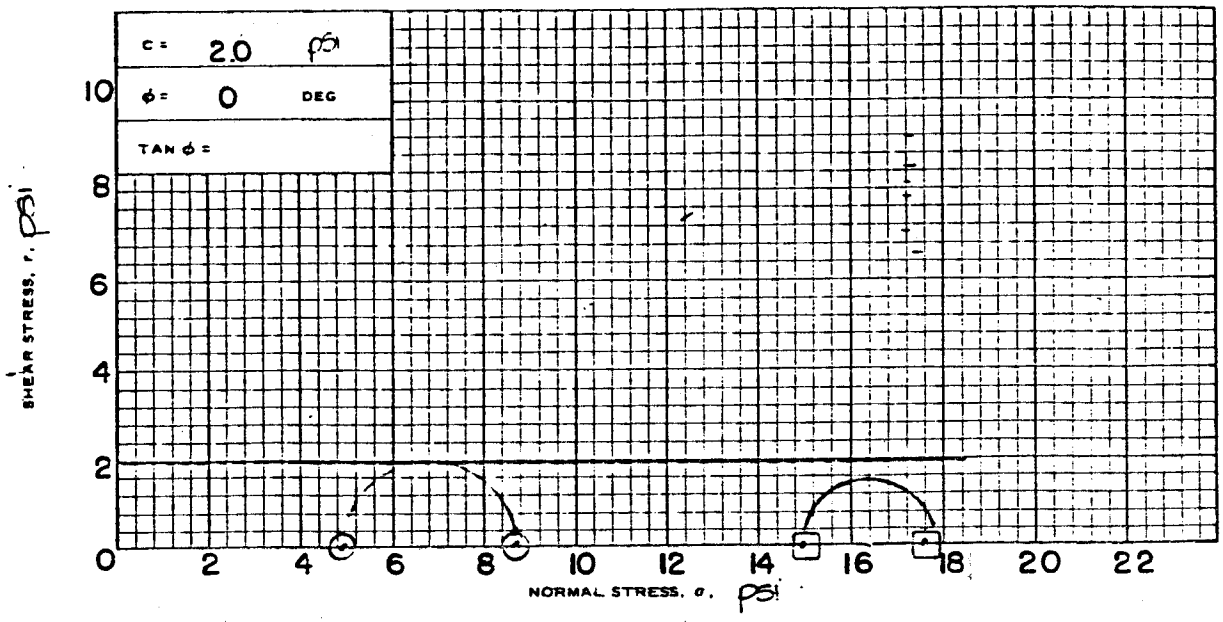
V83157

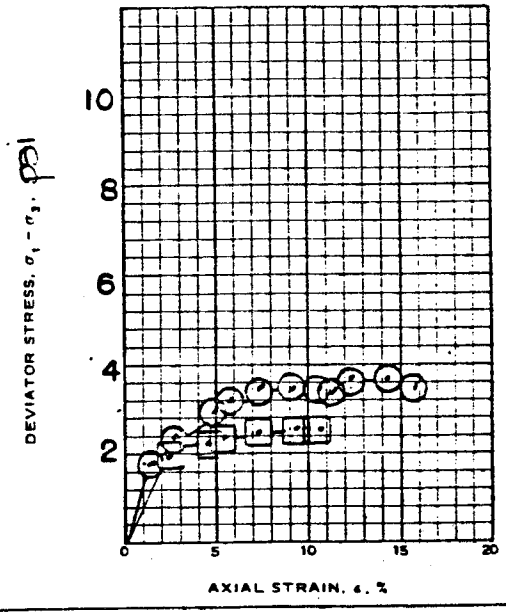
TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089
REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE

TRANSLUCENT

Norfolk Harbor Channel





SPECIMEN NO.			⊙	⊡		
INITIAL	WATER CONTENT, %	w_o	51.9	51.9		
	DRY DENSITY LB/CU FT	γ_{d_o}	69.9	69.9		
	SATURATION, %	S_o				
	VOID RATIO	e_o				
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_b				
MINOR PRINCIPAL STRESS, psi		σ_3	5	15		
MAXIMUM DEVIATOR STRESS, psi		$(\sigma_1 - \sigma_3)_{MAX}$	3.7	2.6		
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f				
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.		D_o	2.875	2.875		
INITIAL HEIGHT, IN.		H_o	6.0	5.5		

CONTROLLED- TEST

DESCRIPTION OF SPECIMENS SILTY CLAY, SOME FINE SAND WITH SHELL FRAGMENTS — DARK GRAY (CL)

LL 41 | PL 21 | PI 20 | G_s 2.72

TYPE OF SPECIMEN 3" TUBE | TYPE OF TEST UU

REMARKS: INSUFFICIENT MATERIAL FOR SAMPLE 3.

PROJECT HARBOR DEEPENING
NORFOLK, VIRGINIA

BORING NO. 33A | SAMPLE NO. 1

DEPTH/ELEV 23 — 40'

LABORATORY SCHNABEL | DATE 9-30-83

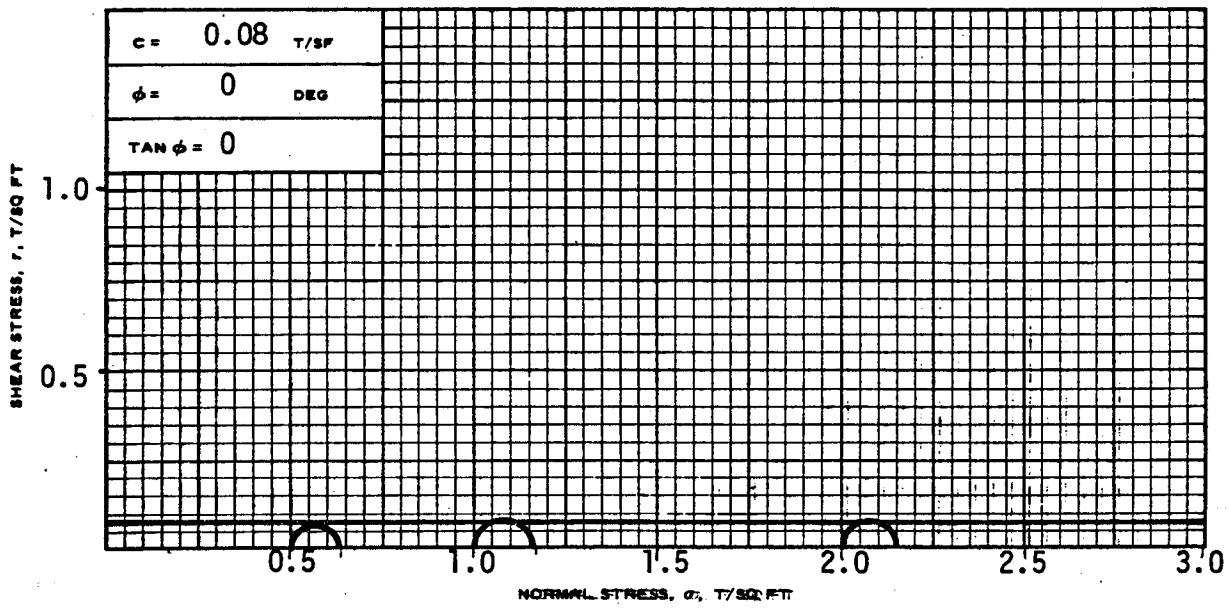
V83157

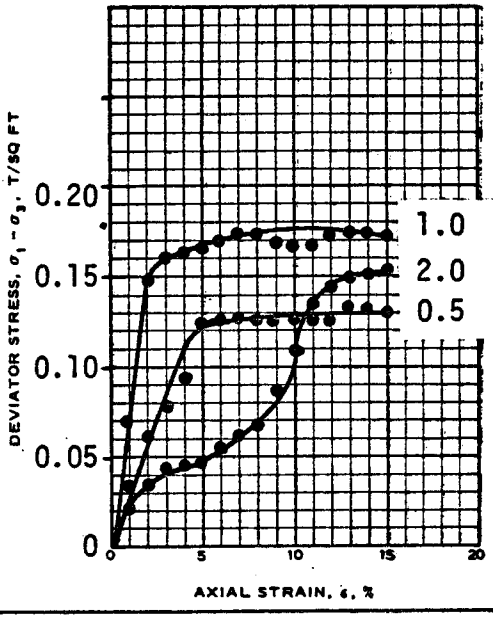
TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE

TRANSLUCENT

Norfolk Harbor Channel





SPECIMEN NO.			1	2	3
INITIAL	WATER CONTENT, %	w_o	87.0	87.0	95.5
	DRY DENSITY LB/CU FT	γd_o	50.5	51.0	48.0
	SATURATION, %	S_o	100+	100+	100+
	VOID RATIO	e_o	2.23	2.19	2.42
BEFORE SHEAR	WATER CONTENT, %	w_c			
	DRY DENSITY LB/CU FT	γd_c			
	SATURATION, %	S_c			
	VOID RATIO	e_c			
	FINAL BACK PRESSURE, T/SQ FT	u_o			
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.5	1.0	2.0
MAXIMUM DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{MAX}$		0.13	0.17	0.15
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	12:40	6:13	15:10
ULTIMATE DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{ULT}$		0.13	0.17	0.15
INITIAL DIAMETER, IN.		D_o	2.8	2.8	2.8
INITIAL HEIGHT, IN.		H_o	6.0	6.0	6.0

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Gray Clay - CH

LL 68.5 | PL | PI 45.5 | Gs 2.62

TYPE OF SPECIMEN Undisturbed | TYPE OF TEST UU

REMARKS:

PROJECT Norfolk Harbor and Channel Deepening

BORING NO. 70 | SAMPLE NO. 1

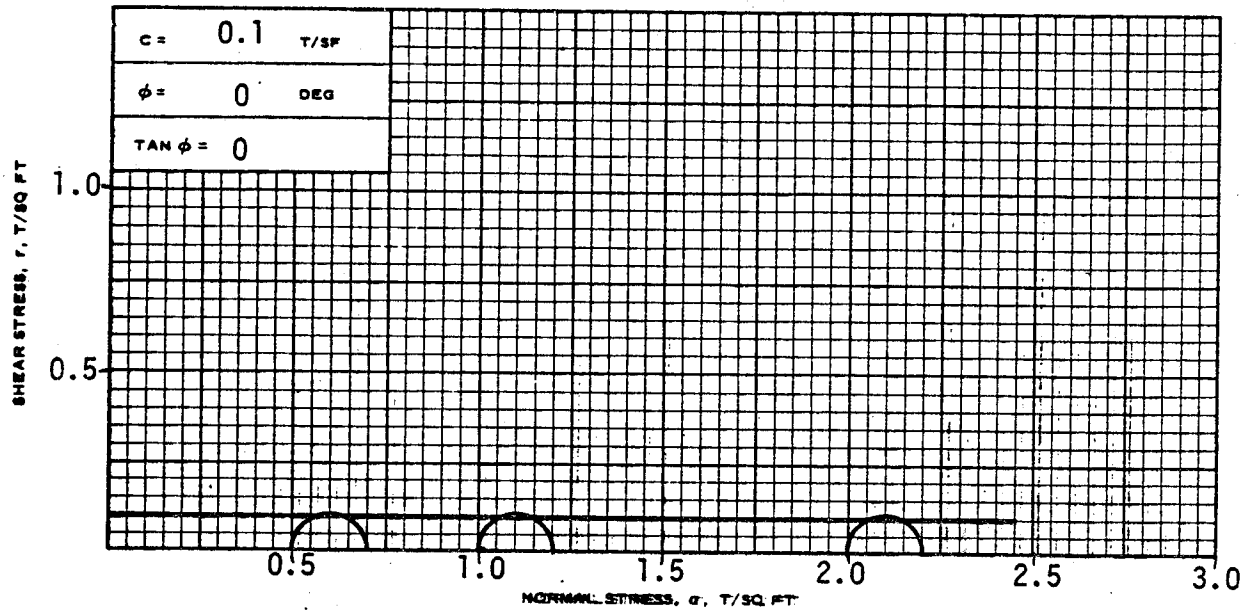
DEPTH/ELEV 3.5-5.5'

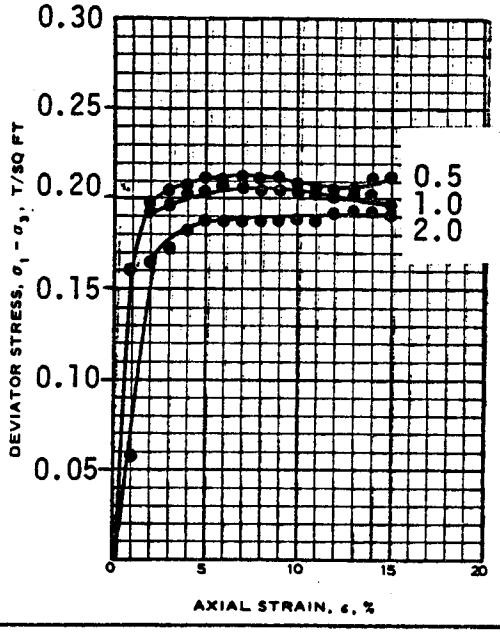
LABORATORY 83-1118 | DATE 9/26/83

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE

TRANSLUCENT Norfolk Harbor Channel





SPECIMEN NO.			1	2	3
INITIAL	WATER CONTENT, %	w_o	77.5	76.0	80.2
	DRY DENSITY LB/CU FT	γd_c	55.0	56.0	54.0
	SATURATION, %	S_o	100+	100+	100+
	VOID RATIO	e_o	1.98	1.94	2.05
BEFORE SHEAR	WATER CONTENT, %	w_c			
	DRY DENSITY LB/CU FT	γd_c			
	SATURATION, %	S_c			
	VOID RATIO	e_c			
	FINAL BACK PRESSURE, T/SQ FT	u_o			
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.5	1.0	2.0
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.21	0.21	0.19
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	14:55	5:53	12:44
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$	0.21	0.20	0.19
INITIAL DIAMETER, IN.		D_o	2.8	2.8	2.8
INITIAL HEIGHT, IN.		H_o	6.0	6.0	6.0

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Gray Clay

LL 68.5	PL 22.5	PI 46.0	Gs 2.63	TYPE OF SPECIMEN Undisturbed	TYPE OF TEST UU

REMARKS:

PROJECT Norfolk Harbor and Channel Deepening

BORING NO. 70 SAMPLE NO. 2

DEPTH/ELEV 8.5-10.6'

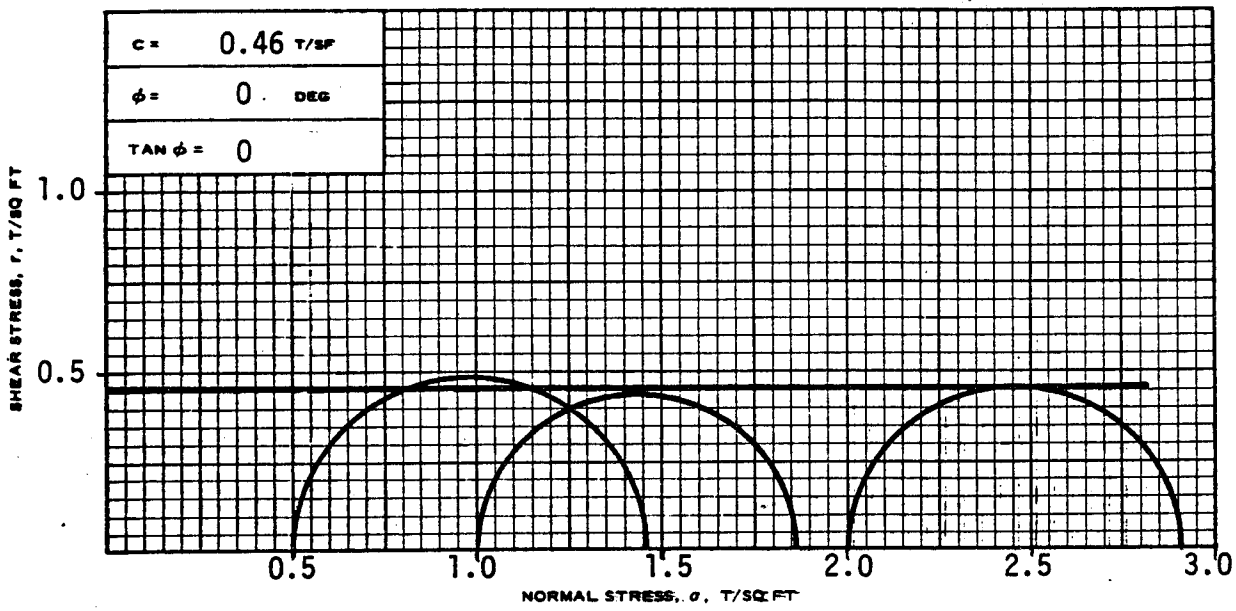
LABORATORY 83-1118 DATE 9/26/83

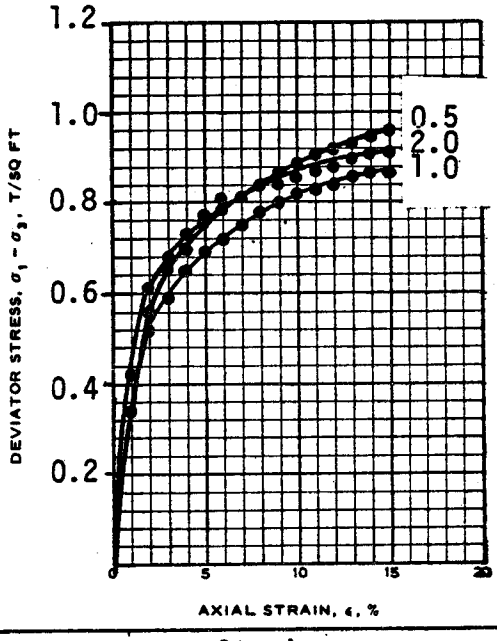
TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE

TRANSLUCENT

Norfolk Harbor Channel





CONTROLLED- Strain TEST

SPECIMEN NO.			1	2	3
INITIAL	WATER CONTENT, %	w_o	37.0	38.5	40.5
	DRY DENSITY LB/ CU FT	γd_o	86.5	83.5	79.5
	SATURATION, %	S_o	100+	100+	100+
	VOID RATIO	e_o	0.88	0.94	1.04
BEFORE SHEAR	WATER CONTENT, %	w_c			
	DRY DENSITY LB/CU FT	γd_c			
	SATURATION, %	S_c			
	VOID RATIO	e_c			
	FINAL BACK PRESSURE, T/SQ FT	u_b			
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.5	1.0	2.0
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.96	0.87	0.91
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	14:33	13:47	14:54
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$	0.96	0.87	0.91
INITIAL DIAMETER, IN.		D_o	2.8	2.8	2.8
INITIAL HEIGHT, IN.		H_o	6.0	6.0	6.0

DESCRIPTION OF SPECIMENS Gray clay - CH

LL 53.5	PL 21.0	PI 32.5	G_s 2.60

†TYPE OF SPECIMEN Undisturbed | TYPE OF TEST UU

REMARKS:

PROJECT Norfolk Harbor and Channel Deepening

BORING NO. 71 | SAMPLE NO. 1

DEPTH/ELEV 1.0-3.0'

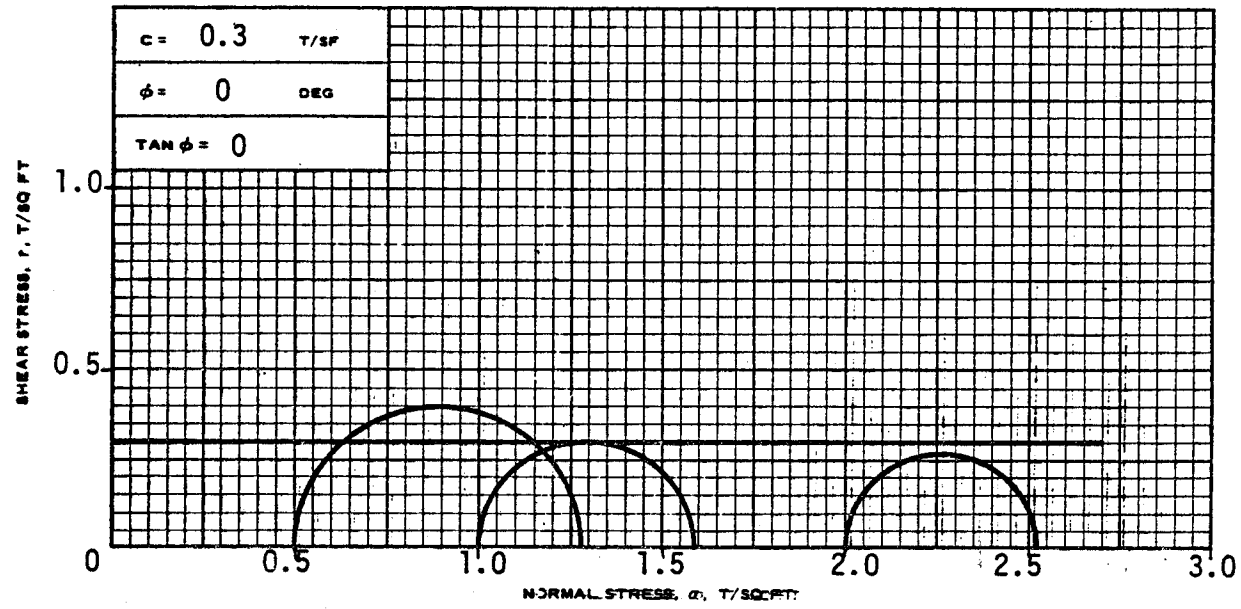
LABORATORY 83-1118 | DATE 9/26/83

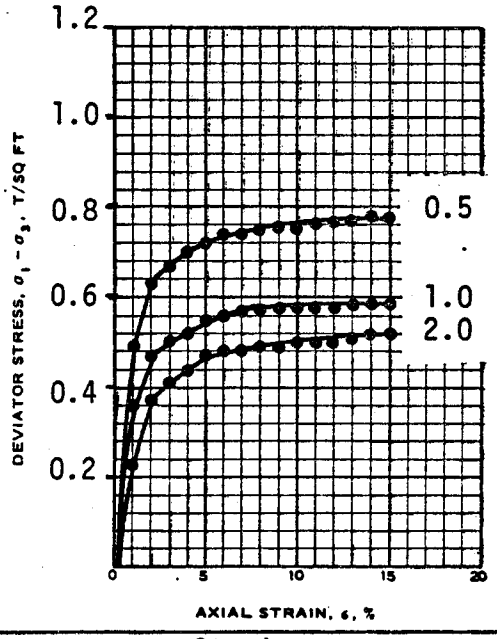
TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE

TRANSLUCENT

Norfolk Harbor Channel





SPECIMEN NO.			1	2	3
INITIAL	WATER CONTENT, %	w_o	53.0	55.0	55.5
	DRY DENSITY LB/ CU FT	γ_{d_o}	71.5	69.0	69.0
	SATURATION, %	S_o	100+	100+	100+
	VOID RATIO	e_o	1.24	1.32	1.33
BEFORE SHEAR	WATER CONTENT, %	w_c			
	DRY DENSITY LB/CU FT	γ_{d_c}			
	SATURATION, %	S_c			
	VOID RATIO	e_c			
	FINAL BACK PRESSURE, T/SQ FT	u_b			
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.5	1.0	2.0
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.78	0.59	0.52
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	14:02	12:49	13:58
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$	0.78	0.59	0.52
INITIAL DIAMETER, IN.		D_o	2.8	2.8	2.8
INITIAL HEIGHT, IN.		H_o	6.0	6.0	6.0

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Gray clay - CH

LL 60.0	PL 19.5	PI 40.5	Gs 2.57	TYPE OF SPECIMEN Undisturbed	TYPE OF TEST UU

REMARKS:

PROJECT Norfolk Harbor and Channel Deepening

BORING NO. 71 SAMPLE NO. 2

DEPTH/ELEV 6.4-8.5'

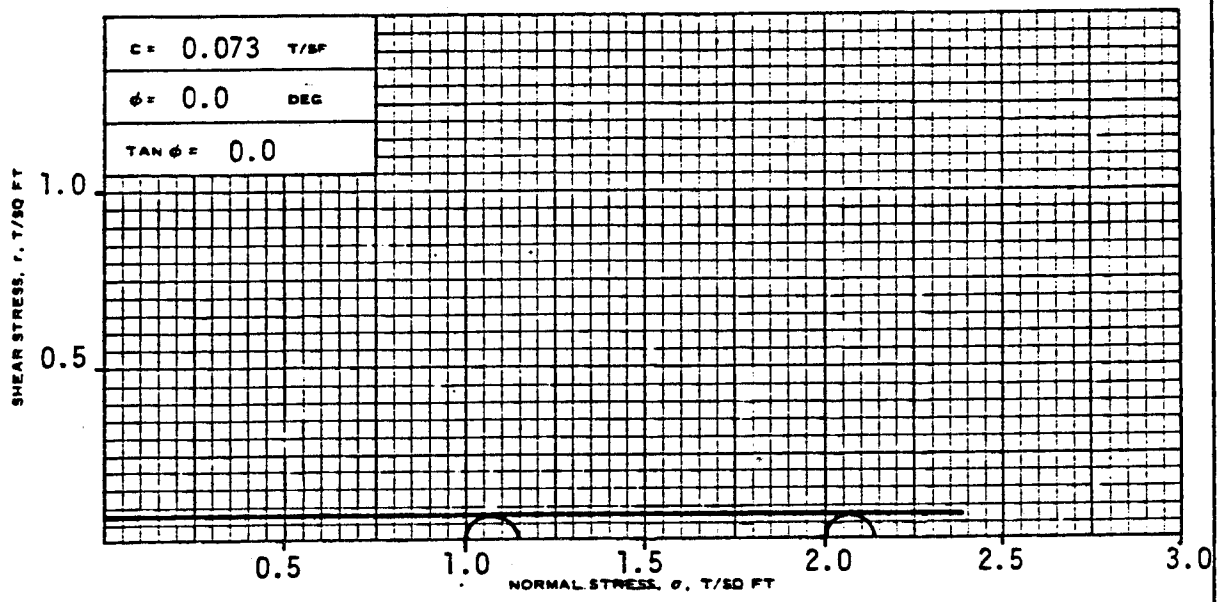
LABORATORY 83-1118 DATE 9/26/83

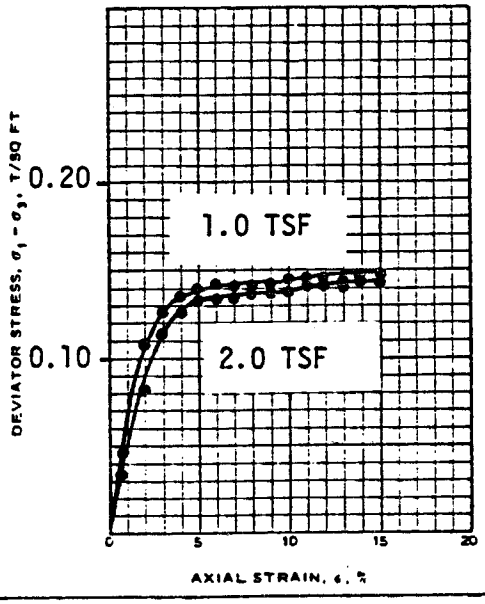
TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE

TRANSLUCENT

Norfolk Harbor Channel





SPECIMEN NO.						
INITIAL	WATER CONTENT, %	w_o	70.5	71.0		
	DRY DENSITY LB/CU FT	γ_{d_o}	58.5	59.0		
	SATURATION, %	S_o	100	100		
	VOID RATIO	e_o	1.87	1.84		
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_b	1.44	1.44		
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0		
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.148	0.144		
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	14.8	13.8		
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$	0.148	0.144		
INITIAL DIAMETER, IN.		D_o	2.8	2.8		
INITIAL HEIGHT, IN.		H_o	6.0	6.0		

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Gray CLAY - CH

LL 73.0 | PL 25.5 | PI 47.5 | G_s 2.69

REMARKS: Type of Failure - Bulge
Not enough sample to run a point
at 0.5 TSF.

TYPE OF SPECIMEN Undisturbed | TYPE OF TEST UU

PROJECT Norfolk Harbor & Channel Deepening

BORING NO. 129 | SAMPLE NO. 1

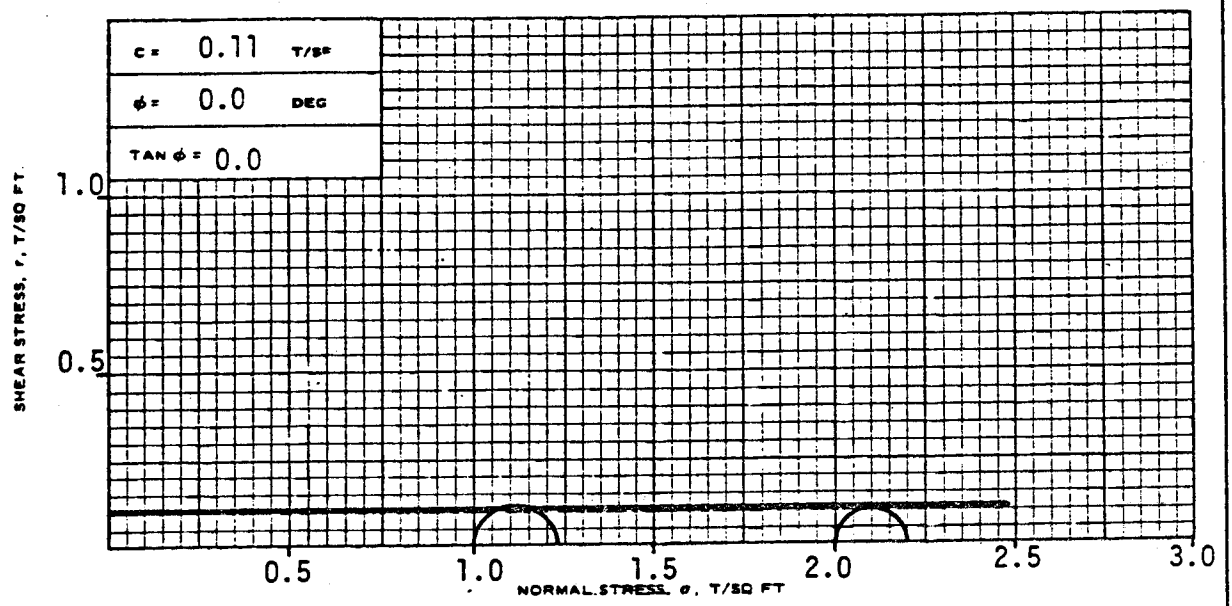
DEPTH/ELEV 3.0-4.5

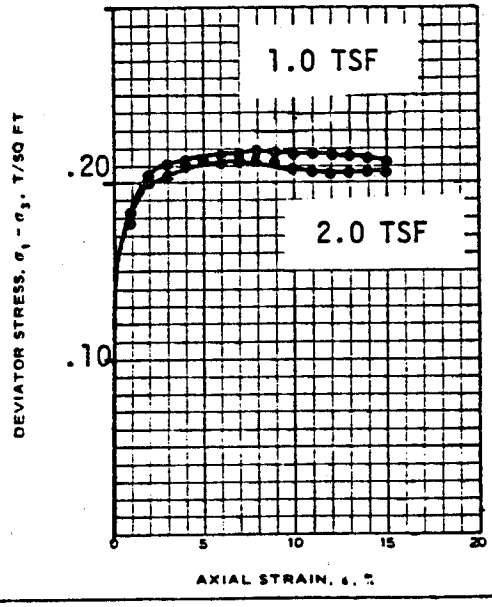
LABORATORY CEI | DATE 2/11/85

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE

TRANSLUCENT CEI 83-1118 Norfolk Harbor Channel





SPECIMEN NO.						
INITIAL	WATER CONTENT, %	w_o	64.0	69.0		
	DRY DENSITY LB/CU FT	γ_{d_o}	62.5	59.5		
	SATURATION, %	S_o	100	100		
	VOID RATIO	e_o	1.65	1.80		
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_b	1.44	1.44		
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0		
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.219	0.214		
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	6.5	6.3		
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$	0.211	0.208		
INITIAL DIAMETER, IN.		D_o	2.8	2.8		
INITIAL HEIGHT, IN.		H_o	6.0	6.0		

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Gray CLAY - CH

LL 78.0 | PL 28.0 | PI 50.0 | Gs 2.66

TYPE OF SPECIMEN Undisturbed | TYPE OF TEST UU

REMARKS: Type of failures: bulge
Not enough sample to run a point at 0.5 TSF

PROJECT Norfolk Harbor and Channels Deepening

BORING NO. 129 | SAMPLE NO. 2

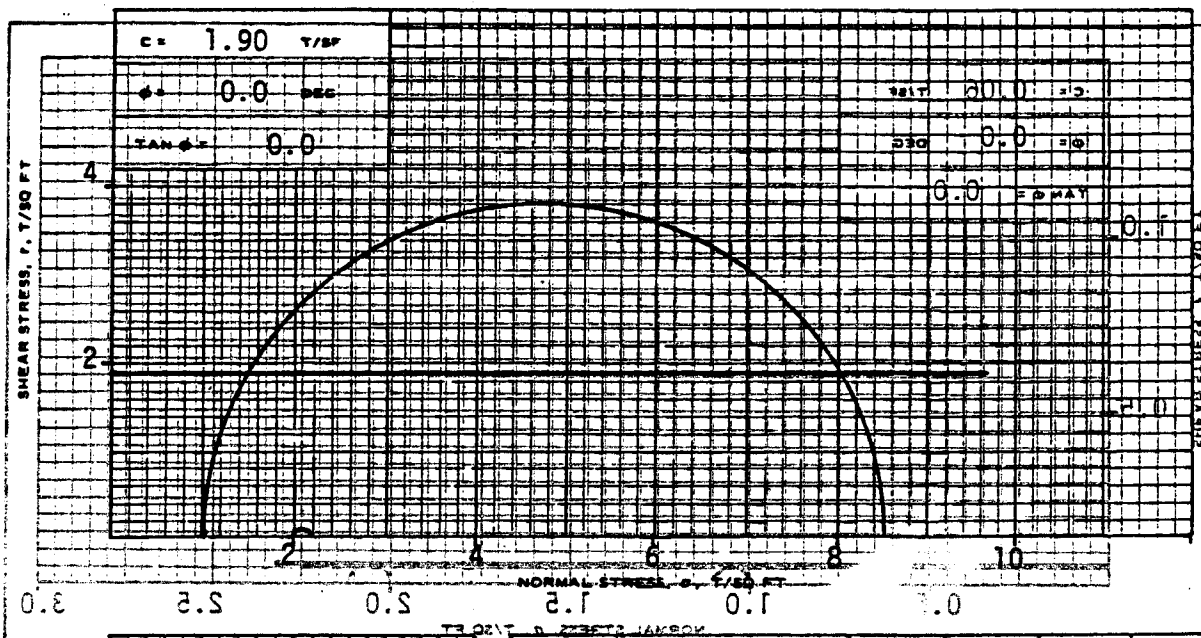
DEPTH/ELEV 10.0 - 11.5

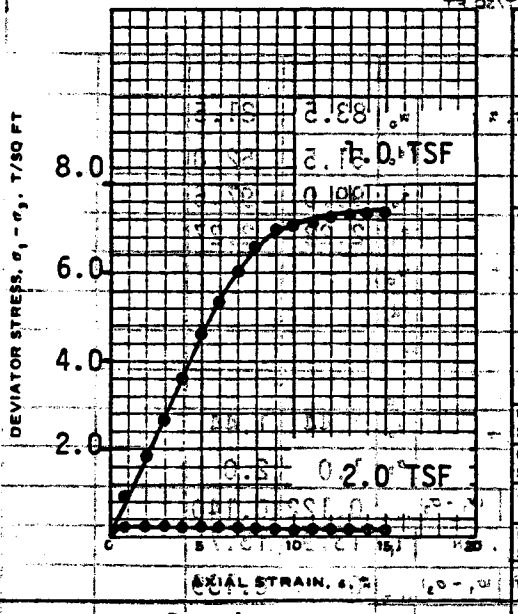
LABORATORY CEI | DATE 2/11/85

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE

TRANSLUCENT CEI 83-1118





SPECIMEN NO.				
INITIAL	WATER CONTENT, %	w_o	23.0	28.0
	DRY DENSITY LB/CU FT	γ_{d_o}	99.5	95.5
	SATURATION, %	S_o	90.0	97.5
	VOID RATIO	e_o	0.70	0.77
BEFORE SHEAR	WATER CONTENT, %	w_c		
	DRY DENSITY LB/CU FT	γ_{d_c}		
	SATURATION, %	S_c		
	VOID RATIO	e_c		
	FINAL BACK PRESSURE, T/SQ FT	u_f	1.44	1.44
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0
MAXIMUM DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{MAX}$		7.51	0.22
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	14.0	2.4
ULTIMATE DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{ULT}$		7.51	0.18
INITIAL DIAMETER, IN.		D_{o_i}	2.80	2.80
INITIAL HEIGHT, IN.		H_o	6.0	6.0

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Gray Silty SAND w SM

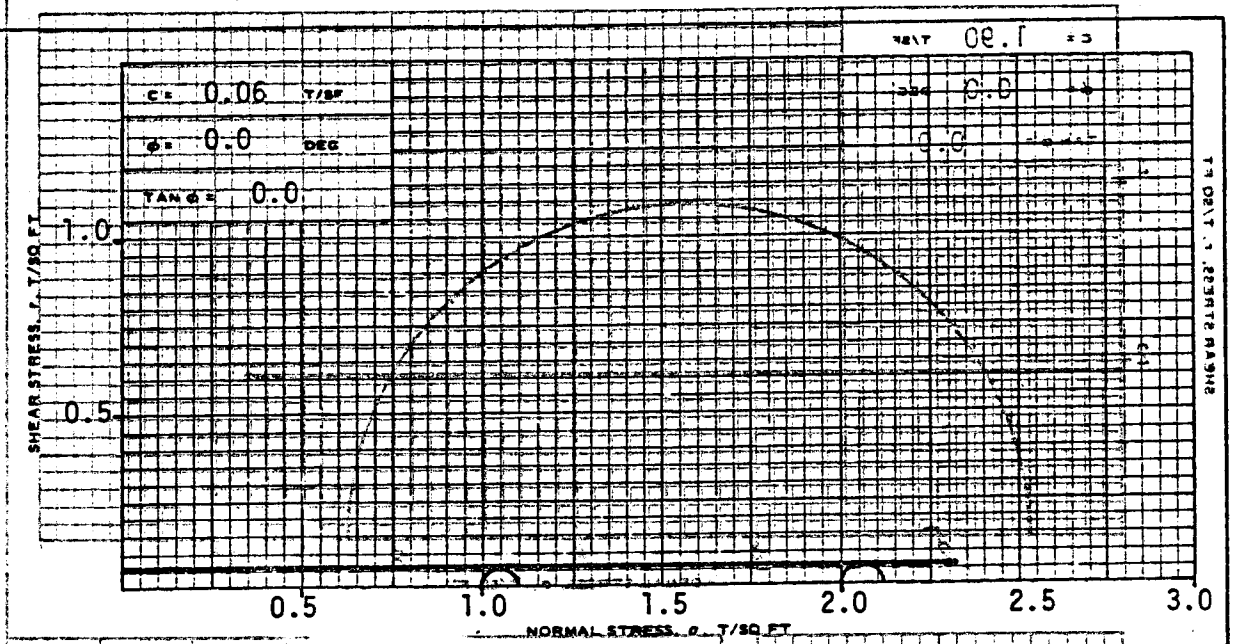
LL NP	PL NP	PI NP	G_s 2.71	TYPE OF SPECIMEN Undisturbed	TYPE OF TEST UU

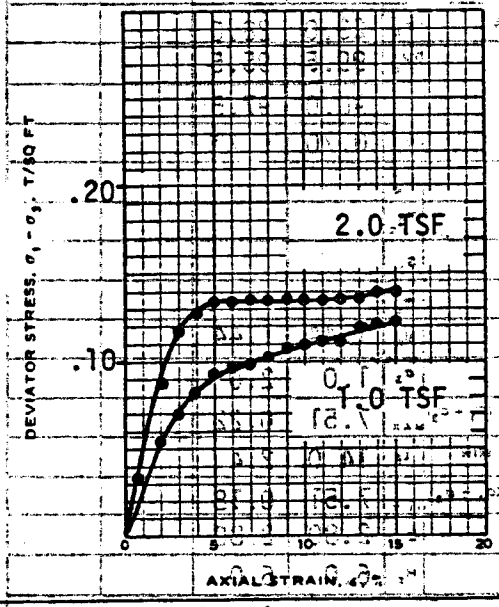
REMARKS: Type of Failure:
1.0 TSF Sample - Fracture
2.0 TSF Sample - Bulge
1.0 TSF Sample appeared to be denser & sandier than 2.0 TSF sample.

PROJECT Norfolk Harbor & Channels Deepening
BORING NO. 13
DEPTH/ELEV. 12.8-14.3
LABORATORY CEI DATE 2/13/85

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 PREVIOUS EDITION IS OBSOLETE TRIAXIAL TRANSLUCENT CEI 83-1118
REV JUNE 1970 Norfolk Harbor Channel





SPECIMEN NO.				
INITIAL	WATER CONTENT, %	w_o	83.5	81.5
	DRY DENSITY LB/CU FT	γ_{d_o}	51.5	52.0
	SATURATION, %	S_o	99.0	97.5
	VOID RATIO	e_o	2.28	2.27
BEFORE SHEAR	WATER CONTENT, %	w_c		
	DRY DENSITY LB/CU FT	γ_{d_c}		
	SATURATION, %	S_c		
	VOID RATIO	e_c		
	FINAL BACK PRESSURE, T/SQ FT	u_b	1.44	1.44
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0
MAXIMUM DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{MAX}$		0.122	0.140
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	13.9	13.7
ULTIMATE DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{ULT}$		0.122	0.139
INITIAL DIAMETER, IN.		D_o	2.80	2.80
INITIAL HEIGHT, IN.		H_o	6.0	6.0

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Gray CLAY - CH

LL 84.0 PL 26.5 PI 57.5 Gs 2.72 TYPE OF SPECIMEN Undisturbed TYPE OF TEST UU

REMARKS: Type of Failure: Bulge
-Insufficient sample for a third point to be run at 0.5 TSF.

