DACW-33-85-D-0011 Delivery Order 0015
Rippowan River, Stamford, CT

FILE COPY

ATLANTIC TESTING LABORATORIES, LIMITED
Sustaining Member—N.Y.S. Society of Professional Engineers

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February 25, 1987

U.S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, MA 02254-9149

Attn: Chief, Engineering Division, NEDED

Re: Subsurface Investigation
Rippowam River, Stamford, CT
Contract DACW-33-85-D-0011
Delivery Order No. 0015
ATL Report No. CD012-1-12-86

Gentlemen:

In accordance with Delivery Order No. 0015, dated 7 October 1986, attached is one final copy of our Engineering Report for the subsurface investigation performed in the Rippowam River in Stamford, CT.

By copy of this letter, we are also transmitting two copies of this report to the Chief of the Geotechnical Engineering Branch.

If you have any questions or comments, please do not hesistate to contact our office.

Respectfully submitted,

Spencer F. Thew, P.E./L.S.
President

SFT/TAB/smf

encs.

2 cc: Chief, Geotechnical Engineering Branch, NEDED-GF

SECTION 1

SUBSURFACE INVESTIGATION
RIPPOWAM RIVER
STAMFORD, CT

CONTRACT DACW 33-85-D-0011
CONTRACTING OFFICER:
Edward D. Hammond, LTC, CE
28 June 1985

DELIVERY ORDER NO. 0015
7 OCTOBER 1986

PREPARED FOR: U.S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, MA 02254-9149

PREPARED BY: Theresa A. Beddoe
Atlantic Testing Laboratories, Limited
P. O. Box 29
Canton, NY 13617

ATL Report No. CD012-1-12-86

December 11, 1986

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SECTION 3

SCOPE OF INVESTIGATION

a. DELIVERY ORDER NO. 0015

CHECKED BOX APPLIES: [X] ORDER FOR SUPPLIES OR SERVICES [ ] REQUEST FOR QUOTATIONS NO. RETURN COPIES OF THIS QUOTE BY (THIS IS NOT AN ORDER. See DD Form 1155)

PAGE 1 OF 2

CONTRACT NO.	PURCHASE ORDER NO.	DATE OF ORDER	REQUISITION/PURCHASE REQ. NO.
DACW33-85-D-0011	0015	86 OCT 07	GEB86-93

5. ISSUED BY: Dept. of the Army, New England Division, Corps of Engineers, 424 Trapelo Road, Waltham, Massachusetts 02254-9149 CODE
BUYER/SYMBOL: HEBERT/NEACL-C PHONE: AC617-647-8207

7. ADMINISTERED BY (If other than 5) CODE

8. DELIVERY FOB: [X] DEST [ ] OTHER See Schedule if other

6. CONTRACTOR/OFFEROR CODE FACILITY CODE

NAME AND ADDRESS: Atlantic Testing Laboratories, LTD.
P. O. Box 29
Canton, New York 13617

10. DELIVER TO F.O.B. POINT BY: In accordance with paragraph 7 of Attachment

11. CHECK IF BUSINESS IS: [X] SMALL [ ] SMALL DISADVANTAGED [ ] WOMEN-OWNED

12. DISCOUNT TERMS: NET

13. MAIL INVOICES TO: Finance & Accounting Officer at issuing office

XXXXXX Services for: CODE
U. S. Army Engineer Division, New England
ATTN: Geotechnical Engineering Branch
424 Trapelo Road
Waltham, Massachusetts 02254-9149

15. PAYMENT WILL BE MADE BY: CODE
Finance & Accounting Officer at issuing office

MARK ALL PACKAGES AND PAPERS WITH CONTRACT OR ORDER NUMBER

16. DELIVERY: X This delivery order is subject to instructions contained on this side of form only and is issued pursuant to authority cited on face hereof and is in accordance with and subject to terms and conditions of above numbered contract. XXXXXXXXXXXXXXXXXX

PURCHASE: Reference your [illegible] furnish the following on terms specified herein. [illegible]

[illegible] and follows as checked. This purchase is negotiated under authority of

10 USC 2304(a)(3) [illegible]

[ ] If checked, additional General Provisions apply. [illegible]

SBSA
~~STATUS~~
GEB
AE/PS COORD.
SO
JJH

17. ACCOUNTING AND APPROPRIATION DATA/LOCAL USE
96X3122 Construction General
3E749304X0PA000 (MB)
Contract

Rmacdr 10/7/86

ITEM NO.	SCHEDULE OF SUPPLIES/SERVICES	QUANTITY ORDERED/ACCEPTED*	UNIT	UNIT PRICE	AMOUNT
Eine	Furnish necessary services, equipment and personnel to perform four(4) test borings with associated tests and environmental controls in vicinity of Main Street Dam, Rippowam River, Stamford, CT, in accordance with attachment No. 1.	APPROX.			ESTIMATED
1.2	Geotechnical Inspector	60	Hr	$40.00	$2,400.00

* If quantity accepted by the Government is same as quantity ordered, indicate by ✓ mark. If different, enter actual quantity accepted below quantity ordered and encircle.

24. UNITED STATES OF AMERICA BY: THOMAS A. RHEN, Colonel, CE, Division Engineer
CONTRACTING/ORDERING OFFICER

25. TOTAL: $12,061.00
29. DIFFER-ENCES

26. QUANTITY IN COLUMN 20 HAS BEEN: [ ] INSPECTED [ ] RECEIVED [ ] ACCEPTED, AND CONFORMS TO THE CONTRACT EXCEPT AS NOTED
DATE SIGNATURE OF AUTHORIZED GOVERNMENT REPRESENTATIVE

27. SHIP NO. [ ] PARTIAL [ ] FINAL

28. D.O. VOUCHER NO. XXXXX

30. INITIALS

32. PAID BY

33. AMOUNT VERIFIED CORRECT FOR

31. PAYMENT [ ] COMPLETE [ ] PARTIAL [ ] FINAL

34. CHECK NUMBER

36. I CERTIFY THIS ACCOUNT IS CORRECT AND PROPER FOR PAYMENT
DATE SIGNATURE AND TITLE OF CERTIFYING OFFICER

35. BILL OF LADING NO.

37. RECEIVED AT 38. RECEIVED BY 39. DATE RECEIVED 40. TOTAL CONTAINERS 41. S.R. ACCOUNT NUMBER 42. S.R. VOUCHER NO.

DD FORM 1155 PREVIOUS EDITION WILL BE USED UNTIL EXHAUSTED. PAGE 2

STANDARD FORM 36, JULY 1986
GENERAL SERVICES ADMINISTRATION
FED PROC REG 141 CFR) 1-16.101

CONTINUATION SHEET

REF. NO. OF DOC. BEING CONT'D
Delivery Order No. 0015
To DACW33-85-D-0011

NAME OF OFFEROR OR CONTRACTOR
Atlantic Testing Laboratories, LTD

Contract Line ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1.3	Per Diem -- Overnight Stay	APPROX. 6	day	$ 45.00	ESTIMATED $ 270.00
1.4	Mileage from Waltham, MA and return	300	mi	0.35	105.00
2.1	Geotechnical Report (Price expressed as Percentage of Line Item 1.1 or 1.2)	1	job	60% of Item 1.2	1,440.00
6.1	Mobilization & Demobilization	1	job	700.00	700.00
6.2	Mileage from/to Waltham, MA	300	mi	1.15	345.00
6.5	Standby time/on site moves	16	hr	75.00	1,200.00
10.1	12ft Boat	7	day	55.00	385.00
13.1	0-30 ft. Depth	24	ea	13.00	312.00
18.2	HX, and 6-inch size	88	lf	28.00	2,464.00
22.3	NWX size and/or NWM	20	lf	45.00	900.00
25.1	Hydraulic Pressure Testing	8	hr	115.00	920.00
30.1	Light Lumber for Shoring Excavation, Etc.	1	mbf	620.00	620.00

ATTACHMENT 1

DACW-33-85-D-0011

DELIVERY ORDER NO. 0015

SCOPE OF INVESTIGATIONS

PROJECT: Explorations for dam replacement

SITE: Main Street Dam, Rippowam River, Stamford, CT

PURPOSE: The borings are required to design a replacement dam

1. SCOPE OF INVESTIGATIONS

a. General. Locate and execute four borings each 25 feet in depth in the bed of the Rippowam River, Stamford, CT (see attachment 2). Permeability tests shall be performed in overburden at each of the four holes. Pressure testing will be performed on two borings if sufficient bedrock is encountered. An oil spill control boom and sediment fence will be used during the prosecution of the work.

b. Explorations

(1) All explorations shall be at positions shown and located by taping from surveyed features shown on the Site Plan (Attachment No. 3).

(2) Overburden sampling shall be performed using the standard SPT method with samples taken every 5 feet until refusal is encountered. Refusal is defined as 50 blows with no penetration or bouncing refusal. NWX coring shall then be employed until break through or as limited in para. 1.b.(3).

(3) Borings exclusively in overburden shall not be over 25 feet deep. When bedrock or refusal is encountered, coring shall be employed. Coring shall continue in the bedrock to a maximum of 25 feet below the surface or 15 feet below the bedrock surface whichever is less.

(4) Pressure testing shall be performed in holes FD-A and FD-D if 5 feet or more of bedrock is encountered. Permeability tests shall be performed on all four holes according to directions given in Attachment 5.

(5) An oil spill boom and separate sediment control fence are required by the City of Stamford, Environmental Protection Board (EPB) for execution of the borings in the water. These items shall be provided by the Contractor and deployed within 50 feet downstream of the drill rig at all times during on-site moves and the prosecution at all borings and tests. These controls will be inspected and approved by the EPB prior to start of work. The contractor agrees to notify the Board at (203) 358-4028 if there is any release of pollutants.

(6) Boreholes shall be marked with wooden posts or any other durable means that will permit later concurrent surveys of elevations by others.

(7) A geotechnical inspector shall act as field inspector for the explorations. The inspector shall provide telephone reports to Mr. Paul L'Heureux, Corps of Engineers, at tel. (617) 647-8597 at least once a day.

(8) All samples shall be delivered to the Corps of Engineers Headquarters in Waltham, Massachusetts. Sample delivery shall be coordinated with the Director, NED Materials and Water Quality Laboratory at tel. (617) 647-8357/8392.

2. SITE CONDITIONS

The proposed explorations are approximately 5 feet below the Main Street Dam on the Rippowam River in Stamford, CT. The existing dam is shown by Attachment 3. About 2 feet of water is expected to be flowing in the riverbed. Gravel, cobbles and boulders are on the surface of the riverbed. The underlying soils are expected to be sandy materials. Concrete from the old dam structure may be encountered. Although bedrock is not expected, the contractor shall be prepared to core if bedrock or boulders are encountered.

3. RIGHTS OF ENTRY

Rights of entry have been obtained by the Government from the City of Stamford for the period of work. (Attachment 4)

4. COORDINATION

The contractor shall provide advance written notice of the date of commencement of exploration activities to the City of Stamford, Mark W. Lubbers, Environmental Protection Board, 429 Atlantic Street, Stamford, CT 06904-2152. Paul L'Heureux, Corps of Engineers, (617) 647-8597, shall be contacted five days prior to start of work and at least once a day by the geotechnical inspector to report on how work is progressing and what types of materials are being encountered.

5. EXPLORATION NUMBERS

The ~~space~~ boring locations are shown on Attachment No. 3 and designated FD-A through D and shall be renumbered FD-86-1 through FD-86-4 in order of their completion. The numbers shall be indicated on the boring logs and shown on a plan of explorations.

6. GOVERNMENT REVIEW

The Government will review the draft submittal of the geotechnical report. Subsequent to such review, the Contractor shall accomplish any corrections which may be directed as the result of the Government review.