PROJECT Norfolk Harbor & Channels Deepening

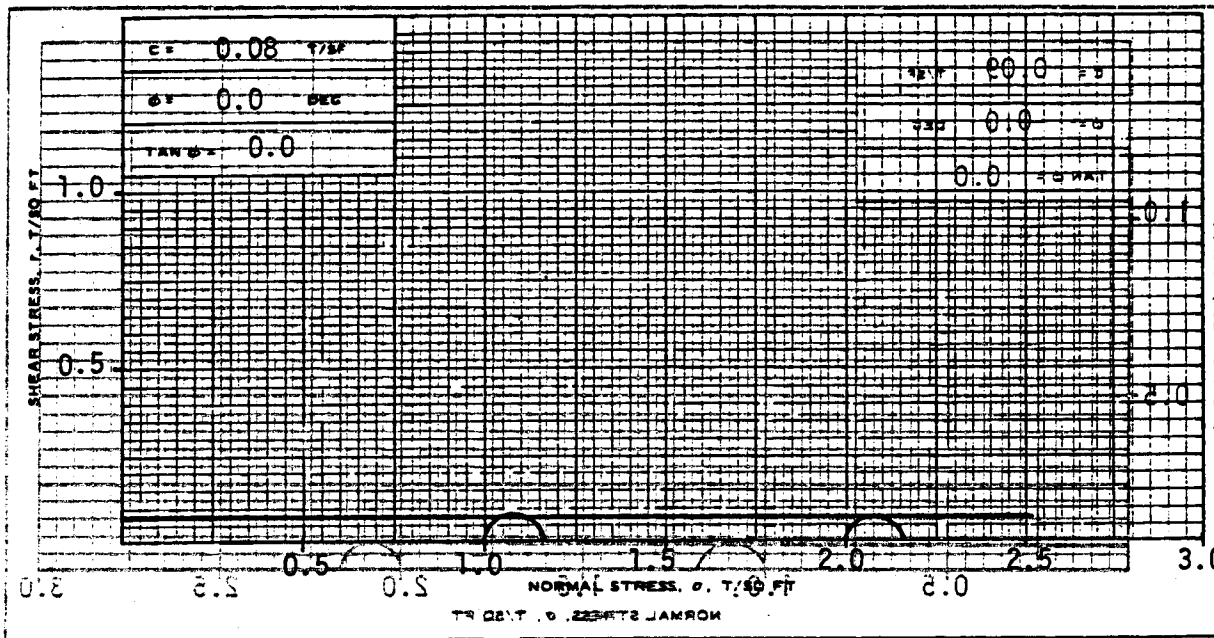
BORING NO. 132 SAMPLE NO. 2

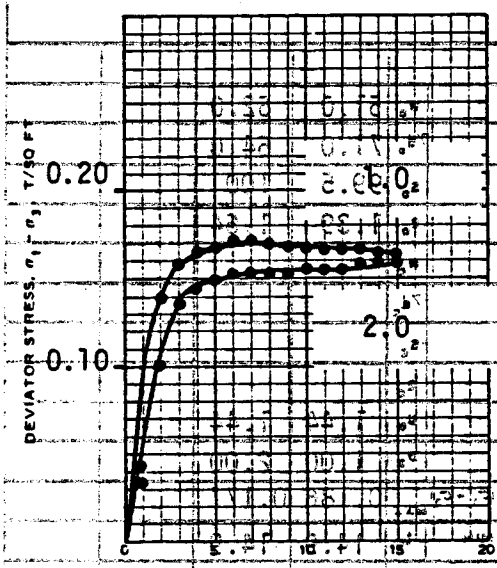
DEPTH/ELEV 8.2-9.7

LABORATORY CEI DATE 2/13/85

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT CEI 83-1118





SPECIMEN NO.				
INITIAL	WATER CONTENT, %	w_o	72.0	73.5
	DRY DENSITY, LB/CU FT	γ_{d_o}	58.0	57.0
	SATURATION, %	S_o	100	100
	VOID RATIO	e_o	1.91	1.96
BEFORE SHEAR	WATER CONTENT, %	w_c		
	DRY DENSITY, LB/CU FT	γ_{d_c}		
	SATURATION, %	S_c		
	VOID RATIO	e_c		
	FINAL BACK PRESSURE, T/SQ FT	u_b	1.44	1.44
	MINOR PRINCIPAL STRESS, T/SQ FT	σ_3	1.0	2.0
	MAXIMUM DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{max}$	0.171	0.160
	TIME TO $(\sigma_1 - \sigma_3)_{max}$, MIN	t_f	6.0	14.0
	ULTIMATE DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{ult}$	0.165	0.160
	INITIAL DIAMETER, IN	D_o	2.8	2.8
	INITIAL HEIGHT, IN	H_o	6.0	6.0

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Gray CLAY - CH

LL 74.0	PL 26.5	PI 47.5	Gs 2.70	TYPE OF SPECIMEN Undisturbed	TYPE OF TEST UU

REMARKS: Type of Failure: Bulge
-Insufficient sample for additional point to be run at 0.5 TSF.

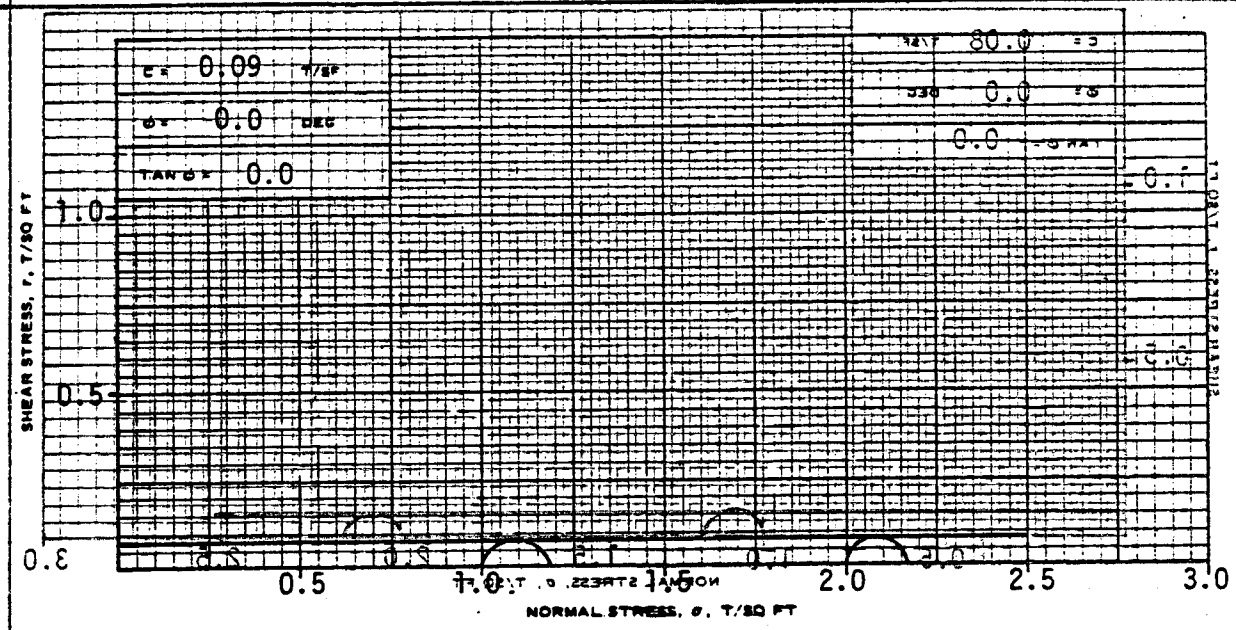
PROJECT Norfolk Harbor & Channels Deepening

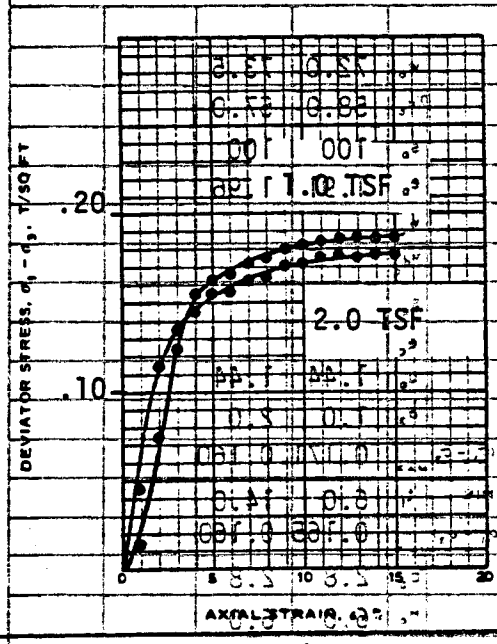
BORING NO.	132
SAMPLE NO.	2
DEPTH, FEET	18.1 - 19.4
ELEVATION	10.5-12.0
LABORATORY	CEI
DATE	2/13/85

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITIONS OBSOLETE TRANSLUCENT

CEI 83-1118
Norfolk Harbor Channel





SPECIMEN NO.				1	2
INITIAL	WATER CONTENT, %		w_o	51.0	62.0
	DRY DENSITY LB/CU FT		γ_{d_o}	71.0	64.0
	SATURATION, %		S_o	99.5	100
	VOID RATIO		e_o	1.39	1.64
BEFORE SHEAR	WATER CONTENT, %		w_c		
	DRY DENSITY LB/CU FT		γ_{d_c}		
	SATURATION, %		S_c		
	VOID RATIO		e_c		
	FINAL BACK PRESSURE, T/SQ FT		u_b	1.44	1.44
	MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.00	2.00
	MAXIMUM DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{MAX}$		0.186	0.177
	TIME TO $(\sigma_1 - \sigma_3)_{MAX}$	MIN.	t_f	14.9	14.9
	ULTIMATE DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{ULT}$		0.186	0.177
	INITIAL DIAMETER, IN.		D_o	2.80	2.80
	INITIAL HEIGHT, IN.		H_o	6.00	6.00

CONTROLLED: Strain TEST

DESCRIPTION OF SPECIMENS: Gray CLAY - CH

TYPE OF SPECIMEN: Undisturbed TYPE OF TEST: UU

REMARKS: Type of Failure: Bulge
Insufficient Sample to run a point at 0.5 TSF.

PROJECT: Norfolk Harbor & Channels Deepening

BORING NO.: 133A SAMPLE NO.: 2

DEPTH/ELEV.: 10.5-12.0

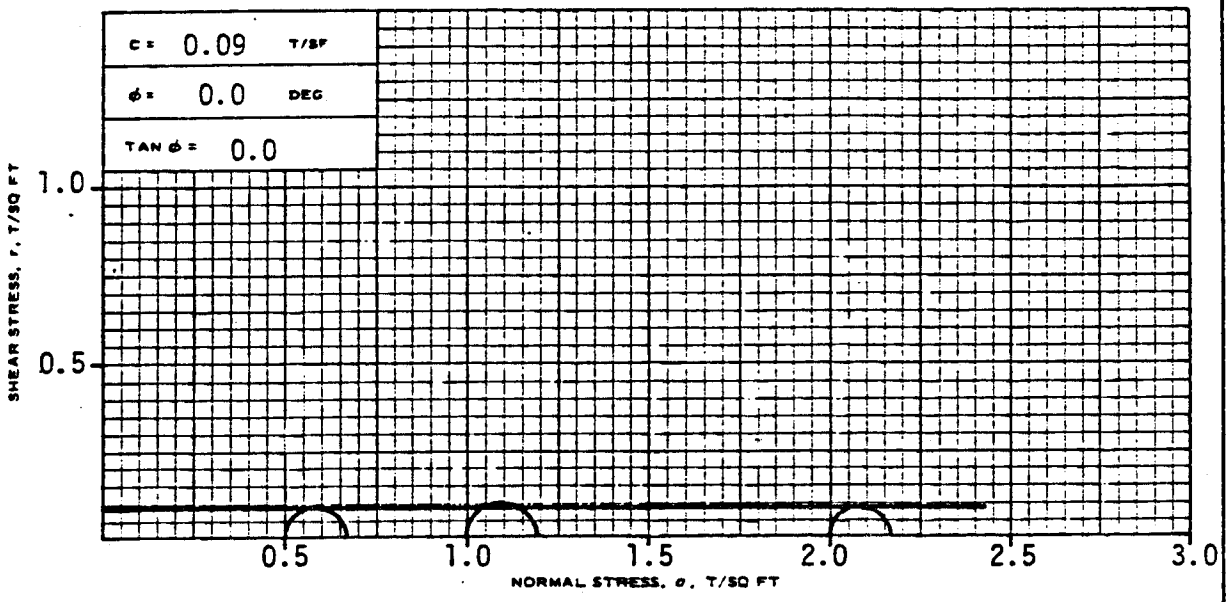
LABORATORY: CEI DATE: 2/13/85

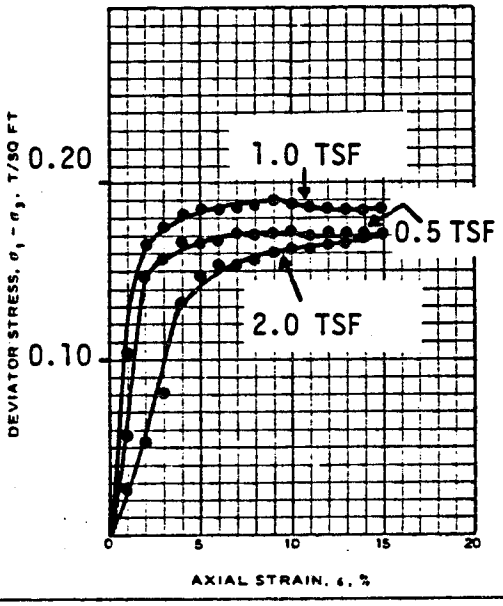
TRIAXIAL COMPRESSION TEST REPORT

TRANSLUCENT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE

Norfolk Harbor Channel
CEI 83-1118





SPECIMEN NO.						
INITIAL	WATER CONTENT, %	w_o	74.0	71.0	74.5	
	DRY DENSITY LB/CU FT	γ_{d_o}	55.0	57.5	52.0	
	SATURATION, %	S_o	96.5	98.5	89.5	
	VOID RATIO	e_o	2.10	1.97	2.28	
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o	1.44	1.44	1.44	
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.5	1.0	2.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.172	0.190	0.172	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	6.90	8.6	15.1	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$	0.172	0.185	0.172	
INITIAL DIAMETER, IN.		D_o	2.80	2.80	2.80	
INITIAL HEIGHT, IN.		H_o	6.0	6.0	6.0	

CONTROLLED- Strain TEST

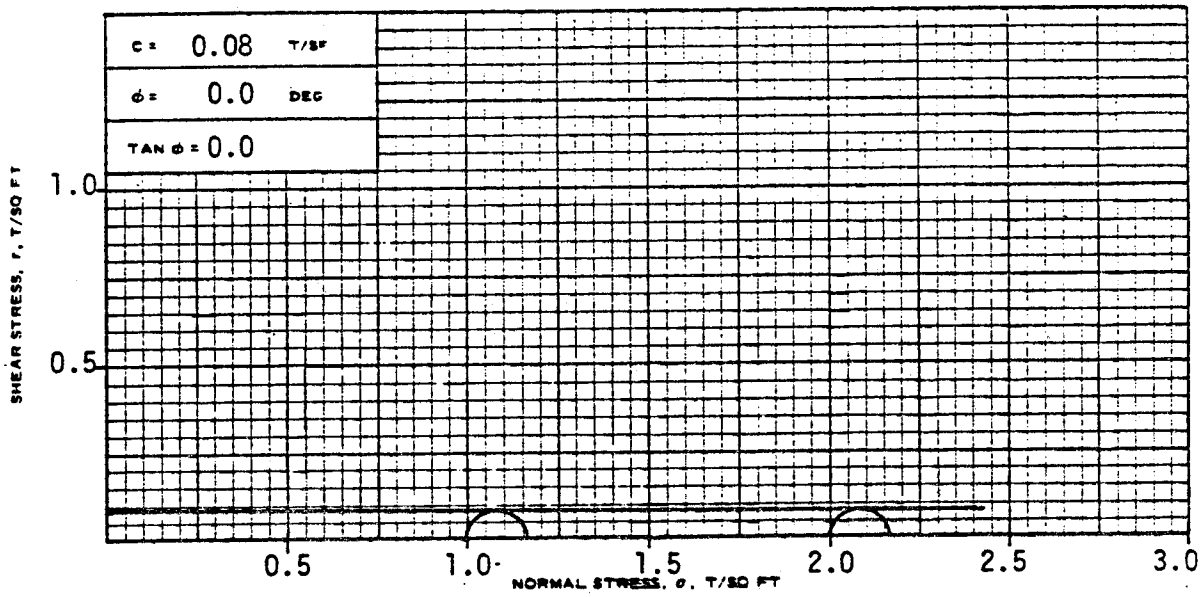
DESCRIPTION OF SPECIMENS Gray CLAY - CH

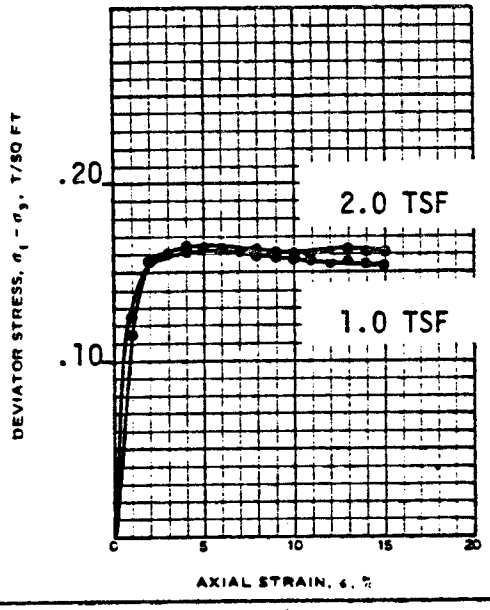
LL 76.0	PL 25.0	PI 51.0	Gs 2.74	TYPE OF SPECIMEN Undisturbed	TYPE OF TEST UU
REMARKS: Type of Failure: Bulge				PROJECT Norfolk Harbor & Channels Deepening	
				BORING NO. 133	SAMPLE NO. 2
				DEPTH/ELEV 12.2-13.7	
				LABORATORY CEI	DATE 2/13/85
				TRIAXIAL COMPRESSION TEST REPORT	

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT

CEI 83-1118

Norfolk Harbor Channel





SPECIMEN NO.						
INITIAL	WATER CONTENT, %	w_o	77.5	82.0		
	DRY DENSITY LB/CU FT	γ_{d_o}	55.5	54.0		
	SATURATION, %	S_o	100	100		
	VOID RATIO	e_o	2.09	2.19		
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_b	1.44	1.44		
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.00	2.00		
MAXIMUM DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{MAX}$		0.164	0.165		
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	4.8	4.6		
ULTIMATE DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{ULT}$		0.154	0.161		
INITIAL DIAMETER, IN.		D_o	2.80	2.80		
INITIAL HEIGHT, IN.		H_o	6.0	6.0		

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Gray CLAY - CH

LL 88.0	PL 27.5	PI 60.5	Gs 2.75	TYPE OF SPECIMEN Undisturbed	TYPE OF TEST UU

REMARKS: Type of Failure : Bulge
-Insufficient sample for a point
to be run at 0.5 TSF

PROJECT Norfolk Harbor & Channels Deepening

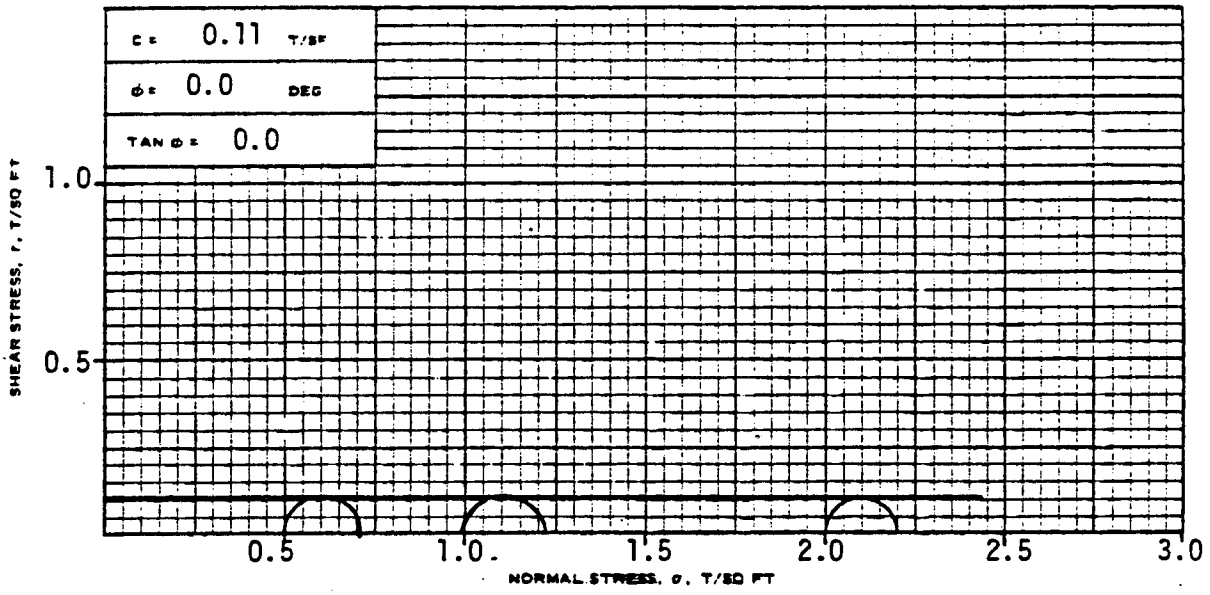
BORING NO. 135 SAMPLE NO. 2

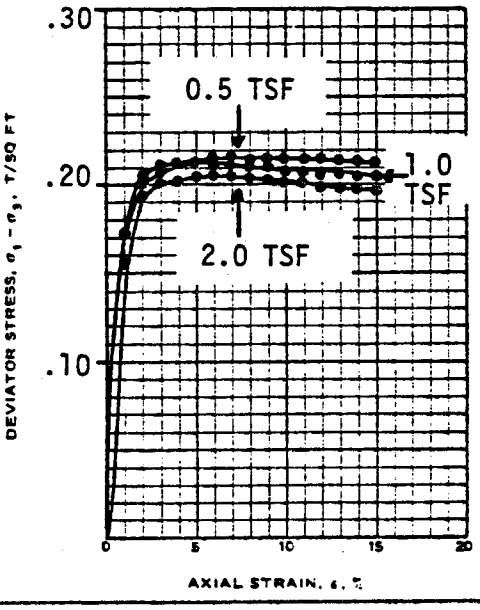
DEPTH/ELEV 7.7 - 9.0

LABORATORY CEI DATE 2/13/85

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT CEI 83-1118





SPECIMEN NO.						
INITIAL	WATER CONTENT, %	w_o	82.5	84.5	81.5	
	DRY DENSITY LB/CU FT	γ_{d_o}	52.5	52.0	51.5	
	SATURATION, %	S_o	100	100	96.0	
	VOID RATIO	e_o	2.24	2.28	2.33	
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_b	1.44	1.44	1.44	
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.5	1.0	2.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.218	0.212	0.207	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	5.2	4.0	5.3	
ULTIMATE DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{ULT}$		0.237	0.205	0.197	
INITIAL DIAMETER, IN.		D_o	2.80	2.80	2.80	
INITIAL HEIGHT, IN.		H_o	6.0	6.0	6.0	

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Gray CLAY - CH

LL	PL	PI	G_s	TYPE OF SPECIMEN	TYPE OF TEST
85.5	28.5	57.0	2.74	Undisturbed	UU

REMARKS: Type of Failure: Bulge

PROJECT Norfolk Harbor & Channels Deepening

BORING NO. 136 SAMPLE NO. 2

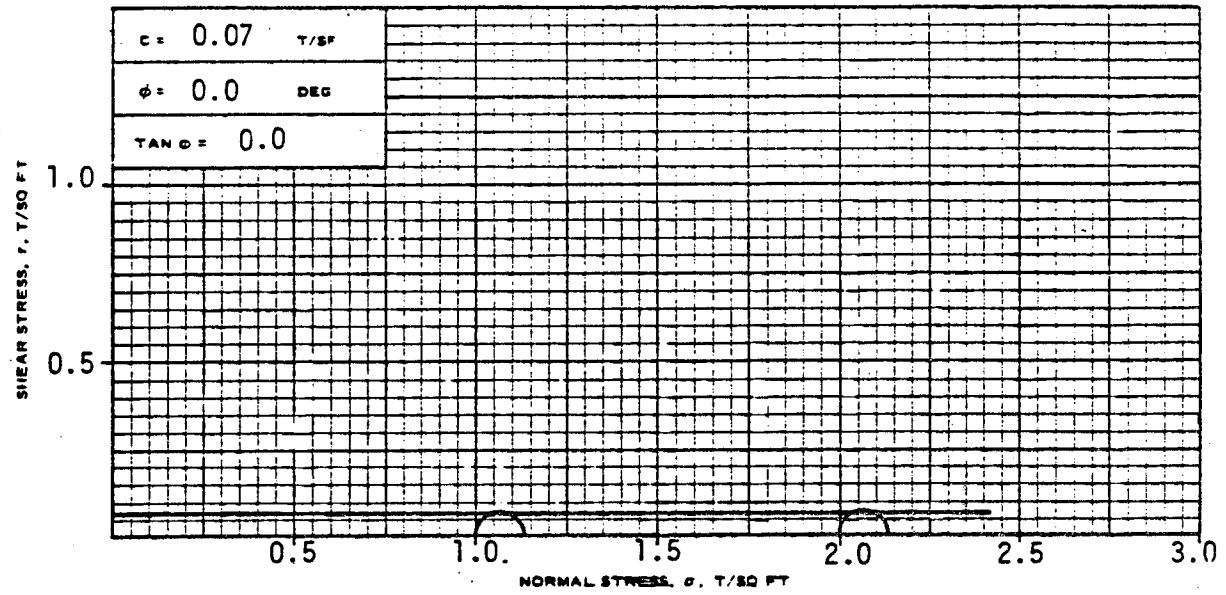
DEPTH/ELEV 7.2 - 8.7

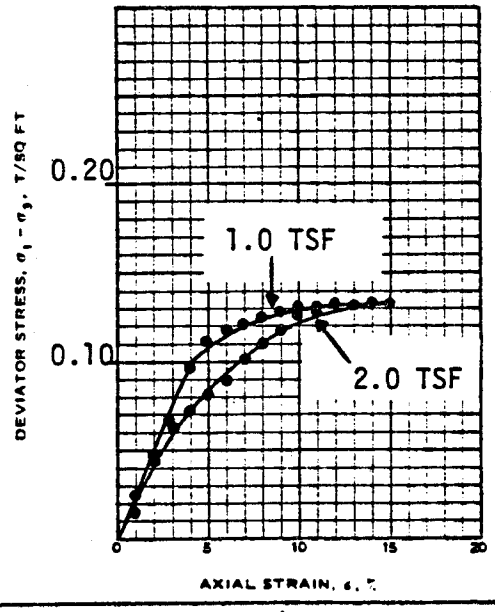
LABORATORY CEI DATE 2/15/85

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT CEI 83-1118

Norfolk Harbor Channel





SPECIMEN NO.						
INITIAL	WATER CONTENT, %	w_o	94.5	112.0		
	DRY DENSITY LB/CU FT	γ_{d_o}	44.5	41.5		
	SATURATION, %	S_o	93.0	99.0		
	VOID RATIO	e_o	2.71	3.01		
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o	1.44	1.44		
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0		
MAXIMUM DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{MAX}$		0.136	0.137		
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	14.9	14.8		
ULTIMATE DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{ULT}$		0.136	0.137		
INITIAL DIAMETER, IN.		D_o	2.8	2.8		
INITIAL HEIGHT, IN.		H_o	6.0	6.0		

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Gray CLAY - CH

LL 104.5	PL 37.5	PI 67.0	G_s 2.66

TYPE OF SPECIMEN Undisturbed TYPE OF TEST UU

REMARKS: Type of Failure: Bulge
-Insufficient sample to run a point at 0.5 TSF.

PROJECT Norfolk Harbor & Channels Deepening

BORING NO. 138 SAMPLE NO. 1

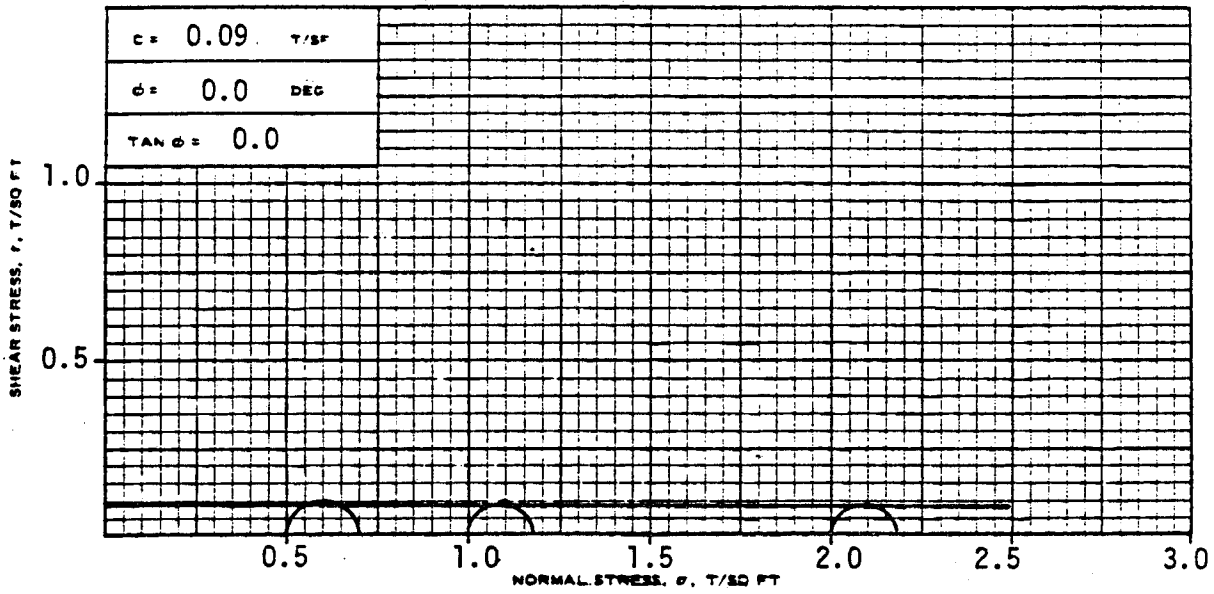
DEPTH/ELEV 2.5 - 4.0

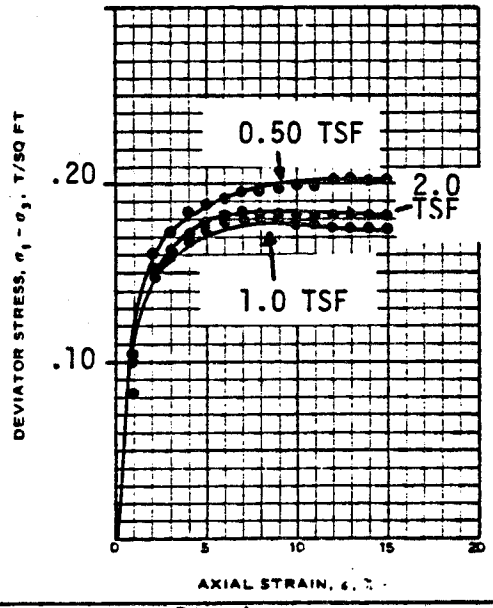
LABORATORY CEI DATE 2/15/85

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT

CEI 83-1118 Norfolk Harbor Channel





SPECIMEN NO.						
INITIAL	WATER CONTENT, %	w_o	34.5	39.0	39.5	
	DRY DENSITY LB/CU FT	γ_{d_o}	88.5	82.0	80.0	
	SATURATION, %	S_o	100	100	98.0	
	VOID RATIO	e_o	0.88	1.03	1.08	
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o	1.44	1.44	1.44	
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.5	1.0	2.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.202	0.182	0.183	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	11.70	6.48	6.42	
ULTIMATE DEVIATOR STRESS T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$	0.202	0.177	0.181	
INITIAL DIAMETER, IN.		D_o	2.80	2.80	2.80	
INITIAL HEIGHT, IN.		H_o	6.0	6.0	6.0	

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Gray Silty CLAY - CL

LL 45.0 | PL 22.0 | PI 23.0 | Gs 2.66

TYPE OF SPECIMEN Undisturbed | TYPE OF TEST UU

REMARKS: Type of Failure: Bulge

PROJECT Norfolk Harbor & Channels Deepening

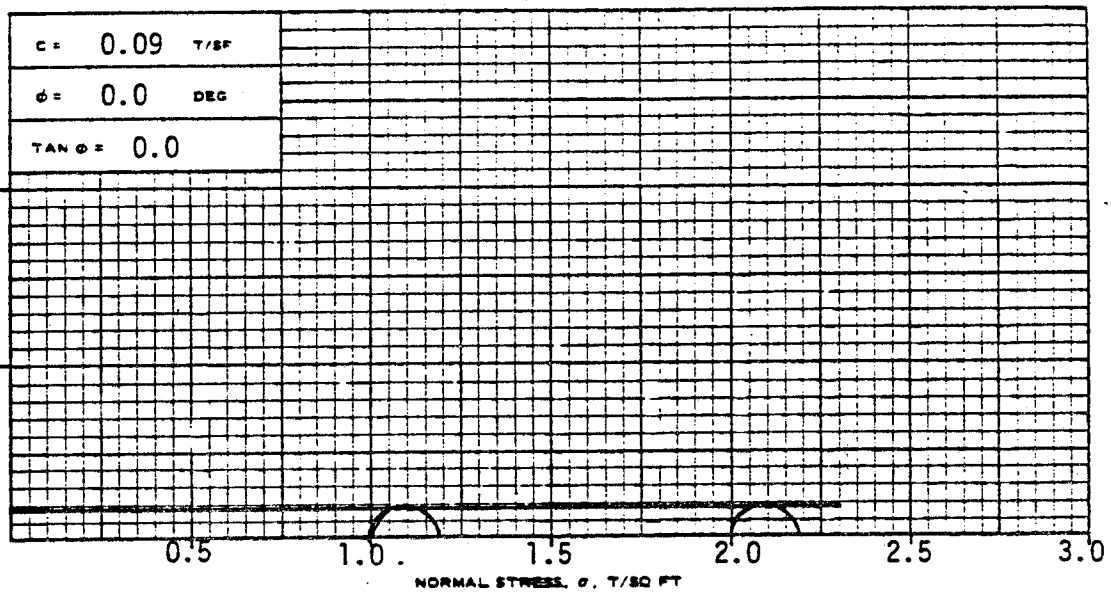
BORING NO. 138A | SAMPLE NO. 2

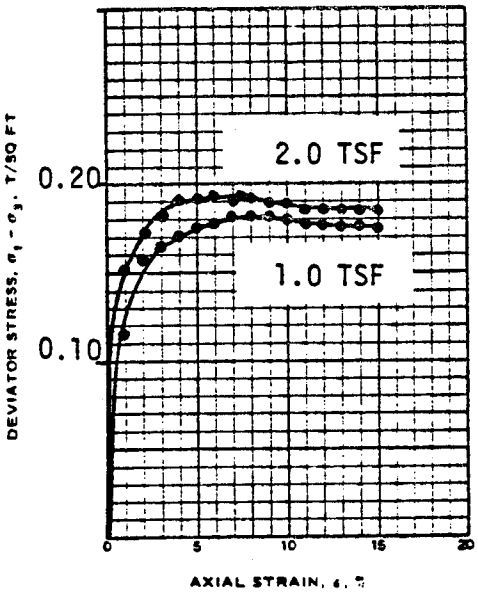
DEPTH/ELEV 21.0 - 23.3

LABORATORY CEI | DATE 2/15/85

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT CEI 83-1118





SPECIMEN NO.						
INITIAL	WATER CONTENT, %	w_o	80.5	83.0		
	DRY DENSITY LB/CU FT	γ_{d_o}	53.5	52.0		
	SATURATION, %	S_o	100	99.0		
	VOID RATIO	e_o	2.21	2.29		
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_b	1.44	1.44		
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0		
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.193	0.182		
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	7.1	7.3		
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$	0.185	0.175		
INITIAL DIAMETER, IN.		D_o	2.8	2.8		
INITIAL HEIGHT, IN.		H_o	6.0	6.0		

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Gray CLAY - CH

LL 89.5 | PL 28.5 | PI 61.0 | Gs 2.74

TYPE OF SPECIMEN Undisturbed | TYPE OF TEST UU

REMARKS: Type of Failure: Bulge

PROJECT Norfolk Harbor & Channels Deepening

BORING NO. 140 | SAMPLE NO. 2

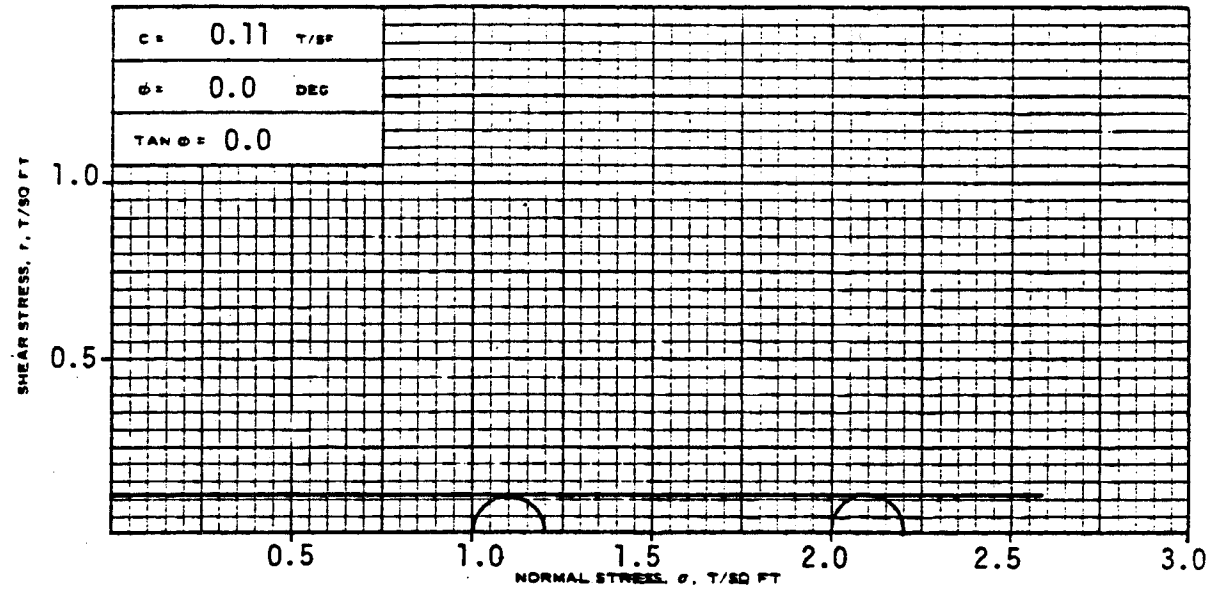
DEPTH/ELEV 10.1 - 11.6

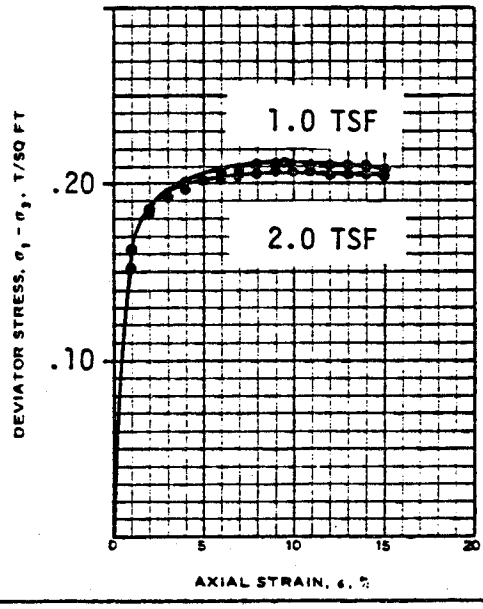
LABORATORY CEI | DATE 2/18/85

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT

Norfolk Harbor Channel
CEI 83-1118





SPECIMEN NO.						
INITIAL	WATER CONTENT, %	w_o	73.0	75.5		
	DRY DENSITY LB/CU FT	γ_{d_o}	56.5	55.5		
	SATURATION, %	S_o	99.5	100.0		
	VOID RATIO	e_o	1.98	2.03		
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_b	1.44	1.44		
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0		
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.212	0.208		
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	9.2	10.2		
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$	0.209	0.203		
INITIAL DIAMETER, IN.		D_o	2.80	2.80		
INITIAL HEIGHT, IN.		H_o	6.0	6.0		

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Gray CLAY - CH

LL 96.0	PL 33.5	PI 62.5	Gs 2.69	TYPE OF SPECIMEN Undisturbed	TYPE OF TEST UU

REMARKS: Type of Failure: Bulge

PROJECT Norfolk Harbor & Channels Deepening
Norfolk Harbor Channel

BORING NO. 142 SAMPLE NO. 2

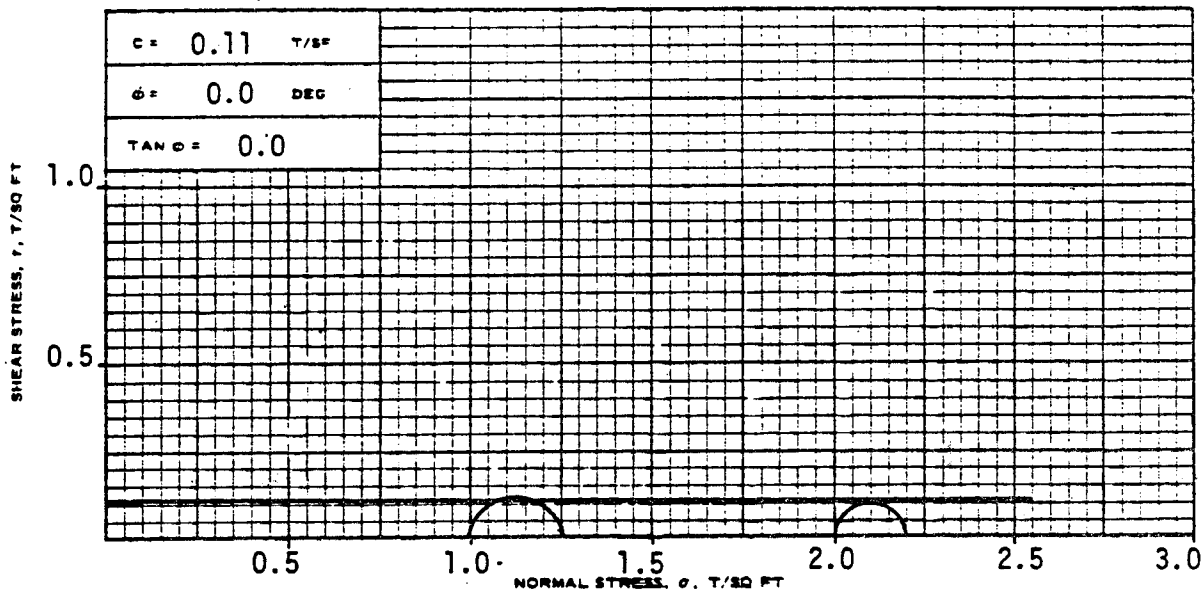
DEPTH/ELEV 13.6 - 15.1

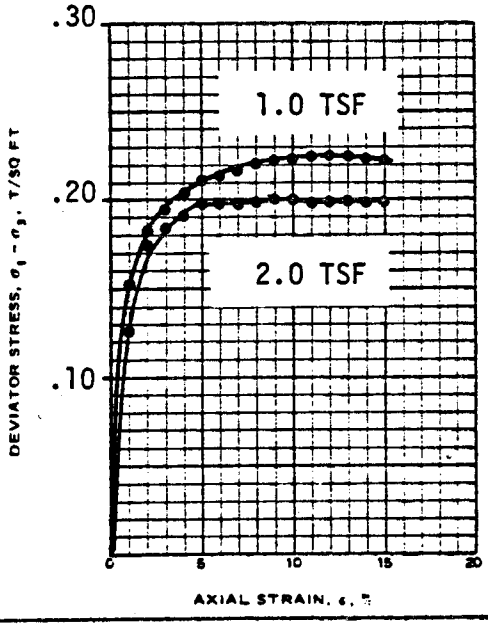
LABORATORY CEI DATE 2/18/85

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT

CEI 83-1118





SPECIMEN NO.						
INITIAL	WATER CONTENT, %	w_o	87.5	88.5		
	DRY DENSITY LB/CU FT	γ_{d_o}	47.0	49.5		
	SATURATION, %	S_o	91.0	99.5		
	VOID RATIO	e_o	2.57	2.39		
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_b	1.44	1.44		
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0		
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.225	0.201		
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	11.3	8.8		
ULTIMATE DEVIATOR STRESS T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$	0.222	0.199		
INITIAL DIAMETER, IN.		D_o	2.8	2.8		
INITIAL HEIGHT, IN.		H_o	6.0	6.0		

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS Gray CLAY - CH

LL 94.0 | PL 34.0 | PI 60.0 | Gs 2.68

TYPE OF SPECIMEN Undisturbed | TYPE OF TEST UU

REMARKS: Type of Failure: Bulge

PROJECT Norfolk Harbor & Channels Deepening

Norfolk Harbor Channel

BORING NO. 144 | SAMPLE NO. 2

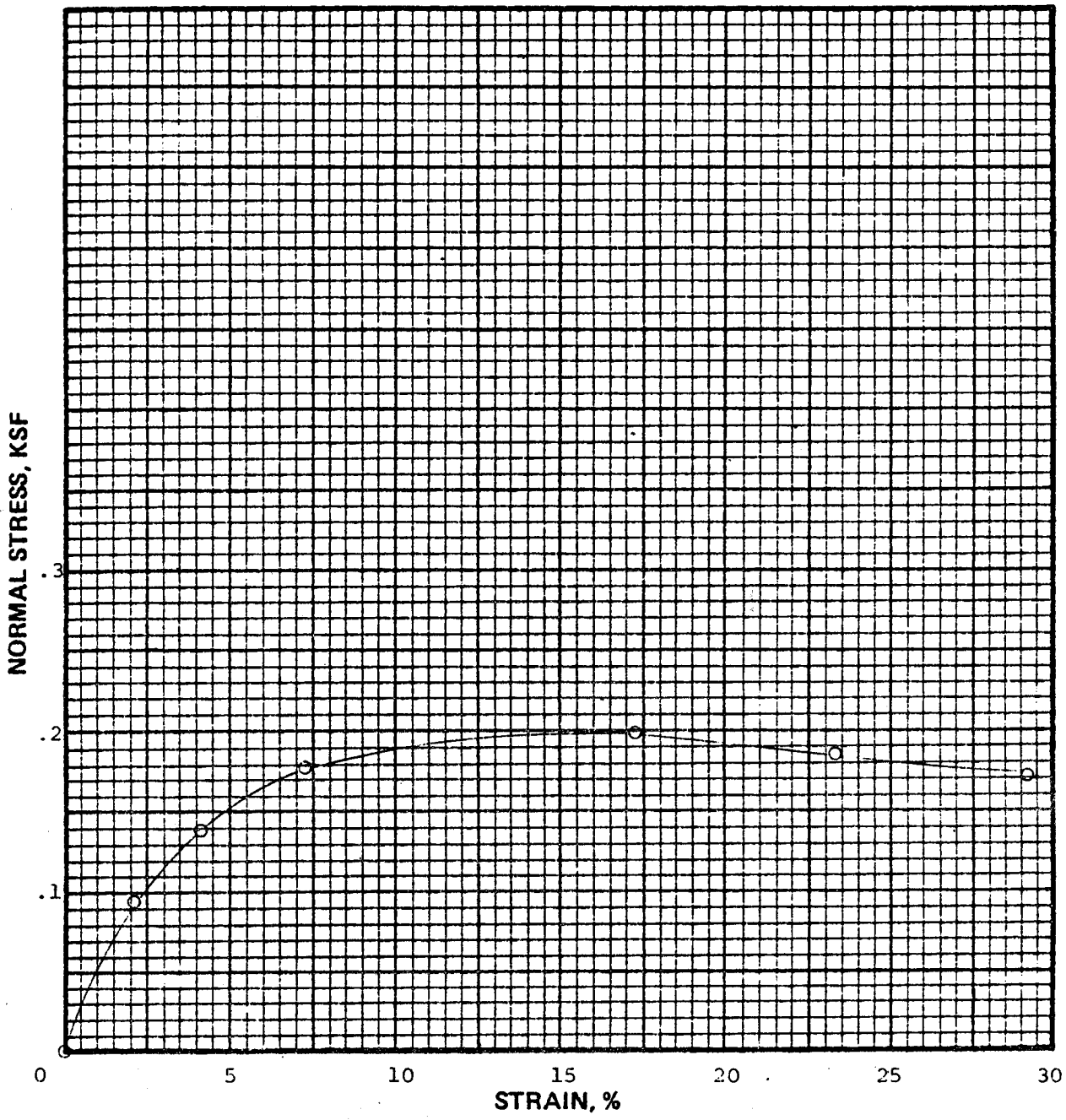
DEPTH/ELEV 7.0 - 8.0

LABORATORY CEI | DATE 2/18/85

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT

CEI 83-1118



Type: Undisturbed
Shape: Cylindrical
Height-to-diam. ratio: 1.9
Soil Classification: CH
Initial wet unit weight: 83.8 pcf
Initial water content, % 125.3 %
Initial void ratio: 3.331
Average rate of strain: 3%/min

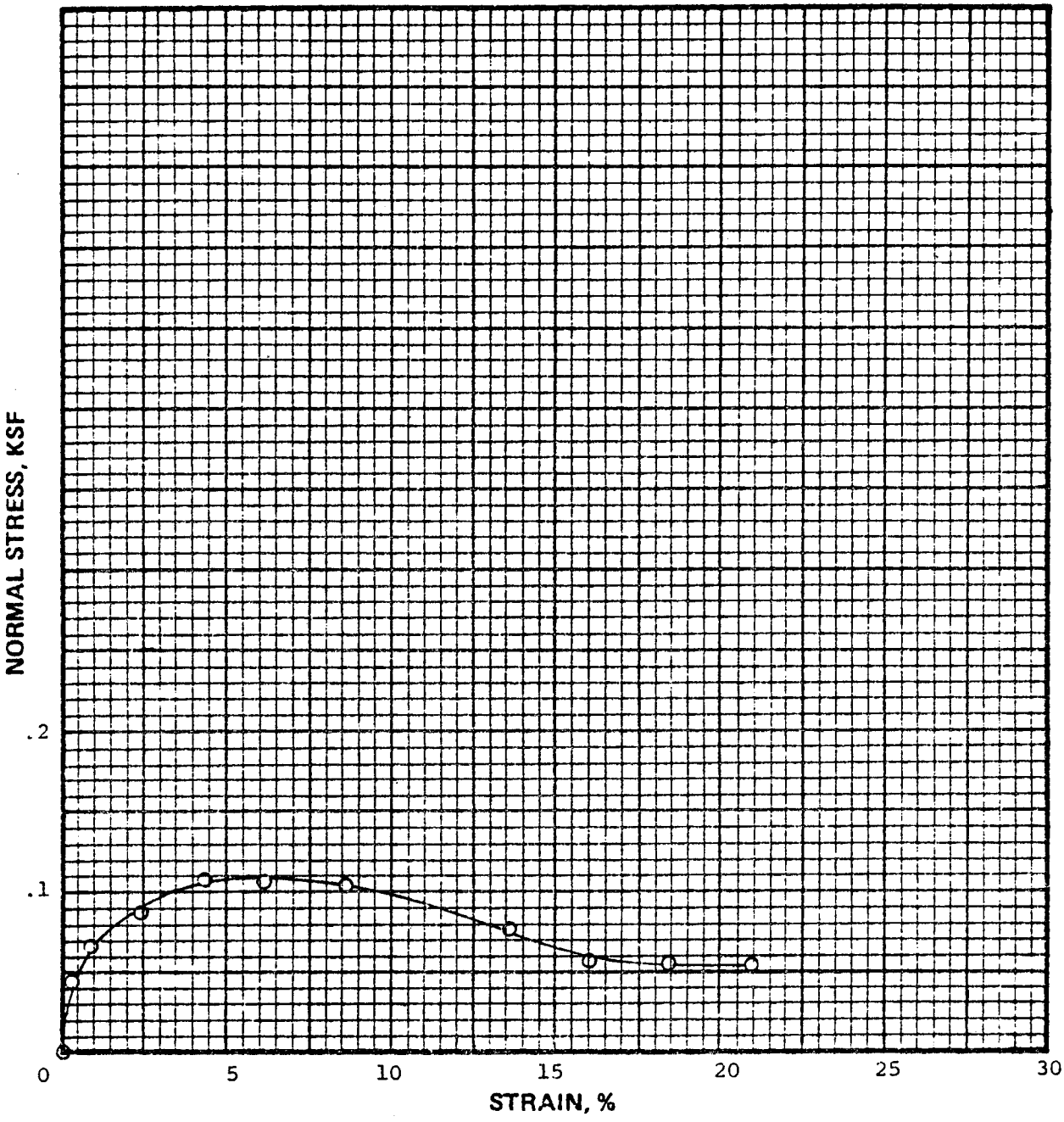
UNCONFINED COMPRESSION TEST
(ASTM-D-2166)

Boring No. 85VC235 Depth 0-1.5'
Job No. NK5-1175 Date 11-28-85

LAW ENGINEERING TESTING COMPANY

Ref: ASTM D-2166; EM1110-2-1906 Appendix XI

Norfolk Harbor Channel



Type: Undisturbed
Shape: Cylindrical
Height-to-diam. ratio: 1.8
Soil Classification: CH
Initial wet unit weight: 89.2 pcf
Initial water content, % 103.7 %
Initial void ratio: 2.601
Average rate of strain: 3%/min

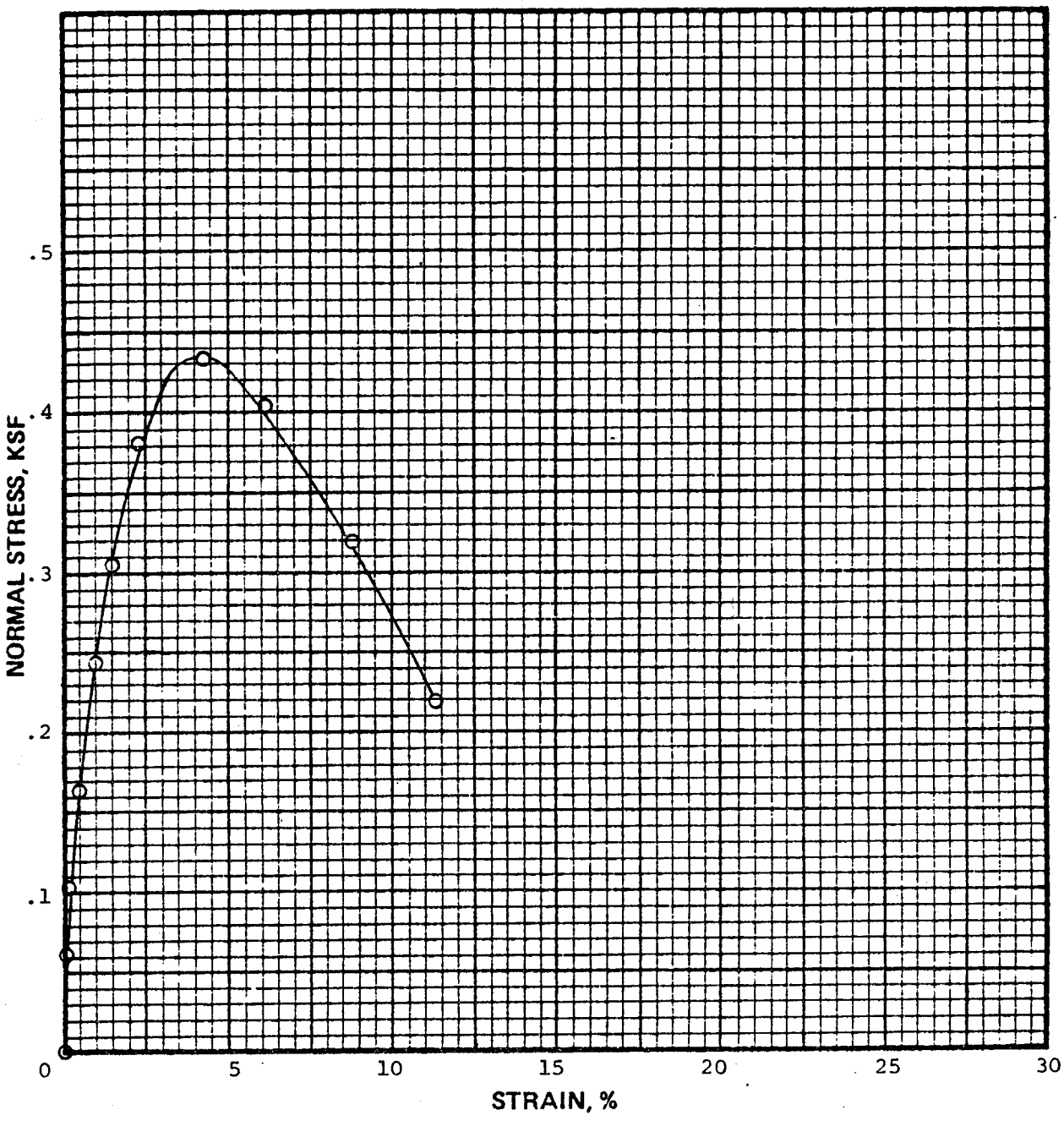
UNCONFINED COMPRESSION TEST
(ASTM-D-2166)

Boring No. 85VC239 Depth 0-1.5'
Job No. NK5-1175 Date 11-28-85

LAW ENGINEERING TESTING COMPANY

Ref: ASTM D-2166; EM1110-2-1906 Appendix XI

Norfolk Harbor Channel



Type: Undisturbed
Shape: Cylindrical
Height-to-diam. ratio: 1.7
Soil Classification: CH
Initial wet unit weight: 92.8 pcf
Initial water content, %: 81.8 %
Initial void ratio: 2.139
Average rate of strain: 3%/min

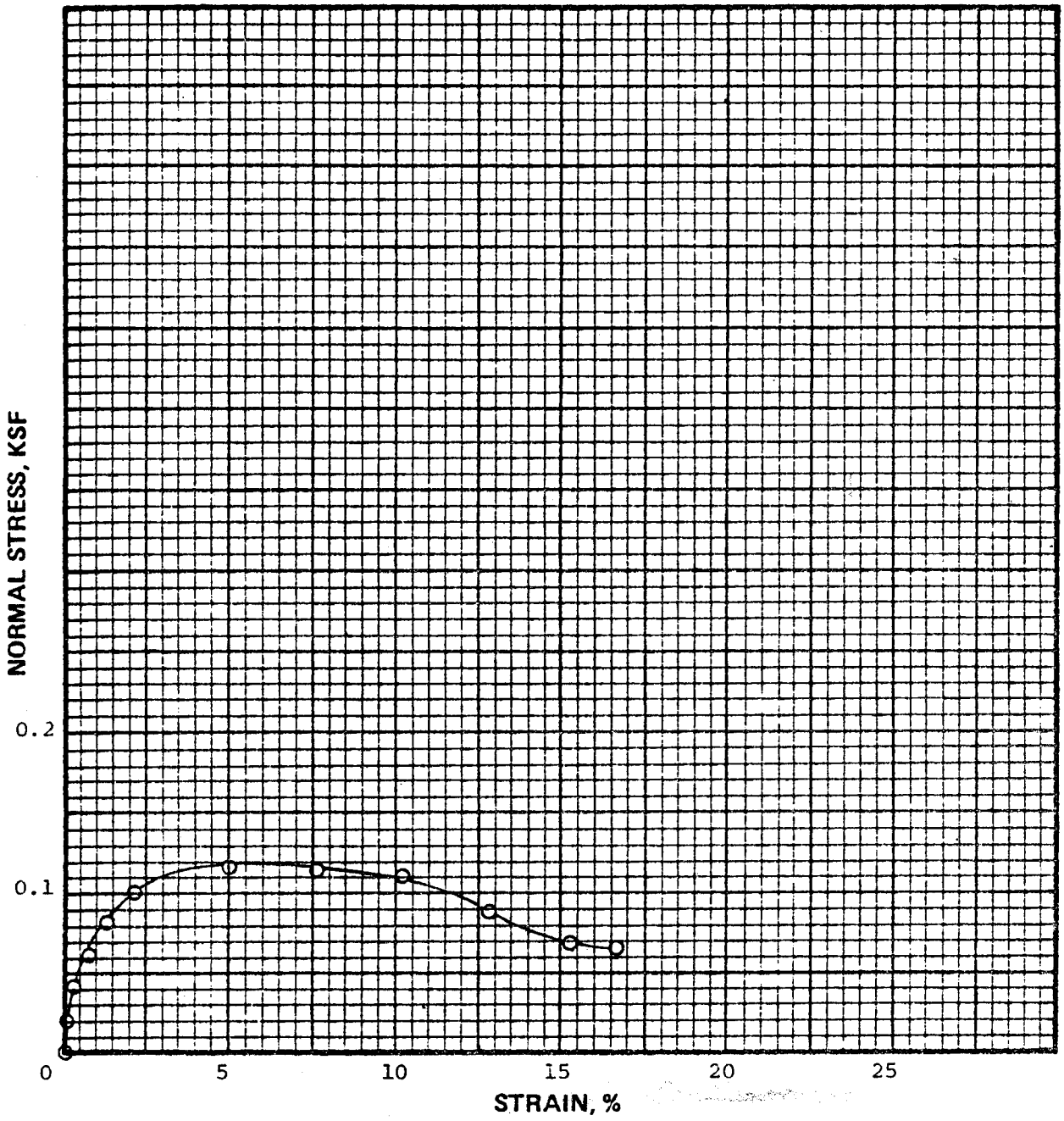
UNCONFINED COMPRESSION TEST
(ASTM-D-2166)

Boring No. 85VC240-A Depth 6.2-7.7
Job No. NK5-1175 Date 11-28-85

LAW ENGINEERING TESTING COMPANY

Ref: ASTM D-2166; EM1110-2-1906 Appendix XI

Norfolk Harbor Channel



Type: Undisturbed
Shape: Cylindrical
Height-to-diam. ratio: 1.7
Soil Classification: CH
Initial wet unit weight: 89.8 pcf
Initial water content, %: 89.4 %
Initial void ratio: 2.380
Average rate of strain: 3%/min

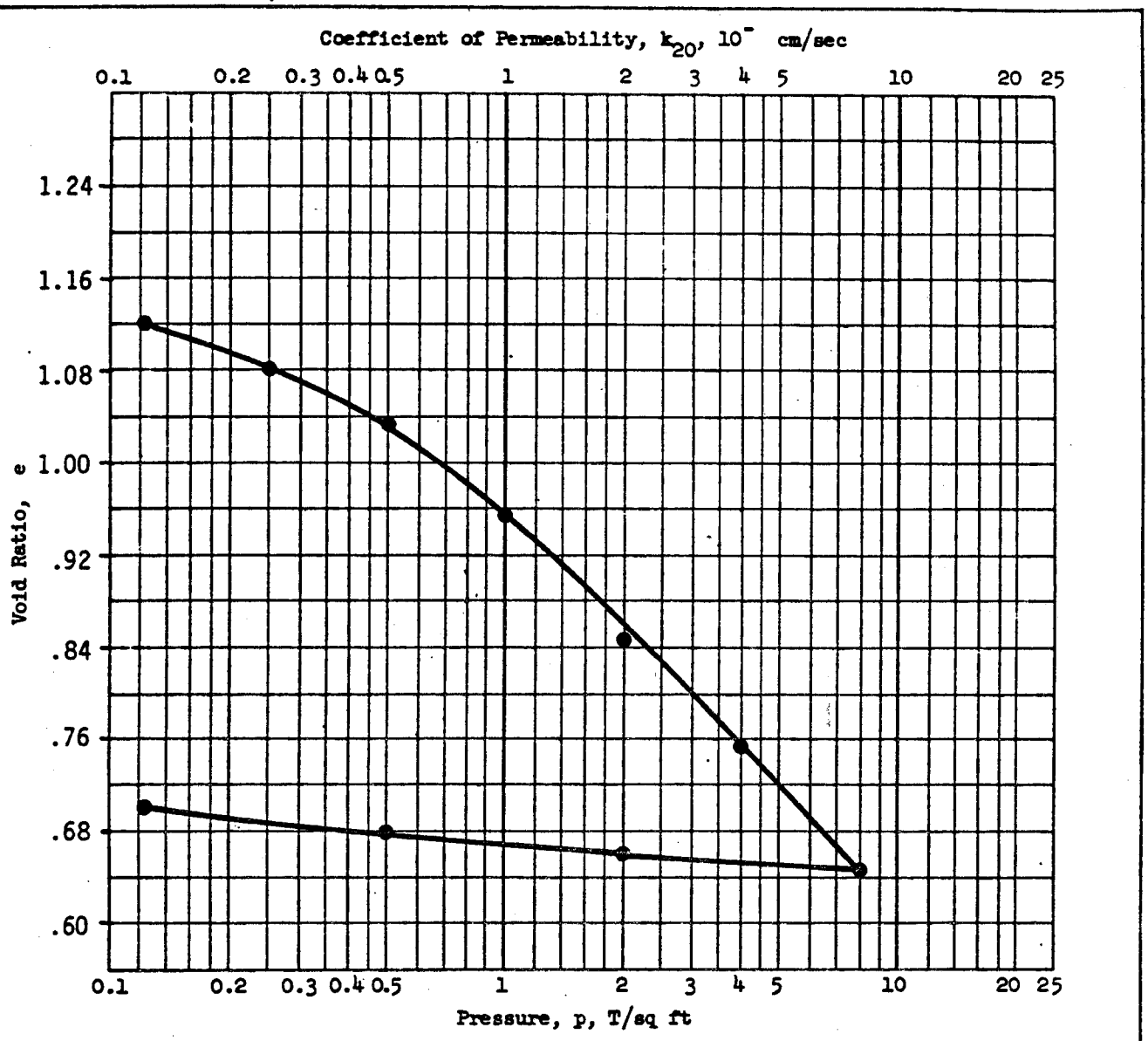
UNCONFINED COMPRESSION TEST
(ASTM-D-2166)

Boring No. GSVC245 Depth 0-1.5'
Job No. NK5-1175 Date 11-28-85

LAW ENGINEERING TESTING COMPANY

Ref: ASTM D-2166; EM1110-2-1906 Appendix XI

Norfolk Harbor Channel

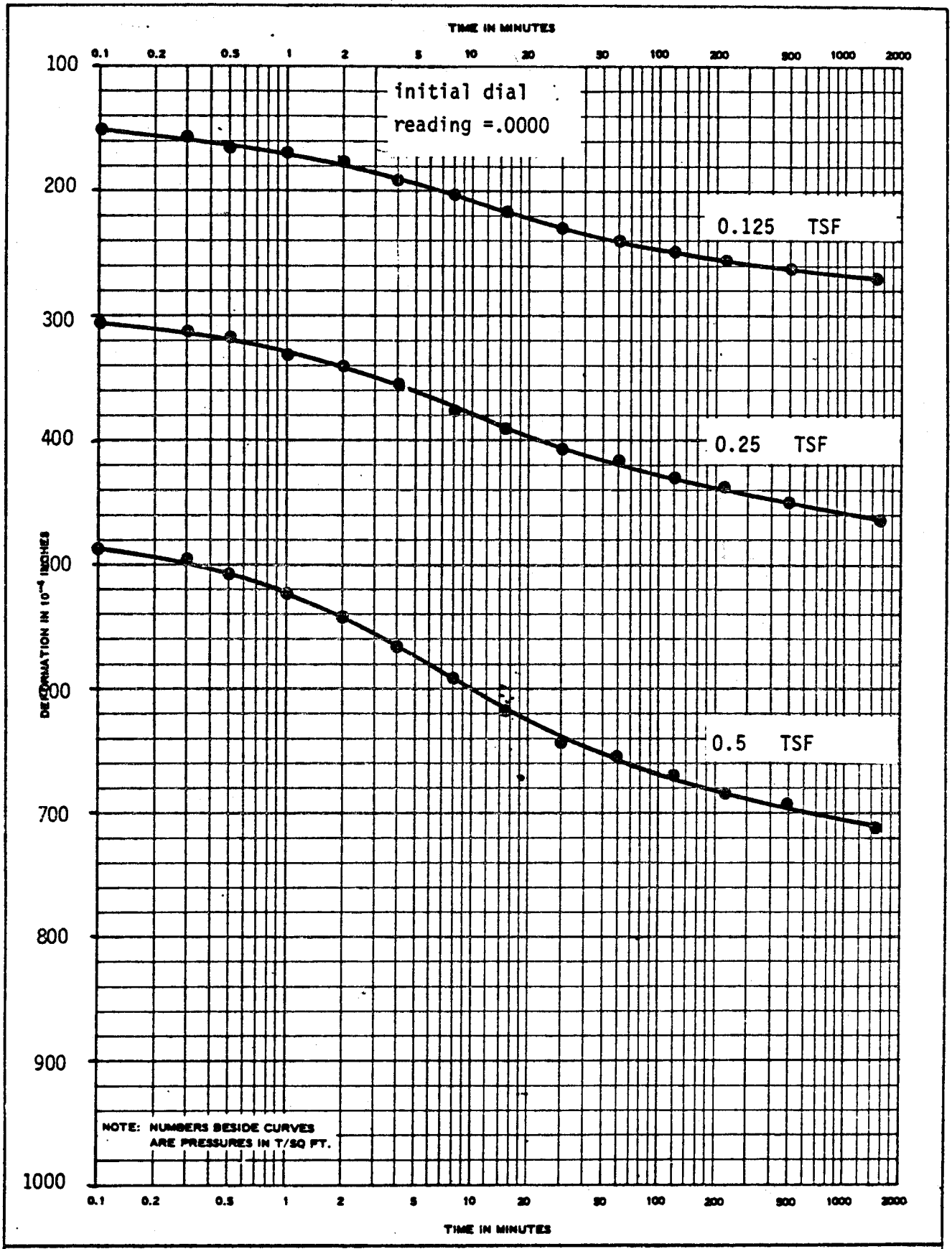


Type of Specimen undisturbed		Before Test		After Test	
Diam 2.50 in.	Ht 1.00 in.	Water Content, w_o	46.5 %	w_f	28.5 %
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	1.17	e_f	0.70
Preconsol. Pressure, p_c T/sq ft		Saturation, S_o	100+ %	S_f	100+ %
Compression Index, C_c		Dry Density, γ_d	75.5 lb/ft^3		
Classification SC		k_{20} at e_o =	$\times 10^{-}$ cm/sec		
LL 32.0	G_s 2.63	Project	USACOE - Norfolk District		
PL 15.0	D_{10}		Norfolk Harbor and		
Remarks		Area	Channel Deepening		
		Boring No. 17		Sample No. 1	
		Depth El 4.7-7.0		Date 9/14/83	

CONSOLIDATION TEST REPORT

ENG FORM 2090 1 MAY 63 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

Norfolk Harbor Channel
CEI 83-1118



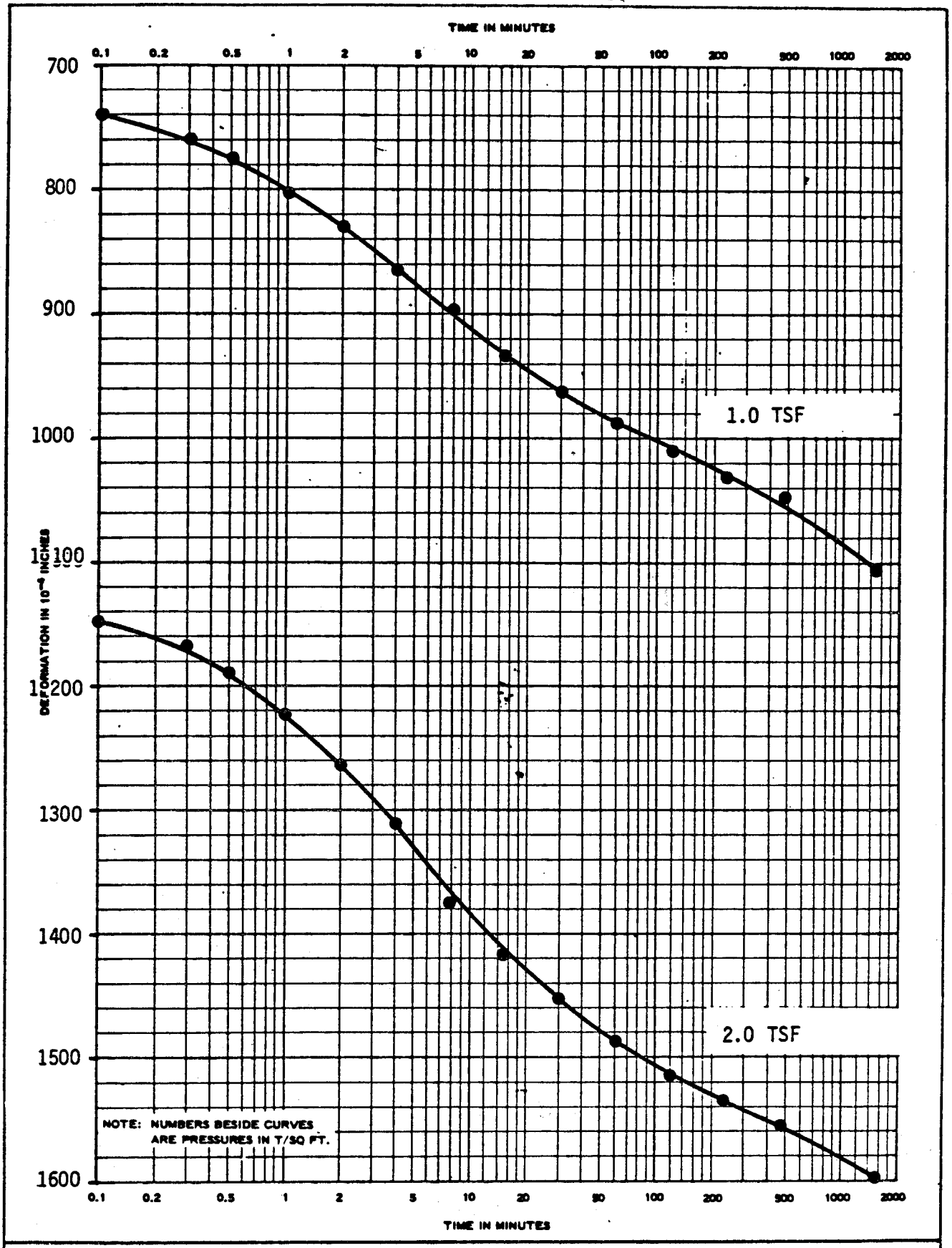
Project	USACOE - Norfolk District			
Area	Norfolk Harbor and Channel Deepening			
Boring No. 17		Sample No. 1	Depth El 4.7-7.0'	Date 9/14/83

ENG FORM 2088
1 MAY 82
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES

(TRANSLUCENT)

8-1338



Project	USACOE - Norfolk District				
Area	Norfolk Harbor and Channel Deepening				
Boring No.	17	Sample No.	1	Depth El	4.7-7.0
Date	9/14/83				

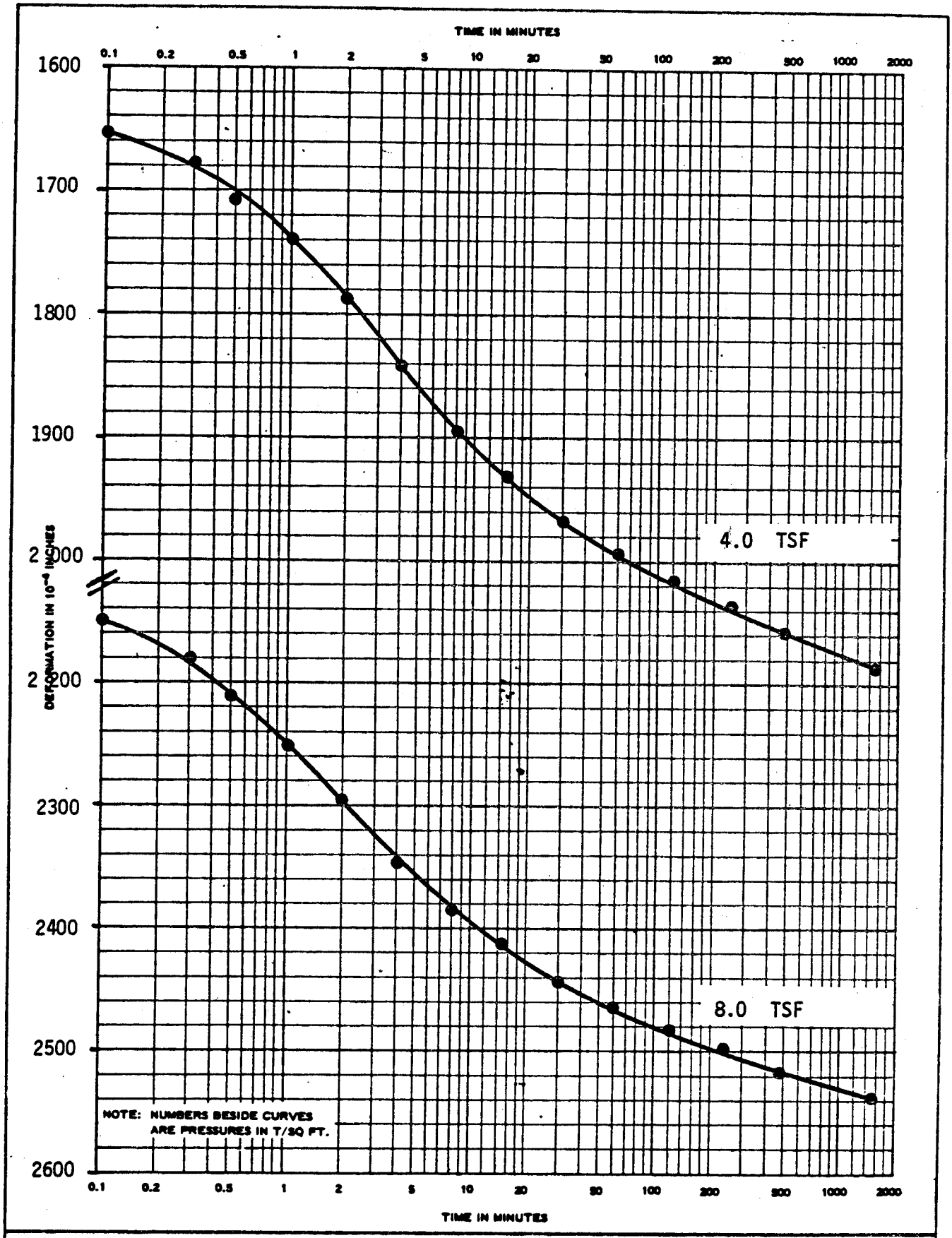
ENG FORM 2088
1 MAY 63
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES

(TRANSLUCENT)

8 1835

Norfolk Harbor Channel
CET 83 1119



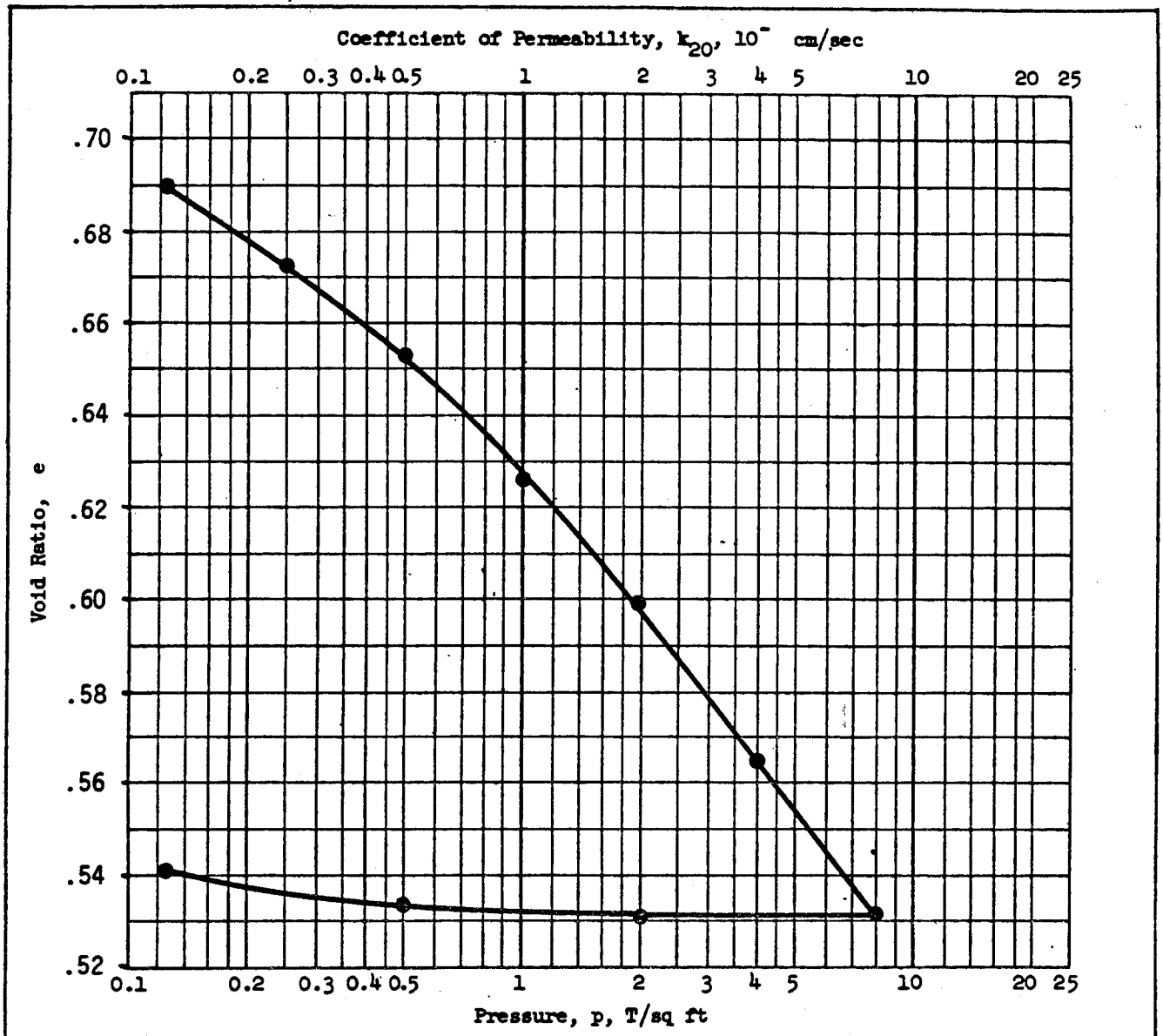
Project	USACOE - Norfolk District			
Area	Norfolk Harbor and Channel Deepening			
Boring No. 17	Sample No. 1	Depth El 4.7-7.0	Date 9/14/83	

ENG FORM 2088 1 MAY 63 PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES (TRANSLUCENT)