7. COMPLETION SCHEDULE

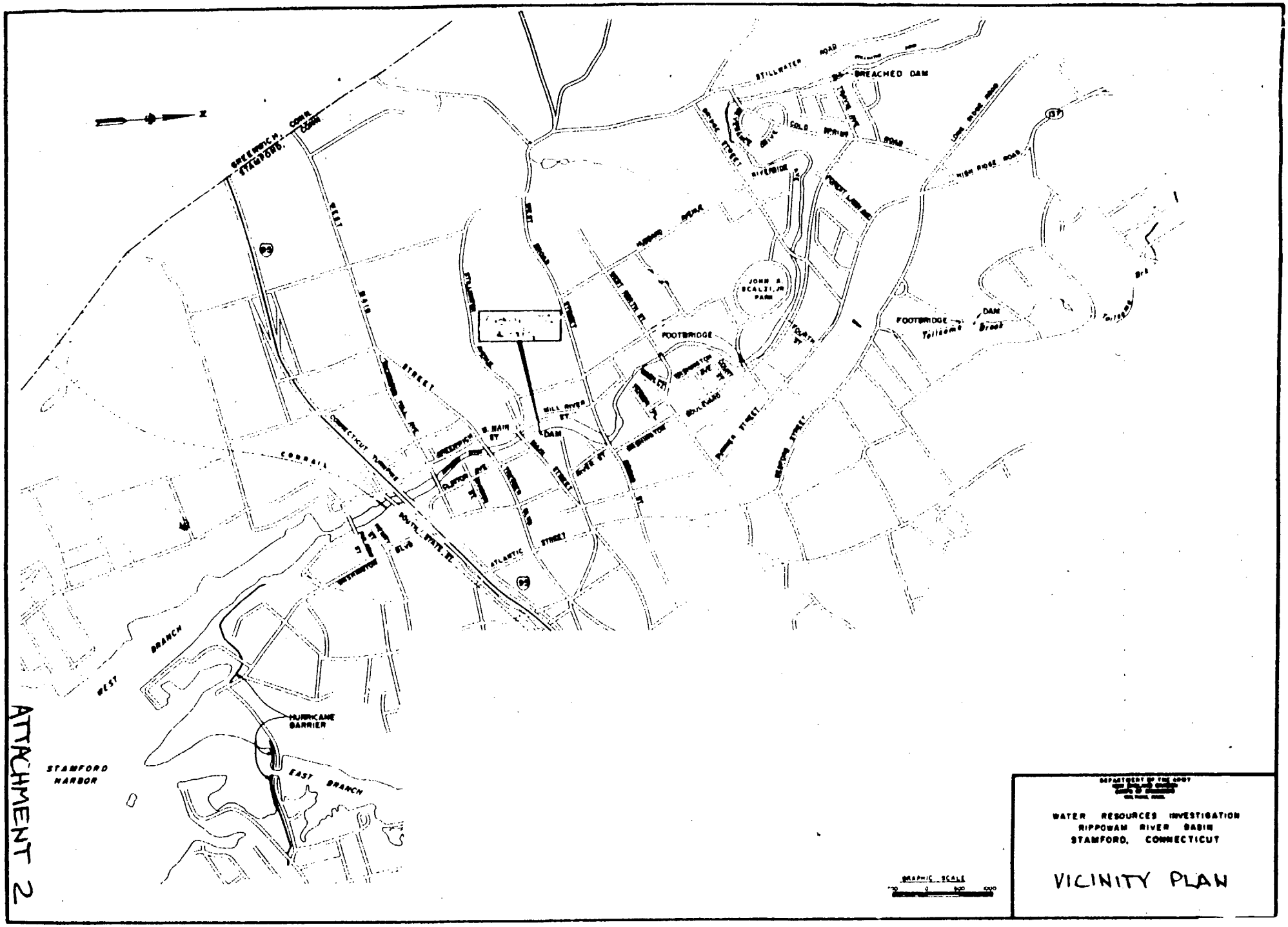
Services under this delivery order shall start within 15 calender days after the receipt of the delivery order. Duration of the drilling effort is estimated to be seven calendar days. The geotechnical report shall be submitted in draft format for review to the Government, postmarked no later than seven calendar days after completion of the field work.

Government review will take approximately ten calendar days from receipt of draft report. The final geotechnical report shall be submitted postmarked no later than seven calendar days after receipt of draft report with Government comments.

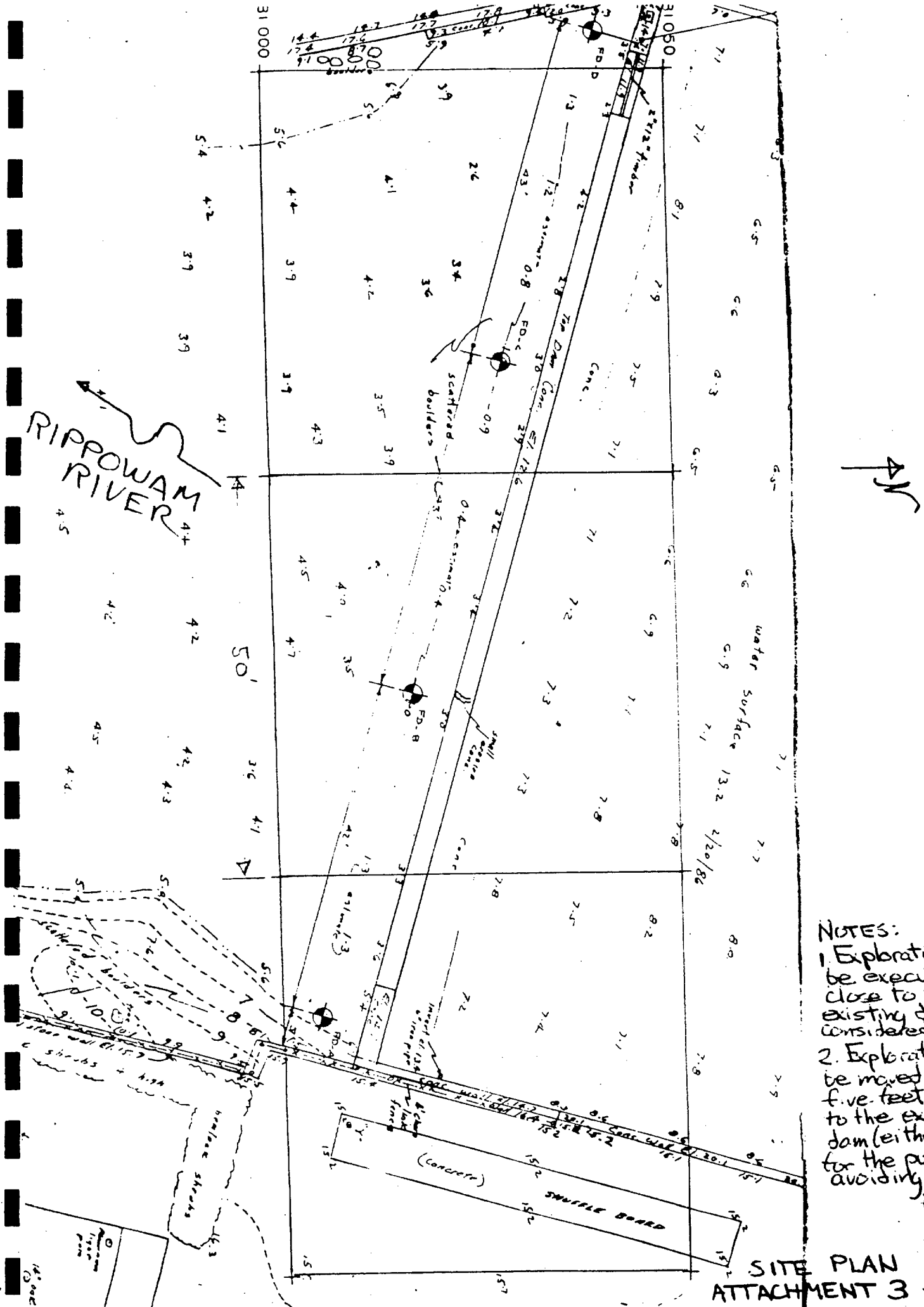
8. QUALITY CONTROL.

You will be held responsible for the quality of the maps submitted and for all damages caused the Government as a result of your negligence in the performance of any services furnished under the contract.

Although submissions required by your contract are technically reviewed by the Government, it is emphasized that your work must be prosecuted using proper internal controls and review procedures. The letter of transmittal for each submission which you make shall include a certification that the submission has been subjected to your own review and coordination procedures to insure (a) completeness for each discipline commensurate with the level effort required for that submission, (b) elimination of conflicts, errors and omissions, and (c) the overall professional and technical accuracy of the submission. Documents which are significantly deficient in any of these areas will be returned to you for correction and/or upgrading prior to our completing our review. Contract submission dates will not be extended if a resubmission of draft material is required for this reason.



ATTACHMENT 2



NOTES:
1. Explorations shall be executed as close to the existing dam as is considered safe
2. Explorations may be moved up to five feet parallel to the existing dam (either direction) for the purpose of avoiding boulders

SITE PLAN
ATTACHMENT 3

DEPARTMENT OF THE ARMY

RIGHT-OF-ENTRY FOR SURVEY AND EXPLORATION

RECEIVED
MAY 2 1986
ENVIRONMENTAL PROTECTION BOARD

RIPPOWAM RIVER FLOOD CONTROL PROJECT
(Project, Installation or Activity)

CITY OF STAMFORD, CONNECTICUT
(Tract Number or Other Property Identification)

The undersigned, hereinafter called the "Owner", hereby grants to the UNITED STATES OF AMERICA, hereinafter called the "Government", a permit or right-of-entry upon the following terms and conditions:

1. The Owner hereby grants to the Government an irrevocable right to enter upon the lands hereinafter described at any time within a period of (6) months from the date of this instrument, in order to survey, make test borings, and carry out such other exploratory work as may be necessary to complete the investigation being made of said lands by the Government.

2. The permit includes the right of ingress and egress on other lands of the Owner not described below, provided such ingress and egress is necessary and not otherwise conveniently available to the Government.

3. All tools, equipment, and other property taken upon or placed upon the land by the Government shall remain the property of the Government and may be removed by the Government at any time within a reasonable period after the expiration of this permit or right-of-entry.

4. The Government agrees to be responsible for damages arising from the activity of the Government, its officers, employees, or representatives on said land, in the exercise of rights under this permit or right-of-entry, either by repairing such damage or at the option of the Government by making an appropriate settlement with the Owner in lieu thereof.

5. If aircraft flights over said lands, or entry upon the land by means of helicopter or other type aircraft, are necessary, the Government shall inform the Owner, in advance, of each such flight or entry.

6. The land affected by this permit or right-of-entry is located in the State of Connecticut, *County of* Fairfield, *and is described as follows:*
Rippowam River and adjoining lands in the immediate vicinity of the Mill Pond Dam.

(Additional terms and conditions are continued on the attached sheet).

WITNESS MY HAND AND SEAL this 20th *day of* May, *19* 86

John R. O'Brien *(SEAL)*
John R. O'Brien
Commissioner of Public Works *(SEAL)*

UNITED STATES OF AMERICA

By A. H. FRECHETTE
Acting Chief, Real Estate Division

ENG FORM 1 APR 74 1258 (ER 405-1-625) EDITION OF 1 DEC 62 IS OBSOLETE.

ATTACHMENT 4

7. The work will continue for a period of approximately 5 days, and in no event shall continue for more than 2 weeks without supplemental authorization from the Owner. The Government shall provide prior written notice to the Owner of the date work shall commence.

8. The Government or its representatives agree to maintain in force throughout the period of this permit, the following insurance:

a. Workers compensation in the amount required by the State of Connecticut or any other Federal compensation act.

b. Comprehensive public liability insurance (to include automotive liability) covering all of the Government's operation hereunder, with limitations of not less than:

(1) $1,000,000 for injury to or death of any one person.

(2) $1,000,000 for injury to or death of any two persons, and,

(3) $500,000 for property damage.

Each of the foregoing limitations shall be for each accident and shall not be an aggregate limit in the policy.

9. The Government shall implement standard pollution control measures including installation of oil spill control booms and standard erosion and sediment control fence. Required controls are to be installed, and inspected by the Owners prior to start of work.

10. The Government shall notify the Owner immediately of problems arising from the conduct of activities herein authorized and shall take immediate measures to correct all such problems and control the effects thereof.

11. The Government shall be responsible for identification and notification of all utilities with service in the area and of the location and protection of utility lines to prevent damage to same.

ATTACHMENT NO. 5

FIELD TEST PROCEDURE

FIELD PERMEABILITY TESTS

(Piezometer Method)

1. Use. Field permeability tests shall, in general, be used for determining the permeability of cohesionless strata penetrated by borings. Useful results can be obtained on cohesionless soils having a permeability less than 10^{-3} centimeters per second, if reasonable care is exercised.

2. Apparatus. The following equipment is necessary to run the tests:

a. Drill rig or other means of driving, pulling, and cleaning casing (pipe).

b. Casing (pipe)

c. Filter material (ottawa sand, coarse sand, and gravel)

d. Pump

e. Timing device (watch or clock with second hand)

f. Water level reader

g. Scale

3. Water. The water to be used for the field permeability tests shall be clean. Small amounts of suspended matter in the water could cause grossly misleading test results. A settling tank, filter or other appropriate method should be used to assure only clear water is added during the test. It is also desirable for the temperature of the added water to be higher than groundwater temperature to prevent the creation of air bubbles in the ground which may greatly reduce the acceptance of water.

4. Procedure. The procedure shall consist of the following steps:

a. General.

(1) Drive casing to the bottom elevation of the proposed test. Permeability tests shall be executed in each borehole at 5-7 feet, 10-12 feet and 20-22 feet of depth unless rock is encountered.

(2) Clean inside of casing with water without disturbing the soil below the bottom elevation of the casing.

(3) Bump back casing 1.5 to 2.0 feet. Fill uncased portion of hole with a filter material which is coarser than the material that was removed as casing is being bumped. Filter material can be omitted if uncased portion of hole will remain open without the filter material.

(4) Remove all drill rods and equipment.

b. Falling Head Test

(5) Fill casing with water

(6) Record water elevation versus elapsed time

(7) Repeat steps (5) and (6) until test results are consistent.

(8) Add 5 feet of casing

(9) Repeat steps (5), (6, and (7).

c. Rising Head Test

(10) Pump water out of casing until water level in casing is at least 5 feet below river level.

(11) Record water elevation versus elapsed time. A water level reader may be required.

(12) Repeat steps (10), (11) until test results are consistent.

5. Presentation of Results. Test data should be recorded on copies of attached form. Test locations (depths) should be noted on the boring logs.

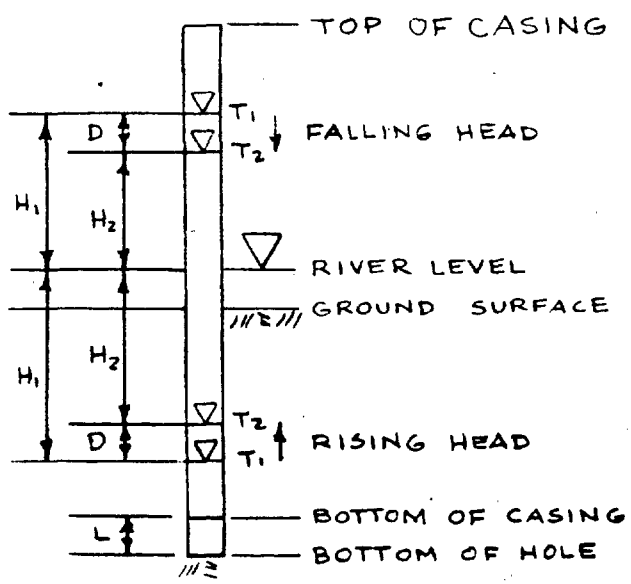
FIELD PERMEABILITY TEST RESULTS

DATE: _____	BORING NO: _____	DEPTH: _____	INSPECTOR: _____
D_o = _____	D_i = _____	L = _____	H_1 = _____	m = 3

FALLING HEAD				RISING HEAD			
ELAPSED TIME $(t_2 - t_1)$	D $(H_2 - H_1)$	H_2 $(H_1 - D)$	K_H	ELAPSED TIME $(t_2 - t_1)$	D $(H_2 - H_1)$	H_2 $(H_1 - D)$	K_H

NOTES:

SCHEMATIC



SYMBOLS

D_o = OUTSIDE DIAMETER OF CASING (CM)
D_i = INSIDE DIAMETER OF CASING (CM)
L = LENGTH OF SAMPLE (CM)
m = TRANSFORMATION RATIO
H = PIEZOMETRIC HEAD
T = TIME (SEC.)
k_h = HORIZONTAL PERMEABILITY (CM/SEC)
D = CHANGE IN H

$$K_h = \frac{D_i^2 \ln\left[\frac{mL}{D_o} + \sqrt{1 + \left(\frac{mL}{D_o}\right)^2}\right]}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$$

$$K_h = \frac{D_i^2 \cdot \ln\left(\frac{2mL}{D_o}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2} \quad \text{for } \frac{mL}{D_o} > 4$$

b. Project Site

The site of the subsurface explorations is the foot of the Main Street Dam of the Rippowam River in Stamford, CT. A general project map and site location map are located in Section 8.

c. Purpose

The subsurface investigations were to provide information on foundation conditions to facilitate the design of a replacement dam.

d. Scope of Work

Inspection and exploration instructions, which were provided by the Army Corps of Engineers, New England Division, are included in Section 3a.

Work under this delivery order consisted of locating four borings at the toe of the Main Street Dam by means of taping the distances given on Attachment No. 3 of the delivery order. All borings were relocated from their requested positions due to site access problems caused by too deep water. A boring location plan is in Section 8c. The ground elevation at each boring was estimated from Attachment No. 3 of the delivery order. The explorations were performed in accordance with Paragraphs 13, 18 and 22 of the contracted "Specifications for Services and Equipment Necessary for Conducting Geotechnical Exploratory Work, Various Locations in New England and New York". Testing procedures were performed in accordance with Paragraph 25 of the Specificatons and Attachement No. 5 of the Delivery Order. Specific instructions and changes during the course of the work were given verbally in telephone conversations with a Corps of Engineers representative and are documented in Section 5.

SECTION 4

QUALITY CONTROL

a. General Certification Statement

I hereby certify that the records, equipment and procedures mentioned below were used to perform the subsurface exploration described herein. I also certify that the work was performed in a professional manner and meets the requirements set forth in the delivery order. This report has been subject to my review and is both complete and technically accurate.

CERTIFIED 11 December 1986

Spencer F. Thew, P.E./L.S.

b. Records Taken

Pertinent drilling procedures, sampling operations, soil classifications and field testing were noted on the following forms provided for use by the Corps of Engineers:

NED 121 - Field Log of Test Boring, Summary
NED 58 and 58a - Field Log of Test Boring
NED 130 - Field Log of Test Boring in Rock
NED 59 - Subsurface Water Observations and Boring Location Sketch
NED 50 - Field Log of Pressure Test for Core Boring in Rock
Attachment 5, Page 3 - Field Permeability Test Results

A complete series of logs for each of the borings is included in Section 8d.

Sample containers were labeled using ENG Form 1742. A summary of daily activities and a telephone log are Tables I and II of Section 5, respectively. A chain of custody log is in Section 6. The safety meeting reports, NED Form 251, including exposure time for Atlantic Testing Laboratories' personnel, is located in Section 7.

c. Equipment Used

All equipment and supplies were provided by Atlantic Testing Laboratories, Limited. A listing of pertinent equipment follows:

- skid-mounted CME 45 drill rig on trailer
- 1-3/8" I.D. split spoon soil samplers, 2 ft in length
- AW sized rods used to advance the split spoon sampler
- 3" I.D. casing with spin and drive shoes
- 2-15/16" roller bit
- 3" O.D. by 5 ft diamond bit core barrel
- NW sized rods used to advance the roller bit and core barrel
- 140 pound hammer
- drilling platform, approximately 8 ft by 12 ft, constructed of 2" by 10" rough cut timber planks placed on a shallow frame of 4" by 4" timber beams
- track vehicle used to gain access to the river (John Deere backhoe, go-track, J-5)
- 2.15 ft long packer and pressure testing equipment
- oil spill control boom and sediment control fence

d. Procedures

The boring locations were established by taping the distances given on Attachment No. 3 of the delivery order. All borings were relocated from their requested positions due to site access problems. Borings FD86-1, 2, and 3 were located further downstream from the locations specified as the water was too deep and flow over the dam made it too dangerous and difficult to work close to the dam face. FD86-3(A) was moved further away from the side wall of the dam as the tree-filled boulder slope was too difficult to access. FD86-4(D) was moved out of the river bed onto the road surface as four inches of precipitation in three days had made the river to swollen to access. The City of Stamford Street Opening Permit allowing this work is in Section 9. Ground elevations were estimated from Attachment 3 of the delivery order.

The borings were advanced by spinning or driving 3" I.D. casing and washing out with a 2-15/16" roller bit. A 3-1/4" I.D. hollow stem auger was employed to start FD86-2 and FD86-4. NX diamond coring with water was employed to complete borings FD86-2, 3 and 4, with top of bedrock occurring at -15.0 ft in FD86-2, at -10.9 ft in FD86-3, and at -14.3 ft in FD86-4. The drilling platform was used to advance FD86-1 only. FD86-1 was abandoned prior to completion as we were not able to spin the casing through a 1-1/2 ft boulder. Attempts to restart the boring were unsuccessful and it was later cancelled by the Corps (see Section 5). FD86-2 and 3 were completed to the specified depth. FD86-4 was terminated 2 ft above the specified depth at the direction of a Corps of Engineers representative. Borings FD86-2 and 3 were marked using wood lath. FD86-4 was marked with spray paint around the concrete surface patch. FD86-1 was unmarked as it was abandoned and was expected to be completed at a later time.

Standard penetration testing sampling was accomplished using a 1-3/8" I.D. by 2 ft long split spoon sampler advanced by a 140 pound hammer dropping in free fall from a height of 30". The sampling interval was 5 ft. Refusal was defined as 50 blows with no penetration or bouncing refusal. The soil samples were placed in 16 oz glass jars with hermetically sealed lids. Samples were classified in the field immediately following their removal. Classification was in accordance with ASTM D-2488. Jars were labeled using ENG Form 1742 provided by the Corps of Engineers. A chain of custody log was maintained documenting custody of the samples between Atlantic Testing Laboratories and the Corps of Engineers. The samples were delivered to the USACE NED Materials and Water Quality Laboratory on November 26, 1986.

Permeability testing was performed in the overburden at the specified depths; in FD86-4 the depths were adjusted for the new location of the boring. A settling tank was used to assure only clear water was added during the test. A sample of the sand used for filter material was included with the soil samples delivered to the Materials and Water Quality Laboratory. Tests performed in the surficial sandy gravels of FD86-1 and 2 yielded questionable results as the gravels were observed to be in direct hydraulic connection with the river, and as it was possible to get a time reading only on the total change in the head. Also, note that the tests were performed using English units and the results have been reported in metric units as requested. Pressure testing was performed in FD86-3 only.

The oil spill control boom and sediment control fence were deployed prior to the start of any drilling and inspected and approved by Mark Lubbers, City of Stamford Environmental Protection Board.

It should be noted that the rig was moved on and off the riverbed in the morning and evening and during the day when the tide threatened to engulf the engine.

SECTION 5

SUMMARY OF ACTIVITIES
AND
TELEPHONE LOG

TABLE I

Summary of Activities

NOTE: On-site hours reflect inspector's on-site time.

Date	Activity
November 3	Monday: onsite 1:30-5:00 - Investigate for site access, will have to hire backhoe to bring us in and out at night. - Paul Schimelfenyg on-site 2:30-5:00. - Mark Lubbers, City of Stamford Environmental Protection Board on-site 4:30-5:00. - Unload rig. - Standby time, 1 hour for on-site moves.
November 4	Tuesday: on-site 7:00-5:00 - Drillers pick up and deploy oil spill control boom and sediment control fence which was inspected and approved by Mark Lubbers. - Hired subcontractor with a small backhoe. - Arrange to have city of Stamford Housing Authority gates opened to allow access to the river. Mark Lubbers gave us permission to break the locks on whichever gates were not opened. - In afternoon, discover that the site has 2-4 ft of tide. Mark Lubbers arranged to have gate of lower dam opened so that high tide would diminish more rapidly. We purchased hip waders. - Build platform for first boring after staking out boring locations. All borings will be about 20 ft away from the dam as the water is very deep at the immediate toe of the dam. - Standby time, 10 hours for pick up and deployment of boom and fence, and for constructing drilling platform.
November 5	Wednesday: on-site 6:30-5:00 - Advance FD86-1 to 11.5 ft through gravel and cobbles. Unable to advance casing through boulder at 10.0-11.5 ft. Abandon hole. Will move it 1.5 ft downstream. - Permeability test conducted at 5-7 ft yielded questionable results as there was clear hydraulic connection between the sample interval and the river (the water visibly bubbled up around the casing). This may either be the fault of the material or of the drilling procedure (spinning instead of driving the casing, as spinning disturbs the material around the casing). - Hold safety meeting. - Tide caused 3 hours lost time. - Standby time, 2.5 hours for safety meeting, on-site moves.
November 6	Thursday: on-site 6:30-6:30 - Advance FD86-2 to 19.5'. Unable to spin casing past 19.5'. Drill during dark hours with the aid of a flashlight. - Permeability testing at 5-7 ft in gravels yielded results similar to FD86-1. After a material change to sand at 9 ft, the permeability test at 10-12 ft yielded reasonable results which caused me to believe that spinning the casing was not the problem; rather, the gravelly material was. We will see what results we get when we drive the casing before making an official judgement on the permeability testing. - Standby time, 2.5 hours for on-site moves and tide.

Date	Activity
November 7	Friday: - Secure rig for weekend.
November 10	Monday: on-site 11:30-5:00 - Assess condition of rig and site.
November 11	Tuesday: on-site 6:30-7:30 - Complete FD86-2, core bedrock from 22-25 ft. Permeability test from 19.5-22.0 ft yielded reasonable results. Feel that spinning the casing is not the problem with the shallow tests, but rather the material. Will drive the casing in the next hole as the seal in sandy to silty soils would probably be tighter. - Hold safety meeting. - Heavy rains caused us to cancel further operations at 1:30. - Drive to New Haven to purchase topographic map. - Work on logs and reducing data from permeability tests. - Standby time, 0.5 hour for safety meeting.
November 12	Wednesday: on-site 6:30-7:00 - Tide in early morning kept us from moving onto FD86-3 until 8:30. During deployment, the helper fell waist deep into deep hole directly behind the boring location. - Had to return to the motel to warm up, dry out, change. - The driller had a death in the family. He was flown home and a new helper flown in to replace him. - Advanced FD86-3 to 12 ft, driving the casing.
November 13	Thursday: on-site 6:30-3:00 - Advance FD86-3 to 19.5 ft, coring bedrock from 16.5 ft. - At that point, in the middle of the first coring run, the rig blew a head gasket. The head cracked when it was removed. - Remainder of the day was spent on rig repairs and reducing permeability test data.
November 14	Friday: on-site 7:00-9:00 - Final cleanup, check for materials, load hauler to return go-track to Canton.
November 17	Monday: on-site 1:00-4:30 - Noted serious oil spill in progress. Product was entering the river from the two storm sewer pipes which daylight in the left wall immediately upstream from the Main Street bridge and well downstream from our oil boom and the job site. The spillage was witnessed to continue in pulses from 1:00-3:00 pm. - Unload J-5, inventory equipment to ascertain if we were fully equipped to handle the packer test tomorrow.
November 18	Tuesday: on-site 7:00-7:00 - Complete FD86-3, coring from 19.5 to 25.0 ft. - Set up packer test. - Run constant pressure test at 10 and 20 psi, noting that no pressures were requested in the delivery order. - Purchase shut off valve and place immediately upstream of the test box.