B-1835

Norfolk Harbor Channel
CEI 83-1118

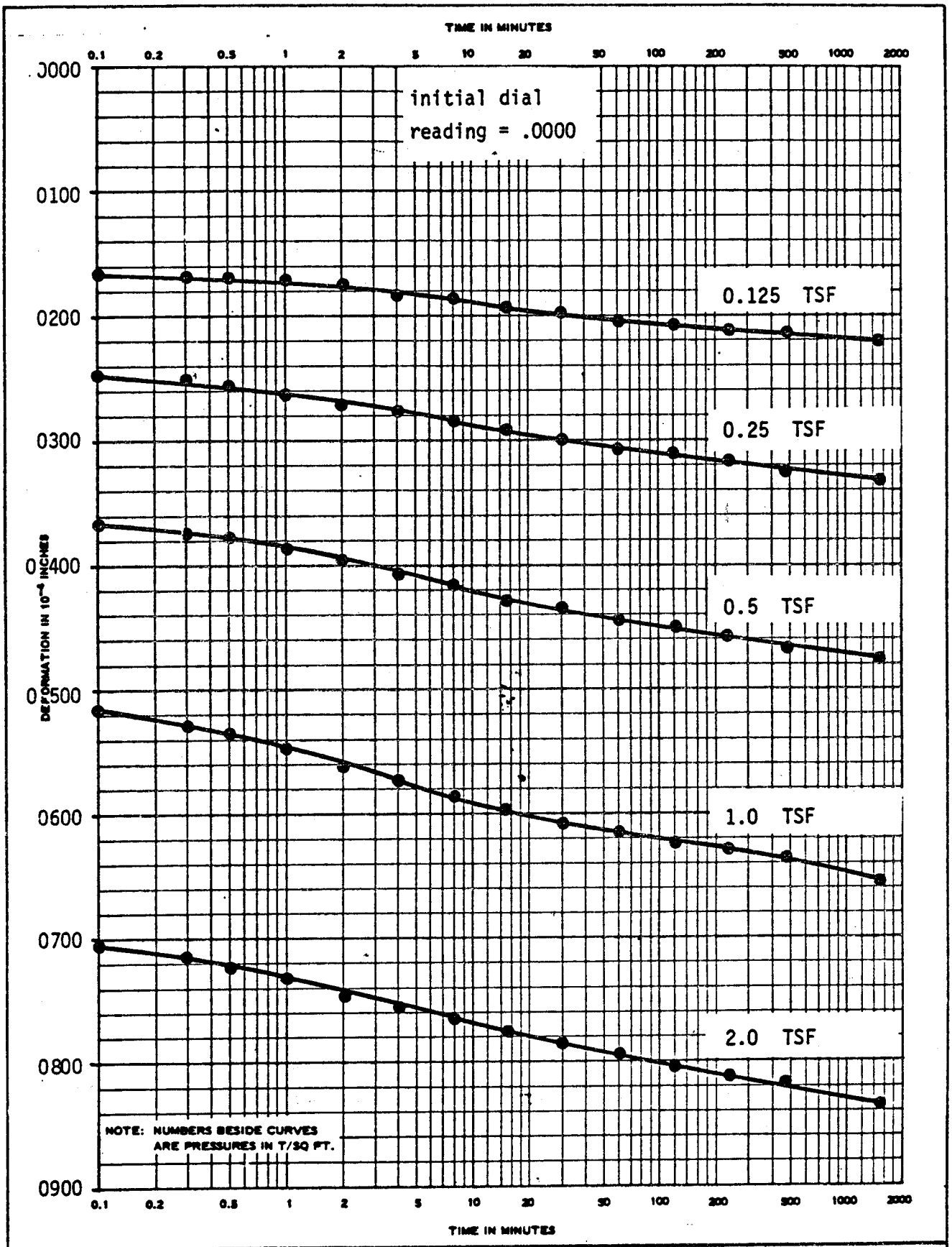


Type of Specimen undisturbed		Before Test		After Test	
Diam 2.50 in.	Ht 1.00 in.	Water Content, w_o	27.0 %	w_f	21.0 %
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	0.73	e_f	0.54
Preconsol. Pressure, p_c T/sq ft		Saturation, S_o	97.5 %	S_f	100 %
Compression Index, C_c		Dry Density, γ_d	94.0 lb/ft^3		
Classification SC		k_{20} at e_o =	× 10^{-} cm/sec		
LL NP	G_s 2.60	Project	USACOE - Norfolk District		
PL NP	D_{10}		Norfolk Harbor and		
Remarks		Area	Channel Deepening		
		Boring No. 22		Sample No. 1	
		Depth El 5.5-7.7'		Date 9/14/83	

CONSOLIDATION TEST REPORT

ENG FORM 2090 1 MAY 63 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

Norfolk Harbor Channel
CEI 83-1118



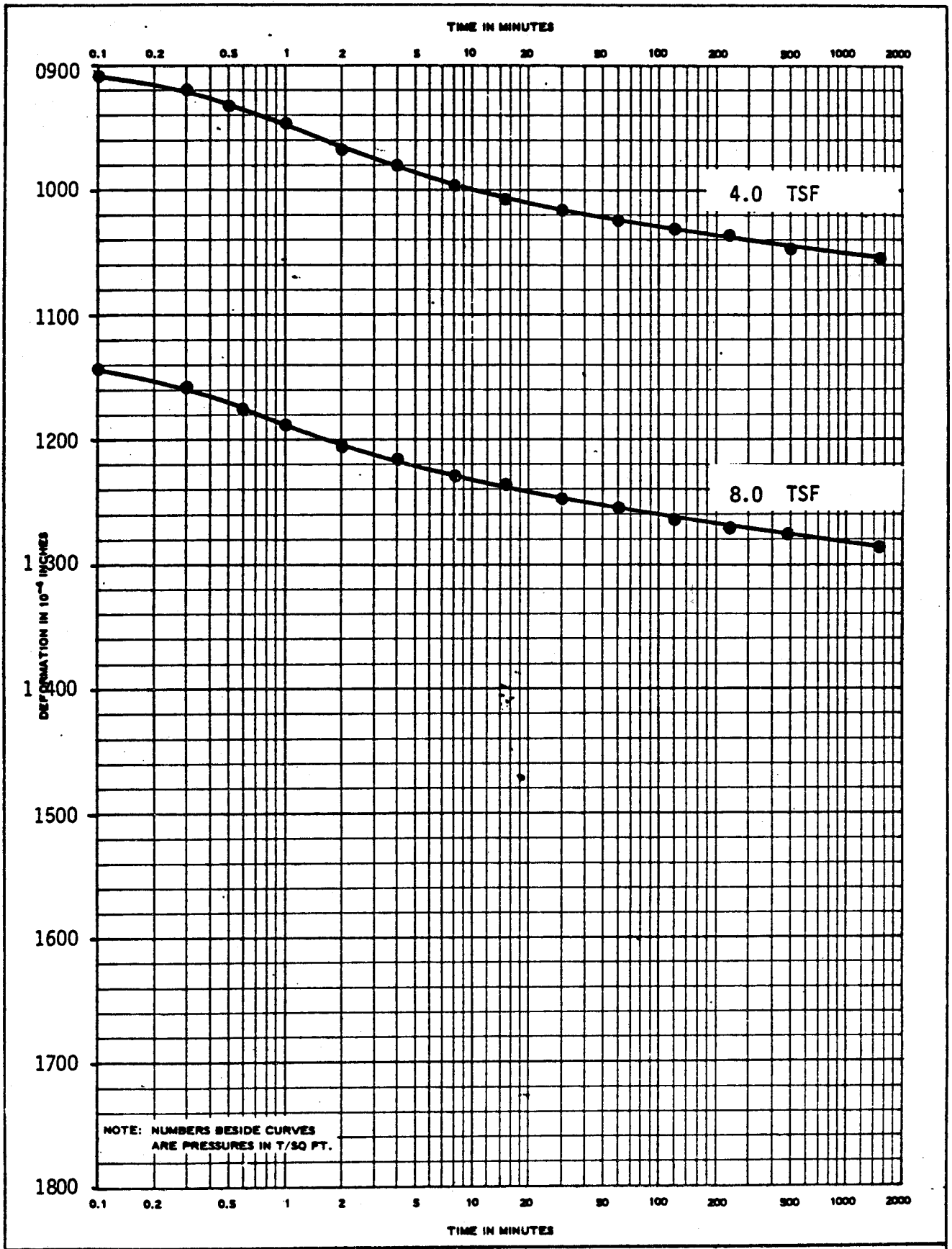
Project	USACOE - Norfolk District				
Area	Norfolk Harbor and Channel Deepening				
Boring No.	22	Sample No.	1	Depth El	5.5-7.7'
Date	9/14/83				

ENG FORM 2088
1 MAY 63
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES

(TRANSLUCENT)

8-1836



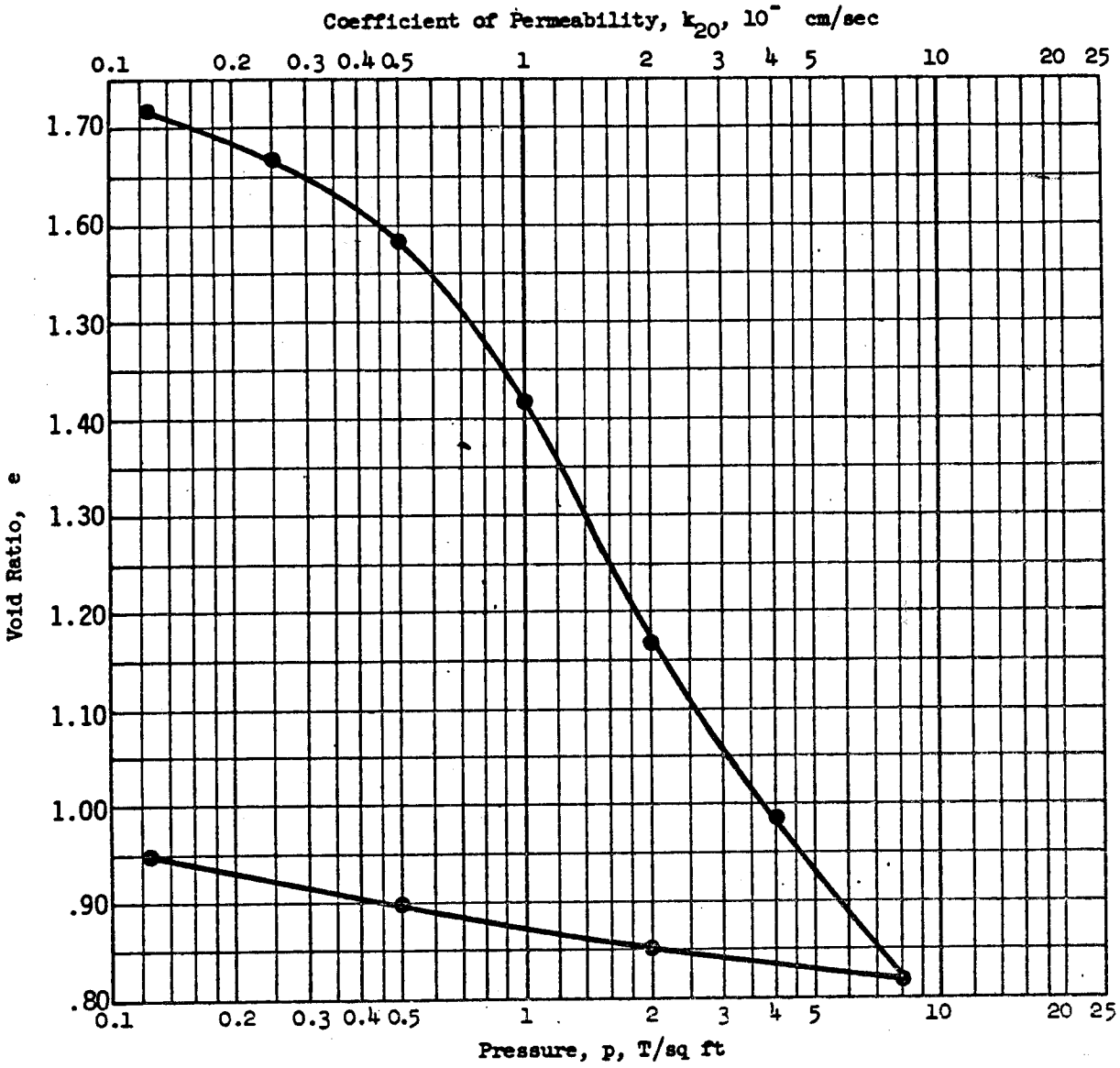
Project	USACOE - Norfolk District			
Area	Norfolk Harbor and Channel Deepening			
Boring No. 22	Sample No. 1	Depth El 5.5-7.7'	Date 9/14/83	

ENG FORM 2088
1 MAY 63
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES (TRANSLUCENT)

Norfolk Harbor Channel B' 1835

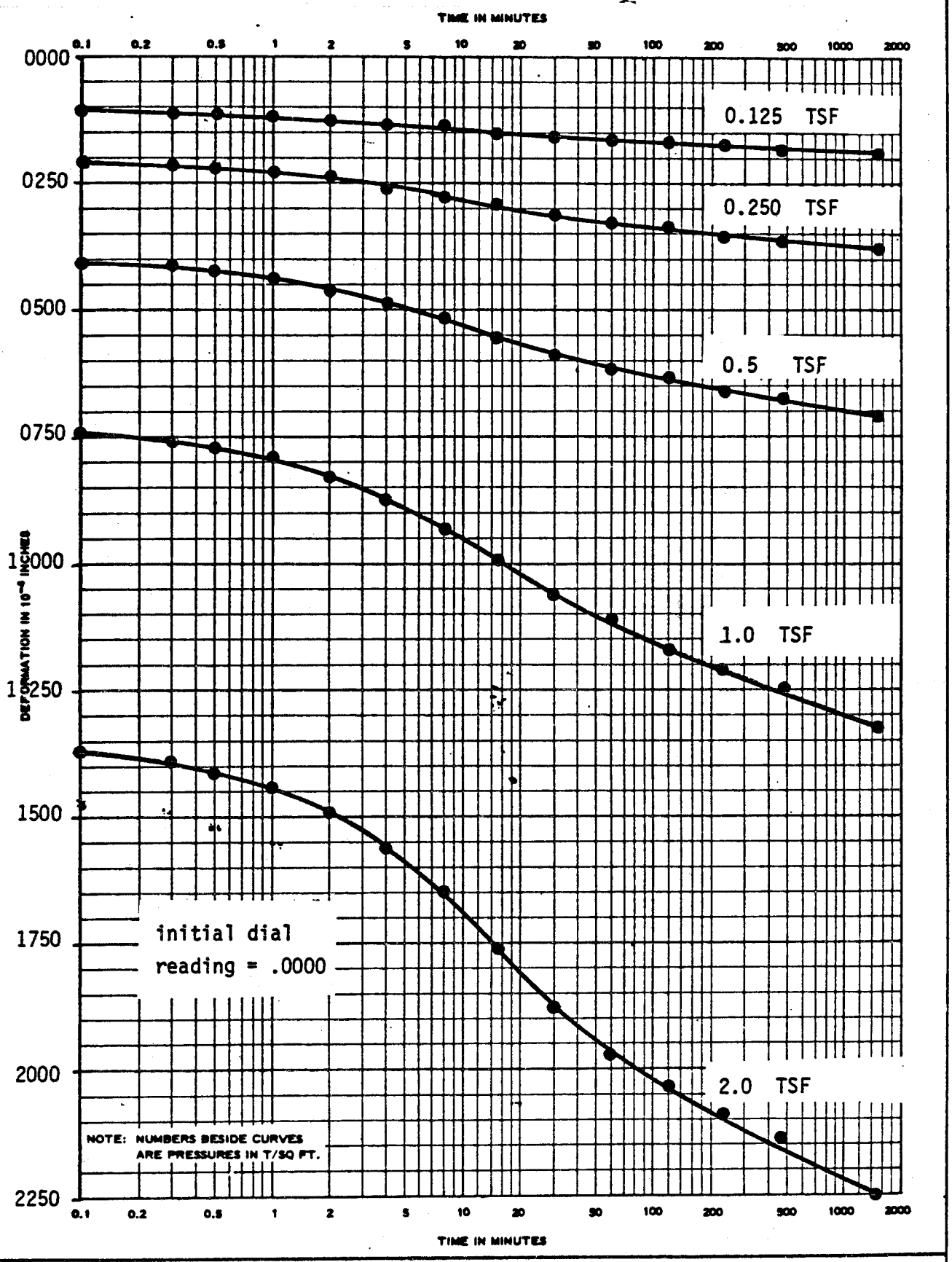
CEI 83-1118



Type of Specimen	undisturbed		Before Test			After Test	
Diam 2.50 in.	Ht 1.0 in.		Water Content, w_o	67.5 %		w_f	38.0 %
Overburden Pressure, p_o	T/sq ft		Void Ratio, e_o	1.76		e_f	.95
Preconsol. Pressure, p_c	T/sq ft		Saturation, S_o	100+ %		S_f	100+ %
Compression Index, C_c			Dry Density, γ_d	59.0 lb/ft^3			
Classification	CH		k_{20} at e_o =	$\times 10^{-}$ cm/sec			
LL 56.0	G_s 2.62		Project	USACOE - Norfolk District			
PL 20.5	D_{10}			Norfolk Harbor and			
Remarks			Area	Channel Deepening			
			Boring No. 25		Sample No. 1		
			Depth El 2.5-4.5'		Date 9/14/83		
			CONSOLIDATION TEST REPORT				

ENG FORM 2090 1 MAY 63 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

Norfolk Harbor Channel

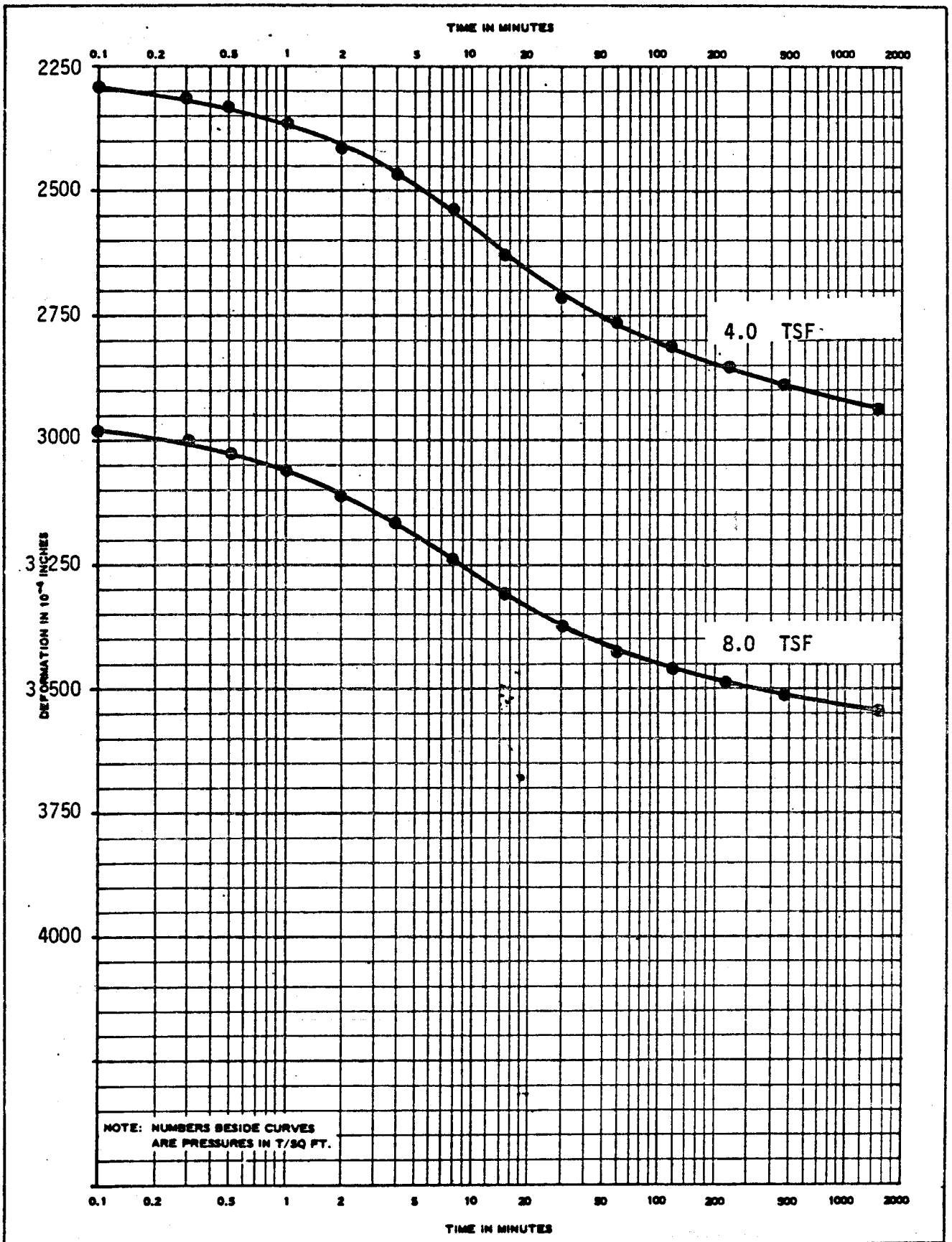


Project	USACOE Norfolk District				
Area	Norfolk Harbor and Channel Deepening				
Boring No.	25	Sample No.	1	Depth El	2.5-4.5
				Date	9/14/83

ENG FORM 2088
1 MAY 63
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES (TRANSLUCENT)

B-1835



Project	USACOE - Norfolk District			
Area	Norfolk Harbor and Channel Deepening			
Boring No. 25	Sample No. 1	Depth El 2.5-4.5	Date 9/14/83	

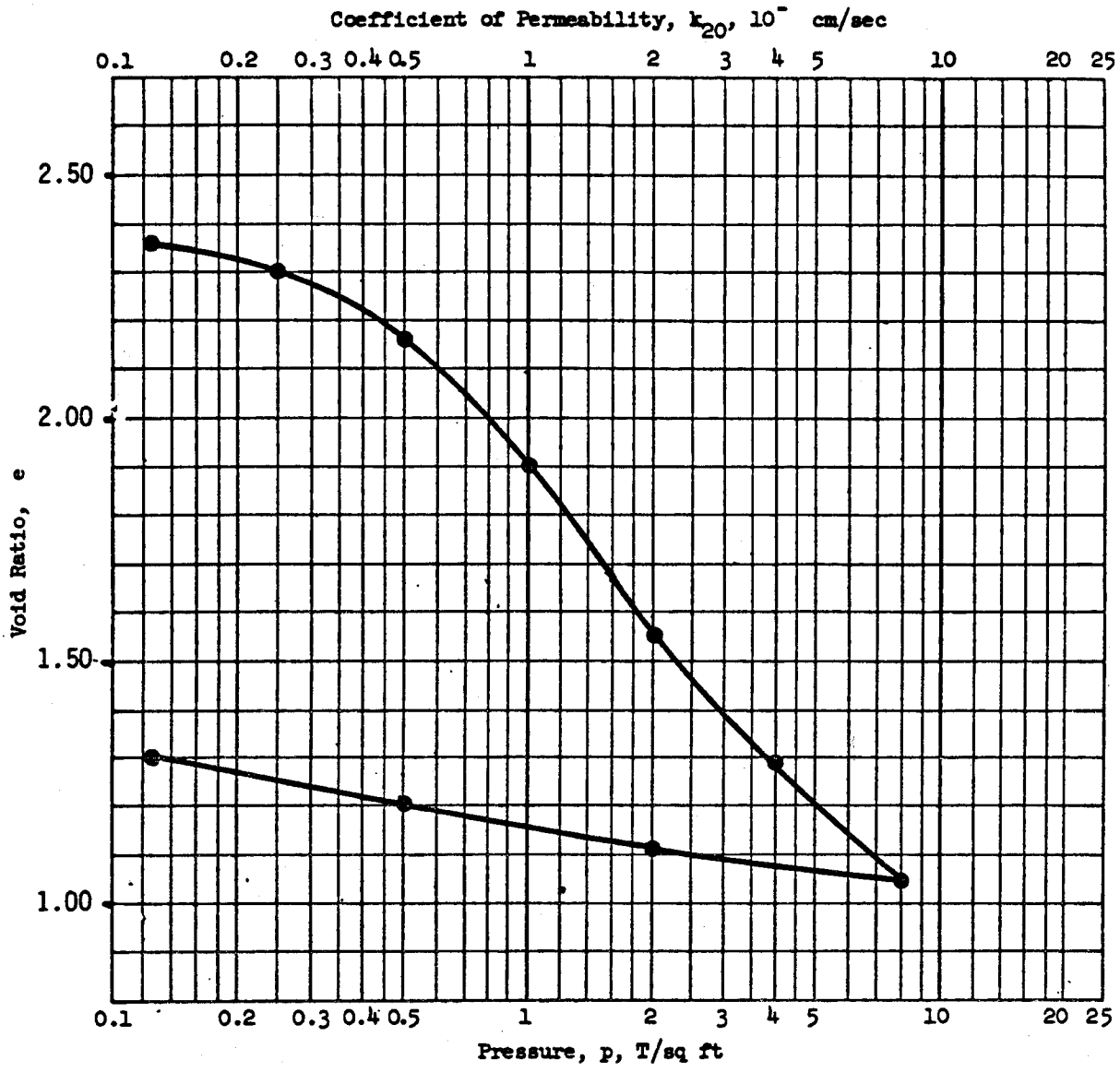
ENG FORM 2086
1 MAY 82
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES

(TRANSLUCENT)

8'1835

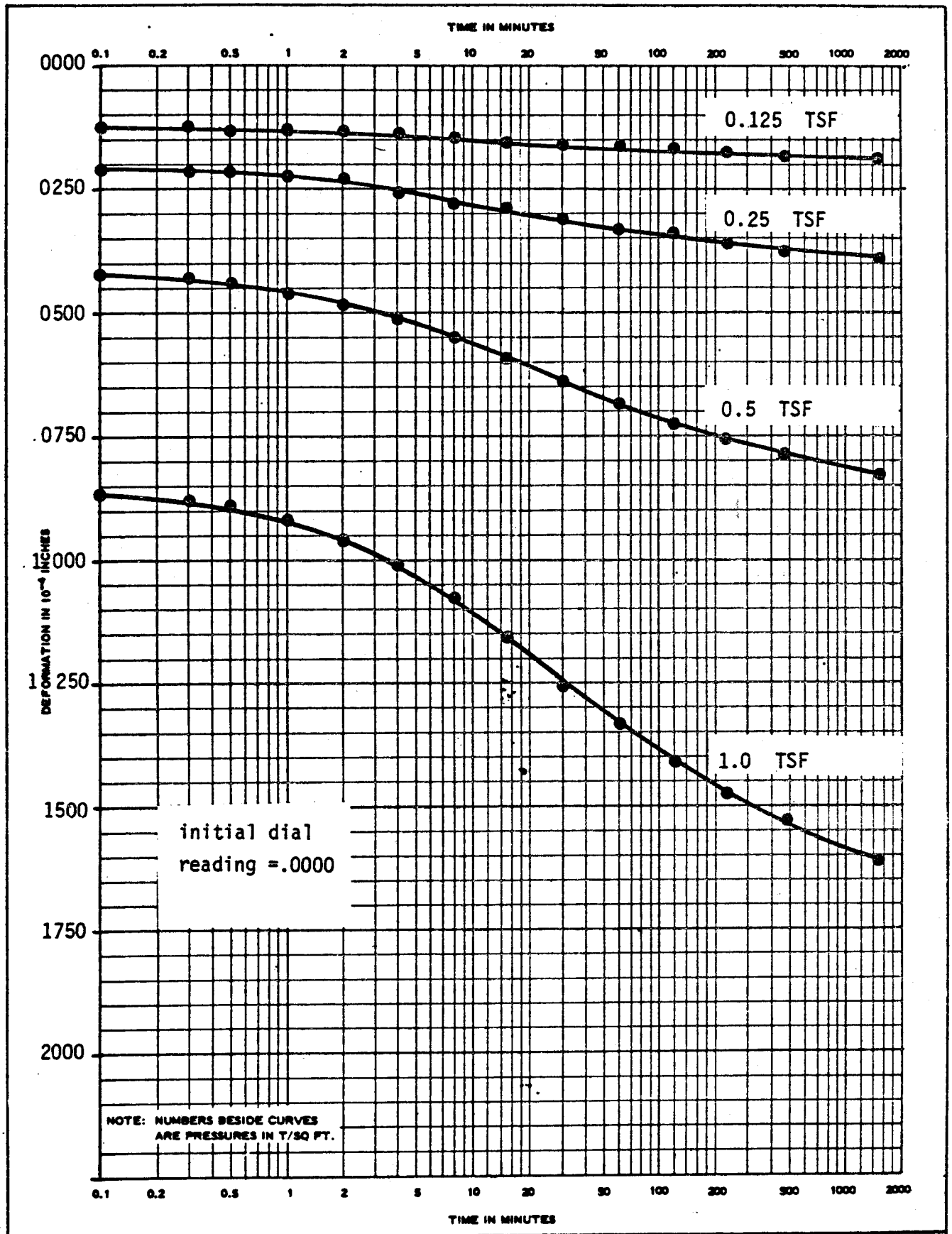
Norfolk Harbor Channel



Type of Specimen undisturbed		Before Test		After Test	
Diam 2.50 in.	Ht 1.00 in.	Water Content, w_o	96.0 %	w_f	53.5 %
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	2.41	e_f	1.30
Preconsol. Pressure, p_c T/sq ft		Saturation, S_o	100+ %	S_f	100+ %
Compression Index, C_c		Dry Density, γ_d	47.5 lb/ft^3		
Classification CH		k_{20} at e_o =	× 10^{-} cm/sec		
LL 81.0	G_s 2.58	Project USACOE - Norfolk District			
PL 27.0	D_{10}	Norfolk Harbor and			
Remarks		Area Channel Deepening			
		Boring No. 29		Sample No. 1	
		Depth El 7.5-9.5'		Date 9/14/83	
		CONSOLIDATION TEST REPORT			

ENG FORM 2090 1 MAY 63 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

Norfolk Harbor Channel
CEI 83-1118



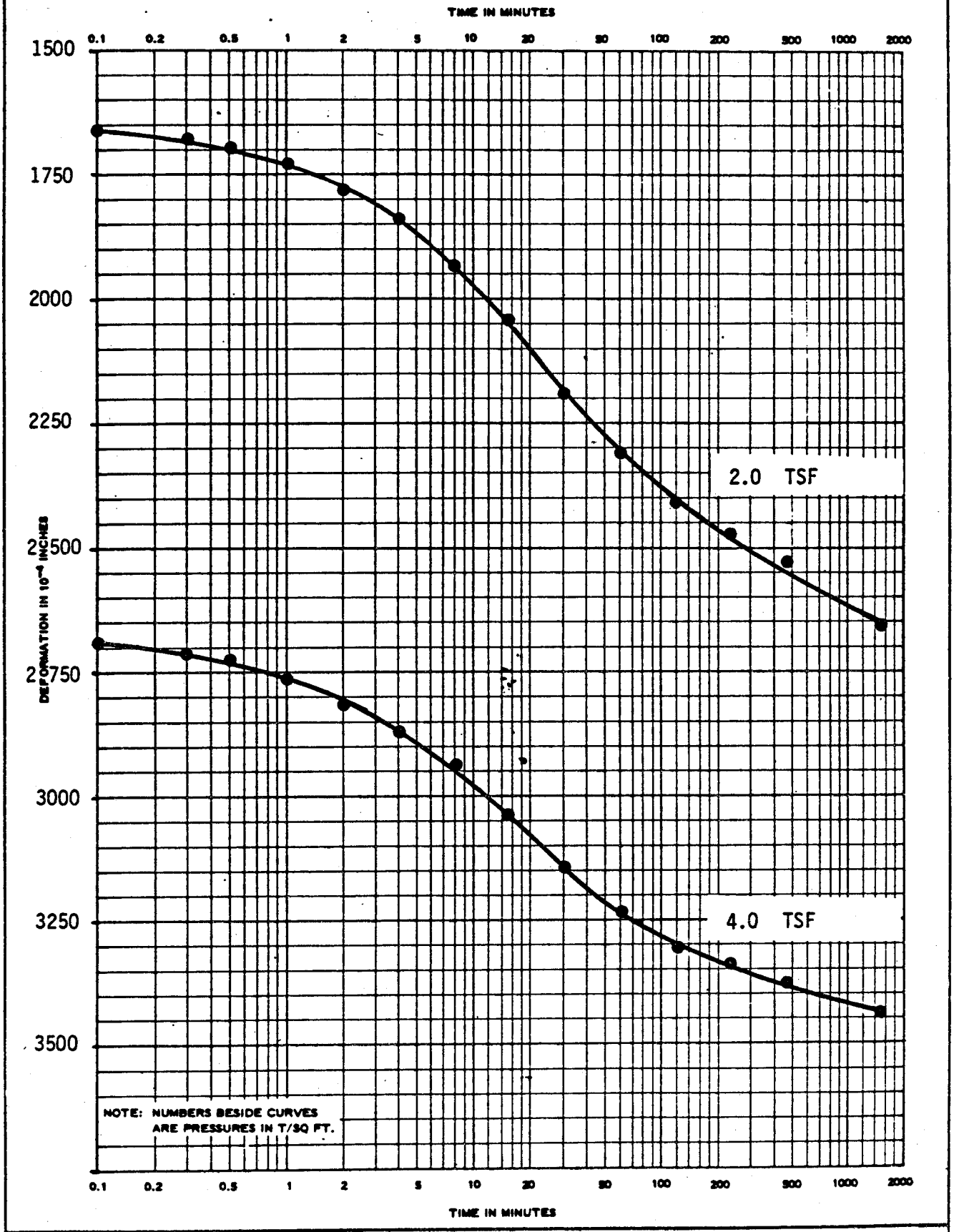
Project	USACOE - Norfolk District				
Area	Norfolk Harbor and Channel Deepening				
Boring No.	29	Sample No.	1	Depth El 7.5-9.5'	Date 9/14/83

ENG FORM 2088
1 MAY 63
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES

(TRANSLUCENT)

8" 1 8 3 5



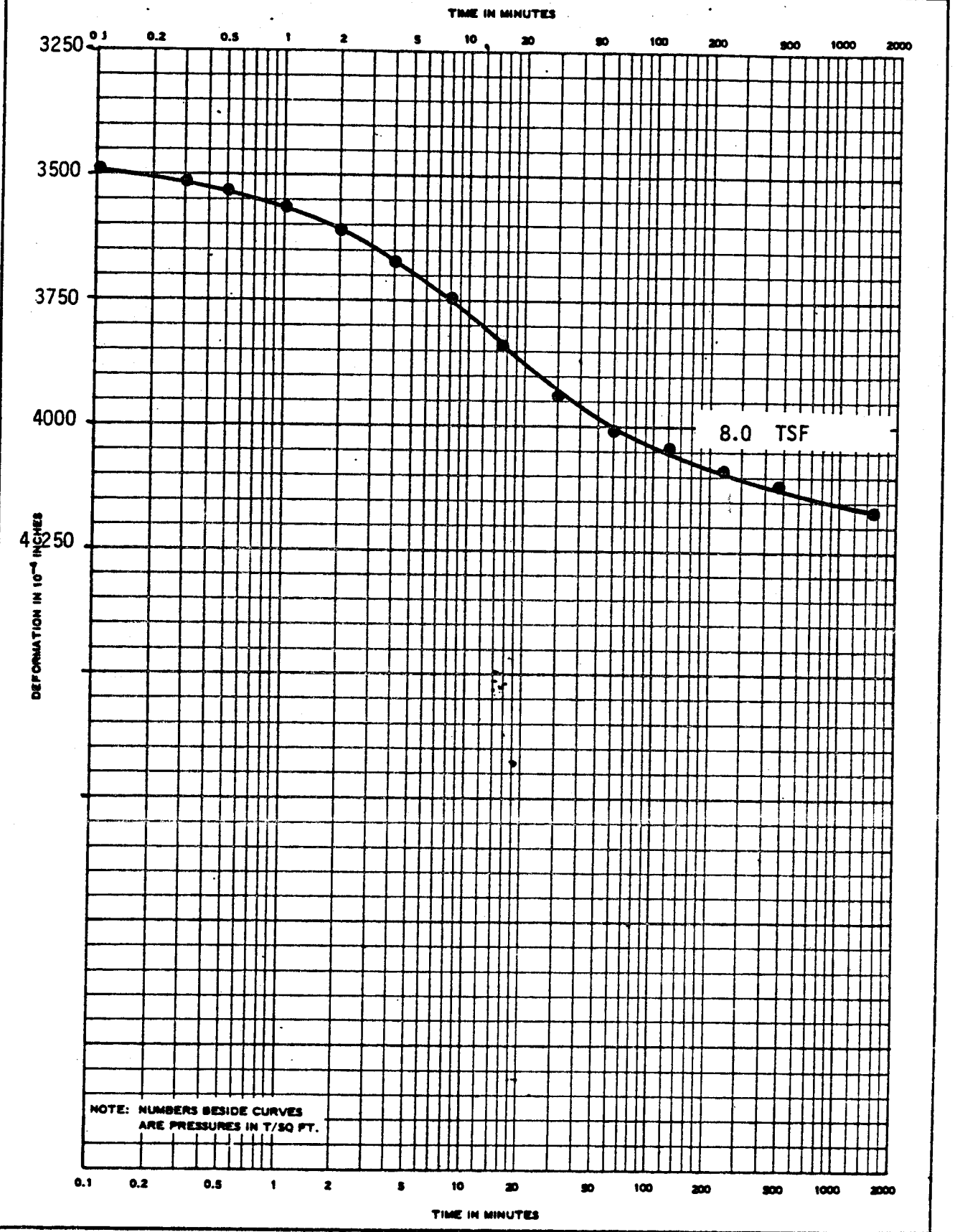
Project	USACOE - Norfolk District			
Area	Norfolk Harbor and Channel Deepening			
Boring No. 29	Sample No. 1	Depth El 7.5-9.5'	Date 9/14/83	

ENG FORM 2088
1 MAY 63
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES (TRANSLUCENT)

B-1835

Norfolk Harbor Channel
CFI 83-1118



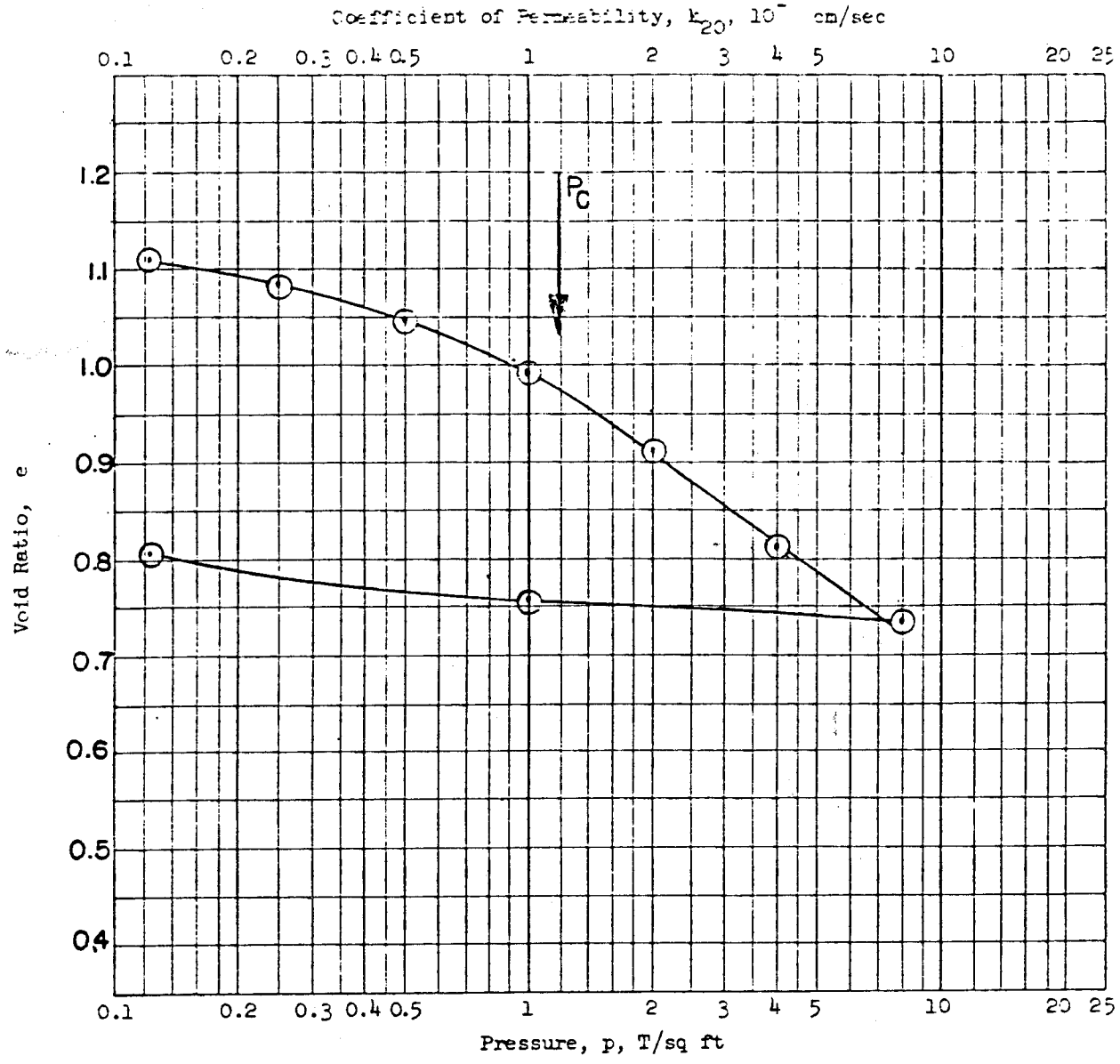
Project	USACOE - Norfolk District			
Area	Norfolk Harbor and Channel Deepening			
Boring No. 29	Sample No. 1	Depth El 7.5-9.5'	Date 9/14/83	

ENG FORM 2088
1 MAY 83
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES

(TRANSLUCENT)