Date	Activity
	- Conduct falling pressure test. - Moved off FD86-3 onto FD86-1-A. - Attempted the boring three times but were unable to drive the casing straight. All borings were abandoned before 3.5 ft. - Note, 4.5 hours for packer test. - Standby time, 0.5 hour for safety meeting.
November 19	Wednesday: on-site 7:00-3:00 - Melting of 4" of wet snow which fell in the early hours caused high water which prevented us from entering the riverbed. Driller felt that the only way we could work today would be to move FD-A to the street level. - After much difficulty, managed to gain a street opening permit from the City of Stamford. - Initiated utility clearance. - Staked the boring location on the street. - Standby time, 8 hours due to weather. - NOTE: Frank T. Soldano, P.E., City Engineer, Stamford, requested that we perform two additional borings along the river wall. After conferring with Pat Sullivan, we will perform the borings only if we can complete them before next Wednesday.
November 20	Thursday: on-site 7:00-3:00 - Water still high. - Set up on boring on the street. - Street opening permit required a policeman to be on-site. Called to arrange for one and was told that a policeman would not be available till tomorrow. - In conference with the drillers, it was felt that we may not finish the boring Friday, and that we could not leave any casing sticking up or the hole unrepaired over the weekend. - I went to the City offices and attempted to convince the Traffic Department to revoke the requirement for a policeman. They would not. - As the street opening permit refused work on Saturday or Sunday, we did not feel that starting FD-D on Friday would be advisable. Likewise, an expected big storm (1" of rain forecast) meant that the water would remain high. We hoped that the data gained from FD-D would encourage the Corps to cancel FD-C. We expect to finish FD-D easily by Tuesday of next week. - Attempted to approach FD86-1-A but were unable due to high water. - Standby time, 4.5 hours for on-site moves.
November 21	Friday: - On-site to dismantle drilling platform, but water was so high we were unable to enter the water. Drilling platform had been carried under the bridge.
November 24	Monday: on-site 7:00-5:30 - Advance FD86-4 to 24.5 ft. - No policeman came to the site at 9:00. Attempted often to reach Lt. Martinelli but his phone was always busy. Police cruisers passed us often, but none stopped, so we assumed they did not feel we were a hazard.

Date	Activity
	- Cathead chain broke and had to be replaced - used a chain from the rig to be returned to Connecticut Test Boring so that our down time was minimal. - Conduct safety meeting. - Standby time. 0.5 hour for safety meeting.
November 25	Tuesday: on-site 7:00-7:00 - Conduct permeability test on hole which was still open. - Advance FD86-4 to 32 ft with roller bit. Core to 33 ft where core barrel plugged. Diamond bit was destroyed, inner barrel was distorted and could no longer be used. - Verified solid bedrock with roller bit, 33 to 35 ft. Boring terminated. - Tape final boring locations, backfill FD86-4 capping with concrete. - Final site cleanup, removal of drilling platform, oil spill control boom, etc. - Final demobilization. - NOTE: Officer Frank Cronin was on-site 9:30-5:00 and while he was present, traffic obstruction by police cruisers was a frequent annoyance. The drill rig did not obstruct traffic in any way.
November 26	Wednesday: - Deliver samples to USACE NED Materials and Water Quality Laboratory. - Check in with GEB for final debriefing. - At USACE NED HQ in Waltham, 11:00-12:00.

TABLE II

Telephone Log

Date	Conversation
November 3	Monday: Paul Schimelfenyg - Clarify the delivery order, especially regarding the testing.
November 4	Tuesday: Mark Lubbers, City of Stamford Environmental Protection Board - Gave Atlantic Testing Laboratories permission to break the locks of whichever gates remain locked on City of Stamford Housing Authority property.
November 4	Tuesday: Paul Schimelfenyg - Gave permission to move boring locations to points which would be easily accessible by the rig. The two borings at the sides will be most greatly affected.
November 6	Thursday: Ron DeFilippo - Job progress. - Feeling that spinning the casing may be causing meaningless results for the permeability testing. Ron stated that if that remained my professional opinion, I should insist on driving the casing, if at all possible.
November 12	Wednesday: Paul L'Heureux - Job progress. - Will attempt to drive casing as per the delivery order.
November 18	Tuesday: Ron DeFilippo - Job progress. - Is it necessary to run a falling pressure test? After checking delivery order, contract and Paul Schimelfenyg, test was requested.
November 19	Wednesday: Terry Wong - Want to move FD-A to street level. - Want to use standby time.
November 19	Wednesday: Paul L'Heureux - Authorized to use standby time. - After talking to Paul Schimelfenyg, authorized moving the boring to street level.
November 20	Thursday: Paul L'Heureux - Re: our lack of progress yesterday, today and tomorrow. - Asked about use of standby time. He would not authorize it and agreed that he would probably have to wait until the report was received to determine what he would pay for.
November 25	Tuesday: Ron DeFilippo - Job progress. - Authorized us to terminate FD86-4. - After consulting Paul Schimelfenyg, authorized us to cancel the redrilling of FD86-1 and demobilize. - Expect sample delivery tomorrow.

Date	Conversation
January 16	Friday: Ron DeFilippo

- Re: explanation of changes to draft report.
- As the inspector, T. A. Beddoe is presently in the field for D. O. No. 0018, Roughan's Point, Revere, MA, the final copy of this report will n ot be mailed by the usual Corps deadline. Corps recognized the problems inherent in the scheduling of the inspector.

SECTION 6

CHAIN OF CUSTODY LOG

ATLANTIC TESTING LABORATORIES, Limited

CHAIN OF CUSTODY LOG

PROJECT: Rippowam River, Stamford CT
DACW33-85-D-0011 D.O. # 0015

ITEMS:

Tubes -0-

Bottles -0-

Jar Samples 2 boxes

Core Boxes 1 box

Sampling Logs 4 logs

Date & Time Received	Date & Time Transferred	Comments	Custodian
as sampled	11/26/86 11:20		Beddoe
11/26/86 11:20			[illegible]

SECTION 7

SAFETY REPORTS

WEEKLY SAFETY MEETING

NEDSO

Date held 11/5/86

THRU: Area Engineer, New England Area

Time 1:00

TO: Safety Office, NED

Report No. C0012

1. Weekly safety meeting was held this date for the following personnel:

Contract No. /D.O.No. 0015 Contractor Atlantic Testing Laboratories, Ltd.

Conducted By T Beddoe All personnel present (Contr) 3
(Sub)
(Govt)

Subjects discussed (Note, delete, or add):
EM 385-1-1, Section:

✓ Accident Prevention Plan – note tetanus shots should be up to date

✓ Individual Protective Equipment – gloves, hip boots, hard hats

✓ Prevention of Falls – esp. on slick rocks – slow careful movement is best

✓ Back Injury, Safe Lifting Techniques –

✓ Fire Prevention – have fire extinguisher on rig

✓ Sanitation, First Aid, Waste Disposal – note location + condition of kit

✓ Tripping Hazards – trash, hose, nails in lumber –

✓ Staging, Ladders, Concrete Forms, Safety Nets – be careful with staging particularly at high tides

Hand Tools, Portable Power Tools, Woodworking Machinery –

✓ Equipment Inspection & Maintenance (Zero Defects) – Keep all equip in excellent condition

Hoisting Equipment –

✓ Ropes, Hooks, Chains and Slings – inspect + replace regularly

✓ Electrical Grounding, Temporary Wiring, GFCI – watch high tides

Lockouts for safe clearance procedures – electrical, pressure, moving parts –

Welding, Cutting –

Excavations –

✓ Loose Rock and Steep Slopes – rocks are algae covered + slick.

Explosives –

✓ Water Safety – be careful in wtr, esp. @ high tides

Toxic materials – hazards, MSDS, respiratory, ventilation –

Other – Phone Numbers
Emergency Medical 357-1441
Fire 323-3131 (note alarm box near site)
Police 327-2345
Stamford Hospital, Shelburne Rd 325-7000
St. Joseph's, 128 Strawberry Hill 327-3500

Prepared by Beddoe Title Geologist

2. Forwarded.

Signature Theresa A. Beddoe
Resident Engineer

CF: EXPOSURE HOURS:
Work Date: 11/3, 11/4, 11/5, 11/6, 11/7
Non-work Date: 11/2, 11/8

Man Hours:
Contr: 106.0
Subcontr: 20.5
Govt: 8.5
TOTAL: 135.0

NED FL APP F2 251

WEEKLY SAFETY MEETING

NEDSO

Date held 11/11/86

THRU: Area Engineer, New England Area

Time 12:00

TO: Safety Office, NED

Report No. CD012

1. Weekly safety meeting was held this date for the following personnel:

Contract No. /D.O.No. 0015 Contractor Atlantic Testing Laboratories, Ltd.

Conducted By TABeddoe All personnel present (Contr) 3
(Sub) ____
(Govt) ____

Subjects discussed (Note, delete, or add):
EM 385-1-1, Section: ____

Accident Prevention Plan

✓ Individual Protective Equipment - hip boots - warm clothing

✓ Prevention of Falls -

Back Injury, Safe Lifting Techniques -

✓ Fire Prevention - note locations of extinguishers

✓ Sanitation, First Aid, Waste Disposal - note kit locations, condition

✓ Tripping Hazards - trash, hose, nails in lumber - rocks

Staging, Ladders, Concrete Forms, Safety Nets -

Hand Tools, Portable Power Tools, Woodworking Machinery -

✓ Equipment Inspection & Maintenance (Zero Defects) -

✓ Hoisting Equipment - cathead in rain

✓ Ropes, Hooks, Chains and Slings - watch condition, replaced rope 11/12

Electrical Grounding, Temporary Wiring, GFCI -

Lockouts for safe clearance procedures - electrical, pressure, moving parts -

Welding, Cutting -

Excavations -

✓ Loose Rock and Steep Slopes -

Explosives -

✓ Water Safety - watch deep holes in river bed

Toxic materials - hazards, MSDS, respiratory, ventilation -

Other -

Prepared by Beddoe Title Geologist

2. Forwarded.

Signature Theresa A. Beddoe
Resident Engineer

CF: EXPOSURE HOURS:
Work Date: 11/10, 11/11, 11/12, 11/13, 11/14
Non-work Date: 11/9, 11/15

Man Hours:
Contr: 103.5
Subcontr: —
Govt: —
TOTAL: 103.5

NED FL APP PZ 251

WEEKLY SAFETY MEETING

NEDSO

Date held 11/18/86

THRU: Area Engineer, New England Area

Time 1200

TO: Safety Office, NED

Report No. C0012

1. Weekly safety meeting was held this date for the following personnel:

Contract No. /D.O.No. 0015 Contractor Atlantic Testing Laboratories, Ltd.

Conducted By Beddoe

All personnel present (Contr) 3
(Sub) —
(Govt) —

Subjects discussed (Note, delete, or add):
EM 385-1-1, Section: _____

✓ Accident Prevention Plan

✓ Individual Protective Equipment - against cold

✓ Prevention of Falls -

Back Injury, Safe Lifting Techniques -

✓ Fire Prevention -

✓ Sanitation, First Aid, Waste Disposal -

✓ Tripping Hazards - trash, hose, nails in lumber -

Staging, Ladders, Concrete Forms, Safety Nets -

Hand Tools, Portable Power Tools, Woodworking Machinery -

✓ Equipment Inspection & Maintenance (Zero Defects) -

Hoisting Equipment -

Ropes, Hooks, Chains and Slings -

Electrical Grounding, Temporary Wiring, GFCI -

Lockouts for safe clearance procedures - electrical, pressure, moving parts -

Welding, Cutting -

Excavations -

Loose Rock and Steep Slopes -

Explosives -

Water Safety -

Toxic materials - hazards, MSDS, respiratory, ventilation -

✓ Other - safety re: traffic on road side

Prepared by Beddoe Title Geol.

2. Forwarded.

Signature Theresa A. Beddoe
Resident Engineer

CF: EXPOSURE HOURS:
Work Date: 11/17, 11/18, 11/19, 11/20, 11/21
Non-work Date: 11/16, 11/22

Man Hours:
Contr: 95.5
Subcontr: —
Govt: —
TOTAL: 95.5

NED FL APP FL 251

WEEKLY SAFETY MEETING

NEDSO

Date held 11/24/86

THRU: Area Engineer, New England Area

Time 12:30

TO: Safety Office, NED

Report No. CD012

1. Weekly safety meeting was held this date for the following personnel:

Contract No. /D.O.No. 0015 Contractor Atlantic Testing Laboratories, Ltd.

Conducted By Beddoe

All personnel present (Contr) 3
(Sub) –
(Govt) –

Subjects discussed (Note, delete, or add):
EM 385-1-1, Section: _____

Accident Prevention Plan

✓ Individual Protective Equipment -

✓ Prevention of Falls - slick roads, watch placement of rod

✓ Back Injury, Safe Lifting Techniques -

Fire Prevention -

Sanitation, First Aid, Waste Disposal -

✓ Tripping Hazards - trash, hose, nails in lumber -

Staging, Ladders, Concrete Forms, Safety Nets -

Hand Tools, Portable Power Tools, Woodworking Machinery -

✓ Equipment Inspection & Maintenance (Zero Defects) -

✓ Hoisting Equipment -

✓ Ropes, Hooks, Chains and Slings - watch condition

Electrical Grounding, Temporary Wiring, GFCI -

Lockouts for safe clearance procedures - electrical, pressure, moving parts -

Welding, Cutting -

Excavations -

Loose Rock and Steep Slopes -

Explosives -

Water Safety -

Toxic materials - hazards, MSDS, respiratory, ventilation -

✓ Other - safety re: traffic

Prepared by Beddoe Title Geol.

2. Forwarded.

Signature Theresa A. Beddoe
Resident Engineer

CF: EXPOSURE HOURS:
Work Date: 11/24, 11/25
Non-work Date: 11/23, 11/26, 11/27, 11/28, 11/29

Man Hours:
Contr: 60.5
Subcontr: 7.5
Govt: –
TOTAL: 67.5

NED APR 82 FL 251

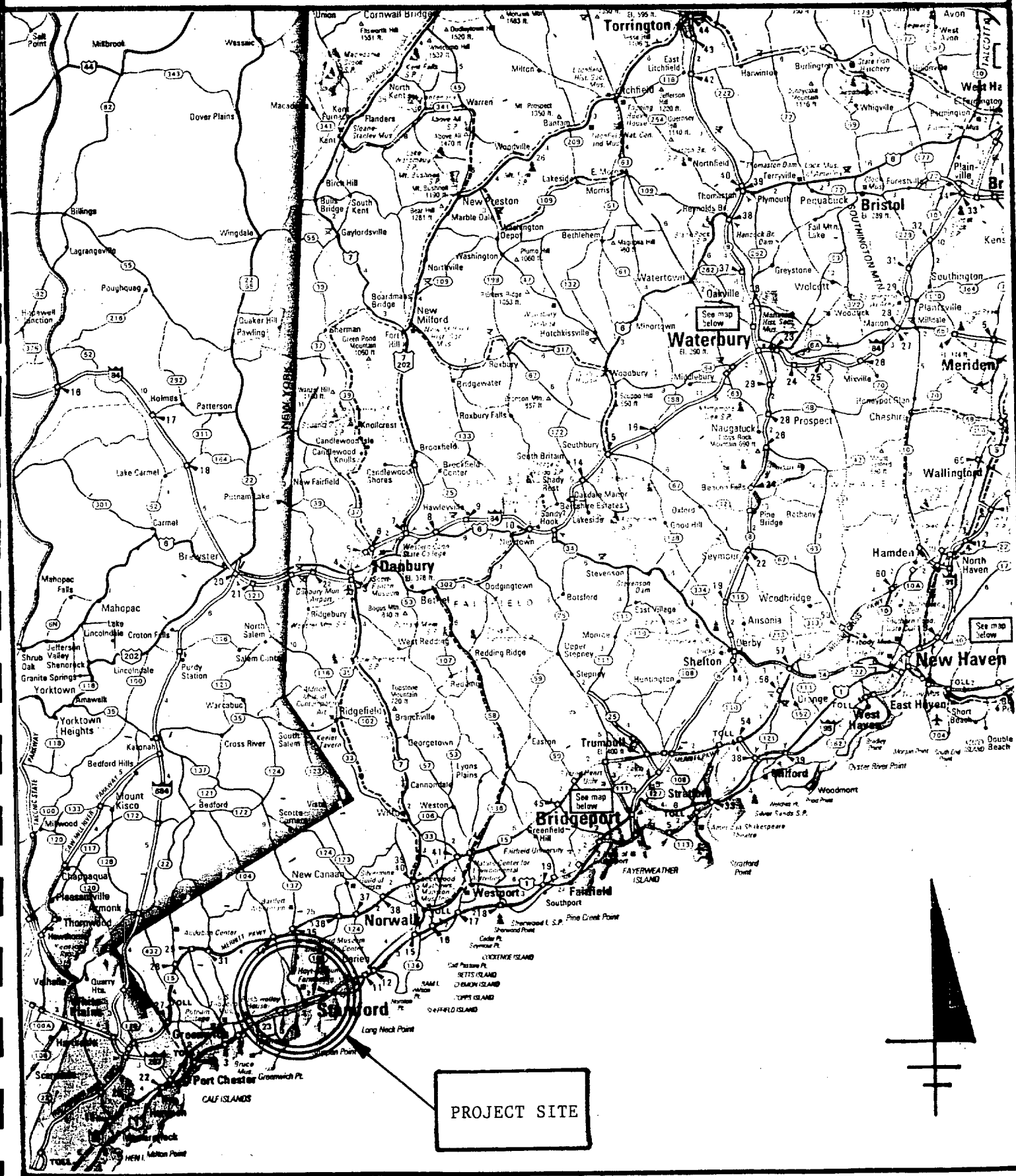
SECTION 8

BORING LOGS

a. Figure 1 – General Project Map

FIGURE 1

GENERAL PROJECT MAP

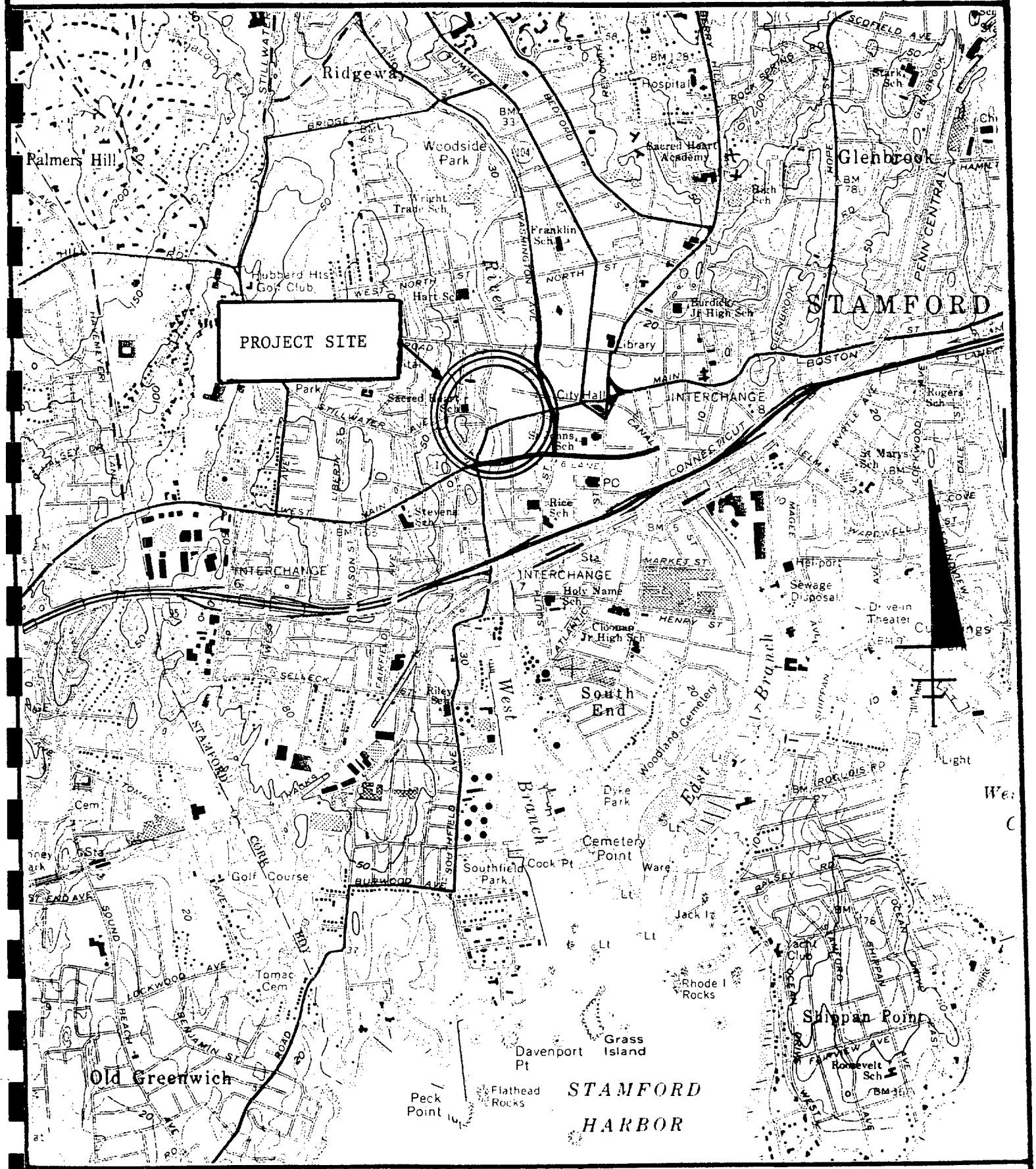


PROJECT No CD012	SCALE: 1" = 7 mi.	CONNECTICUT

a. Figure 2 – Site Location Map

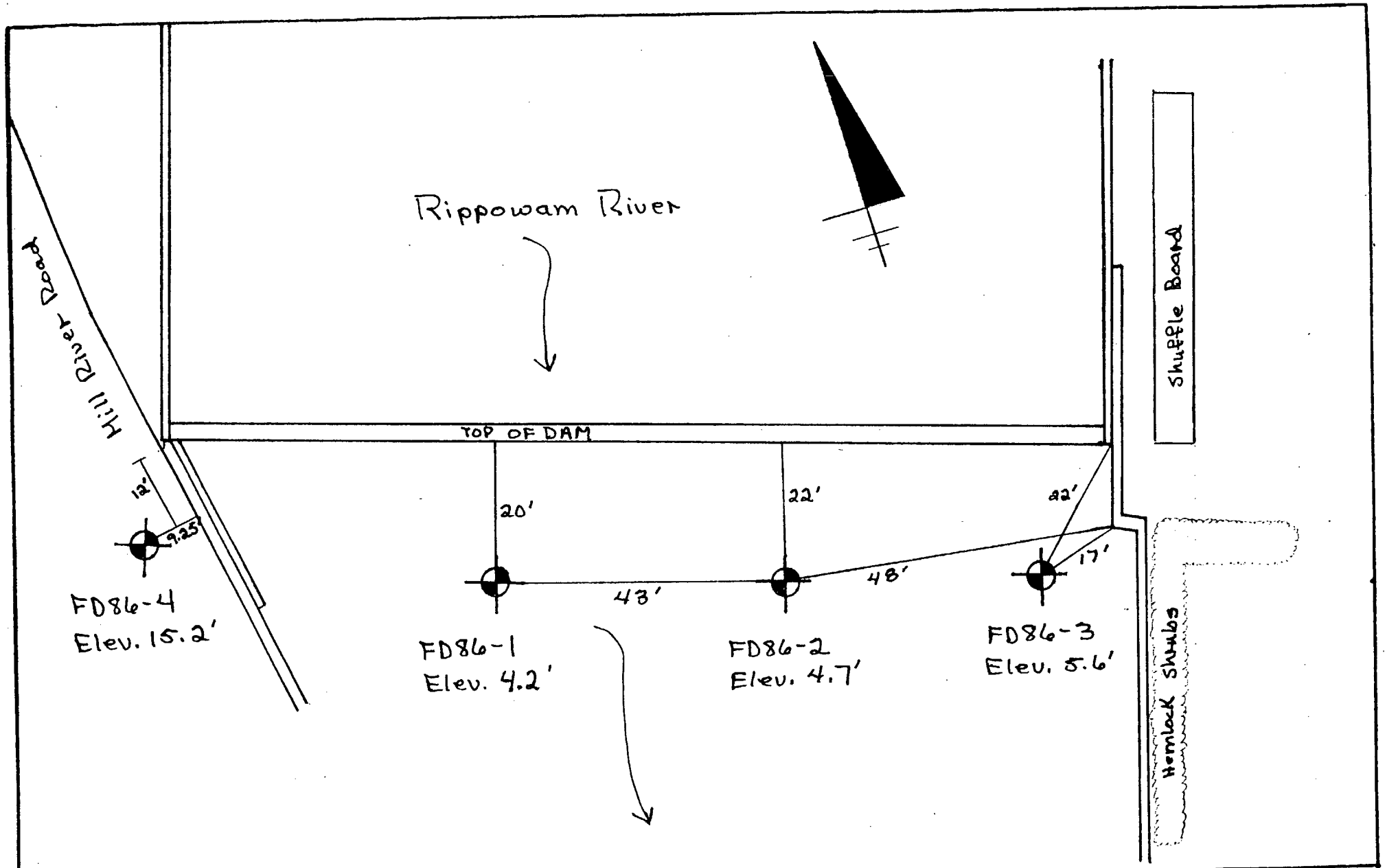
FIGURE 2

SITE LOCATION MAP



PROJECT No	CD012	SCALE: 1:24,000	U.S.G.S. QUAD: Stamford, Conn.

a. Figure 3 – Boring Location Plan



SKETCH OF BORING LOCATIONS	SCALE 1:233	PROJECT No. CD012	DATE 12/9/86
Rippowam River, Stamford CT	ATLANTIC TESTING LABORATORIES., Limited BOX 28 CANTON, NY 13617	BOX 356 CICERO, NY 13039	

d. Boring Logs

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. D.D. #0015

Site Rippowam River, Stamford CT — Page 1 of 7 Pages

Hole No. FD86-1 Dim. (Casing) 3" — Boring Started 11/5/86

Co-ordinates: X see Y plan — Boring Completed 11/5/86

Drilled by Todd & Sawyer — Report Submitted

Purpose of Exploration determine foundation conditions for the design of a replacement dam

Elevation Top of Hole 4.2 M.S.L.
Total Overburden Drilled 11.5 Feet
Elevation Top of Rock — M.S.L.
Elevation Bottom of Hole −7.3 M.S.L.
Total Rock Drilled 0 Feet
Total Depth of Hole 11.5 Feet
Core Recovered — %
Core Recovered — Ft.; — Diam. — In.
Soil Samples 1 3/8 In. Diam. 2 No.
Soil Samples — In. Diam. — No.