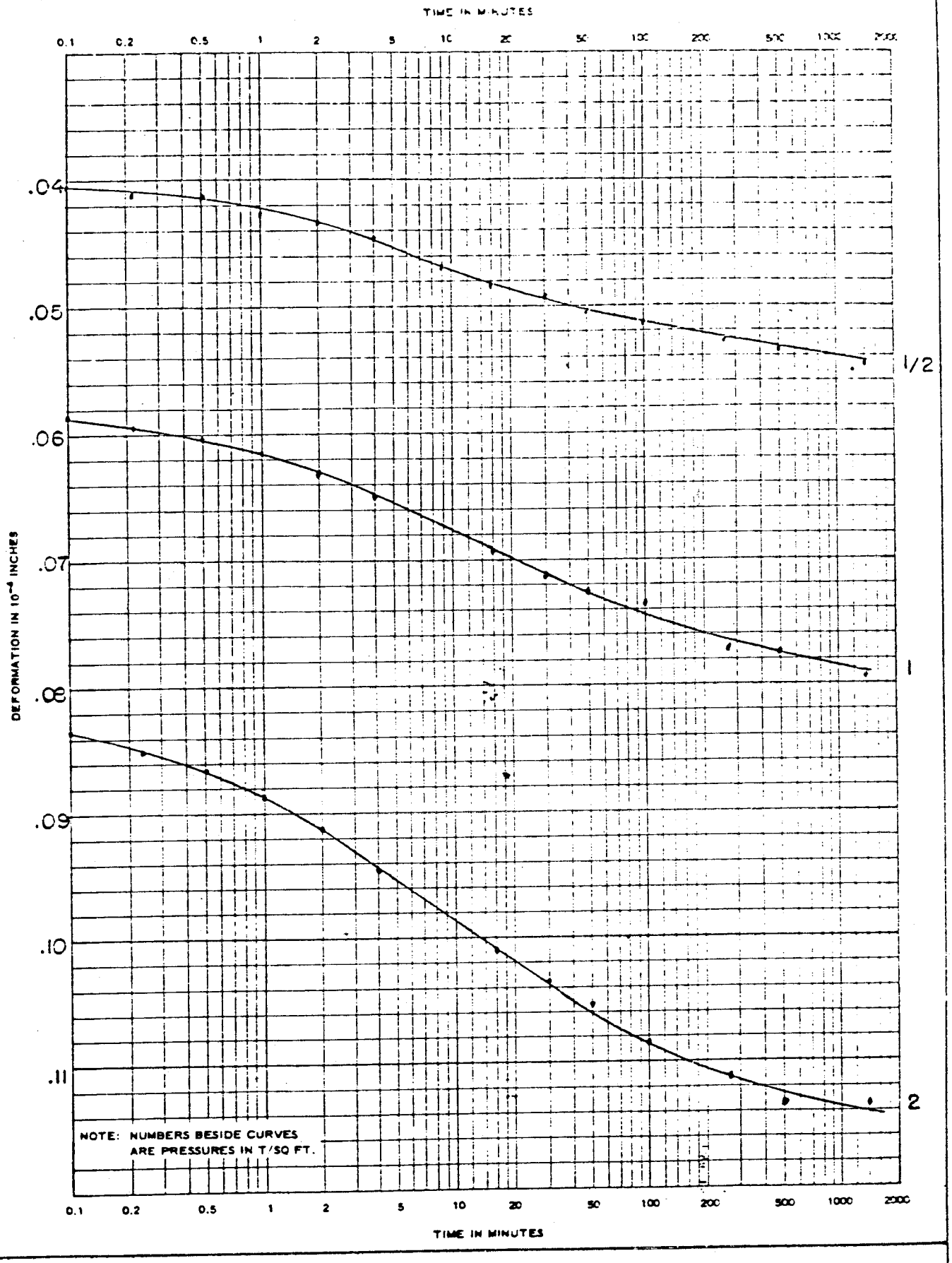
B-1835



Type of Specimen 4" TUBE		Before Test		After Test	
Diam 2.5 in.	Ht 1.0 in.	Water Content, w_o	39.5 %	w_f	%
Overburden Pressure, p_o	T/sq ft	Void Ratio, e_o	1.169	e_f	0.818
Preconsol. Pressure, p_c 1.2	T/sq ft	Saturation, S_o	%	S_f	%
Compression Index, C_c 0.25		Dry Density, γ_d	77.1 lb/ft^3		
Classification CL		k_{20} at e_o =	$\times 10^{-}$ cm/sec		
LL 28	G_s 2.68	Project HARBOR DEEPENING			
PL 21	D_{10}	NORFOLK, VIRGINIA			
Remarks		Area			
		Boring No. 30		Sample No. 1	
		Depth / El 3.0'-5.0'		Date 9-30-83	
V83157		CONSOLIDATION TEST REPORT			

ENG FORM 2090 1 MAY 63 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

Norfolk Harbor Channel

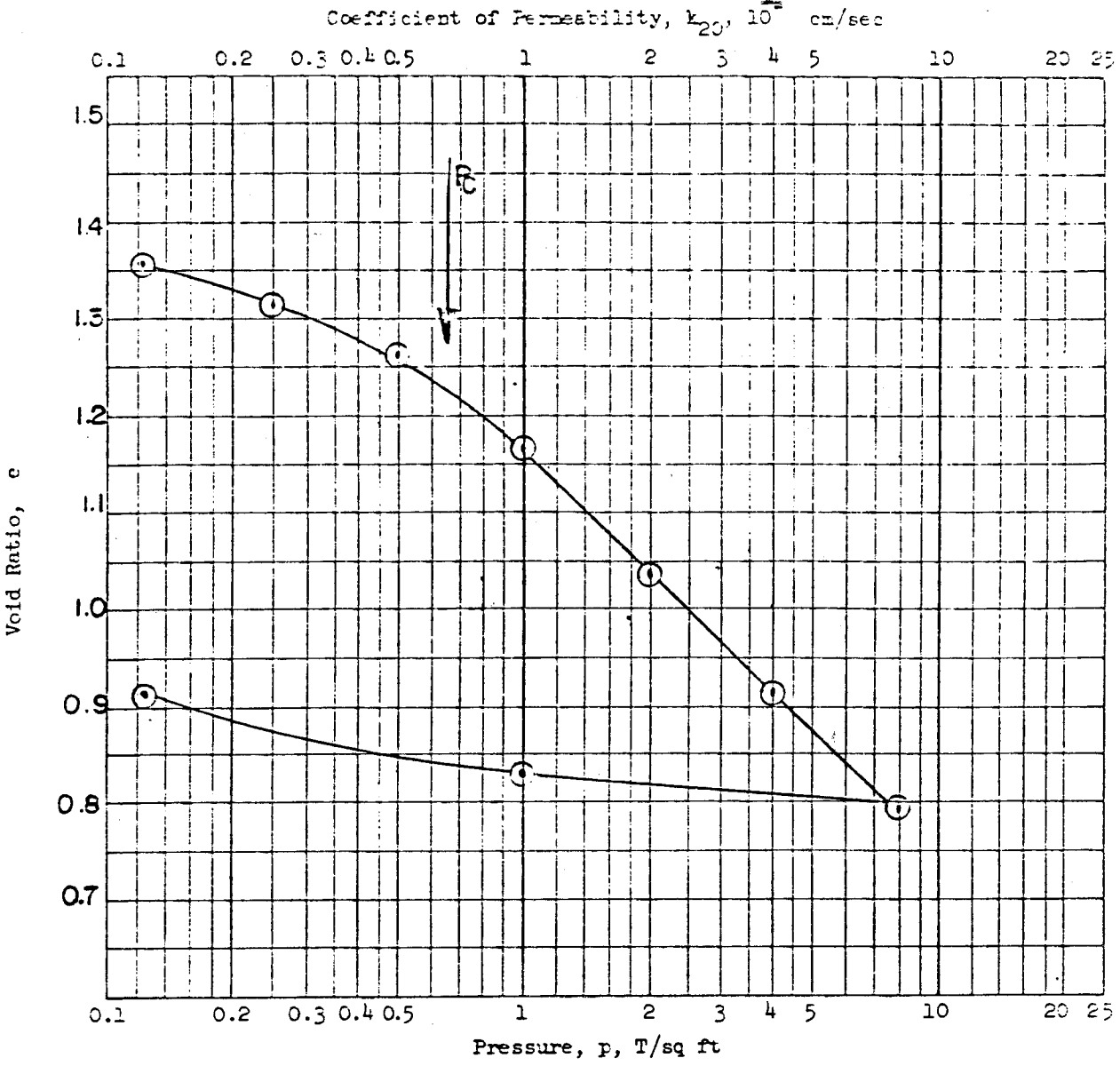


Project HARBOR DEEPENING, NORFOLK, VIRGINIA

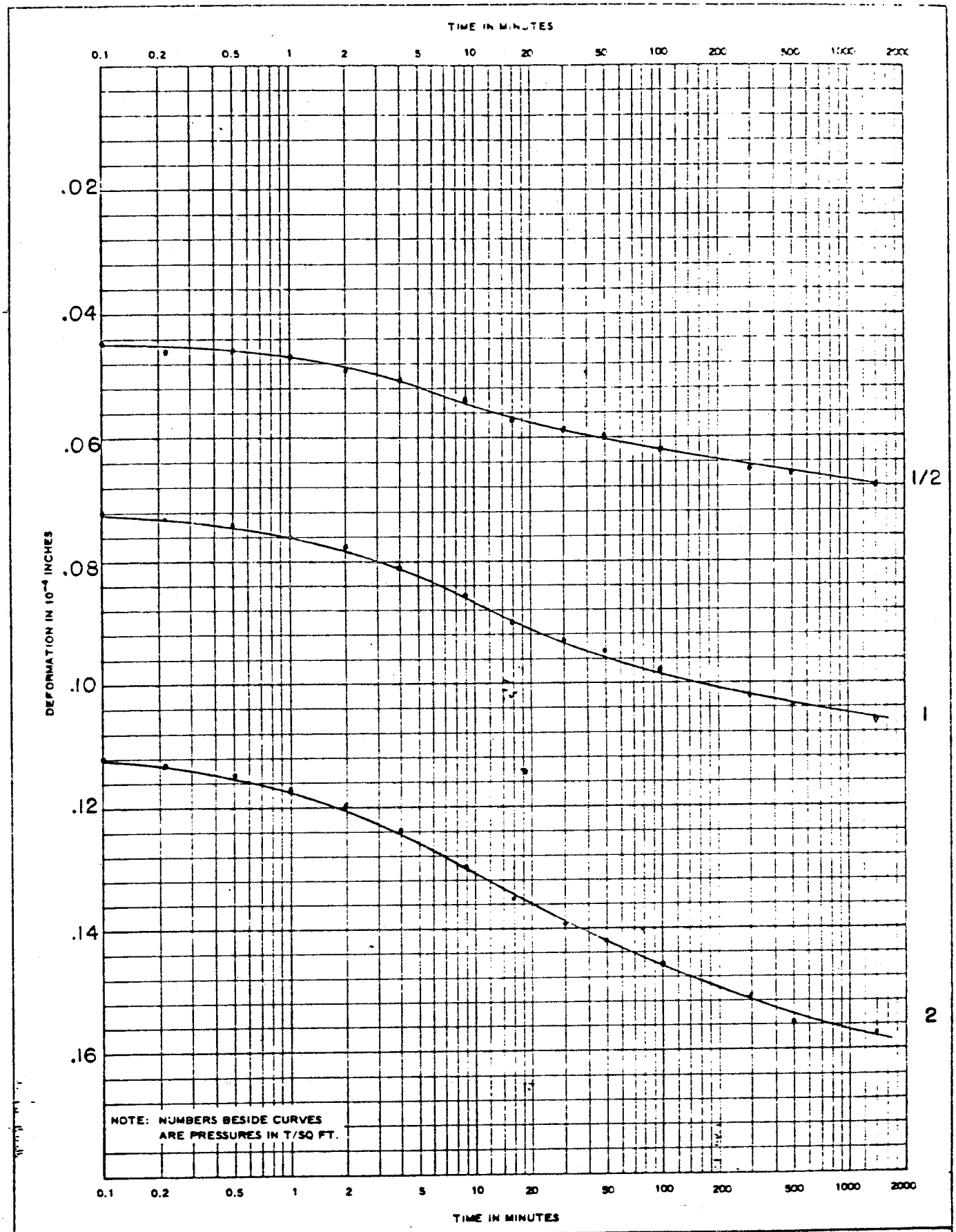
Area

Boring No. 30 | Sample No. 1 | Depth El 3.0'-5.0' | Date 9-30-63

ENG FORM 2088 (TRANSLUCENT)



Type of Specimen 4" TUBE		Before Test		After Test	
Diam 2.5 in.	Ht 1.0 in.	Water Content, w_o	55.6 %	w_f	%
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	1.427	e_f	0.910
Preconsol. Pressure, p_c 0.66 T/sq ft		Saturation, S_o	%	S_f	%
Compression Index, C_c 0.95		Dry Density, γ_d	69.9 lb/ft^3		
Classification CL		k_{20} at e_o =	$\times 10^{-}$ cm/sec		
LL 41	G_s 2.72	Project HARBOR DEEPENING			
PL 21	D_{10}	NORFOLK, VIRGINIA			
Remarks		Area			
		Boring No. 33A		Sample No. 1	
		Depth / El 2.3'-4.0'		Date 9-30-83	
V83157		CONSOLIDATION TEST REPORT			



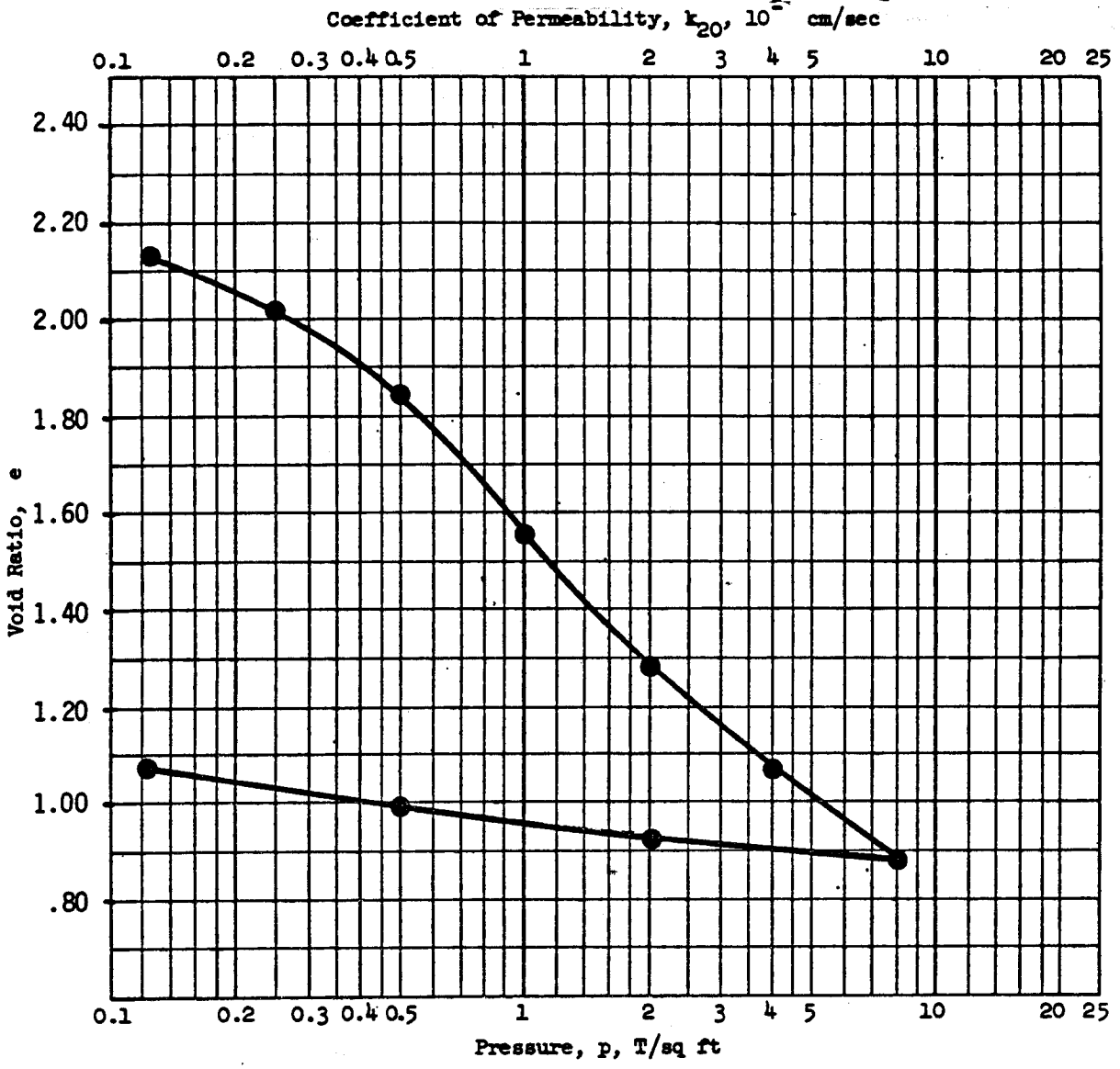
Project HARBOR DEEPENING, NORFOLK, VIRGINIA

Area

Boring No. 33A	Sample No. 1	Depth El 2.3'-4.0'	Date 9-30-83

ENG FORM 2088
1 MAY 63
PREVIOUS EDITIONS ARE OBSOLETE

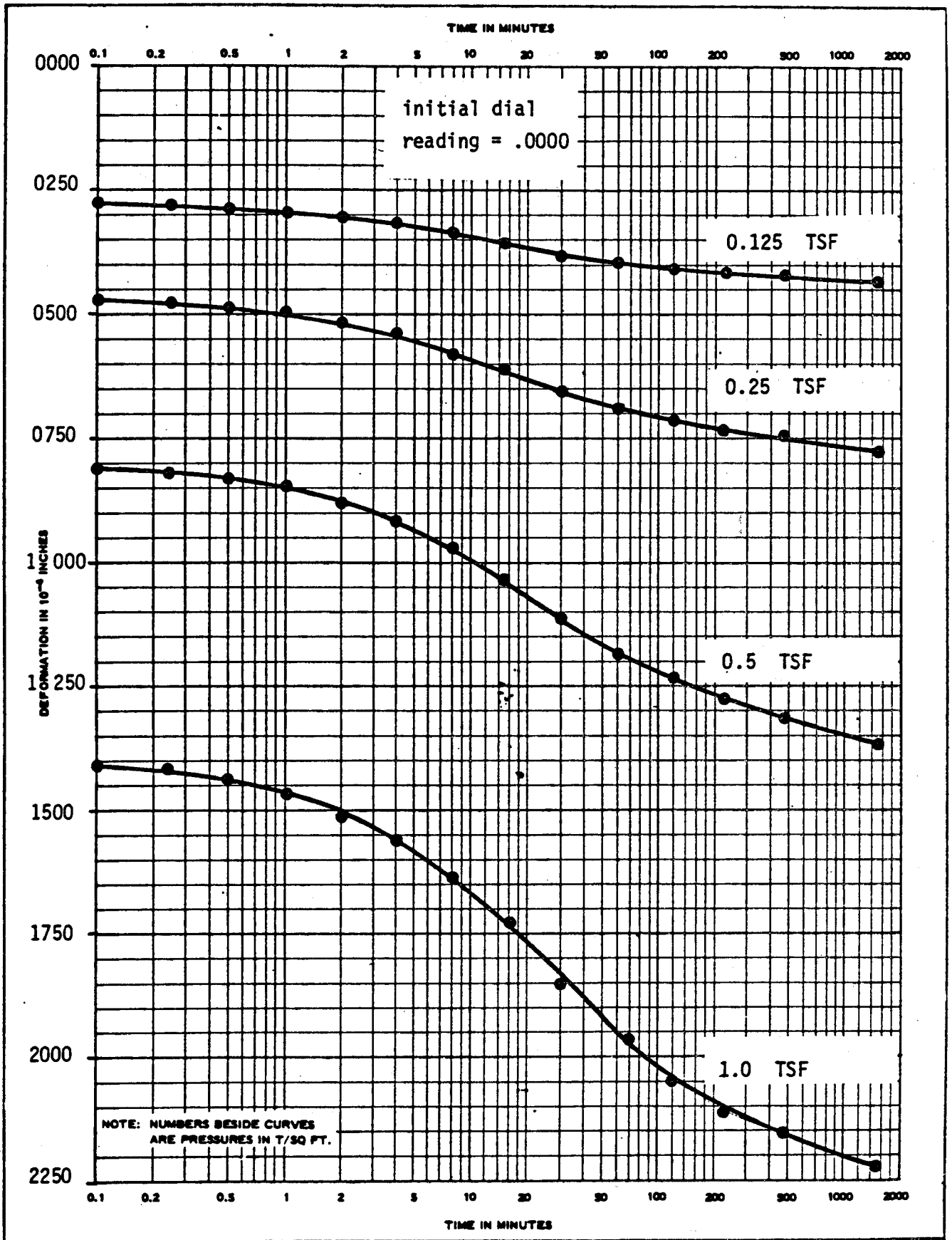
CONSOLIDATION TEST--TIME CURVES (TRANSLUCENT) Norfolk Harbor Channel



Type of Specimen undisturbed		Before Test		After Test	
Diam 2.50 in.	Ht 1.00 in.	Water Content, w_o	89.0 %	w_f	44.5 %
Overburden Pressure, Po T/sq ft		Void Ratio, e_o	2.27	e_f	1.07
Preconsol. Pressure, P_c T/sq ft		Saturation, S_o	100+ %	S_f	100+ %
Compression Index, C_c		Dry Density, γ_d	50.0 lb/ft^3		
Classification CH		k_{20} at e_o =	x 10^{-} cm/sec		
LL 68.5	G_s 2.62	Project	USACOE - Norfolk District		
PL 23.0	D_{10}		Norfolk Harbor and		
Remarks		Area	Channel Deepening		
		Boring No. 70		Sample No. 1	
		Depth El 3.5-5.5		Date 9/14/83	
		CONSOLIDATION TEST REPORT			

ENG FORM 2090 1 MAY 83 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

Norfolk Harbor Channel
CET 83-1118



Project	USACOE - Norfolk District				
Area	Norfolk Harbor and Channel Deepening				
Boring No.	70	Sample No.	1	Depth El	3.5 - 5.5'
Date	9/14/83				

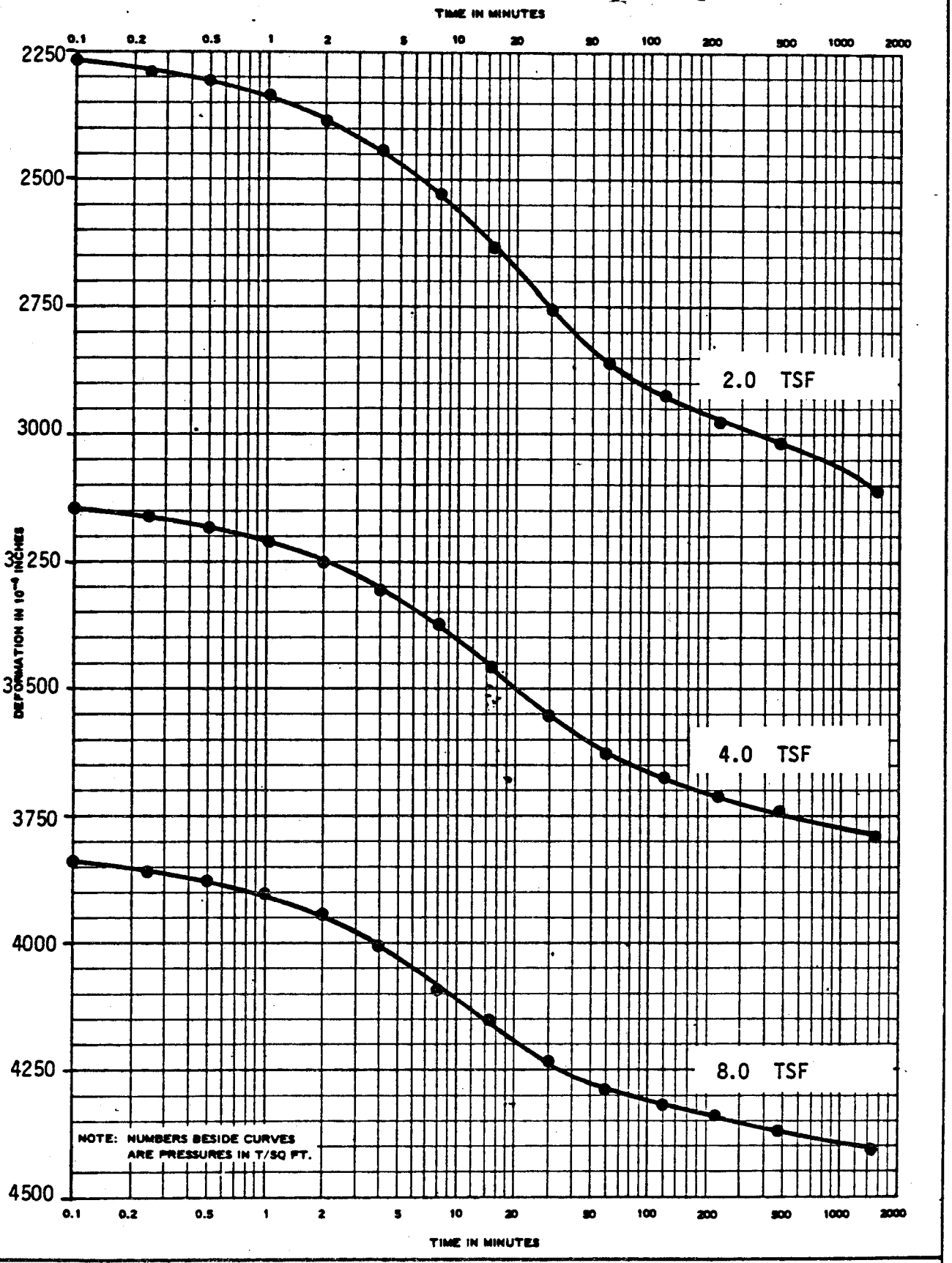
ENG FORM 2088
1 MAY 63
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES

(TRANSLUCENT)

B-1635

Norfolk Harbor Channel



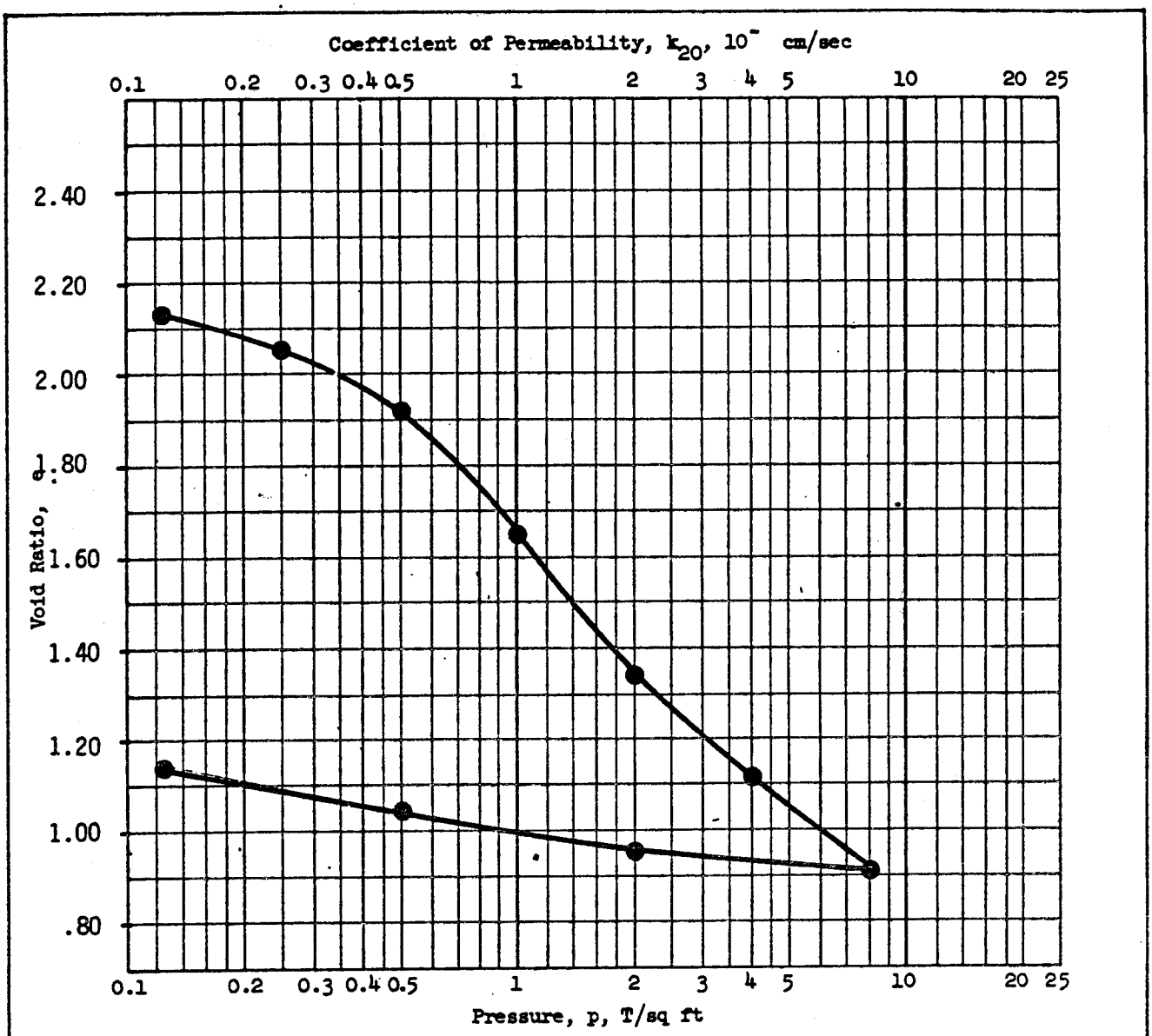
Project	USACOE - Norfolk District			
Area	Norfolk Harbor and Channel Deepening			
Boring No. 70	Sample No. 1	Depth El 3.5-5.5'	Date 9/14/83	

ENG FORM 2088
1 MAY 63
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES (TRANSLUCENT)

B-1835

Norfolk Harbor Channel
CEI 83-1118

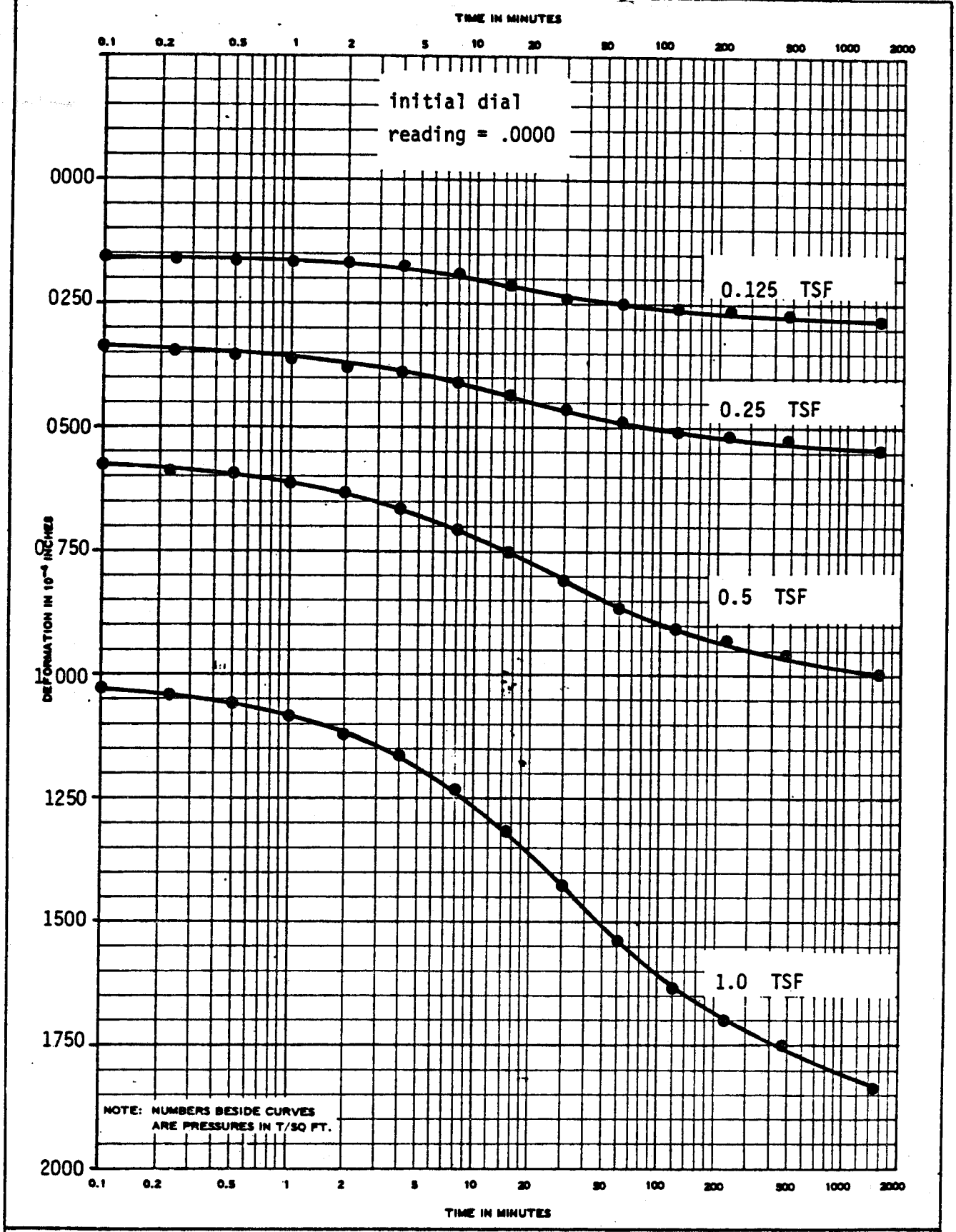


Type of Specimen	Undisturbed		Before Test			After Test	
Diam 2.50 in.	Ht 1.00 in.		Water Content, w_o	86.5 %		w_f	46.5 %
Overburden Pressure, p_o	T/sq ft		Void Ratio, e_o	2.22		e_f	1.13
Preconsol. Pressure, p_c	T/sq ft		Saturation, S_o	100+ %		S_f	100+ %
Compression Index, C_c			Dry Density, γ_d	51.0 lb/ft^3			
Classification	CH		k_{20} at e_o =	$\times 10^{-}$ cm/sec			
LL 68.5	G_s 2.63		Project	USACOE - Norfolk District			
PL 22.5	D_{10}			Norfolk Harbor and			
Remarks			Area	Channel Deepening			
			Boring No. 70		Sample No. 2		
			Depth El 8.5-10.6'		Date 9/14/83		

CONSOLIDATION TEST REPORT

ENG FORM 2090 1 MAY 63 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

Norfolk Harbor Channel



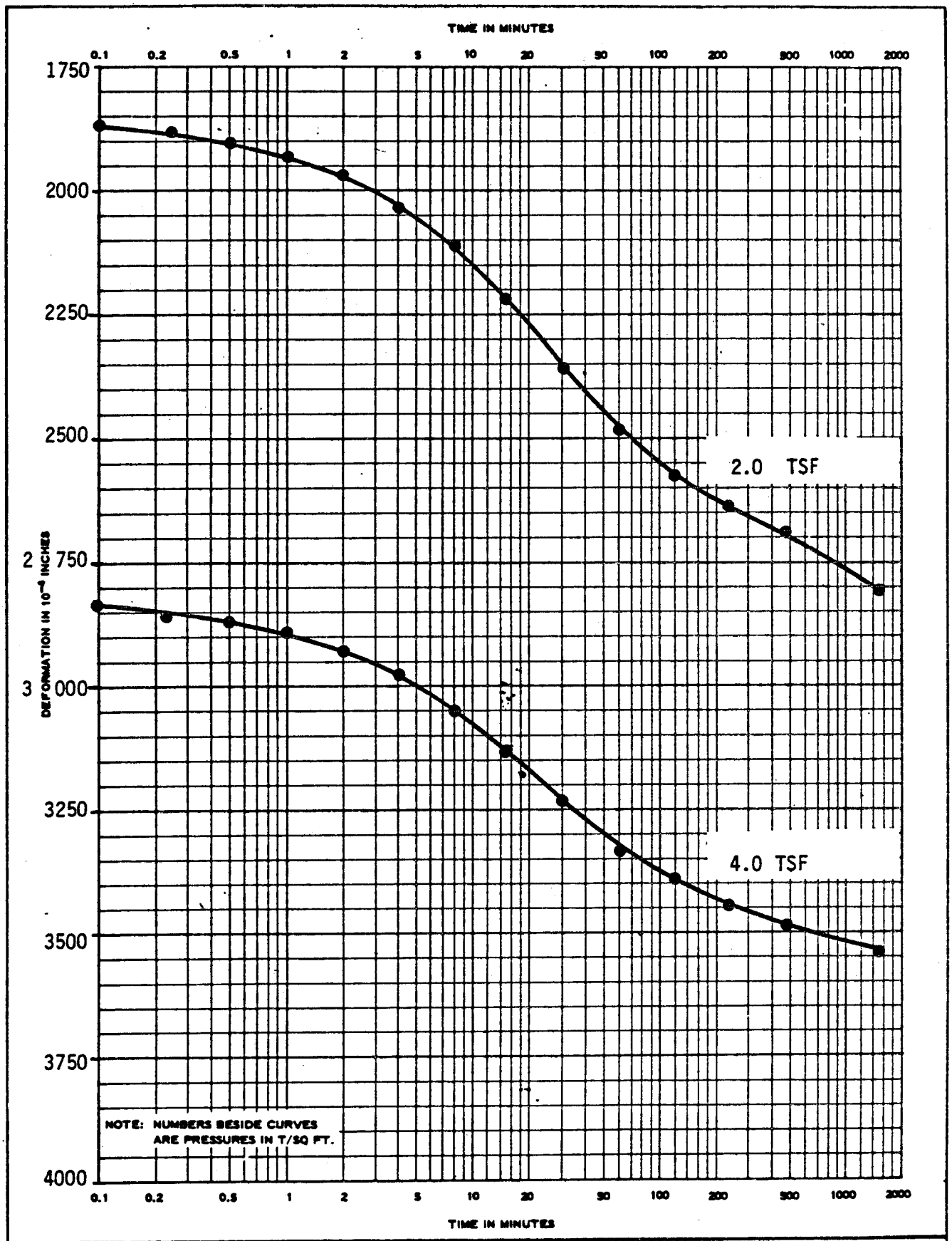
Project	USACOE - Norfolk District				
Area	Norfolk Harbor and Channel Deepening				
Boring No.	70	Sample No.	2	Depth Ft	8.5-10.6
Date	9/14/83				

ENG FORM 2088
1 MAY 63
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES

(TRANSLUCENT)

B-1835



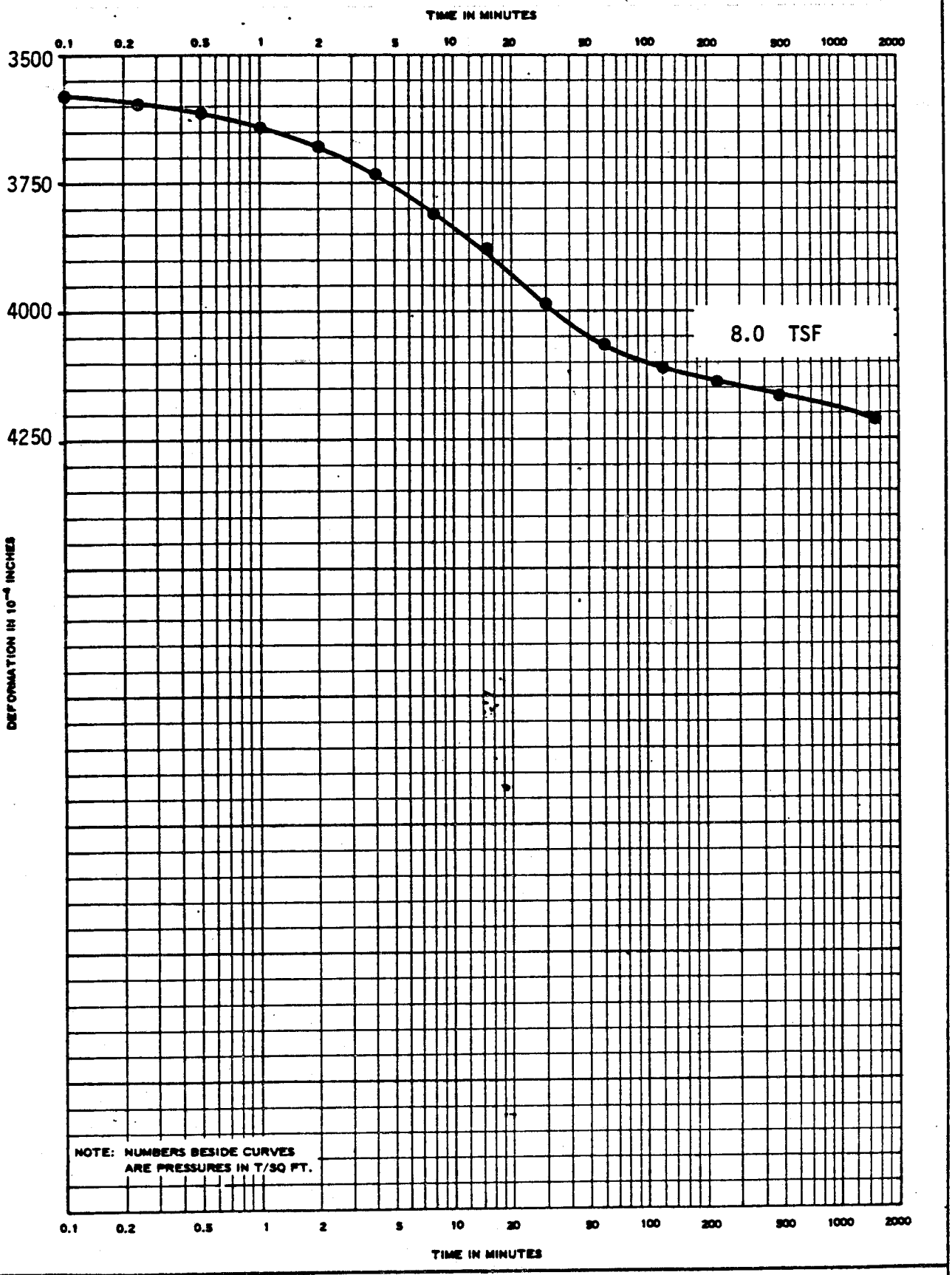
Project	USACOE - Norfolk District		
Area	Norfolk Harbor and Channel Deepening		
Boring No. 70	Sample No. 2	Depth El 8.5-10.6	Date 9/14/83