Casing Left in Place 0 Feet

Water Table Depth River level

Depth From	Depth To	Method of Drilling and Type of Bit Used
0.0	11.5	3" casing spun with water, followed or preceeded by 2 15/16" roller bit with water*
		*includes sampling on 5' intervals using 1 3/8" ID split spoon sampler

INDEX

Ground Water	Back of Page	—
Boring Location Sketch	~~Back of~~ Page	4
Overburden Record	Page	2-3
Rock Drilling	Page	—
Field Permeability Test Results	Page	5-7
	Page	
	Page	

Prepared by Theresa A. Beddoe (Field Data) — (Lab. Data)

Submitted by Atlantic Testing Labs, Ltd.

NED FORM DEC 63 121 — REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site: Rippowam River — Page 2 of 7 Pages

Boring No. ED86-1 Desig. C Diam. (Casing) 3" ID

Co-ordinates: X see X sketch

Elevation Top of Boring: 4.2 M.S.L.
Total Overburden Drilled: 11.5 Feet
Elevation Top of Rock: — M.S.L.
Total Rock Drilled: 0 Feet
Elevation Bottom of Boring: -7.3 M.S.L.
Total Depth of Boring: 11.5 Feet
Core Recovered: — % No. Boxes: —
Core Recovered: — Ft: — Diam. — In.
Soil Samples: 1 3/8 In. Diam. 2 No.
Soil Samples: — In. Diam. — No.

Hammer Wt.: 140# Boring Started: 11/5/86
Hammer Drop: 30"
Casing Left: 0' Boring Completed: 11/5/86
Subsurface Water Data: — Page —
Obs. Well: no
Drilled By: Todd & Saarinen
Mfg. Des. Drill: skid-mounted CME 45
Inspected By: Beddoe
Classification By: Beddoe
Classification By: —

DEPTH 0'	DEPTH 1" = 2'	CORE/SAMPLE NO.	SIZE	DEPTH RANGE / CORE RECOVERY	BLOWS PER FT / 6"	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
2.0'		S-1	1 3/8"	REC 10%	5 6 7 17	Sample using 1 3/8" ID split spoon sampler. Note poor recovery due to coarse gravel and cobbles at surface. 3 1/4" ID Hollow Stem Auger through surface cobbles to 2.5'. Pull augers, spin 3" ID casing to 5', as it was impossible to drive casing due to boulders. Clean casing out using 2 15/16" OD roller bit	Med. brown f. GRAVEL and crse SAND, trace SILT (sat., nonplastic) medium dense GP
5.0'							
7.0'		S-2	1 3/8"	20%	11 11 13 12	Sample as above	GP as above
10.0'						Drill to 7.0' using 2 15/16" OD roller bit. Hole remained open. Conduct permeability test from 5'-7'. Spin casing to 8.5'. Drill using roller bit to 11.5'	encounter large boulder at 10.0'

GENERAL REMARKS:
Elevation estimated from Attachment #3 of the delivery order.
All soil sampling performed in accordance with ASTM D1586.

Site Rippowam River	Boring No. FD86-1	Page 3 of 7

DEPTH 10'	DEPTH 1" 2'	CORE/SAMPLE NO.	CORE/SAMPLE SIZE	CORE/SAMPLE ~~DEPTH RANGE~~	BLOWS PER FT ~~CORE RECVY~~	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
11.5'				REC		Drill using 2 15/16" OD roller bit to 11.5' through boulder (10.0'-11.5') Spin casing to 10.5'	Boulder from 10.0' to 11.5'
						Hole abandoned at 11.5' because casing could not be spun through the drilled boulder. Will be moved 1.5' downstream. 11/5/86. Note that boulder was drilled using roller bit as its stratigraphic position, surrounding soils and "consistency" during drilling indicated that it was not bedrock. Note that on 11/18/86 three attempts were made to redrill this hole slightly downstream from FD86-1. All were abandoned before 3.5' as we were unable to drive the casing in vertically. Consequently, we were unable to extend this boring deep enough to intersect the bedrock surface.	

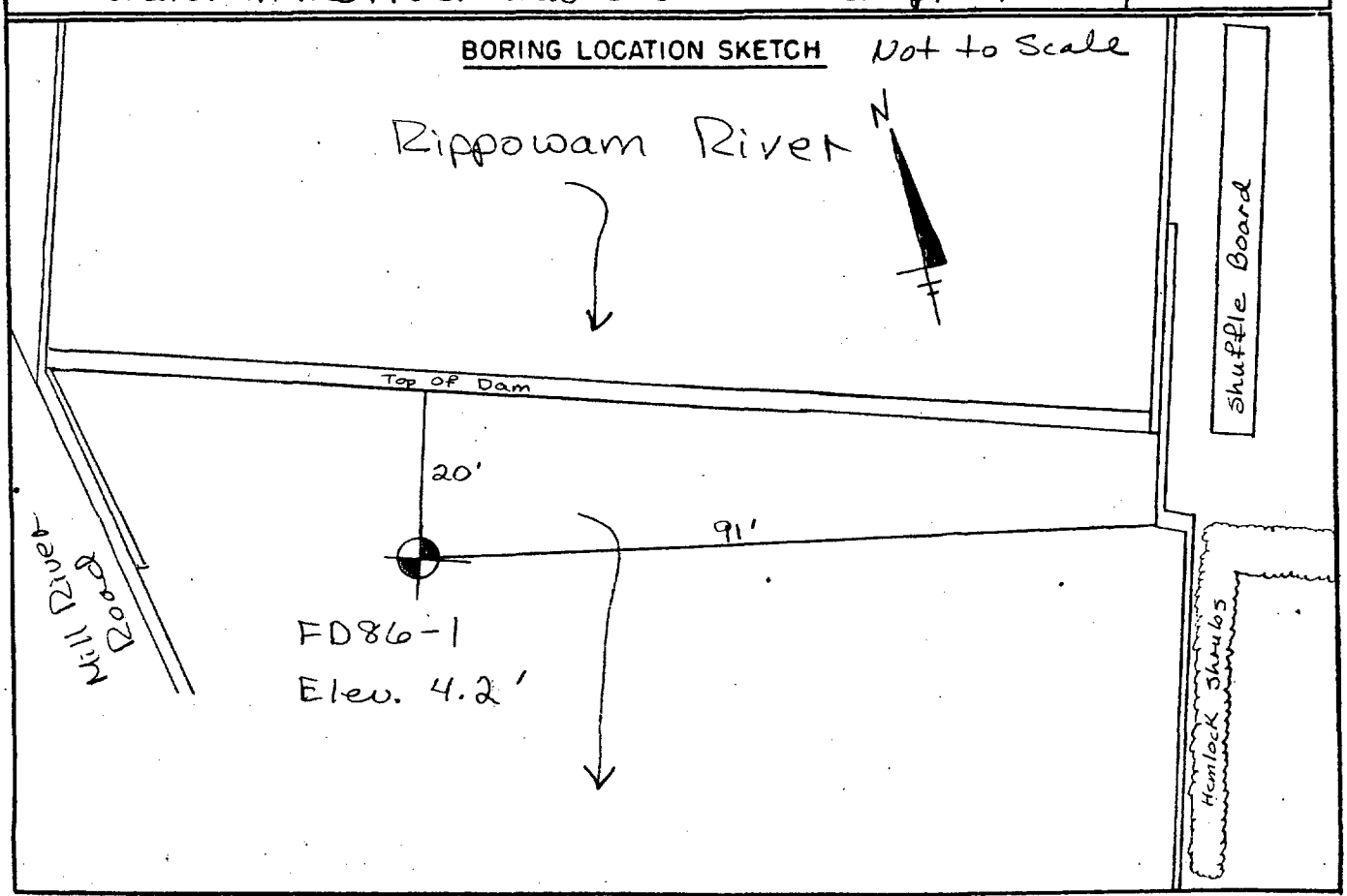
Site: Rippowam River
Boring No: FD 86-1

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS

Note: Depths are in feet below original ground
water in the river was 0.8' to 4.0' deep, depending on the tide.

BORING LOCATION SKETCH Not to Scale



Notes to Field Permeability Test Results FD86-1, 5.0' to 7.0'

1. Test was performed in coarse sandy gravels with cobbles (GP) typical of the river bed. These gravels were observed to be in direct hydraulic connection with the river: during the falling head test, the water introduced to the casing was observed to flood up around casing and surrounding gravels. During the rising head test, it was impossible to lower the water level beyond a particular point using the drill rig's pump due to the flow of river water through the gravels into the casing.

2. Because of this direct hydraulic connection with the river, it was impossible to properly time the precipitous fall or rise of water within the casing at intermediate times during the test. We were only able to determine accurately the elapsed time from termination of addition/subtraction of water to the casing to the point at which the water stabilized at the river level. Two separate tests confirmed the accuracy of these readings; both test results are presented.

3. In the calculation, H_1 corresponds to the level of the water in the casing at T_1, the initial time, and H_2 corresponds to the level of the water in the casing at T_2, the final time. Both H_1 and H_2 are measured with respect to the river level. In these tests, H_2 is the river level (see note 2), that is, $H_2 = 0$. As it is impossible to divide by zero (see equation), H_2 was given a value of 1.0 cm in an attempt to give the calculation some meaning.

4. Attachment No. 5 of the Delivery Order (see Section 3a) requests that the casing be driven to the bottom elevation of the test, cleaned, bumped back to the top elevation of the test and backfilled with "filter material which is coarser than the material that was removed as casing is being bumped".

   a) The Drilling Method

      1. Attempts were made to drive the casing which were unsuccessful in all but one boring (FD86-3) due to the cobbles and coarse gravels of the river bed. Casing was spun in the remainder of the borings. It was felt that the questionable results of this permeability test (i.e., the hydraulic connection between the sample interval and the river) was either the fault of the material encountered (coarse gravels) or of the drilling procedure (spinning instead of driving the casing)(see Section 5, Table 1, November 5, second note). Later, testing from 5' to 7' in FD86-2 (spun casing, coarse gravels) yielded similar questionable results and testing from 10' to 12' in FD86-2 (spun casing, sand) yielded reasonable results, which indicated that the questionable results encountered in the gravels was the fault of the coarseness of the material (see Section 5, Table 1, November 6, second note). Finally, testing from 5.5' to 7.5' in FD86-3 (driven casing, sand) yielded results similar to those for casing spun into sand (10' to 12', FD86-2) which confirmed that the questionable results achieved in the coarse gravels was the fault of the material and not of the drilling method (spun vs. driven casing).

2. To substantiate this conclusion, the inspector consulted Freeze RA and Cherry JA (1979) Groundwater, Prentice-Hall, New Jersey, Table 2.2, Page 29, which indicated that values of K = 0.1 cm/sec were not unreasonable for coarse sandy gravels.

3. Finally, Attachment No. 5 of the Delivery Order (Section 3a), No. 1 states "Useful results can be obtained in cohesionless soils having a permeability <u>less than</u> 10^{-3} cm/sec, if reasonable care is exercised". The tests in the sandy gravels yielded results greater than 10^{-3}. If these tests are not useful because of the lack of intermediate values, it is apparent that the difficulty lies in the extremely high permeability of the gravels and not in the test procedure.

b) Backfilling

If the test interval were to be backfilled with filter material coarser than that removed, it would be necessary to backfill the casing with cobbles 3" in diameter or larger. The possibility that these would bridge in the casing and result in warping the casing or spin shoe was felt too great to be risked. This test did not require a filter as the hole remained open; however, the tests conducted in FD86-2 at 5' to 7' and 10' to 12' were not backfilled because of this reason, and due to the lack of appropriately-sized clean backfill material.

FIELD PERMEABILITY TEST RESULTS

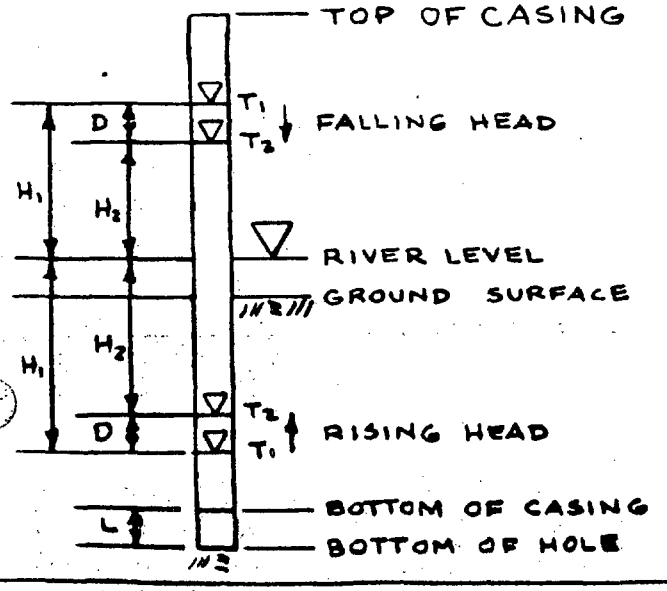
E: 11/5/86	BORING NO: FD86-1	DEPTH: 5'-7'	INSPECTOR: Beddoe
D_o = 8.9	D_i = 7.6	L = 61.0	$\frac{mL}{D_o}$ = 20.6 ; m = 3

FALLING HEAD				RISING HEAD			
ELAPSED TIME ($t_2 - t_1$)	D ($H_2 - H_1$)	H_2 ($H_1 - D$)	K_H	ELAPSED TIME ($t_2 - t_1$)	D ($H_2 - H_1$)	H_2 ($H_1 - D$)	K_H
20	69.9	1.0	0.1	8	35.6	1.0	0.2
19	68.7	1.0	0.1	8	37.0	1.0	0.2

NOTES: Test performed in sandy gravels (GP). Hole remained open during test. No filter was used.

Results listed are for four separate tests.

SCHEMATIC



SYMBOLS

D_o = OUTSIDE DIAMETER OF CASING (CM)
D_i = INSIDE DIAMETER OF CASING (CM)
L = LENGTH OF SAMPLE (CM)
m = TRANSFORMATION RATIO
H = PIEZOMETRIC HEAD
T = TIME (SEC.)
k_h = HORIZONTAL PERMEABILITY (CM/SEC)
D = CHANGE IN H

$$K_h = \frac{D_i^2 \ln\left[\frac{mL}{D_o} + \sqrt{1 + \left(\frac{mL}{D_o}\right)^2}\right]}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$$

$$K_h = \frac{D_i^2 \cdot \ln\left(\frac{2mL}{D_o}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2} \quad \text{for } \frac{mL}{D_o} > 4$$

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FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. D.O. # 0015

Site Rippowam River, Stamford CT — Page 1 of 9 Pages

Hole No. FD86-2 Diam. (Casing) 3" — Boring Started 11/6/86

Co-ordinates: X see X plan — Boring Completed 11/11/86

Drilled by Todd, Saarinen + Cambridge — Report Submitted

Purpose of Exploration determine foundation conditions for the design of a replacement dam.

Elevation Top of Hole 4.7 M.S.L. — Casing Left in Place 0 Feet

Total Overburden Drilled 19.7 Feet

Elevation Top of Rock -15.00 M.S.L.

Elevation Bottom of Hole -20.3 M.S.L.

Total Rock Drilled 5.3* Feet

Total Depth of Hole 25.0 Feet

Core Recovered 100* %

Core Recovered 3* Ft.; ___ Diam. 2 1/8 In.

Soil Samples 1 3/8 In. Diam. 6 No.

Soil Samples — In. Diam. — No. — Water Table Depth River level

* Total rock cored was 3.0'.

Depth From	Depth To	Method of Drilling and Type of Bit Used
0.0	5.0	3 1/4" ID Hollow Stem Auger
5.0	19.7	3" spun casing with water,
		followed or preceded by 2 15/16" roller
		bit with water*
19.7	22.0	2 15/16" roller bit with water*
22.0	25.0	NX diamond core with water
		*includes sampling on 5' intervals
		using 1 3/8" ID split spoon sampler

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Boring Location Sketch — Back of Page 5
Overburden Record — Page 2-3
Rock Drilling — Page 3-4
Field Permeability Test Results — Page 6-9
— Page
— Page

Prepared by Theresa A. Beddoe (Field Data) — (Lab. Data)

Submitted by Atlantic Testing Labs, Ltd.

NED FORM DEC 63 121 — REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site Rippowam River Page 2 of 9 Pages
Boring No. FD86-2 Desig. B Diam. (Casing) 3" ID
Co-ordinates: see sketch

Elevation Top of Boring 4.7 M.S.L.
Total Overburden Drilled 19.7' Feet
Elevation Top of Rock -15.00 M.S.L.
Total Rock Drilled 5.3* Feet
Elevation Bottom of Boring -20.3 M.S.L.
Total Depth of Boring 25.0 Feet
Core Recovered 100* % No. Boxes 1
Core Recovered 3* Ft: Diam. 2 1/8 In.
Soil Samples 1 3/8 In. Diam. 6 No.
Soil Samples — In. Diam. — No.

Hammer Wt. 140#
Hammer Drop 30"
Casing Left 0'
Subsurface Water Data ____ Page —
Obs. Well no
Drilled By Todd, Soarinen + Cambridge
Mfg. Des. Drill skid mounted CME 45
Inspected By: Beddoe
Classification By: Beddoe
Classification By: —

Boring Started 11/6/86
Boring Completed 11/11/86

DEPTH 0'	DEPTH 1"=2'	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. CORE RECOVY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
2.0'		S-1	1 3/8"	REC 20%	5 10 9 7	Sample using 1 3/8" ID split spoon sampler.	Med. brown fine GRAVEL and cmf SAND, trace SILT, trace DEBRIS (glass). (sat, nonplastic) medium dense GP
5.0'						3 1/4" ID Hollow Stem Auger to 5' through cobbles and gravel. Clean to 5' using 2 5/16" OD roller bit	
7.0'		S-2	1 3/8"	20%	13 18 13 12	sample as above	GP as above
10'						Drill using roller bit to 7.0'; Hole caved to 4.75'. Pull auger. Spin 3" ID casing to 5'. clean out with roller bit to 7.0'; hole caved to 5.0'. Conduct permeability test, 5'-7'. Note that coarse cobble filter material was not available. See page 6. Spin casing to 9.5', clean with roller bit to 10'	Note change in material consistency at 9.0' - much easier to drill.

GENERAL REMARKS:
* Total Rock cored was 3.0'
Elevation estimated from Attachment #3 of the Delivery Order.
All soil sampling performed in accordance with ASTM D1586

Site	Boring No.	Page
Rippowam River	FD86-2	3 of 9

DEPTH	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT / CORE RECVY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
10.0'	S-3	$1\frac{3}{8}$"	REC 50%	8 9 9 9	Sample using $1\frac{3}{8}$" ID split spoon sampler. Drill using $2\frac{15}{16}$" OD roller bit to 12', hole caved to 10.75'. conduct permeability test, 10'-12'.	Light grey cmf SAND, little f GRAVEL, trace SILT (sat., nonplastic) medium dense SP
12.0'					spin 3" ID casing to 15', clean out casing to 15' using $2\frac{15}{16}$" OD roller bit.	
15.0'	S-4A	$1\frac{3}{8}$"	65%	33 60	Sample as above - [illegible] - note change in material halfway through spoon.	Med. grey-brown cmf SAND, trace f GRAVEL, trace SILT (sat., nonpl) very dense SW
17.0'	S-4B			17 22		Light brown mf SAND and cf GRAVEL, trace SILT (sat., nonplastic) dense SP
19.5'					Roller bit to 19.5' followed by spun casing to 19.5' and noting layer of hard material from 15.5'-16.0'	
19.7'	S-5	$1\frac{3}{8}$"	100%	100/2"	Sample as above - [illegible] - noting bouncing refusal end of explorations 11/6/86	Med. silver-brown cf GRAVEL and mf SAND, trace SILT, trace CLAY (sat., v. sl. plastic) very dense GP TILL
22.0'					explorations continue 11/11/86 the helper Saarinen was replaced by Cambridge. Roller bit to 22.0'. conduct permeability test from 19.5'-22.0'. see page 8 and 9.	Material consistency during drilling similar to weathered rock - top of rock at 19.7'.
25.0'	R-1	$2\frac{1}{8}$"	100% (3')		NX diamond core, 22.0' - 25.0', with water	Run #1 100% Recovery = 3' RQD = 100% 2 pieces, 2 fragments 1st piece: grey schist - (boulder ??) 2nd piece: grey gneiss Note that fracture between the two peices was not a driller's break.
					Boring terminated 11/11/86 at 25.0'	

FIELD LOG OF TEST BORING IN ROCK

SITE Rippowam River, Stamford CT HOLE NO. FD86-2 PAGE 4 of 9

DATE	DEPTH FT. FROM	DEPTH FT. TO	RUN FT.	RUN REC'V'Y FT.	REC'V'Y %	DRILLING BEHAVIOR: FEED	DRILLING BEHAVIOR: WATER	DRILLING BEHAVIOR: REASON FOR PULL	ACTUAL DRILLING TIME	BIT NO. SIZE AND TYPE	ADDITIONAL REMARKS
11/11/86	22.0	25.0	3'	3'	100%	medium	no water loss	termination of boring requested at 25.0'	35 min	NX diamond	extremely coherent bedrock may have a schistose boulder above a gneissic bedrock Rock is believed to be bedrock because of the weathered bedrock encountered from 19.7' to 22.0', and because of the "consistency" during drilling, and the characteristics of the rock core itself.

TOTAL BED ROCK DRILLED 3.0 FEET

TOTAL BED ROCK RECOVERED 3.0 FEET

BED ROCK RECOVERY 100 PERCENT

DRILLER Todd & Cambridge

INSPECTOR Beddoe

NED FORM DEC 63 130

REPLACES EDITION OF APR 63 WHICH MAY BE USED UNTIL EXHAUSTED

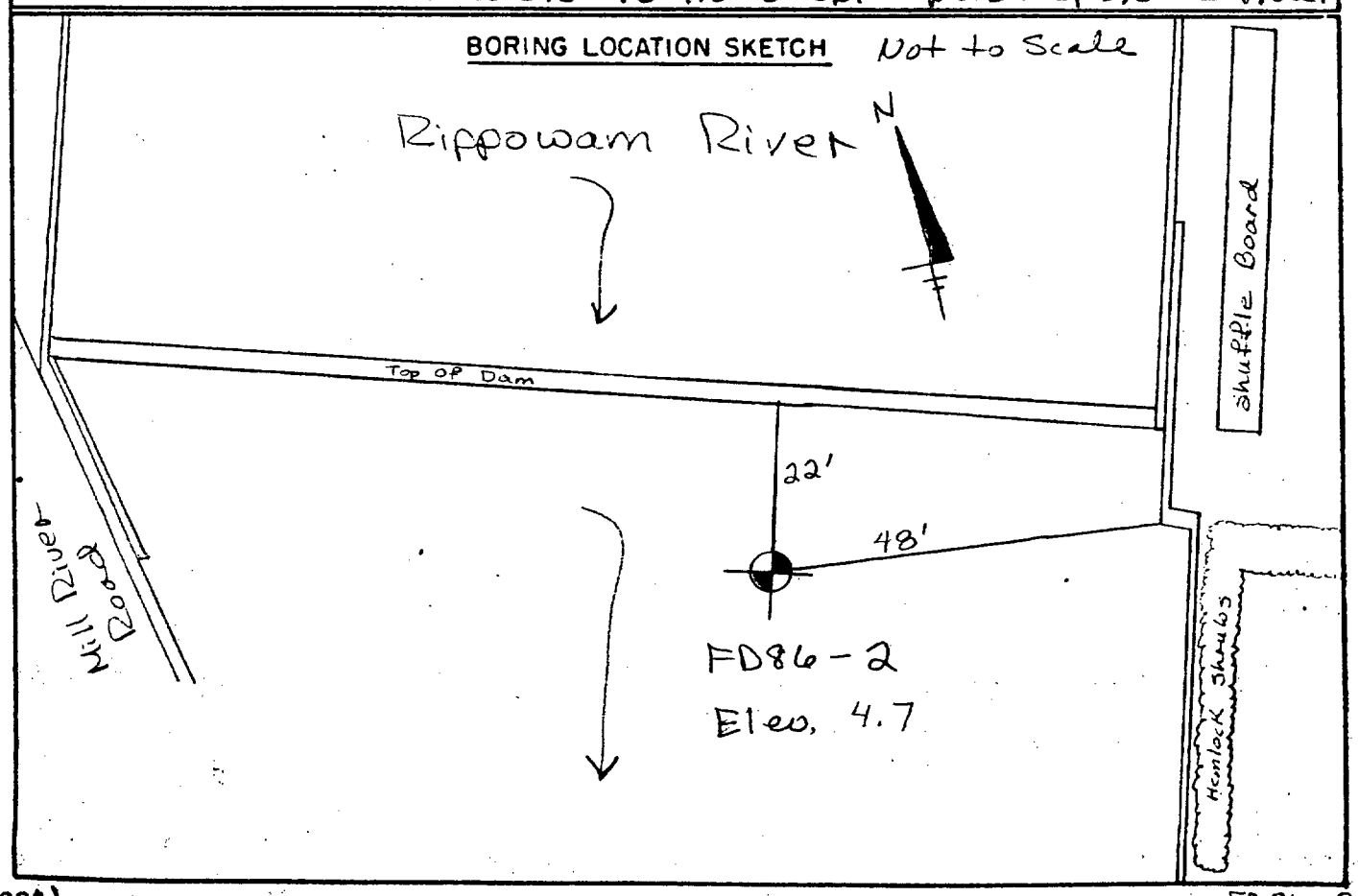
Site: Rippowam River
Boring No: FD 86-2

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS

Note: Depths are in feet below original ground
water in the River was 0.5' to 4.0' deep, depending on the tide.