ENG FORM 2088
1 MAY 53
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES

(TRANSLUCENT)

8-1835



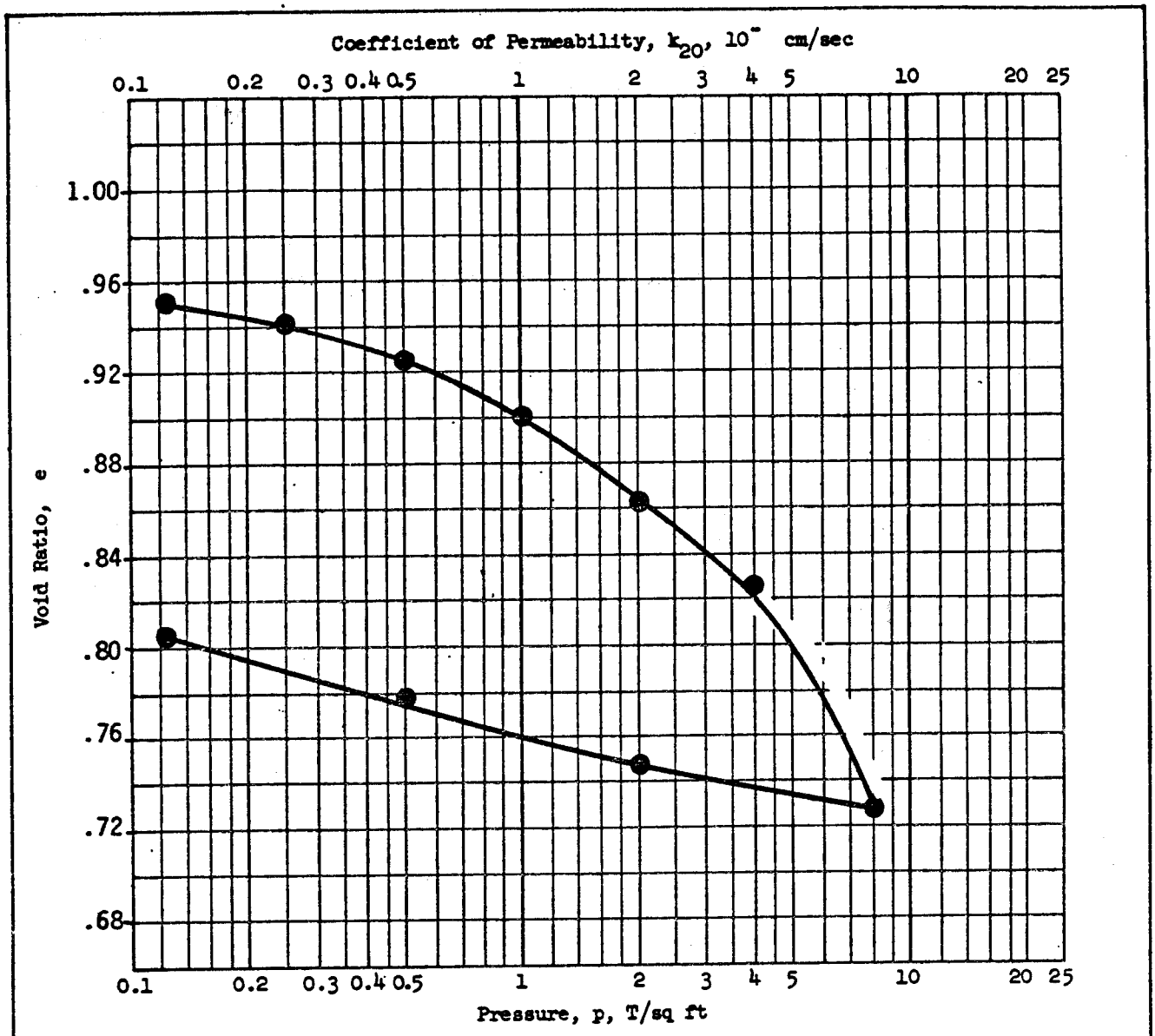
Project: USACOE - Norfolk District			
Area: Norfolk Harbor and Channel Deepening			
Boring No. 70	Sample No. 2	Depth El 8.5-10.6'	Date 9/14/83

ENG FORM 2088
1 MAY 63
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES (TRANSLUCENT)

Norfolk Harbor Channel 1835

CEI 83-1118

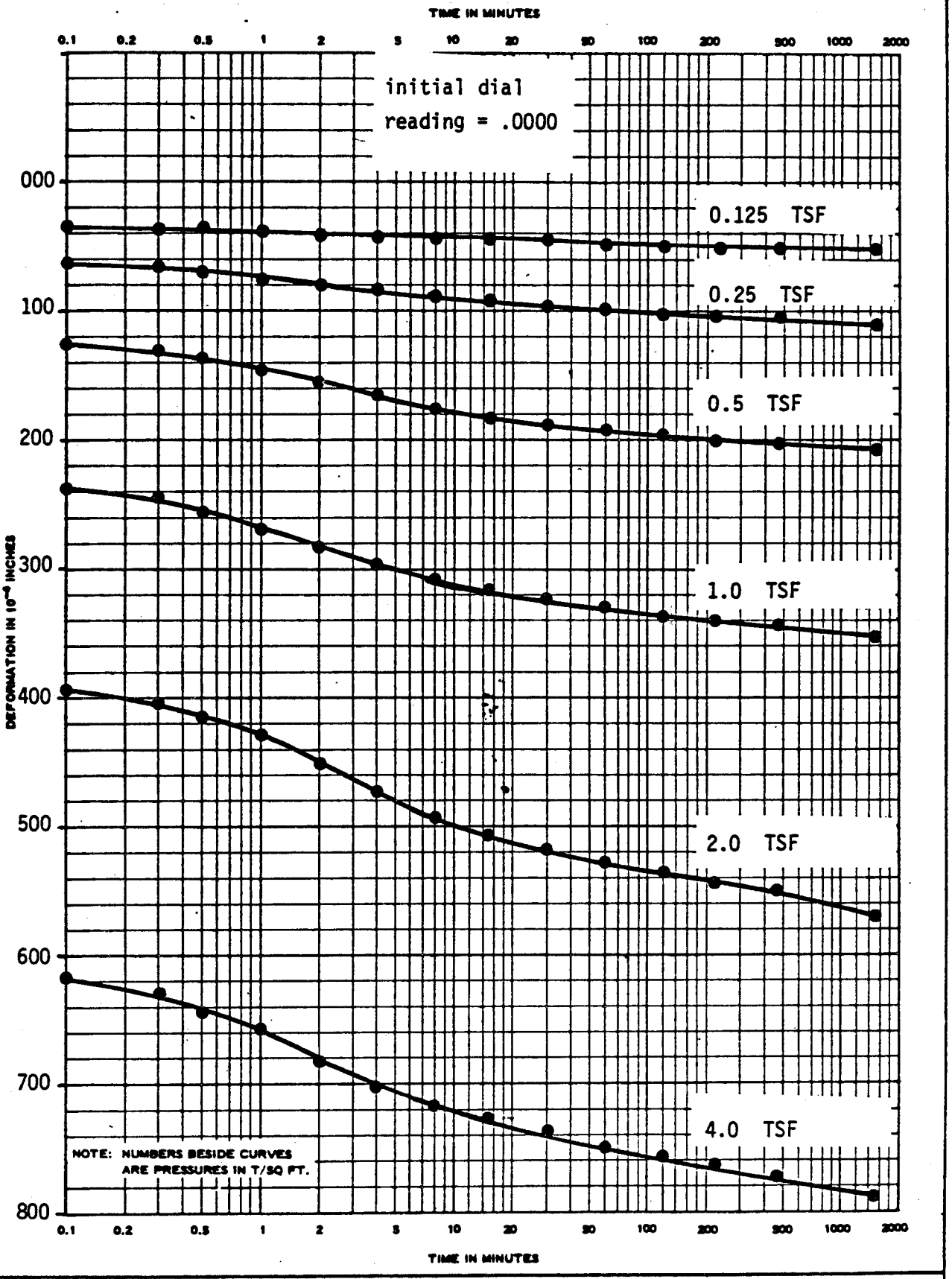


Type of Specimen	undisturbed		Before Test		After Test	
Diam 2.50 in.	Ht 1.00 in.		Water Content, w_o	39.5 %	w_f	34.5 %
Overburden Pressure, p_o	T/sq ft		Void Ratio, e_o	.95	e_f	.81
Preconsol. Pressure, p_c	T/sq ft		Saturation, S_o	100+ %	S_f	100+ %
Compression Index, C_c			Dry Density, γ_d	83.0 lb/ft^3		
Classification	CH		k_{20} at e_o =	$\times 10^{-}$ cm/sec		
LL 53.5	G_s 2.60		Project	USACOE - Norfolk District		
PL 21.0	D_{10}			Norfolk Harbor and		
Remarks			Area	Channel Deepening		
			Boring No. 71		Sample No. 1	
			Depth El 1-3'		Date 9/14/83	

CONSOLIDATION TEST REPORT

ENG FORM 2090 1 MAY 63 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

Norfolk Harbor Channel
CEL 83-1118



Project USACOE - Norfolk District			
Area Norfolk Harbor and Channel Deepening			
Boring No. 71	Sample No. 1	Depth El 1-3'	Date 9/14/83

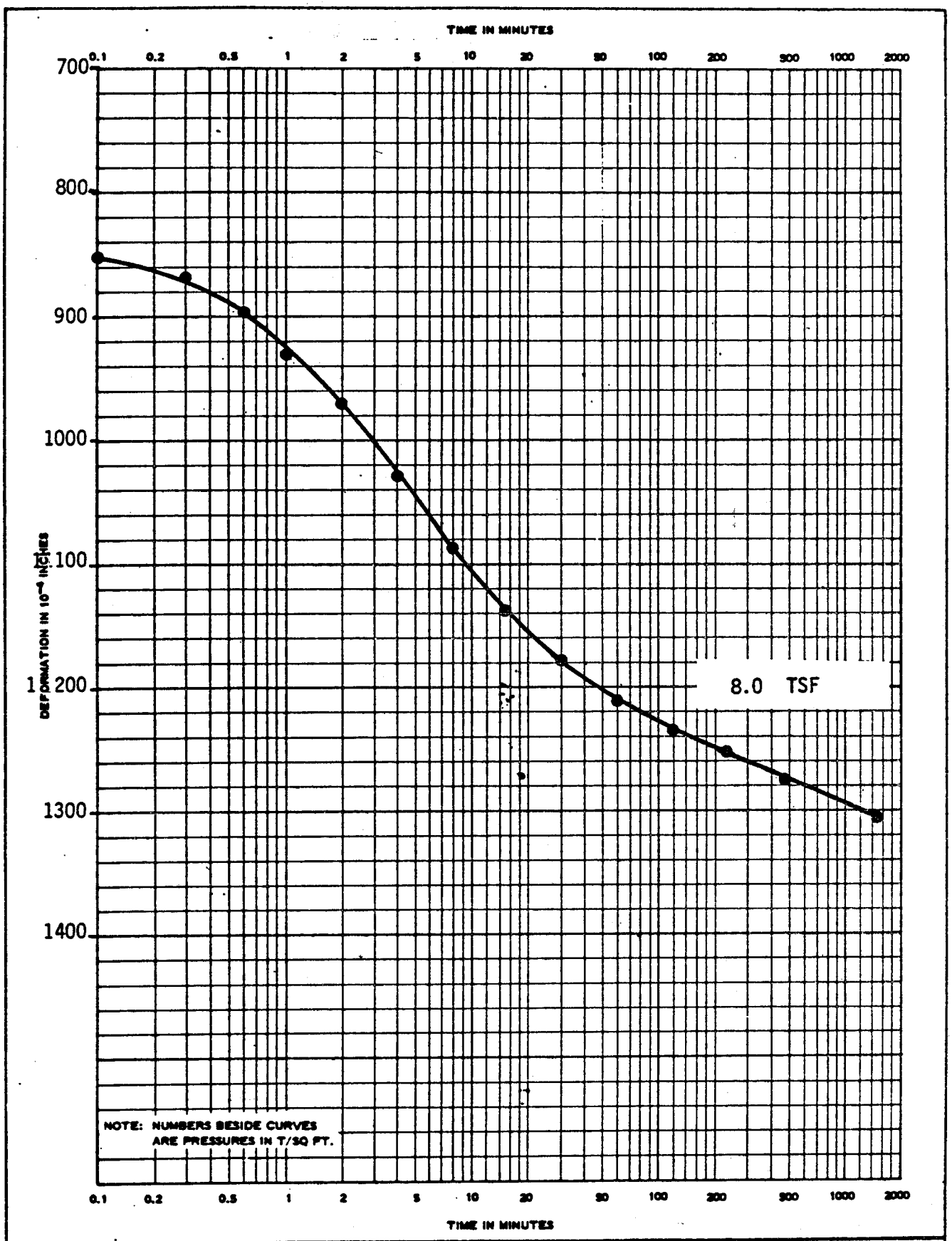
ENG FORM 2088
1 MAY 63
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES (TRANSLUCENT)

B-1835

Norfolk Harbor Channel

CET 83 1119



Project	USACOE - Norfolk District			
Area	Norfolk Harbor and Channel Deepening			
Boring No. 71	Sample No. 1	Depth El 1-3'	Date 9/14/83	

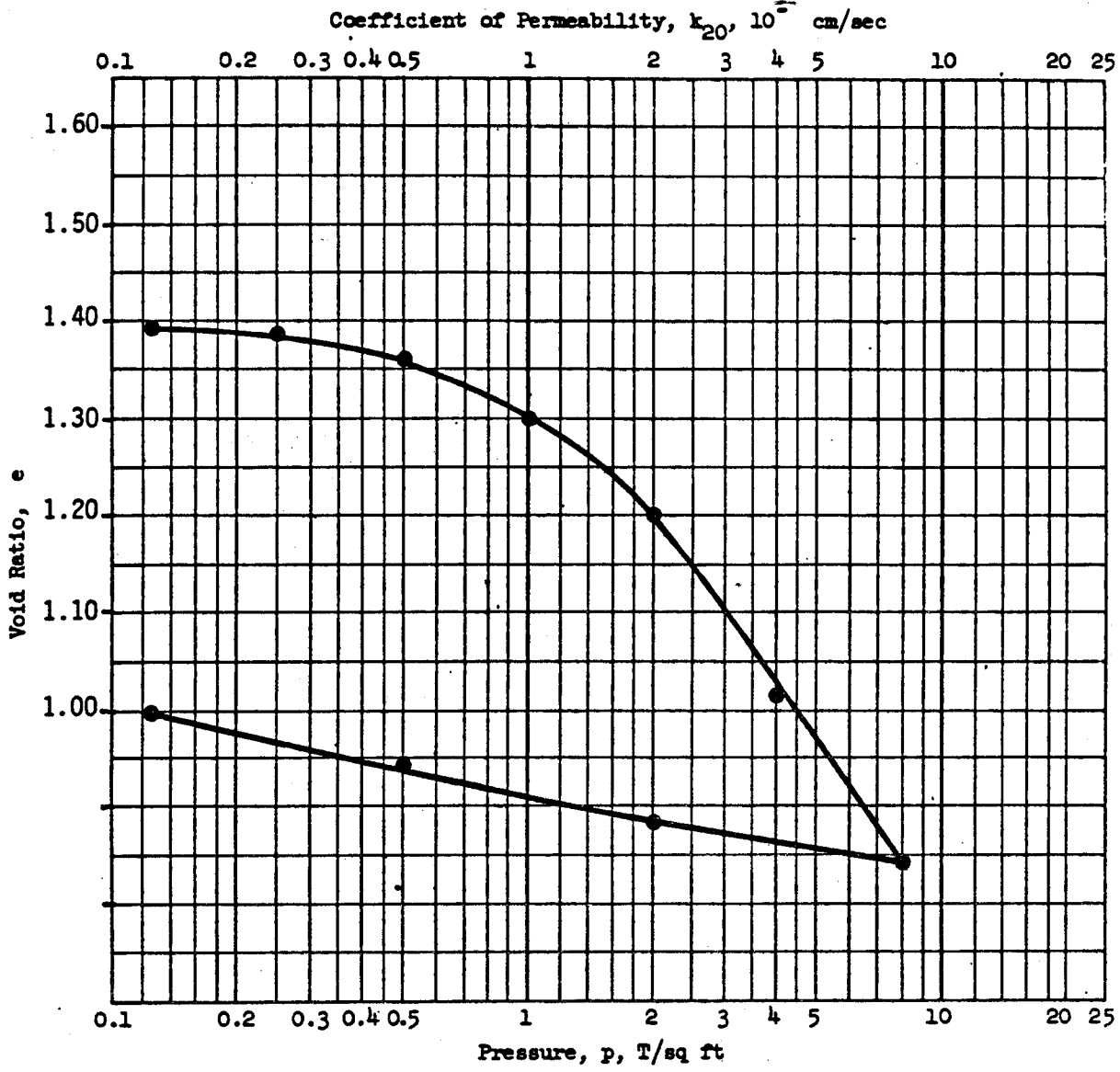
ENG FORM 2088
1 MAY 63
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES

(TRANSLUCENT)

Norfolk Harbor Channel

8-1835

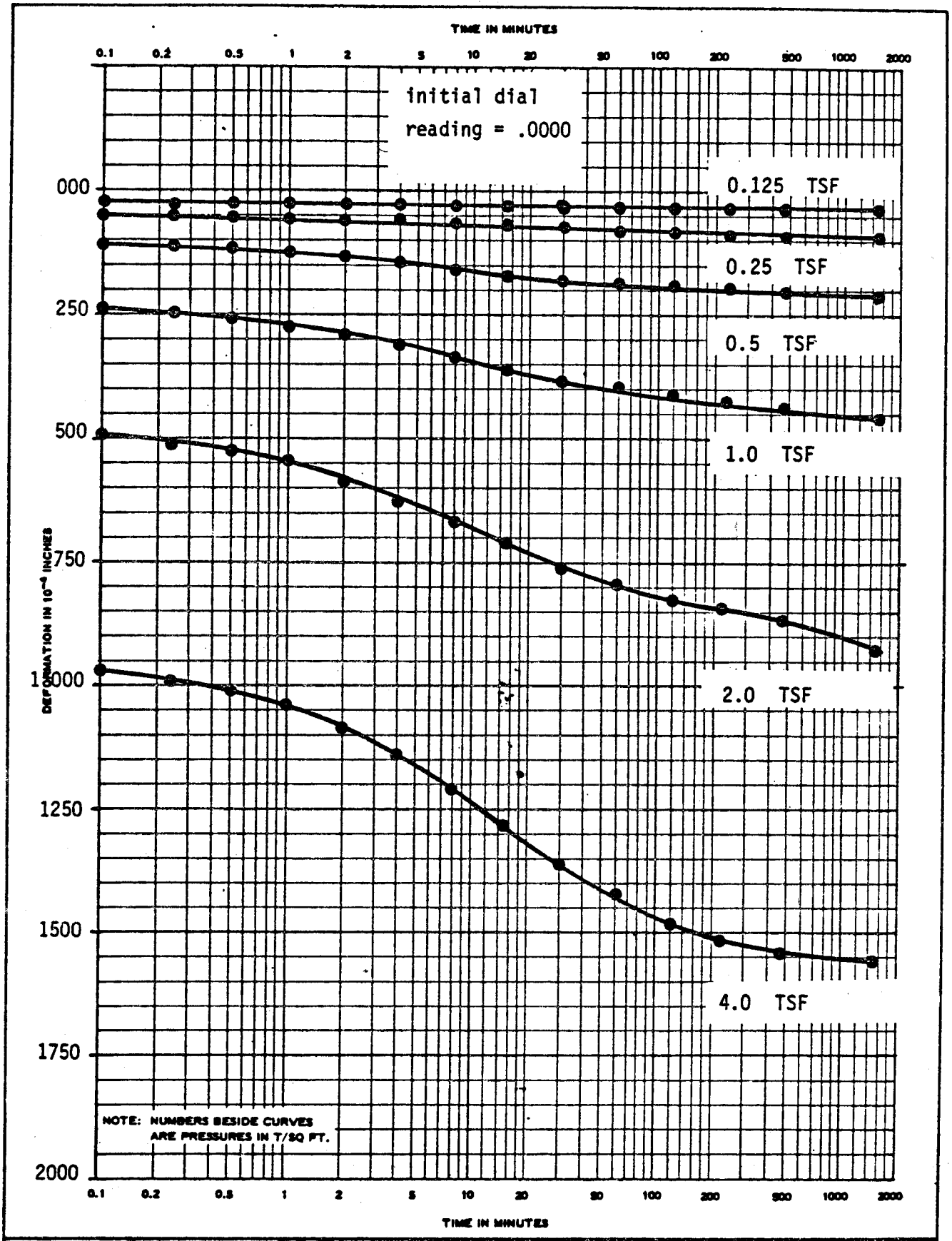


Type of Specimen undisturbed		Before Test			After Test	
Diam 2.50 in.	Ht 1.00 in.	Water Content, w_o	57.5 %	w_f	43.0 %	
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	1.40	e_f	1.00	
Preconsol. Pressure, p_c T/sq ft		Saturation, S_o	100+ %	S_f	100+ %	
Compression Index, C_c		Dry Density, γ_d	67.0 lb/ft^3			
Classification CH		k_{20} at e_o =	$\times 10^{-}$ cm/sec			
LL 60.0	G_s 2.57	Project	USACOE - Norfolk District			
PL 19.5	D_{10}		Norfolk Harbor and			
Remarks		Area	Channel Deepening			
		Boring No. 71		Sample No. 2		
		Depth El 6.4-8.5		Date 9/14/83		
		CONSOLIDATION TEST REPORT				

ENG FORM 2090 1 MAY 63 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

Norfolk Harbor Channel

CEI 83-1118

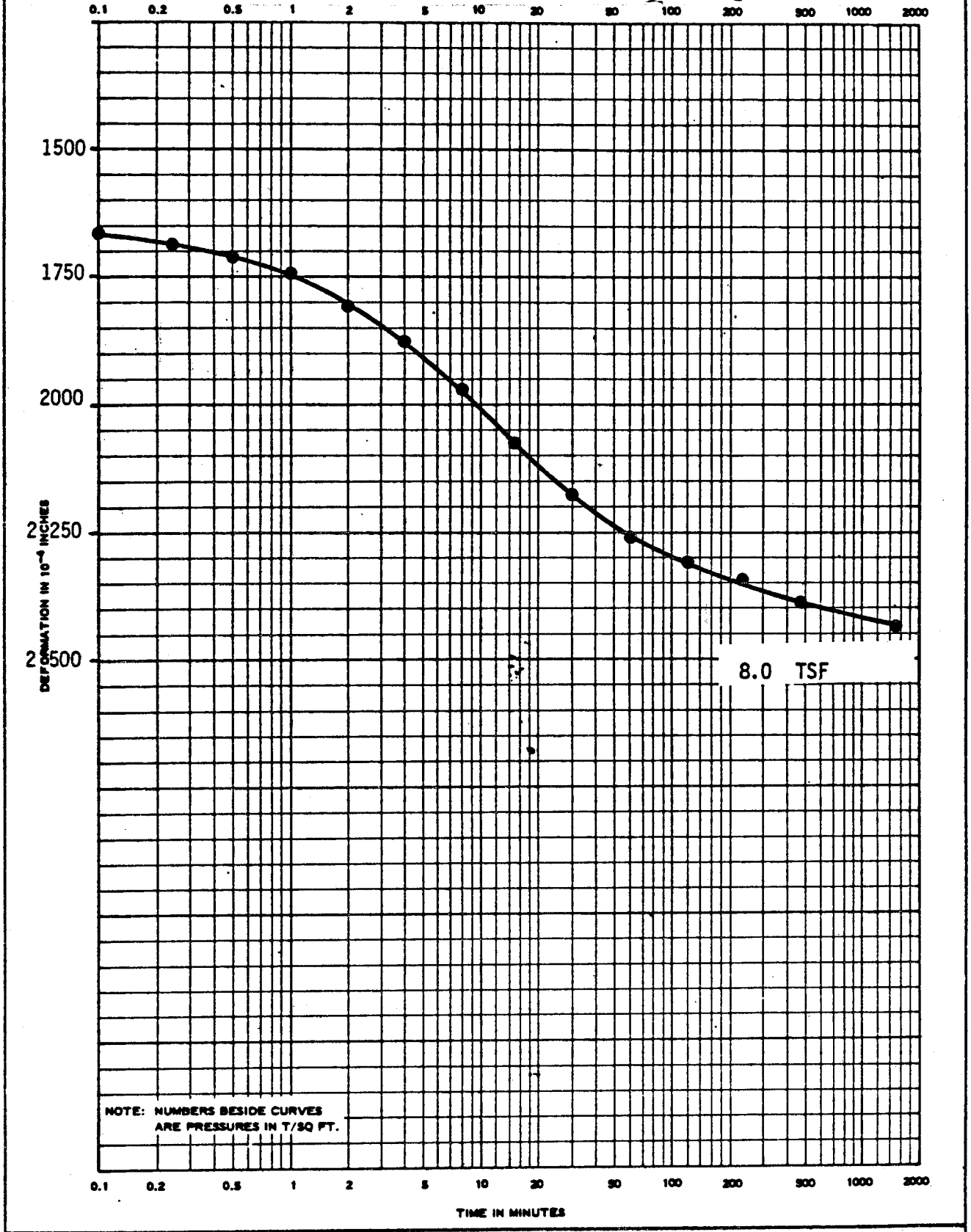


Project	USACOE - Norfolk District			
Area	Norfolk Harbor and Channel Deepening			
Boring No. 71		Sample No. 2	Depth El 6.4-8.5'	Date 9/14/83

ENG FORM 2088
1 MAY 63
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES (TRANSLUCENT)

Norfolk Harbor Channel 87 1835
CEL 82 111H



Project	USACOE - Norfolk District		
Area	Norfolk Harbor and Channel Deepening		
Boring No. 71	Sample No. 2	Depth El 6.4-8.5'	Date 9/14/83

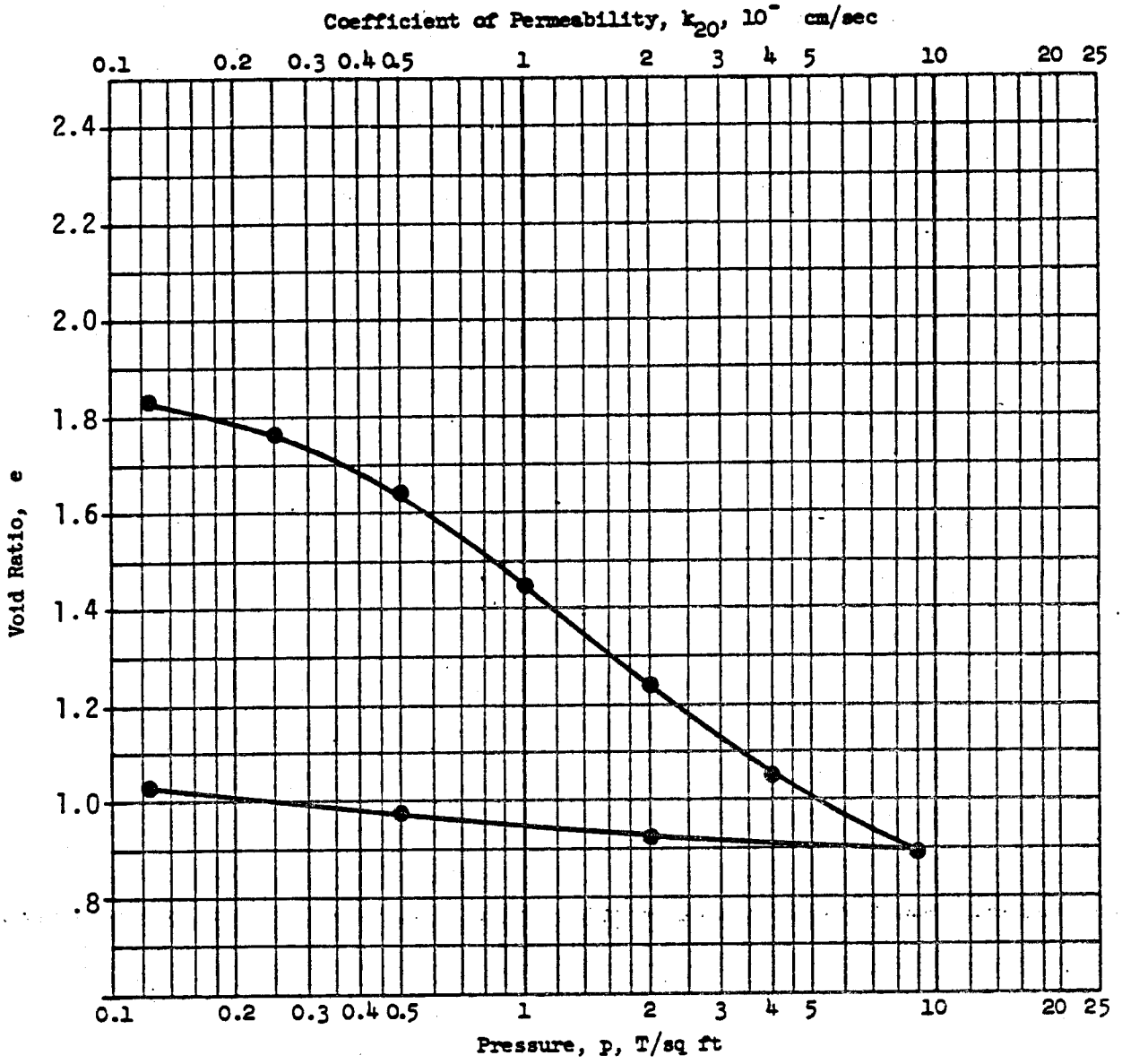
ENG FORM 2088
1 MAY 63
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES (TRANSLUCENT)

B-1835

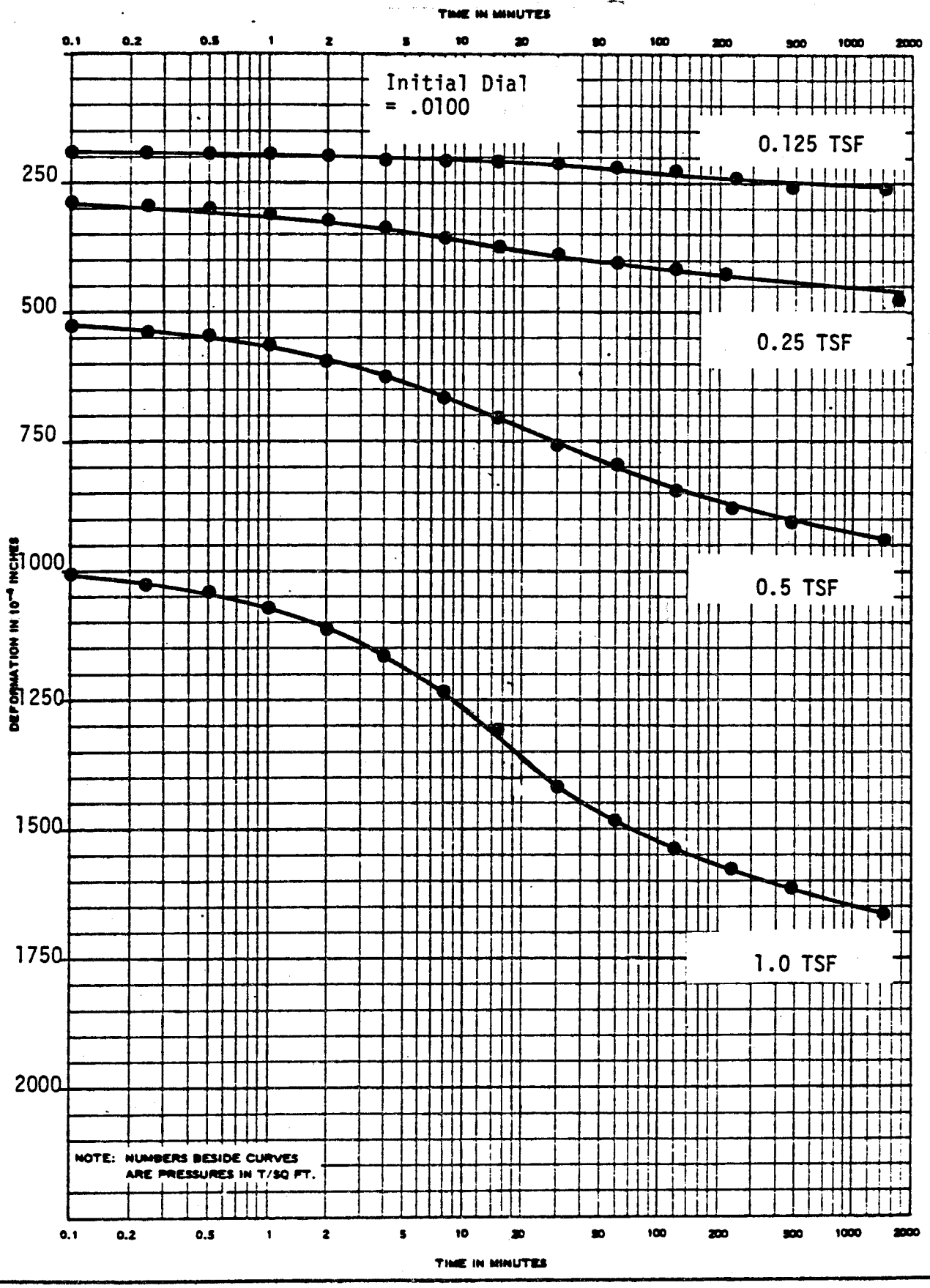
Norfolk Harbor Channel

CEI 83-1118



Type of Specimen	Undisturbed		Before Test		After Test	
Diam 2.50 in.	Ht 1.0 in.		Water Content, w_o	69.5 %	w_f	45.0 %
Overburden Pressure, Po	T/sq ft		Void Ratio, e_o	1.865	e_f	1.033
Preconsol. Pressure, P_c	T/sq ft		Saturation, S_o	99.5 %	S_f	100.0 %
Compression Index, C_c			Dry Density, γ_d	58.0 lb/ft^3		
Classification	CH		k_{20} at e_o =	$\times 10^{-}$ cm/sec		
LL 78.0	G_s 2.66		Project	Norfolk Harbor and Channel Deepening		
PL 28.0	D_{10} -					
Remarks	Gray CLAY		Area	Norfolk, Virginia		
			Boring No. 129	Sample No. 2		
			Depth / El 10-11.5'	Date 2/7/85		

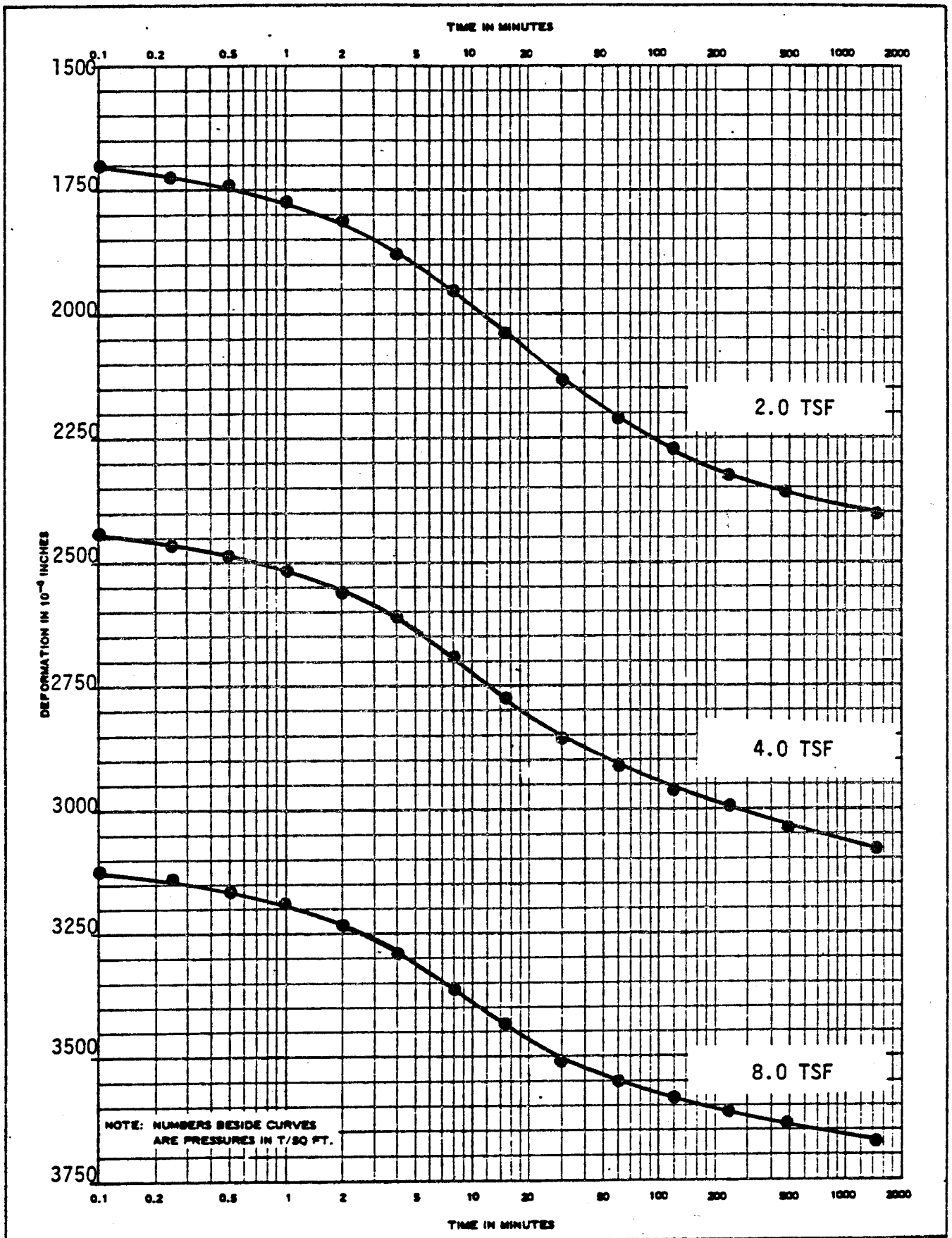
CONSOLIDATION TEST REPORT



Project	Norfolk Harbor and Channels Deepening				
Area	Norfolk, Virginia				
Boring No.	129	Sample No.	2	Depth El	10-11.5'
Date	2/7/85				

ENG FORM 2088
1 MAY 82
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES (TRANSLUCENT)

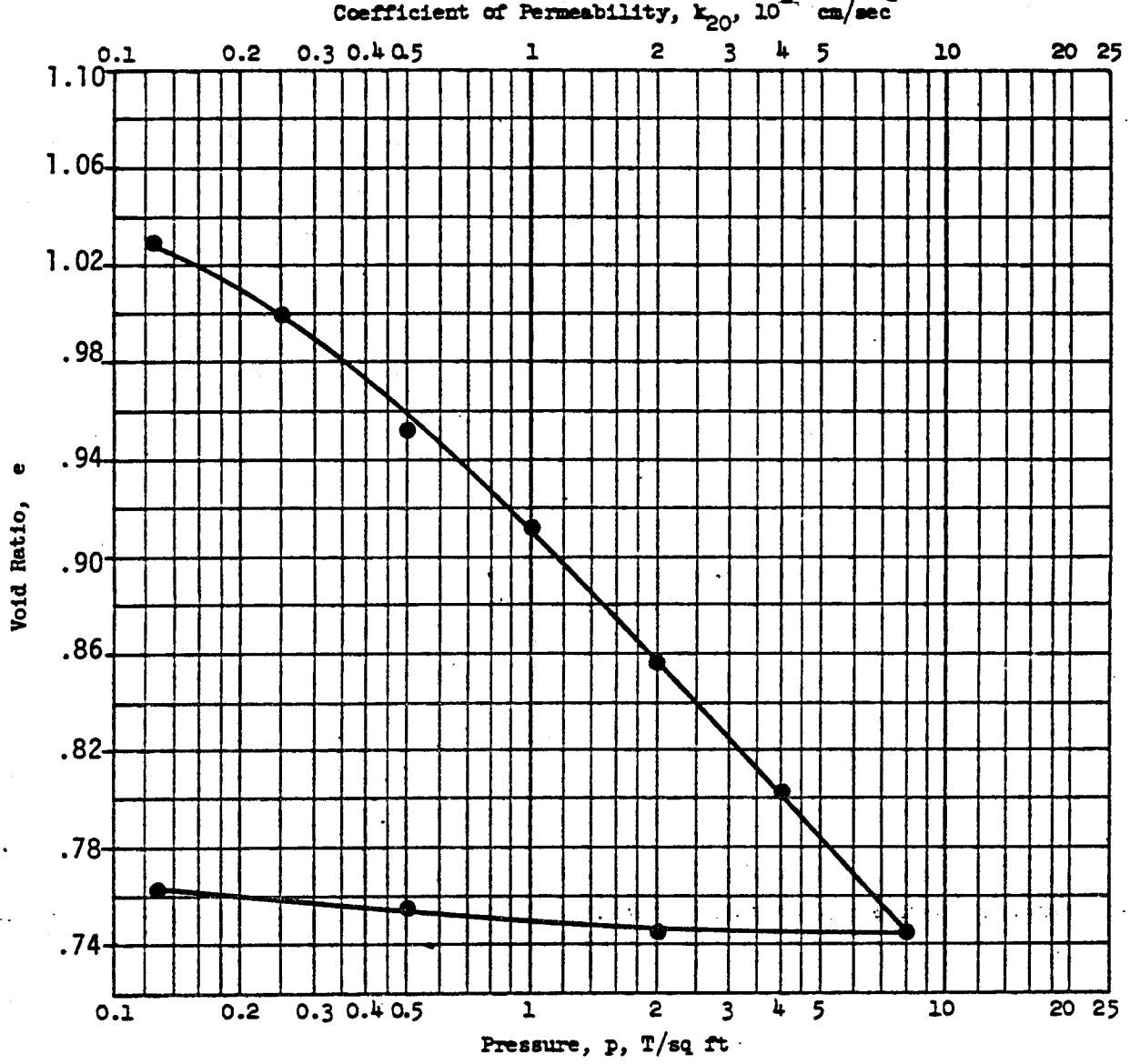


Project	Norfolk Harbor and Channels Deepening				
Area	Norfolk, Virginia				
Boring No.	129	Sample No.	2	Depth El.	10-11.5'
Date	2/7/85				

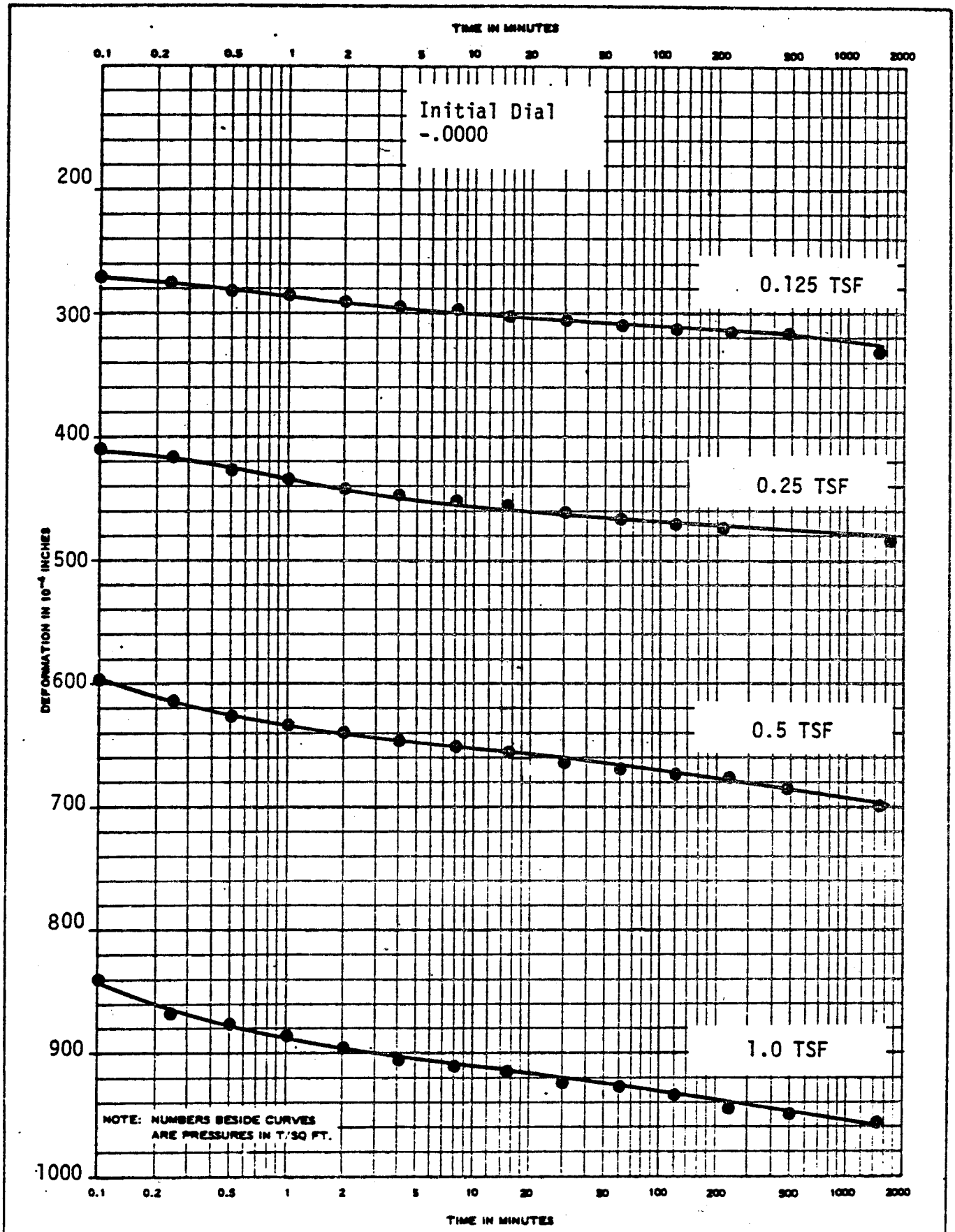
ENG FORM 2088
1 MAY 63
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES

(TRANSLUCENT)



Type of Specimen	Undisturbed			Before Test		After Test	
Diam 2.50 in.	Ht 1.00 in.		Water Content, w_o	34.5 %	w_f	34.0 %
Overburden Pressure, p_o T/sq ft			Void Ratio, e_o	1.092	e_f	0.763
Preconsol. Pressure, p_c T/sq ft			Saturation, S_o	86.0 %	S_f	100 %
Compression Index, C_c			Dry Density, γ_d	81.0 lb/ft^3		
Classification	SM		k_{20} at e_o =	× 10^{-} cm/sec		
LL NP	G_s 2.71		Project	Norfolk Harbor & Channels Deepening		
PL NP	D_{10}					
Remarks	Gray Silty SAND		Area	Norfolk, Virginia		
			Boring No.	131	Sample No.	2
			Depth El	12.8 - 14.3	Date	2/11/85
			CONSOLIDATION TEST REPORT			

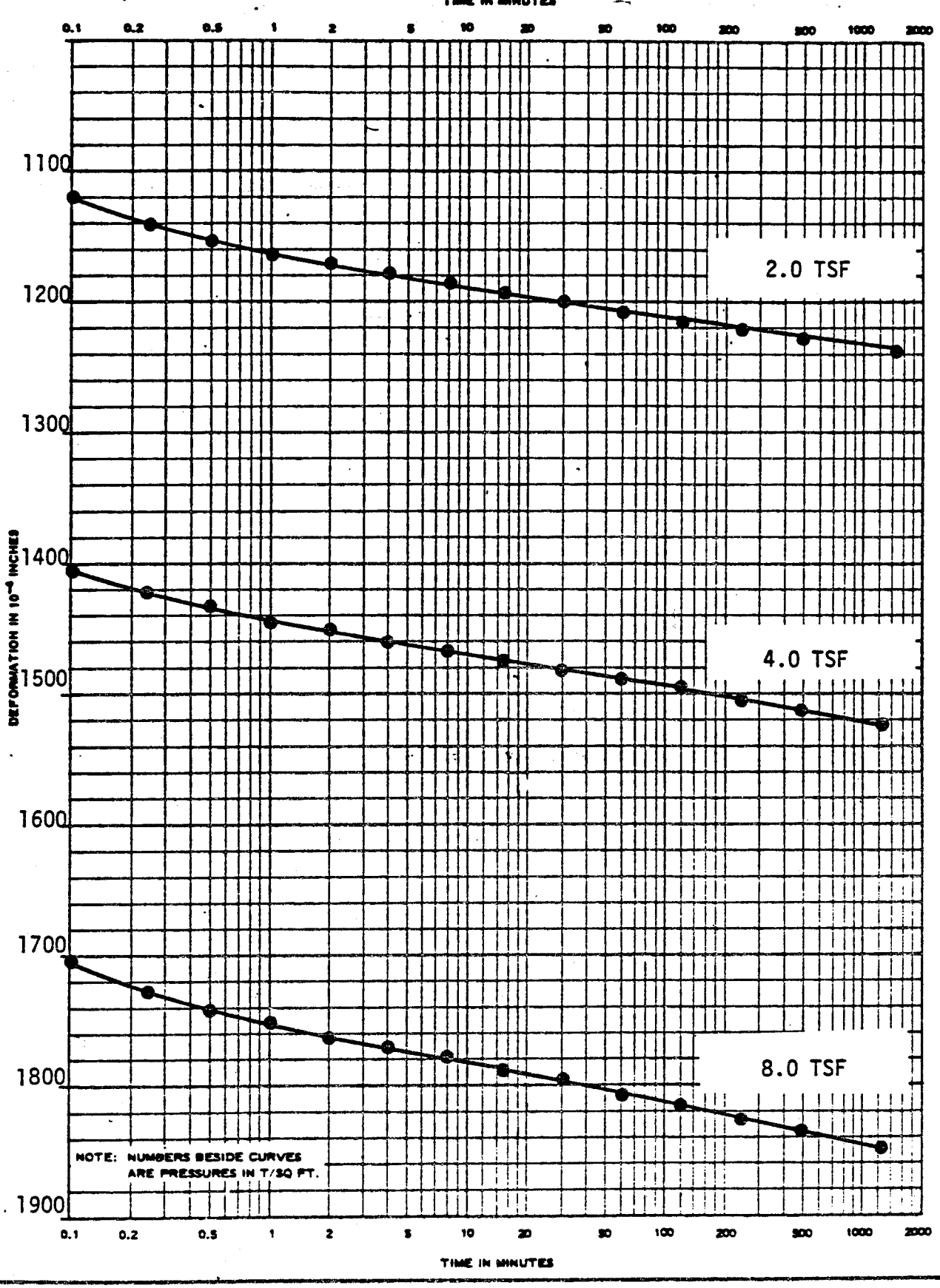


Project	Norfolk Harbor and Channels Deepening						
Area	Norfolk, Virginia						
Boring No.	131	Sample No.	2	Depth El	12.8 - 14.3	Date	2/11/85

ENG FORM 2088
1 MAY 63
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES

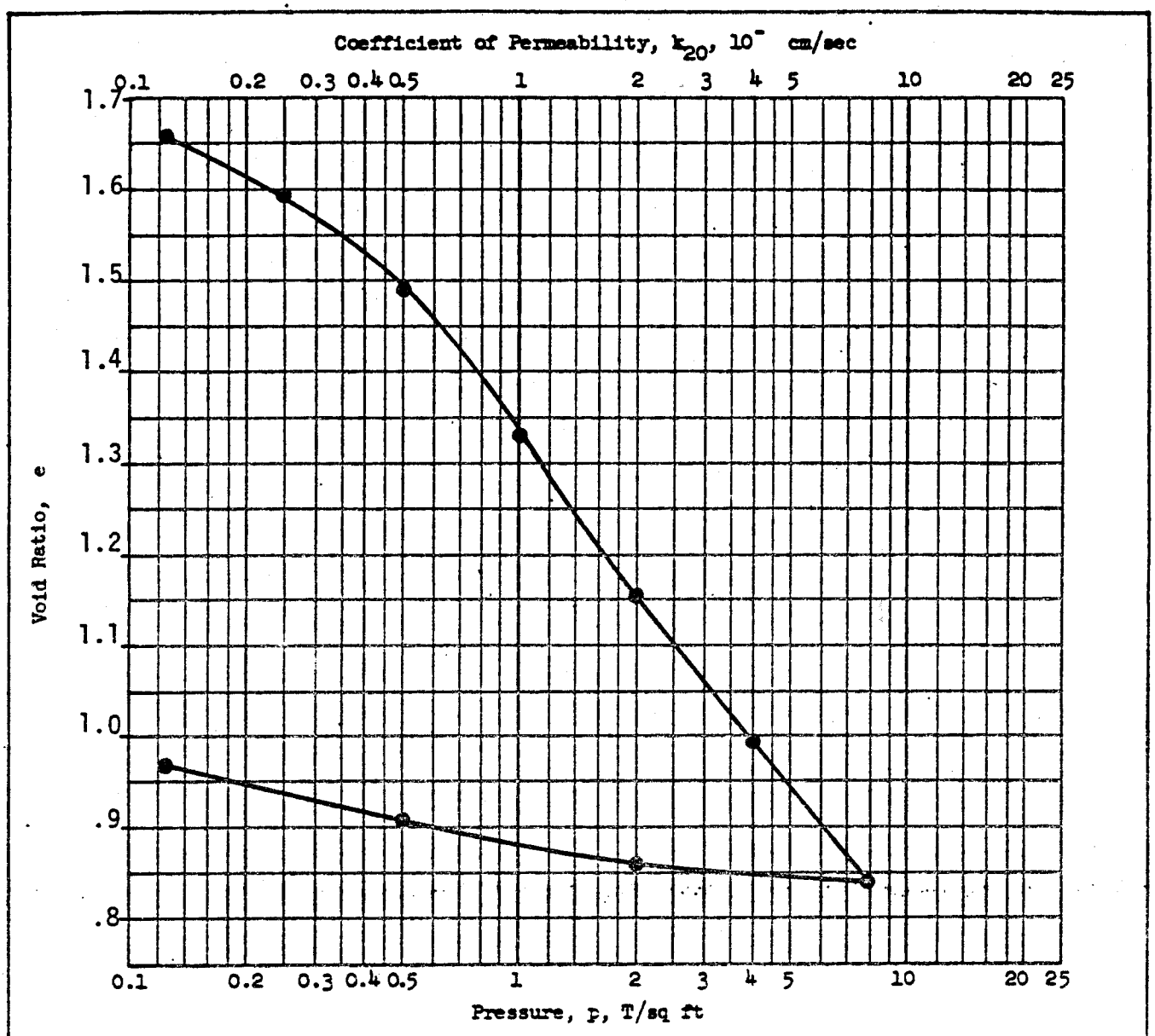
(TRANSLUCENT)



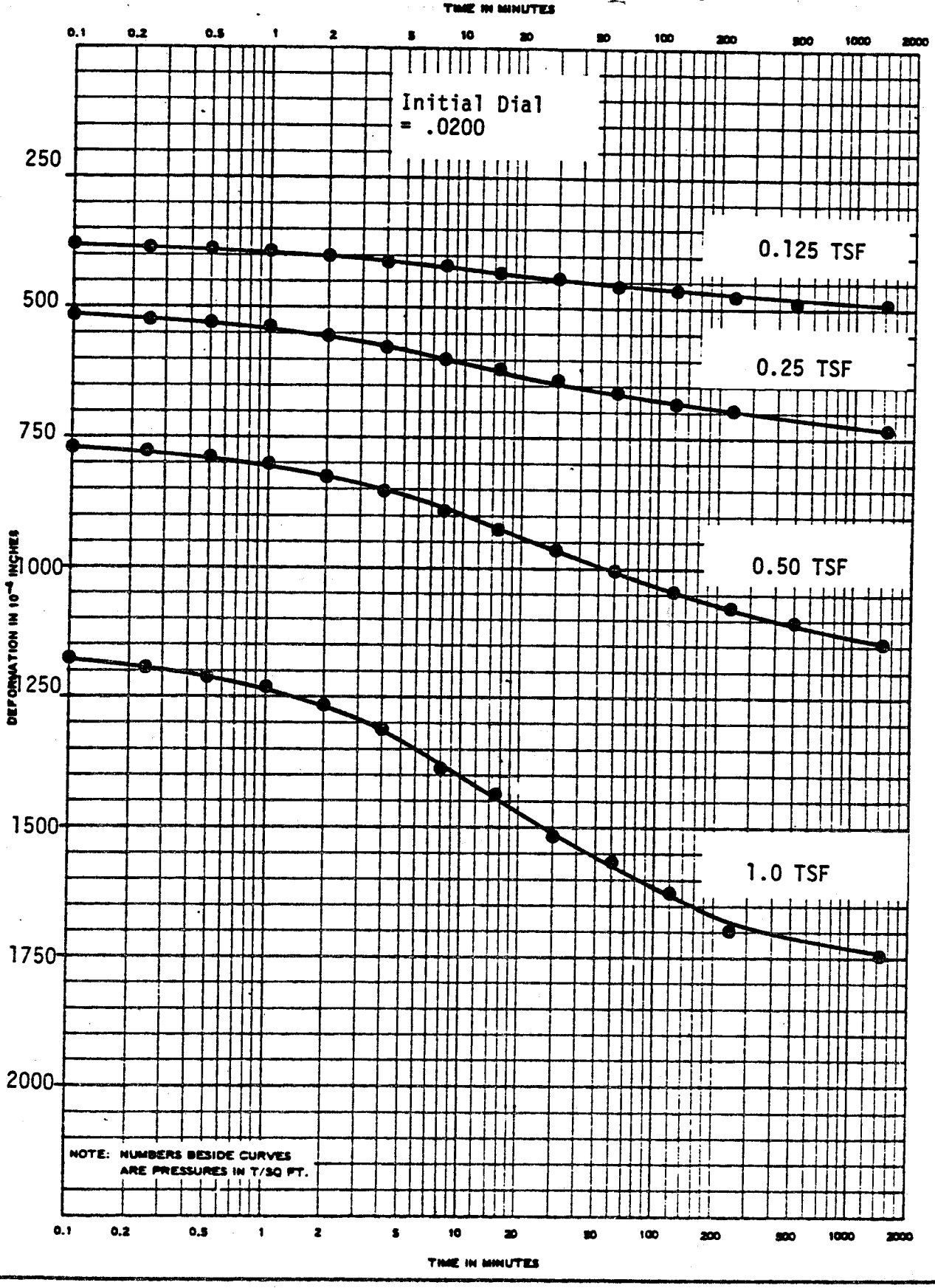
Project	Norfolk Harbor and Channels Deepening				
Area	Norfolk, Virginia				
Boring No.	131	Sample No.	2	Depth Ft	12.8 - 14.3
Date	2/11/85				

ENG FORM 2088
1 MAY 83
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES (TRANSLUCENT)



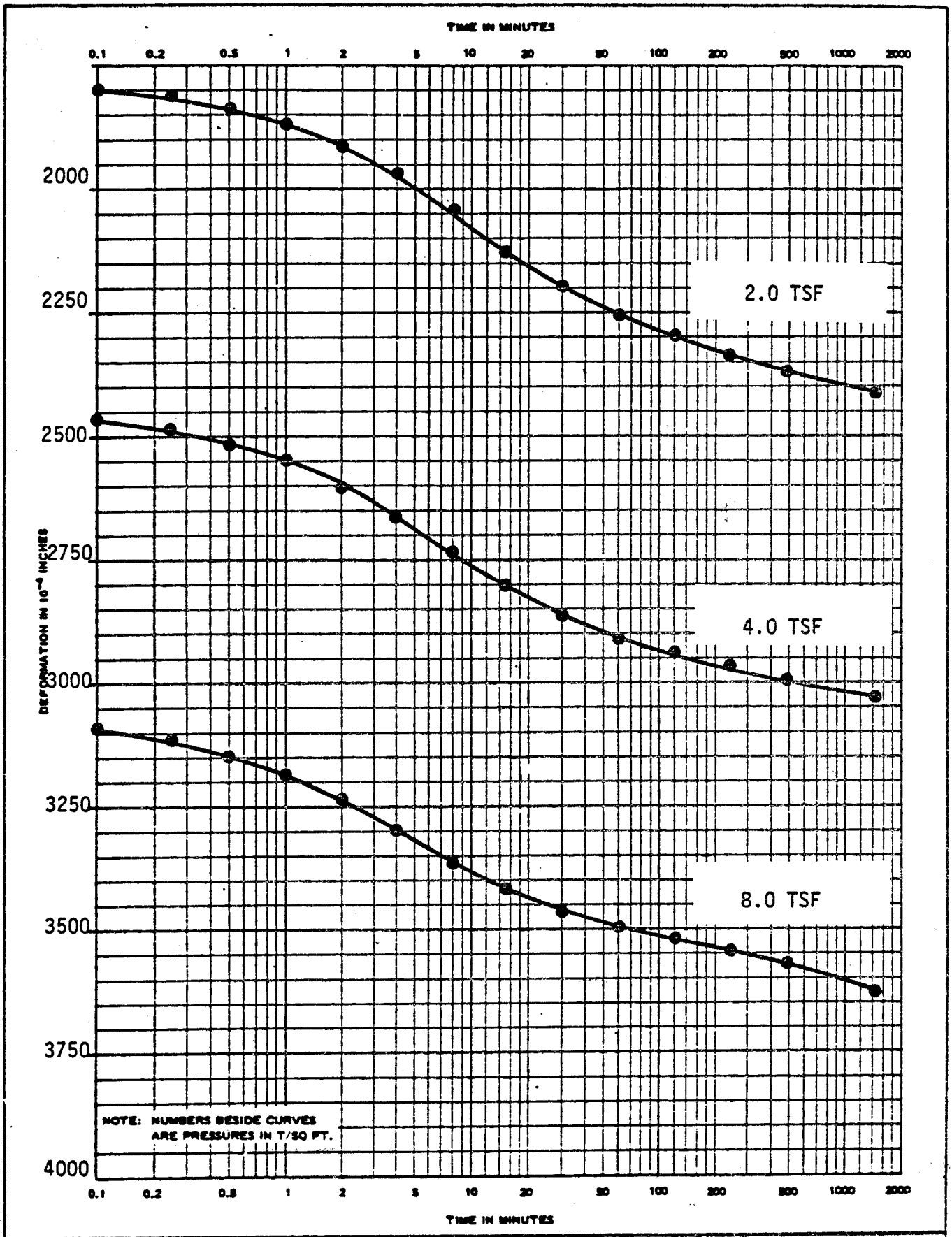
Type of Specimen Undisturbed			Before Test		After Test	
Diam 2.50 in.	Ht 1.00 in.	Water Content, w_o	62.0 %	w_f	41.5 %
Overburden Pressure, Po T/sq ft		Void Ratio, e_o	1.725	e_f	0.969
Preconsol. Pressure, P_c T/sq ft		Saturation, S_o	97.0 %	S_f	100 %
Compression Index, C_c		Dry Density, γ_d	62.0 lb/ft^3		
Classification CH		k_{20} at e_o =	$\times 10^{-}$ cm/sec		
LL 87.5	G_s 2.71	Project Norfolk Harbor & Channels Deepening			
PL 29.5	D_{10}				
Remarks Gray CLAY		Area Norfolk, Virginia			
		Boring No. 133A	Sample No. 2		
		Depth El 10.5 - 12.0	Date 2/11/85		
		CONSOLIDATION TEST REPORT			



Project	Norfolk Harbor and Channels Deepening				
Area	Norfolk, Virginia				
Boring No.	133-A	Sample No.	2	Depth Ft	10.5 - 12.0
				Date	2/11/85

ENG FORM 2088
1 MAY 82
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES (TRANSLUCENT)

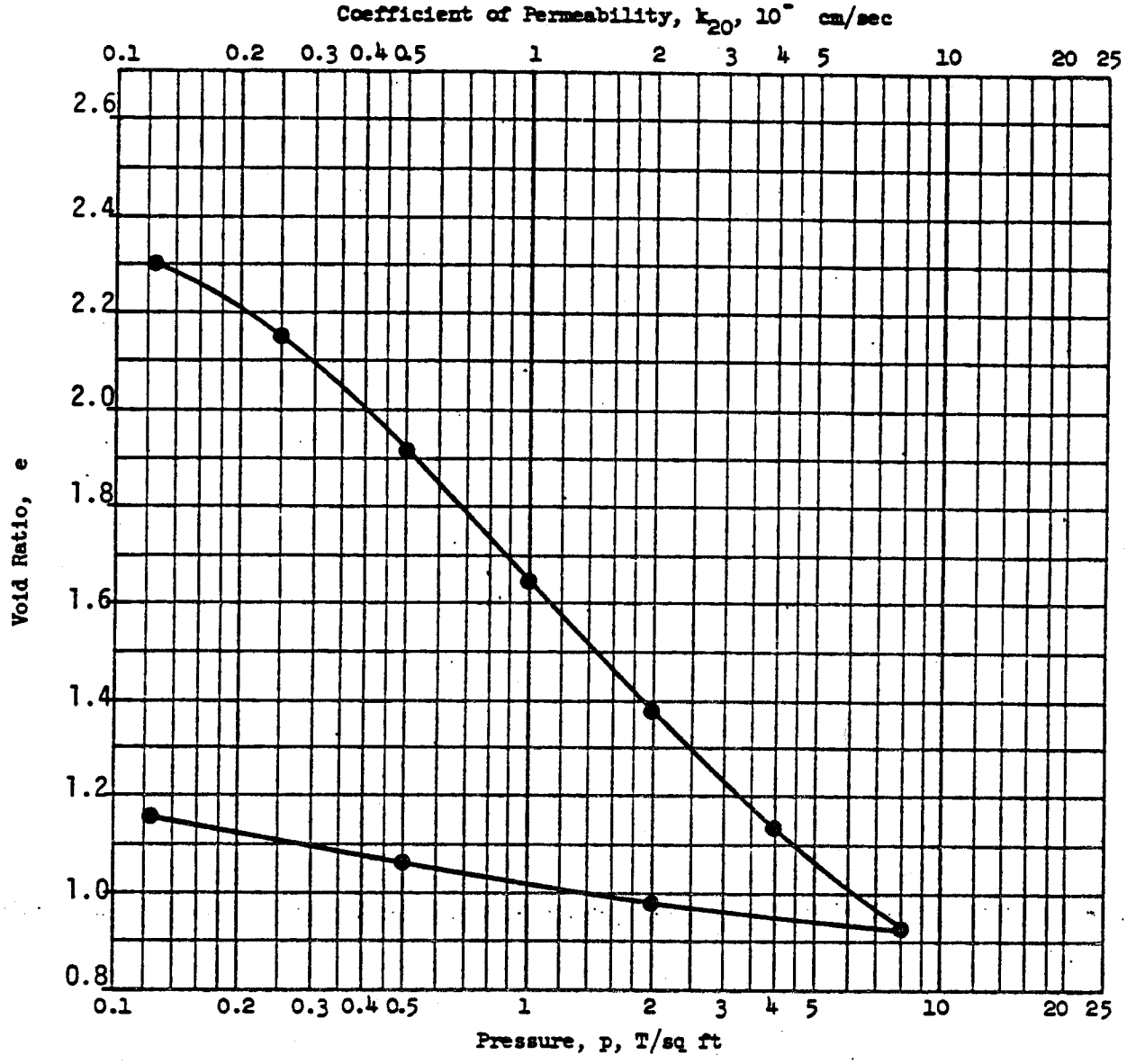


Project	Norfolk Harbor and Channels Deepening			
Area	Norfolk, Virginia			
Boring No. 133A	Sample No. 2	Depth El 10.5 - 12.0	Date 2/11/85	

ENG FORM 2088
1 MAY 63
PREVIOUS EDITIONS ARE OBSOLETE.

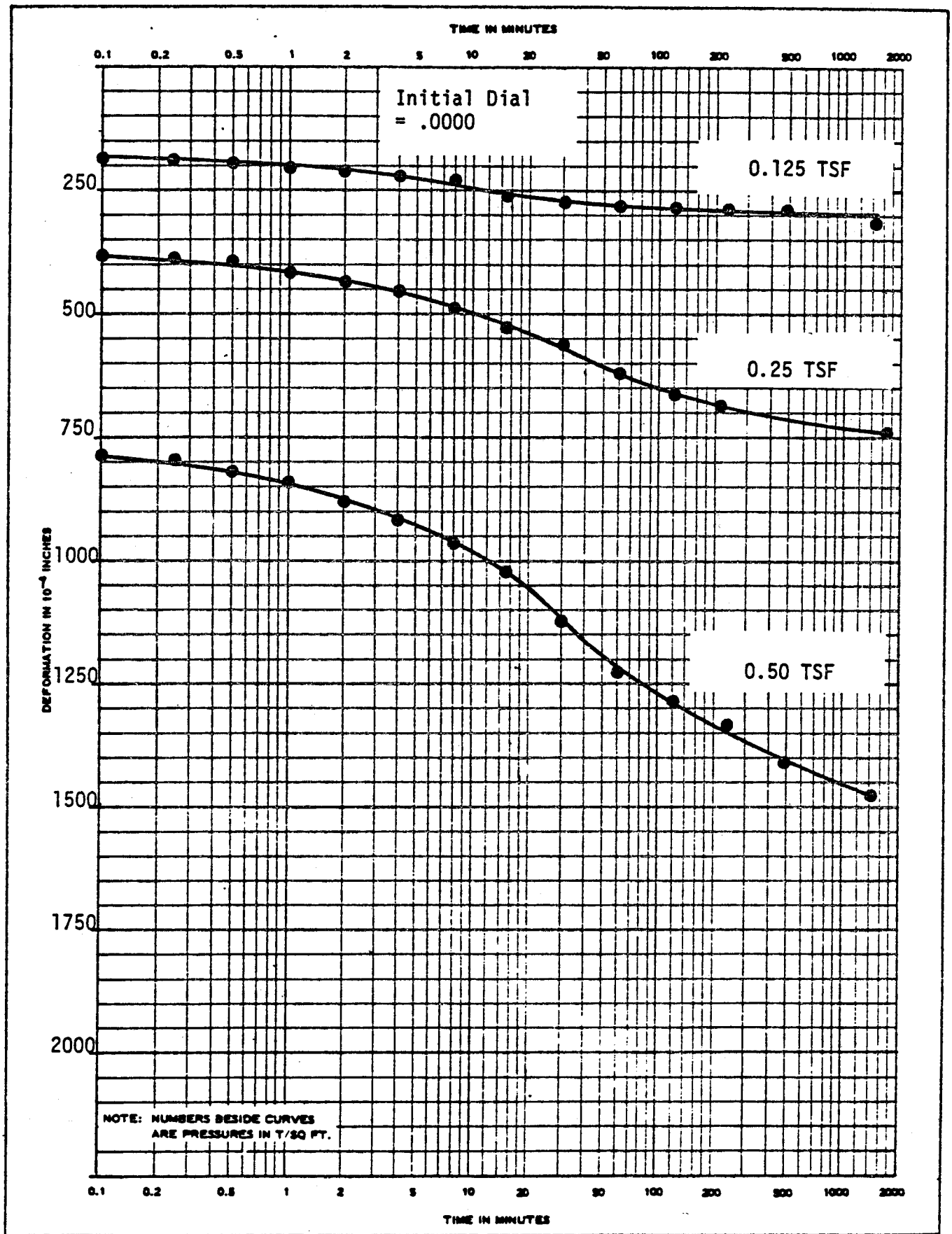
CONSOLIDATION TEST--TIME CURVES

(TRANSLUCENT)



Type of Specimen: Undisturbed		Before Test		After Test	
Diam 2.50 in.	Ht 1.00 in.	Water Content, w_o	85.5 %	w_f	53.5 %
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	2.40	e_f	1.16
Preconsol. Pressure, p_c T/sq ft		Saturation, S_o	97.5 %	S_f	100 %
Compression Index, C_c		Dry Density, γ_d	50.0 lb/ft^3		
Classification: CH		k_{20} at e_o =	$\times 10^{-}$ cm/sec		
LL 89.5	G_s 2.74	Project: Norfolk Harbor & Channels Deepening			
PL 28.5	D_{10}	Norfolk Harbor Channel			
Remarks: Gray CLAY		Area: Norfolk, Virginia			
		Boring No. 140	Sample No. 2		
		Depth / El 10.1 - 11.6	Date 2/11/85		
		CONSOLIDATION TEST REPORT			

ENG FORM 2090 1 MAY 63 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) CEI 83-1118



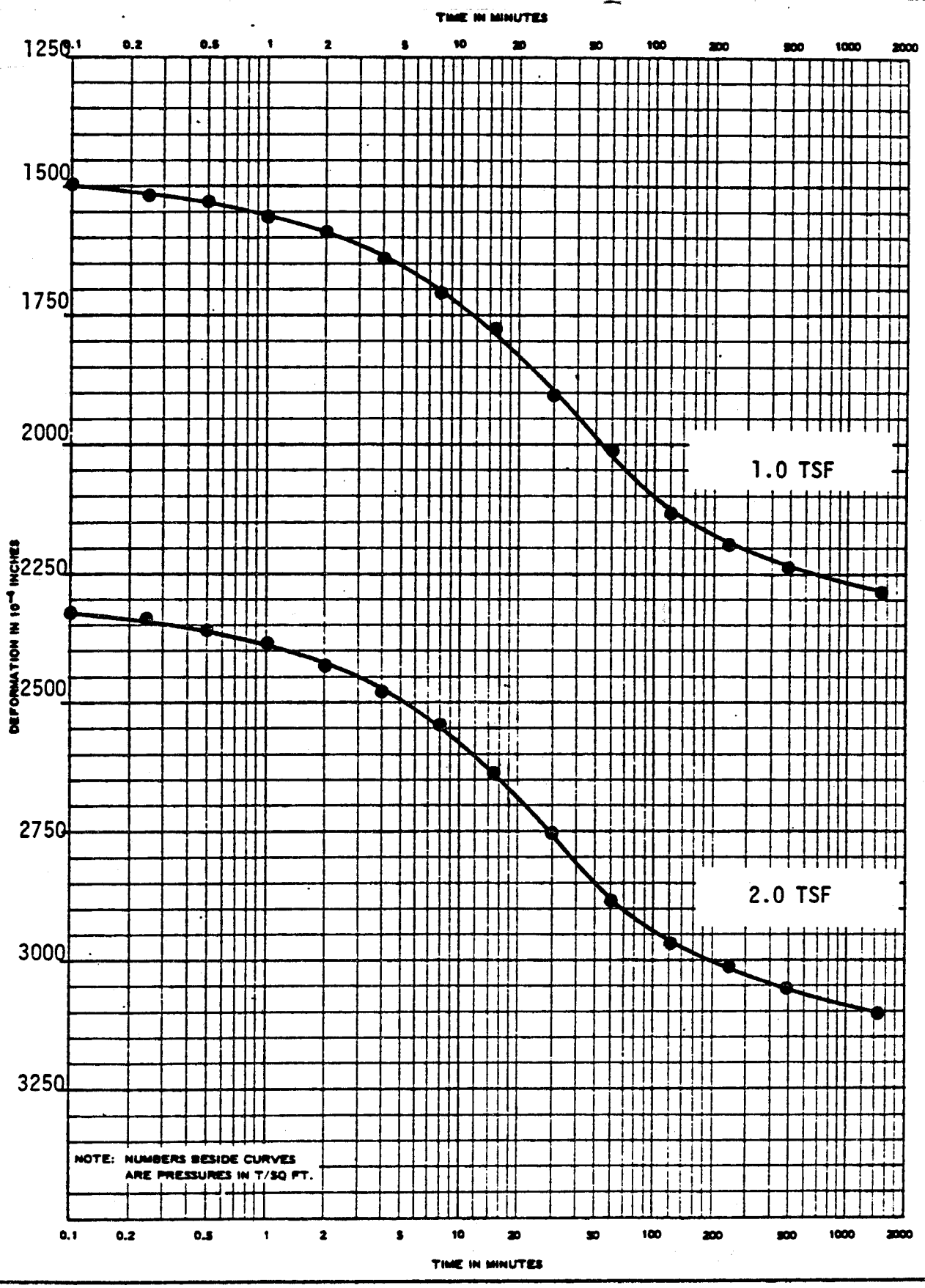
Project	Norfolk Harbor and Channels Deepening				
Area	Norfolk, Virginia				
Boring No.	140	Sample No.	2	Depth Ft.	10.1 - 11.6
Date	2/11/85				

ENG FORM 2088
1 MAY 83
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES

(TRANSLUCENT)

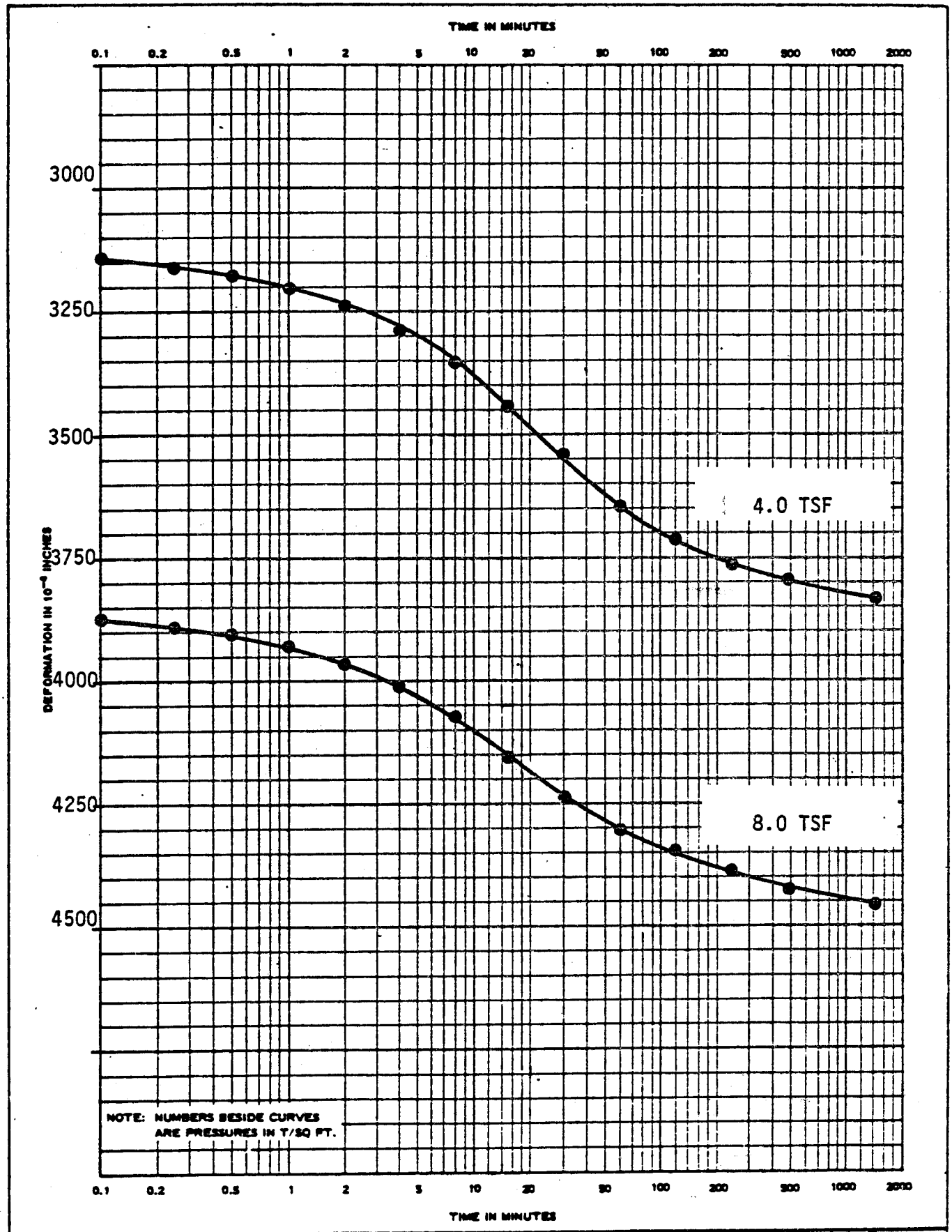
8" 1835



Project	Norfolk Harbor and Channels Deepening				
Area	Norfolk, Virginia				
Boring No.	140	Sample No.	2	Depth El	10.1 - 11.6
				Date	2/11/85

ENG FORM 2088
1 MAY 83
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES (TRANSLUCENT)



Project	Norfolk Harbor and Channels Deepening			
Area	Norfolk, Virginia			
Boring No. 140	Sample No. 2	Depth El 10.1 - 11.6	Date 2/11/85	

ENG FORM 2088
1 MAY 83
PREVIOUS EDITIONS ARE OBSOLETE.

CONSOLIDATION TEST--TIME CURVES

(TRANSLUCENT)

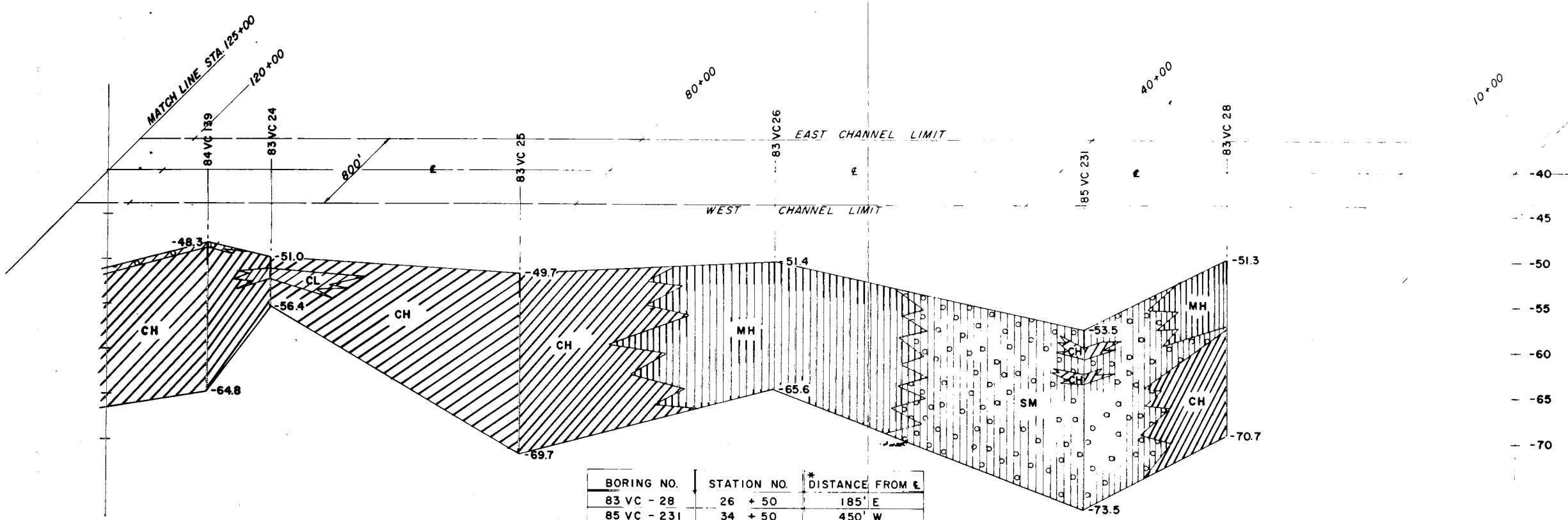
APPENDIX 1D

THREE DIMENSIONAL SUBBOTTOM PROFILES

Sheet	Title
1D-1	Stations 10+00 to 215+00
1D-2	Stations 215+00 to 387+00
1D-3	Stations 387+00 to 470+00

CORPS OF ENGINEERS

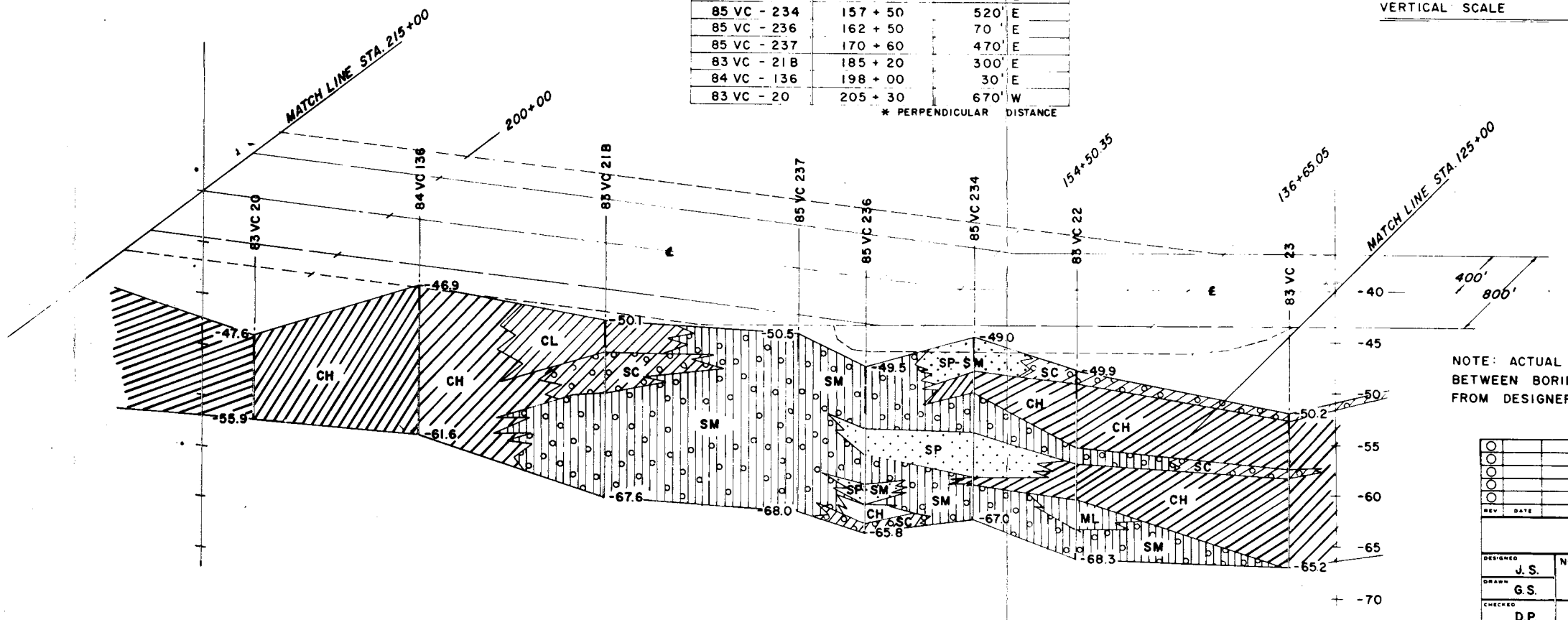
U. S. ARMY



BORING NO.	STATION NO.	* DISTANCE FROM ℄
83 VC - 28	26 + 50	185' E
85 VC - 231	34 + 50	450' W
83 VC - 26	66 + 30	140' E
83 VC - 25	86 + 50	200' W
83 VC - 24	111 + 20	130' E
84 VC - 139	116 + 00	5' W
83 VC - 23	127 + 00	200' W
83 VC - 22	147 + 00	240' E
85 VC - 234	157 + 50	520' E
85 VC - 236	162 + 50	70 ' E
85 VC - 237	170 + 60	470' E
83 VC - 218	185 + 20	300' E
84 VC - 136	198 + 00	30' E
83 VC - 20	205 + 30	670' W

* PERPENDICULAR DISTANCE

LONGITUDINAL SCALE 1" = 400'
TRANSVERSE SCALE 1" = 400'
VERTICAL SCALE 1" = 5'



NOTE: ACTUAL STRATIGRAPHIC RELATIONSHIPS BETWEEN BORING LOCATION MAY VARY CONSIDERABLY FROM DESIGNER'S INTERPRETATION SHOWN.

REV	DATE	DESCRIPTION	BY	APP

DEPARTMENT OF THE ARMY
NORFOLK DISTRICT CORPS OF ENGINEERS
NORFOLK VA

DESIGNED J. S.
DRAWN G. S.
CHECKED D. P.
SUBMITTED

NORFOLK HARBOR AND CHANNELS DEEPENING

NORFOLK HARBOR CHANNEL

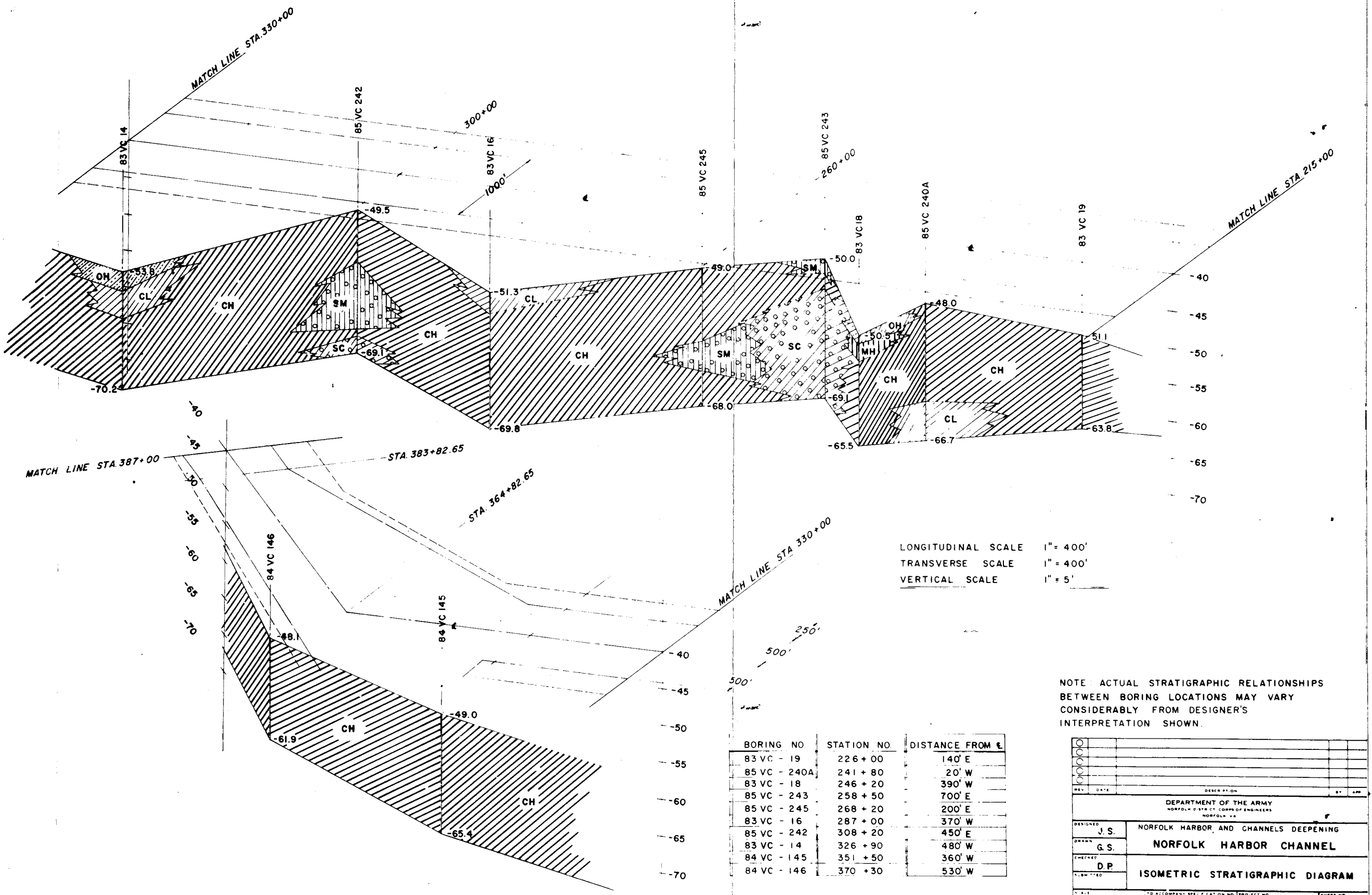
ISOMETRIC STRATIGRAPHIC DIAGRAM

SCALE SEE DISPLAY
DATE JAN 1986
TO ACCOMPANY SPECIFICATION NO
PROJECT NO
DRAWING NO
SHEET NO 1 of 3

ID-1

NORFOLK DISTRICT FILE NO. H-10-32-009 (U)

THIS DRAWING HAS BEEN REDUCED TO HALF SIZE



LONGITUDINAL SCALE 1" = 400'
TRANSVERSE SCALE 1" = 400'
VERTICAL SCALE 1" = 5'

BORING NO	STATION NO	DISTANCE FROM ℄
83 VC - 19	226 + 00	140' E
85 VC - 240A	241 + 80	20' W
83 VC - 18	246 + 20	390' W
85 VC - 243	258 + 50	700' E
85 VC - 245	268 + 20	200' E
83 VC - 16	287 + 00	370' W
85 VC - 242	308 + 20	450' E
83 VC - 14	326 + 90	480' W
84 VC - 145	351 + 50	360' W
84 VC - 146	370 + 30	530' W

NOTE ACTUAL STRATIGRAPHIC RELATIONSHIPS BETWEEN BORING LOCATIONS MAY VARY CONSIDERABLY FROM DESIGNER'S INTERPRETATION SHOWN.

REV	DATE	DESCRIPTION	BY	APP

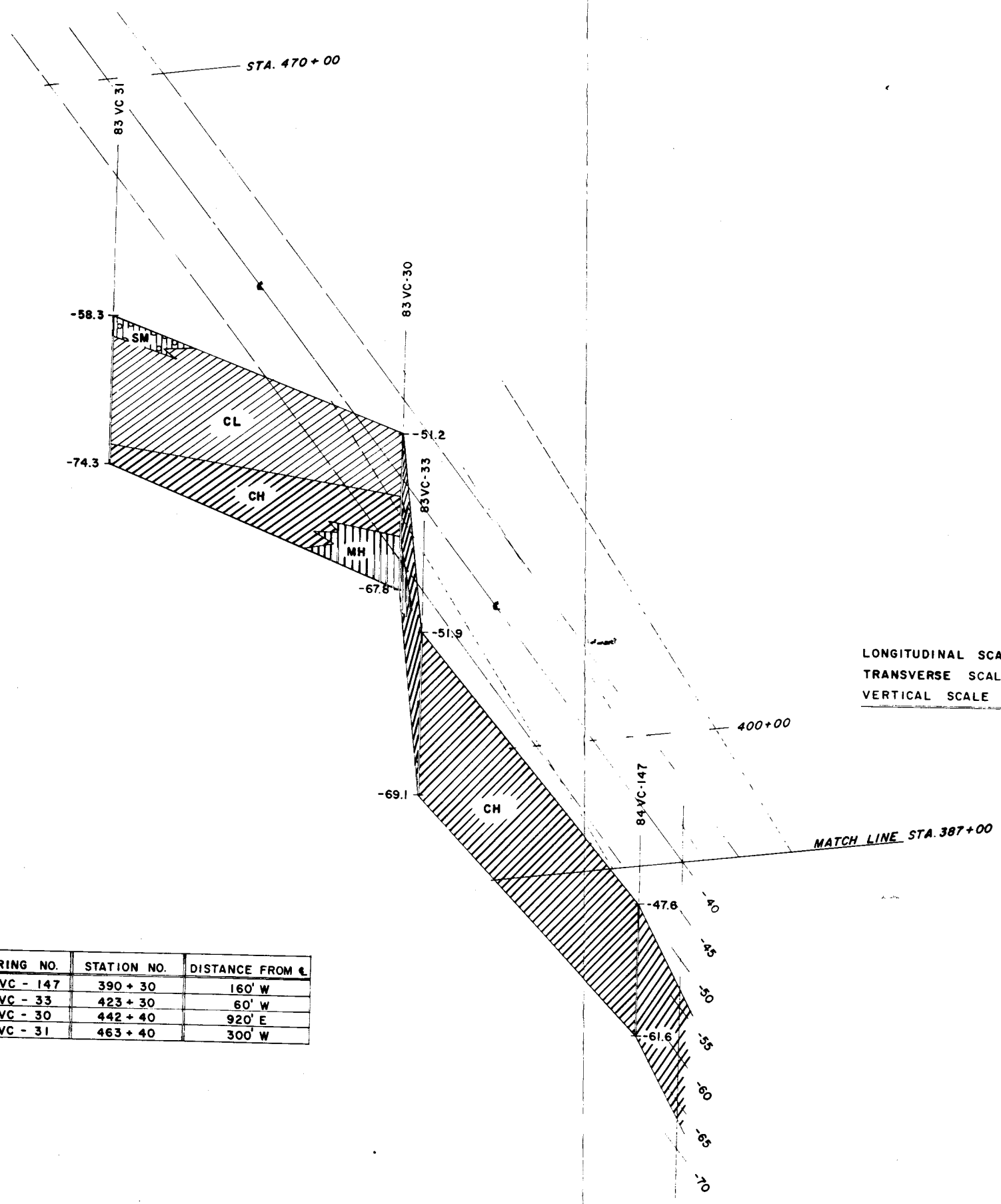
DEPARTMENT OF THE ARMY
NORFOLK DISTRICT CORPS OF ENGINEERS
NORFOLK VA

DESIGNED J. S.	NORFOLK HARBOR AND CHANNELS DEEPENING
DRAWN G. S.	NORFOLK HARBOR CHANNEL
CHECKED D. P.	ISOMETRIC STRATIGRAPHIC DIAGRAM
SUBMITTED	
SCALE SEE DISPLAY	TO ACCOMPANY SPECIFICATION NO. / PROJECT NO. / SHEET NO 2 of 3
DATE JAN 1986	DRAWING NO.

1 D-2

NORFOLK DISTRICT FILE NO. H-10-32-009 (2)

THIS DRAWING HAS BEEN REDUCED TO HALF SIZE



LONGITUDINAL SCALE 1" = 400'
TRANSVERSE SCALE 1" = 400'
VERTICAL SCALE 1" = 5'

BORING NO.	STATION NO.	DISTANCE FROM ℄
84 VC - 147	390 + 30	160' W
83 VC - 33	423 + 30	60' W
83 VC - 30	442 + 40	920' E
83 VC - 31	463 + 40	300' W

NOTE: ACTUAL STRATIGRAPHIC RELATIONSHIPS BETWEEN BORING LOCATIONS MAY VARY CONSIDERABLY FROM DESIGNER'S INTERPRETATION SHOWN.

REV	DATE	DESCRIPTION	BY	APP.

DEPARTMENT OF THE ARMY
NORFOLK DISTRICT CORPS OF ENGINEERS
NORFOLK, VA

DESIGNED J. S.	NORFOLK HARBOR AND CHANNELS DEEPENING
DRAWN G. S.	NORFOLK HARBOR CHANNEL
CHECKED D. P.	ISOMETRIC STRATIGRAPHIC DIAGRAM
SUBMITTED	
SCALE SEE DISPLAY	TO ACCOMPANY SPECIFICATION NO. / PROJECT NO. / SHEET NO. 3 of 3
DATE JAN 1986	DRAWING NO.

ID - 3

NORFOLK DISTRICT FILE NO. H-10-32-009 (3)

APPENDIX 1E

SEDIMENT ANALYSIS
MINERALOGY, PARTICLE ROUNDNESS, HARDNESS, AND DEFORMATION

APPLIED MARINE RESEARCH LABORATORY
NORFOLK, VIRGINIA

DEFORMATION OF SEDIMENTS IN VIBRACORES FROM THE SHOREFACE OFF VIRGINIA BEACH

Prepared for
Schnabel Engineering Associates, P.C.
One West Cary Street
Richmond, Virginia 23220

Submitted by the
Old Dominion University Research Foundation
P.O. Box 6369
Norfolk, Virginia 23508

November 1983

INTRODUCTION

The Norfolk District Corps of Engineers provided the marine sedimentology laboratory at the Department of Oceanography (Old Dominion University) with seventeen vibracore sections for distortion analysis. Analyses were conducted using standard x-ray radiography techniques to determine anomalous textures and structures.

Initially, the polyvinyl core liners were split with a high speed router and core samples were split with a thin, stainless steel leader wire. Splits were immediately wrapped in clear plastic and sealed to prevent moisture loss. All samples were labeled and stored until further processing.

X-ray radiography was performed with a Hewlett-Packard, Faxitron Series x-ray oven. Each core split was placed between a sheet of Industrex AA x-ray film and an x-ray source. The duration of exposure varied directly with the bulk density of the core sample. Core splits had dimensions of approximately 33 cm long and 4.9 cm thick.

Exposures were at 3ma for 85 to 105 kVp with exposure times varying from 4.7 to 9.2 minutes. After exposure, the x-ray film was developed in three gallon tanks utilizing standard temperature control procedures. The resultant x-ray radiographs were high quality images illustrating micro-fine density differences in the core sections.

Distortion Analysis

The degree of disturbance produced by the vibracoring and extruding processes can only be determined after estimating the natural density characteristics of the core samples. X-ray radiographic analysis of each core was initially conducted toward this goal. In general, three basic groups could be established. The first group was composed of radiographs of relatively homogenous density. The second group contained density variations indigenous of sedimentary strata. The third group contained density variations in random patterns. These patterns were generally secondary sedimentary structures produced by locomotion-type biogenic activity, however, when the material was primarily shell hash, it was difficult to ascertain the cause of the random nature of density anomalies.

After assuming the initial density characteristics of each core, an estimate was made of three different characteristics of "operational deformation". The type of deformation, the extent to which deformation extended from the core liner to the center of the core, and the volumetric percentage of deformation were determined for each sample. The results are outlined in Table 1. In general, deformation rarely extended beyond 1.5 cm from the edge of the core liner. Only four out of seventeen samples illustrated deformation extending greater than one centimeter from the core liner to the center of the core. In all cases, these were associated with shelly sediments. Deformation was in the form of concave-down laminations adjacent to the core liner walls.

Two types of "operational deformation" were observed on the radiographs. Small scale fractures, described as horizontal and vertical partings, appeared to be common in the muddy, fine-grained samples. Fractures were generally less than two centimeters in length. They were observed in the central areas as well as at the core margins. "Crossed-foresets" produced by the superpositioning of "marginal drag marks" and "true laminae" were present in a number of cores. For the most part, this type of deformation was confined to a small surface skin around the outer edge of the core sample.

A third type of deformation, related to random density anomalies, was present in one sample (83-VC-08). This random pattern was probably related to convolutions produced by differential drag and shear working toward the center of the core.

In general, the cores with a high percentage of deformation illustrated concave-down bedding at their core margins (Tables 2a-d). The cores with higher amounts of deformation were often associated with coarser-grained sediments. "Crossed-foreset" deformation was minor in terms of the effected portion of the core. While both vertical and horizontal partings extended throughout the entire thickness of some cores, they represented only minor degrees of deformation. The general conclusion of these analyses is that vibracores containing finer-grained sands and muds showed only minor evidence of "operational deformation" and could be considered operationally undisturbed by restricting analyses to the central one to three centimeters of the core.

TABLE 1

X-RAY RADIOGRAPHY FOR MECHANICAL DEFORMATION

CORE NUMBER	RADIOGRAPH DENSITY (H/M/L)	(Homo/Strat/Random)			DEFORMATION (% / Depth to Center / Type)			COMMENTS
Example 1	H			X	*	*	*	shell hash
Example 2	M		X		10	2cm	cc up	sandy
Example 3	L	X			0	--	--	muddy
VC-202-5	H			X	15-20	1.5cm	cc ↓	Shell hash
VC-202-10	H			X	15-20	1.5cm	cc ↓	shell hash
83-VC-08	H/M			X	10-15	1.0cm	Random	Shell hash
VC-03A	H			X	< 10	--	--	oyster & gastr.
VC-25	M/L	X		X	< 10	--	horiz. partings	
VC-77	M/L	X			< 10	< 1.0cm	vert. partings	rotary drag marks
VC-07	M			X	--	--	--	sandy shell hash
VC-33A	M/L		X		--	--	vert. partings	wavy/tab. bedding
VC-66	L	x	ghosts		--	--	--	Undistrubed
VC-17	M/L			Biot.	--	--	--	Undisturbed
VC-70	M/L	X		Biot. ghosts.	--	--	--	Undisturbed
VC-01	M/L		X	X	< 10	< 1.0cm	X-beds	rotary drag marks
VC-75	M			Biot.	< 10	< 1.0cm		weak rotary drag marks
VC-45	M	X	ghosts	shells	30	3.0cm	cc ↓	shells
VC-13	M/L		X		--	--	vert.pt. horiz pt	wavy and tabular bedding
VC-85	M		X		10-30	2-3cm	cc ↓	coarse sand
VC-68	H/M			X	< 10	1cm	cc ↓	shell hash/ washout

Table 2a. Radiograph density characteristics grouped by percent mechanical deformation.

MODERATE (greater than 15% deformation)	LOW (5-15% deformation)	VERY LOW (less than 5% deformation)
VC-45	VC-01	VC-17
VC-85	VC-03A	VC-66
VC-202-5	VC-25	VC-07
VC-202-10	VC-75	VC-33A
VC-08	VC-77	VC-70
	VC-68	VC-13

Table 2b. Radiograph density characteristics grouped by stratification.

Predominantly random	Predominantly homogeneous	Predominantly stratified
VC-03A	VC-25	VC-01
VC-07	VC-45	VC-13
VC-08	VC-66	VC-33A
VC-68	VC-70	VC-85
VC-202-5	VC-77	
VC-202-10		

Table 2c. Radiograph density characteristics grouped by type of deformation.

Predominantly concave down	Rotary drag marks	Horizontal partings	Vertical partings
VC-45	VC-01	VC-25	VC-77
VC-68	VC-75	VC-13	VC-33A
VC-85	VC-77		VC-13
VC-202-5			
VC-202-10			

Table 2d. Radiograph density characteristics grouped by distance of mechanical deformation to center of core (4.9 cm).

No deformation or distance not determined	≤ 1.0 cm	1.0-1.4 cm	1.5-2.0 cm	≥ 2.0 cm
VC-03A	VC-01	VC-08	VC-202-5	VC-45
VC-07	VC-75	VC-68	VC-202-10	VC-85
VC-13				
VC-17				
VC-25				
VC-33A				
VC-66				
VC-70				

DEPARTMEN OF GEOLOGICAL SCIENCES
SCHOOL OF SCIENCES AND HEALTH PROFESSIONS
OLD DOMINION UNIVERSITY
NORFOLK, VIRGINIA 23508

TECHNICAL REPORT NO. GSTR-86-1

SEDIMENT ANALYSIS: MINERALOGY AND PARTICLE ROUNDNESS OF BOREHOLE SAMPLES

Final Report
For the period ended November 30, 1985

Prepared for the
U.S. Army Corps of Engineers
Norfolk District
803 Front Street
Norfolk, Virginia 23510-1096

Under
Contract NACE-86-1191-647
Mr. David Pezza, Chief
Geotechnical Engineering Section

Submitted by the
Old Dominion University Research Foundation
P.O. Box 6369
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December 1985

SEDIMENT ANALYSIS: MINERALOGY AND PARTICLE ROUNDNESS OF BOREHOLE SAMPLES

Borehole samples were analyzed for mineralogy and particle roundness. A total of 83 analyses were performed including 23 for particle roundness and hardness (based on mineralogy), 22 for silt-size mineral composition by X-ray diffraction (XRD), 22 for sand size mineral composition by XRD, 8 for clay mineralogy for the less than 2μm size by XRD, and 8 for carbonate content y acid (HCl) dissolution and weight loss.

Procedure

Particle Roundness - Particle roundness was determined on the sand fraction (>63μm). This size fraction was separated by wet sieving. Roundness estimates were made by examining 300 randomly chosen grains under a disecting microscope (~60x) using the Flee Method (Carver, 1971). Grains were compared to the Power's round ness chart (Powers, 1953). The average numerical value from these comparisons as well as a verbal description is provided.

Mineralogy of Sand and Silt-Size Fractions - The sand and silt size fractions were separated by wet sieving and settling to remove any clay (<2μm). Both the sand and silt fractions were weighed and their weight percent reported as if the sand and silt summed to 100%. Both size fractions were ground and analyzed by XRD

separately. Mineral identification and abundance estimates were based on characteristic XRD peaks and peak areas as detailed in Darby (1983).

The procedure for estimating abundance in the sand and silt fractions assumed that all 10Å material was mica instead of illite. The following mineral fractions were summed:

Quartz Fraction	= 4.26Å x 4
Feldspar Fraction	= 3.2 Å x 2
Calcite Fraction	= 3.03Å x 2
Dolomite Fraction	= 2.89Å x 2
Siderite Fraction	= 2.79Å x 2
Hematite Fraction	= 2.69Å x 3
Zeolite Fraction	= 7.6Å or 8.9Å x 2
Mica + Chlorite Fraction	= 7Å + 10Å
Amphibole Fraction	= 8.4Å x 2.5
Pyroxene Fraction	= 2.99Å x 2

The percentage of each mineral in the sand or silt fraction was then found by dividing the mineral fraction by the sum of all mineral fractions and multiplying the ratio by 100.

Particle Hardness - The average particle hardness was based on the weighted average of the total mineralogy in the sand and silt

size fractions. Average hardness values for each mineral from Mohs' Hardness Scale were multiplied by the percent of that mineral in the sample (sand + silt).

Carbonate Content - The weight percent of carbonate material was determined by treating 130-250g of sample with 10% HCl until all effervescing ceases but no less than 24 hours at room temperature. Samples were centrifuged, washed with deionized water, re-centrifuged, dried and weighed to remove acid and dissolved carbonate. The weight loss was reported as the weight percent $CaCO_3$. Mineralogic evidence confirmed that dolomite or siderite were not present.

Clay Mineral Identification and Abundance - The <2μm size fraction was separated by centrifugation after samples had been treated with bleach to remove organic matter, washed by centrifugation to remove the bleach. This <2μm fraction was saturated with Mg by shaking with 1 N MgCl followed by centrifugation and washing (3 times) with water plus methanol to remove excess MgCl. This Mg saturated clay was smeared while wet onto glass slides and X-rayed from 2-40° 2θ. The smear slides were then saturated with ethylene glycol by heating in an enclosed container with glycol at 60° for two days. This allows the glycol vapors to expand any smectite or vermiculite clays without disrupting the smear mount. The slide was X-rayed from 2-15° 2θ and compared to the Mg X-ray diffractogram.

Shifts in the 14Å peak to 17Å were taken as proof of smectite. These slides were then heated to 180°C to check for collapse of expandable clays and because no mixed-layering was seen and all 17Å clay collapsed to 10Å after 180°C, no further heating was necessary. Any 10Å clay on the glycol treated run was considered as illite. The 7Å clay was a mixture of kaolinite and chlorite and a slow scan of 24-26° 2θ helped to differentiate these two minerals. A ratio of the 3.59Å kaolinite peak to the 3.54Å chlorite peak heights provides an estimate of the kaolinite to chlorite ratio. Although 14Å vermiculite could be present, it could not be confirmed without further testing due to the presence of a 14Å chlorite peak and a strong 17Å smectite peak. Thus all of the expanded 17Å peak was assumed to be smectite but some of it could be due to expandable vermiculite.

Estimates of the relative abundance of clay minerals was made using the procedures of Biscaye (1965) and Schultz (1964) and modified by Darby (1983). For the clay fraction, the equations used to estimate the abundance of each mineral are given below:

Smectite Ratio	= 17Å (glycol)/4x10Å (glycol)
Chlorite + Kaolinite Ratio	= 0.4x7Å (180°C)/10Å (180°C)

Illite Ratio	= 10Å (glycol)/10Å (glycol) = 1
Quartz Fraction	= 0.15x4.27Å (Mg)
Feldspar Fraction	= 0.1x3.18Å (Mg)

The percent for each mineral was calculated by dividing the value for that mineral by the sum of all other mineral values in a sample and multiplying this ratio by 100.

Based on the work of Lyle and Darby (1976), the approximate error in these abundance estimates using XRD is ±20% of the estimated value when it is greater than 40% of the total; ±30% for values between 10 and 39% and ±50% below values of 10% of the total.

RESULTS AND DISCUSSSION

Carbonate Content - Of the eight samples analyzed for carbonate, none had less than 30% with a maximum of 84.4% (Table 1). Samples with more than 50% $CaCO_3$ can be considered as sandy or argillaceous carbonates. These samples are subject to groundwater leaching and the removal of a significant percentage of their bulk volume under acidic groundwater conditions. By inspection, most of the carbonate material was large shell or shell debris which would require a much longer time interval to leach under natural conditions than silt-size carbonate.

TABLE 1. Percent carbonate as $CaCO_3$ from weight loss after 10% HCl digestion.

SAMPLE NO.	DEPTH	WEIGHT % $CaCO_3$	BEGINNING WEIGHT (G)	WT. AFTER DIGESTION (G)
85VC 264	-51.0'	84.4	218.6	34.2
85VC 212	-39.0'	46.8	206.3	109.7
85VC 223	-50.5'	69.6	238.1	72.4
85VC 224	-36.5'	76.2	135.5	32.3
85VC 199	-52.0'	30.4	206.1	143.5
85VC 242	-57.5'	39.3	224.0	135.9
85VC 203	-60.0'	56.5	171.2	74.4
83VC 08	-54.6'	73.8	212.9	55.7

Clay Mineralogy - Illite was the dominant clay mineral in half of the eight samples analyzed. Illite and smectite (montmorillonite clays) were dominant in the remainder (Table 2). Kaolinite plus chlorite was always less than about 20% except in one sample (83VC 51) which had 36% kaolinite plus cholorite and the lowest amount of smectitie (16%). Surprisingly little if any mixed-layering was detected. Normally marine samples have an abundance of mixed-layered clays in southeastern Virginia. The crystallinity of the smectite was moderate to good. This eliminates its rapid formation during early soil or diagenic stages. The other clay minerals were well crystalline based on the sharpness of XRD peaks.

With the moderate abundance of smectite in these samples, swelling and shrinkage of these sediments might present foundation problems depending on environmental and groundwater conditions. These smecittes appear to be closer to Ca-montmorillonite than other varities but precise identification requires further analysis. Ca montmorillonite typically shows a larger reduction in volume at low applied pressures relative to Na-montmorillonite. Other differences in engineering properties are discussed in texts such as Grim (1962).

TABLE 2. Clay mineralogy and semiquantitative relative abundances for minerals in the less than 2 um size fraction.

SAMPLE NO.	ILLITE	SMECTITE	KAOLINITE + CHLORITE	KAOLINITE/ CHLORITE	QUARTZ	FELDSPAR
83VC 51 -52.9 ft.	48	16	36	1.2	1	<1
83VC 42 -50.0 ft.	49	29	20	0.8	1	<1
83VC 14 -56.0 ft.	42	36	21	0.8	<1	<1
83VC 17 -55.0 ft.	55	30	14	0.8	<1	
83VC 10 -53.6 ft.	39	42	19	0.7	<1	<1
83VC 01 -57.1 ft.	43	39	17	0.7	<1	
83VC 33B -56.6 ft.	40	43	16	0.9	<1	<1
83VC 37	43	42	15	0.7	<1	<1

Kaolinite was less abundant than chlorite in all but one sample (83VC 51) based on the height of the 3.54Å chlorite and 3.59Å kaolinite peaks. However, distinction of these two peaks was not obvious even on the slow scan. This overlap as well as the wider

TABLE 3. X-ray diffraction peak areas (except for 3.54Å and 3.59Å which are peak heights) used for calculation of clay mineral abundancies.

SAMPLE NO.	KAOL + CHL. 7Å 180°C	ILLITE 10Å 180°C	CHL. 3.54Å 180°C	KAOL. 3.59Å 180°C	KAOL + CHL 7Å GLY	ILL 10Å GLY	S + CHL 14Å Mg	CHL 14Å GLY	S 17Å GLY
83VC 51	1.68	0.81	10.0	12.0	1.08	0.50	1.07	0.31	0.66
83VC 42	0.66	0.69	16.5	10.3	0.39	0.46	1.86	0.49	1.10
83VC 14	0.81	1.05	7.8	6.4	0.60	0.52	2.55	1.23	1.81
83VC 17	1.18	1.69	11.2	9.0	0.83	0.93	4.23	1.34	2.04
83VC 10	0.99	1.02	8.4	6.2	0.54	0.52	4.76	1.12	2.24
83VC 01	1.30	1.64	9.5	7.0	0.74	0.71	5.56	1.20	2.59
83VC 33B	0.67	0.79	5.5	4.9	0.48	0.53	4.46	1.04	2.28
83VC 37	0.82	0.97	7.5	5.2	0.56	0.65	4.16	1.27	2.58

S Smectite

range of chlorite peaks (3.52-3.58Å) tends to confuse the distinction of these minerals by this technique. If resolution is needed, further analysis using DMSO is required.

Silt and Sand Mineralogy - As expected in clastic sand deposits, quartz dominates the sand fractions and, to a lesser extent, the silt fractions of the samples analyzed (Table 4). Quartz constituted more than 65% of the sands and comprised 100% of the sand in three samples. Besides quartz, feldspar was found in most samples. Calcite, pyroxene, amphibole, apatite, mica and tourmaline were occasionally found. Several samples had more calcite in the silt fraction than in the sand. This might include incipient calcite cement but this could not be confirmed without undisturbed samples. Tourmaline was found in the silt fraction of only one sample (85VC 190 -55.5 ft.). This sample was mostly sand and coarse silt and it leacked shell debris. The tourmaline might have been hydraulically concetrated in this sample by selective sorting during deposition.

Roundness - The sand-sized particles in the 23 samples analyzed were mostly subangular to subrounded with mean roundness values between 0.26 to 0.48 (Table 5). In general, the coarser grains in each sample were better rounded than the finer grains and this results from their mode of transport. The finer sand is mostly transported in suspension where abrasion is far less than for the tractive load. There is an imperfect tendency for coarser sediment

to be better rounded overall. For example, those samples with mean roundness values greater than 0.64 contained little silt (<13%). However, the converse was not true. Samples with mean roundness values less than 0.2 did not always have more silt. Most samples had a wide range of grain roundness. Less than a third had a low range and these samples showed no tendency for any particular mean grain roundness.

TABLE 4A. Mineralogy of the sand (>0.063 mm) and silt (<0.063 mm) size fractions based on X-ray diffraction. Qtz (quartz), Feld (feldspar), Cal (calcite), Px (pyroxene), Amph (amphibole), Ap (apatite), Tour (tourmaline).

		SAND							
SAMPLE NO.	DEPTH	QTZ	FELD	CAL	PX	AMPH	AP	MICA	WT.
83VC 03	-53.9'	83	9	-	-	-	-	-	63.
83VC 04	-55.3'	79	17	2	3	-	-		18.
83VC 09	-53.9'	87	9	3	-	-	1	-	58.
83VC 48	-54.0'	78	17	1	4	-	-	-	72.
83VC 50	-53.8'	96	4	-	-	-	-	-	88.
83VC 55	-52.4'	90	7	-	-	-	3	-	98
83VC 56	-53.9'	91	9	-	-	-	-	-	94
83VC 58	-54.0'	100	-	-	-	-	-	-	86
83VC 59	-51.2'	100	-	-	-	-	-	-	90
83VC 61	-50.6'	65	32	-	3	-	-	-	87
85VC177	62.5'	98	2	-	-	-	-	-	88
85VC179	-54.0'	100	-	-	-	-	-	-	79
85VC183	-53.5'	90	6	-	4	-	-	-	75
85VC186	-55.0'	67	27	-	-	6	-	-	79
85VC190	-55.5'	79	21	-	-	-	-	-	77
85VC194	-55.5'	89	11	-	-	-	-	-	97
85VC196	-51.0'	78	10	12	-	-	-	-	67
85VC199	-51.0'	70	12	15	3	-	-	-	42
85VC205	-24.5'	92	8	-	-	-	-	-	87
85VC208	-27.5'	90	10	-	-	-	-	-	61
85VC213	-25.5'	83	17	-	-	-	-	-	65
85VC220	-27.0'	84	-	16	-	-	-	-	57

TABLE 4B. Mineralogy of the sand (>0.063 mm) and silt (<0.063 mm) size fractions based on X-ray diffraction. Qtz (quartz), Feld (feldspar), Cal (calcite), Px (pyroxene), Amph (amphibole), Ap (apatite), Tour (tourmaline).

		SILT							
SAMPLE NO.	DEPTH	QTZ	FELD	CAL	AMPH	PX	AP	MICA	TOUR
83VC 03	-53.9'	37	24	33	-	6	-	-	-
83VC 04	-55.3'	68	7	9	6	-	5	6	-
83VC 09	-53.9'	51	35	7	-	2	5	1	-
83VC 48	-54.0'	82	12	-	6	-	-	-	-
83VC 50	-53.8'	78	13	8	-	-	-	-	-
83VC 55	-52.4'	96	4	-	-	-	-	-	-
83VC 56	-53.9'	100	-	-	-	-	-	-	-
83VC 58	-54.0'	92	8	-	-	-	-	-	-
83VC 59	-51.2'	92	6	-	2	-	-	-	-
83VC 61	-50.6'	91	10	-	-	-	-	-	-
85VC177	-62.5'	83	17	-	-	-	-	-	-
85VC179	-54.0'	73	27	-	-	-	-	-	-
85VC183	-53.5'	58	24	-	13	5	<1	-	-
85VC186	-55.0'	67	27	3	-	3	-	-	-
85VC190	-55.5'	54	20	-	6	9	-	1	10
85VC194	-55.5'	51	49	-	-	-	-	-	-
85VC196	-51.0'	78	12	11	-	-	-	-	-
85VC199	-51.0'	36	8	7	8	43	-	-	-
85VC205	-24.5'	83	17	-	-	-	-	-	-
85VC208	-27.5'	71	29	-	-	-	-	-	-
85VC213	-25.5'	55	26	-	-	19	-	-	-
85VC220	-27.0'	69	8	22	-	-	1	-	-

TABLE 4C. Mineralogy of the sand (>0.063 mm) and silt (<0.063 mm) size fractions based on X-ray diffraction. Qtz (quartz), Feld (feldspar), Cal (calcite), Px (pyroxene), Amph (amphibole), Ap (apatite), Tour (tourmaline).

		TOTAL (SAND + SILT)							
SAMPLE NO.	DEPTH	QTZ	FELD	CAL	AMPH	PX	AP	MICA	TOUR
83VC 03	-53.9'	66	14	17	-	2	..	..	
83VC 04	-55.3'	73	12	6	3	1	2	3	-
83VC 09	-53.9'	72	20	5	-	1	2	<1	-
83VC 48	-54.0'	79	16	1	2	3	-		
83VC 50	-53.8'	94	5	1	-	-	..	..	
83VC 55	-52.4'	90	7	-	-	-	3	..	-
83VC 56	-53.9'	92	8	-	-	-	-	-	-
83VC 58	-54.0'	99	1	-	-	-	-	-	-
83VC 59	-51.2'	99	1	-	<1	-	-	..	..
83VC 61	-50.6'	68	29	-	-	2	-	-	..
85VC177	62.5'	96	4	-	-	-	-	-	..
85VC179	-54.0'	95	5	-	-	-	-	-	-
85VC183	-53.5'	82	10	-	3	4	-	<1	-
85VC186	-55.0'	67	27	<1	5	<1	-	-	-
85VC190	-55.5'	73	21	-	1	2	-	<1	2
85VC194	-55.5'	88	12	-	-	-	-	-	..
85VC196	-51.0'	78	10	12	-	-	-	-	..
85VC199	-51.0'	50	10	10	4	26	-	-	-
85VC205	-24.5'	91	10	-	-	-	-	..	-
85VC208	-27.5'	83	17	-	-	-	-	-	-
85VC213	-25.5'	74	20	-	-	7	-	..	-
85VC220	-27.0'	78	3	18	-	-	<1	-	-

TABLE 5. Average grain hardness (Mohs') and roundness (Power's).

SAMPLE NO.	DEPTH	SILT (>63μ) HARDNESS	SAND (>63μ) HARDNESS	TOTAL SAMPLE HARDNESS	SAND ROUNDNESS	RELATIVE RANGE
83VC 03	-53.9'	5.3	6.6	6.1	0.27 (subangular)	lg.
83VC 04	-55.3'	6.2	6.7	6.4	0.27 (subangular)	mod.-lg.
83VC 08	-54.6'	-	-	-	0.50 (rounded)	mod.-lg.
83VC 09	-53.9'	6.2	6.8	6.6	0.26 (subangular)	mod.-low
83VC 48	-54.0'	6.8	6.7	6.7	0.16 (v. angular)	low
83VC 50	-53.8'	6.5	7.0	6.9	0.22 (angular)*	lg.
83VC 55	-52.4'	7.0	6.9	6.9	0.65 (rounded)	low
83VC 56	-53.9'	7.0	6.9	6.9	0.47 (subrounded)	mod.-low
83VC 58	54.0'	6.9	7.0	7.0	0.37 (subrounded)	mod.-lg.
83VC 59	-51.2'	6.9	7.0	7.0	0.28 (subangular)*	lg.
83VC 61	-50.6'	6.9	6.6	6.7	0.16 (v. angular)	low
85VC177	-62.5'	6.8	7.0	7.0	0.69 (rounded)	low
85VC179	-54.0'	6.7	7.0	6.9	0.50 (rounded)*	lg.
85VC183	-53.5'	6.5	6.9	6.8	0.26 (subangular)	lg.
85VC186	-55.0'	6.5	6.7	6.6	0.48 (subrounded)	mod.
85VC190	55.5'	6.5	6.8	6.7	0.29 (subangular)	lg.
85VC194	55.5'	6.5	6.9	6.9	0.45 (subrounded)	low
85VC196	51.0'	6.5	6.4	6.4	0.37 (subrounded)	lg.
85VC199	-51.0'	5.7	6.2	5.9	0.16 (v. angular)	lg.
85VC205	24.5'	6.8	6.9	6.9	0.69 (rounded)	low
85VC208	27.5'	6.7	6.9	6.8	0.36 (subrounded)	lg.
85VC213	-25.5'	6.4	6.8	6.7	0.34 (subangular)	low
85VC220	27.0'	6.0	6.4	6.2	0.36 (subrounded)	mod.

*Large grains are rounded, small grains are angular.

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