BORING LOCATION SKETCH Not to Scale



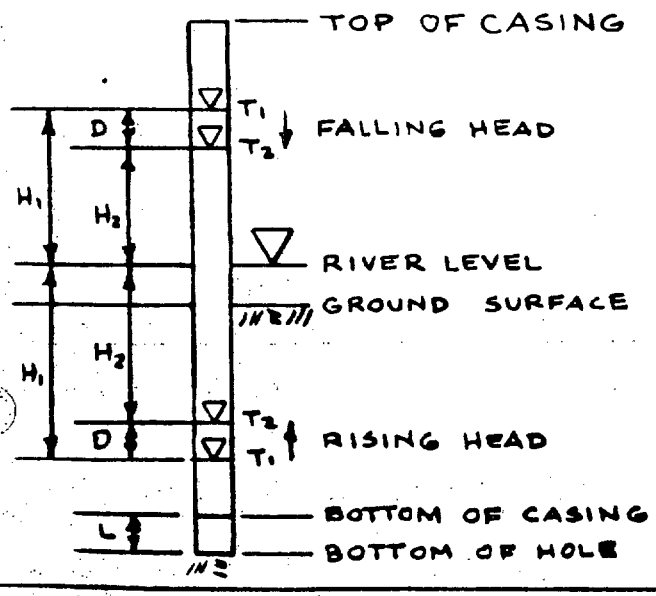
FIELD PERMEABILITY TEST RESULTS

E: 11/6/86	BORING NO: FD86-3	DEPTH: 5'-7'	INSPECTOR: Beddoe
D_o = 8.9	D_i = 7.6	L = 61.0	$\psi = \frac{mL}{D_o} = 20.6$	m = 3

FALLING HEAD				RISING HEAD			
ELAPSED TIME ($t_2 - t_1$)	D ($H_2 - H_1$)	H_2 ($H_1 - D$)	K_H	ELAPSED TIME ($t_2 - t_1$)	D ($H_2 - H_1$)	H_2 ($H_1 - D$)	K_H
15	142.2	1.0	0.2	unable to perform rising head test as we could not pump water out of the casing fast enough.			
16	143.1	1.0	0.1				

NOTES: See notes to Field Perm. Test Results, page 5 of 6 of FD86-1. Test performed in sandy gravels (GP). Hole caved to 5.0'. No filter was used. Results listed are for two separate tests.

SCHEMATIC



SYMBOLS

D_o = OUTSIDE DIAMETER OF CASING (CM)
D_i = INSIDE DIAMETER OF CASING (CM)
L = LENGTH OF SAMPLE (CM)
m = TRANSFORMATION RATIO
H = PIEZOMETRIC HEAD
T = TIME (SEC.)
k_h = HORIZONTAL PERMEABILITY (CM/SEC)
D = CHANGE IN H

$$K_h = \frac{D_i^2 \ln\left[\frac{mL}{D_o} + \sqrt{1 + \left(\frac{mL}{D_o}\right)^2}\right]}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$$

$$K_h = \frac{D_i^2 \cdot \ln\left(\frac{2mL}{D_o}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2} \quad \text{for } \frac{mL}{D_o} > 4$$

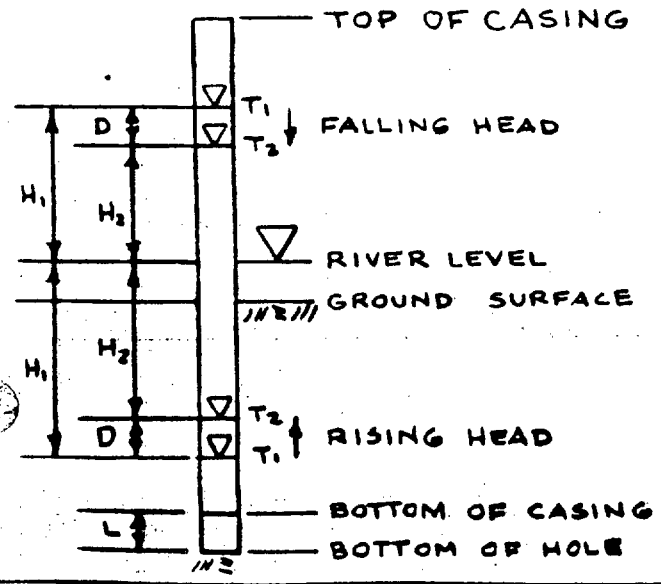
FIELD PERMEABILITY TEST RESULTS

E: 11/6/86	BORING NO: FD86-2	DEPTH: 10'-12'	INSPECTOR: Beddoe
D_o = 8.9	D_i = 7.6	L = 61.0	~~K~~ = mL/D_o = 20.6 m = 3

FALLING HEAD				RISING HEAD			
ELAPSED TIME ($t_2 - t_1$)	D ($H_2 - H_1$)	H_2 ($H_1 - D$)	K_H	ELAPSED TIME ($t_2 - t_1$)	D ($H_2 - H_1$)	H_2 ($H_1 - D$)	K_H
60	0.2	159.8	1.0×10^{-5}	25	91.4	1.0	8.0×10^{-2}
120	1.3	158.7	3.0×10^{-5}				
300	2.5	157.5	2.3×10^{-5}	30	99.1	1.0	6.8×10^{-2}
450	3.0	157.0	1.9×10^{-5}	No intermediate values are available due to rapid rise of water within the casing. See notes to Field Perm. Test Results, page 5+6 of FD86-1, notes 2 and 3, and 4b. It is felt that the river influenced these results unduly and that the falling head test results are more representative.			
60	0.2	159.8	1.0×10^{-5}				
120	0.7	159.3	1.7×10^{-5}				
300	2.3	157.7	2.1×10^{-5}				
450	2.9	157.1	1.8×10^{-5}				
600	3.8	156.2	1.8×10^{-5}				

OTES: Test performed in sands (SP). Hole cased to 10.75'. No filter was used (see note 4b, page 6 of FD86-1). Results listed are for 4 separate tests.

SCHEMATIC



SYMBOLS

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D_i = INSIDE DIAMETER OF CASING (CM)
L = LENGTH OF SAMPLE (CM)
m = TRANSFORMATION RATIO
H = PIEZOMETRIC HEAD
T = TIME (SEC.)
k_h = HORIZONTAL PERMEABILITY (CM/SEC)
D = CHANGE IN H

$$K_h = \frac{D_i^2 \ln\left[\frac{mL}{D_o} + \sqrt{1 + \left(\frac{mL}{D_o}\right)^2}\right]}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$$

$$K_h = \frac{D_i^2 \cdot \ln\left(\frac{2mL}{D_o}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2} \quad \text{for } \frac{mL}{D_o} > 4$$

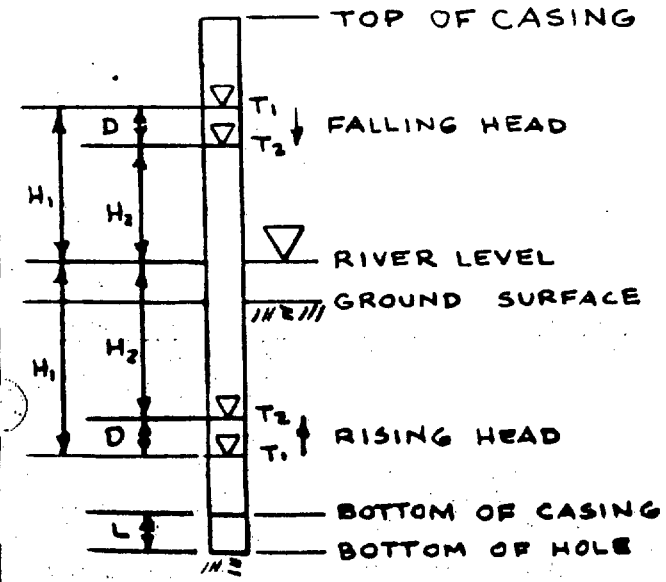
FIELD PERMEABILITY TEST RESULTS

DATE: 11/11/86	BORING NO: FD86-2	DEPTH: 19.5-22.0	INSPECTOR: Beddoe
D_o = 8.9	D_i = 7.6	L = 76.2	$\frac{mL}{D_o}$ = 25.7	m = 3

FALLING HEAD				RISING HEAD			
ELAPSED TIME ($t_2 - t_1$)	D ($H_2 - H_1$)	H_2 ($H_1 - D$)	K_H	ELAPSED TIME ($t_2 - t_1$)	D ($H_2 - H_1$)	H_2 ($H_1 - D$)	K_H
Note: Test performed in gravelly till (GP) and/or weathered bedrock. Test was performed as it was felt that the permeability of weathered bedrock/till would be as important if not more important to the stability of the proposed dam than that of the overlying soils.							
10	3.2	16.2	6.7×10^{-3}	25	41.3	1.0	5.6×10^{-2}
20	3.5	15.9	3.7×10^{-3}	24	41.3	1.0	5.8×10^{-2}
40	3.7	15.7	2.0×10^{-3}	No intermediate values are available			
60	3.8	15.6	1.4×10^{-3}	due to rapid rise of water within the			
120	3.8	15.6	wtr. level stable	casing. It is felt that the river			
10	3.2	16.2	6.7×10^{-3}	influenced these results unduly			
20	3.5	15.9	3.7×10^{-3}	and that the falling head test results			
40	3.8	15.6	2.0×10^{-3}	are more representative. Results are			
60	3.8	15.6	wtr. level stable	for two separate tests.			

NOTES: Hole remained open. No filter was used.
Water rose in the casing 5.9" above river level; rising head test used this level in the casing as the reference level. See note #3 in Notes to Field Perm Test Results, page 5 of FD86-1.

SCHEMATIC



SYMBOLS

D_o = OUTSIDE DIAMETER OF CASING (CM)
D_i = INSIDE DIAMETER OF CASING (CM)
L = LENGTH OF SAMPLE (CM)
m = TRANSFORMATION RATIO
H = PIEZOMETRIC HEAD
T = TIME (SEC.)
k_h = HORIZONTAL PERMEABILITY (CM/SEC)
D = CHANGE IN H

$$k_h = \frac{D_i^2 \ln\left[\frac{mL}{D_o} + \sqrt{1 + \left(\frac{mL}{D_o}\right)^2}\right]}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$$

$$k_h = \frac{D_i^2 \cdot \ln\left(\frac{2mL}{D_o}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2} \quad \text{for } \frac{mL}{D_o} > 4$$

FIELD PERMEABILITY TEST RESULTS

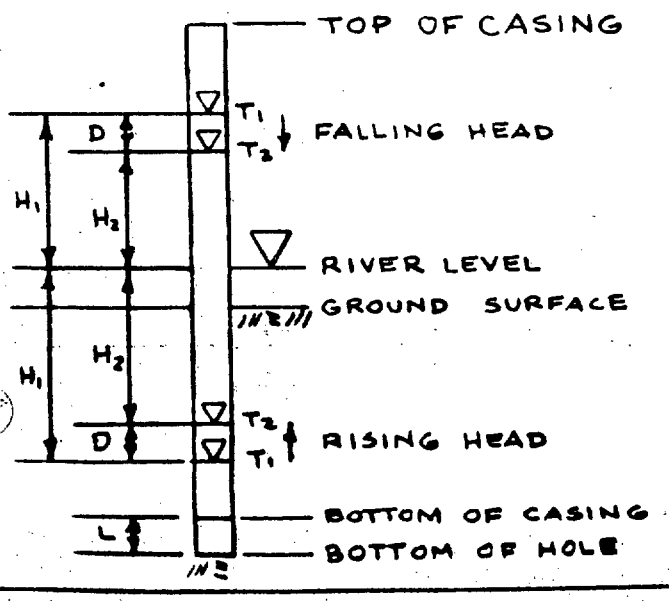
TE: 11/11/86	BORING NO: F086-2	DEPTH: 19.5-22.0	INSPECTOR: Beddoe
D_o = 8.9	D_i = 7.6	L = 76.2	mL/D_o = 25.7	m = 3

FALLING HEAD				RISING HEAD			
ELAPSED TIME ($t_2 - t_1$)	D ($H_2 - H_1$)	H_2 ($H_1 - D$)	K_H	ELAPSED TIME ($t_2 - t_1$)	D ($H_2 - H_1$)	H_2 ($H_1 - D$)	K_H
15	105.4	67.3	2.3×10^{-2}				
30	147.3	25.4	2.4×10^{-2}				
45	152.4	20.3	1.8×10^{-2}				
60	156.2	16.5	1.5×10^{-2}				
15	121.9	50.8	3.0×10^{-2}				
30	147.3	25.4	2.4×10^{-2}				
45	154.9	17.8	1.9×10^{-2}				
60	160.0	12.7	1.6×10^{-2}				
15	116.8	55.9	2.8×10^{-2}				
30	147.3	25.4	2.4×10^{-2}				
45	156.2	16.5	1.9×10^{-2}				
60	157.5	15.2	1.5×10^{-2}				

ote: Falling head results at this interval are for five separate tests.

OTES: Hole remained open. No filter was used. Test performed in gravelly till (GP) or weathered bedrock. See note, page 8, regarding purpose of the test.

SCHEMATIC



SYMBOLS

D_o = OUTSIDE DIAMETER OF CASING (CM)
D_i = INSIDE DIAMETER OF CASING (CM)
L = LENGTH OF SAMPLE (CM)
m = TRANSFORMATION RATIO
H = PIEZOMETRIC HEAD
T = TIME (SEC.)
k_h = HORIZONTAL PERMEABILITY (CM/SEC)
D = CHANGE IN H

$$K_h = \frac{D_i^2 \ln\left[\frac{mL}{D_o} + \sqrt{1 + \left(\frac{mL}{D_o}\right)^2}\right]}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$$

$$k_h = \frac{D_i^2 \cdot \ln\left(\frac{2mL}{D_o}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2} \quad \text{for } \frac{mL}{D_o} > 4$$

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FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. D.O. #0015

Site Rippowam R., Stamford CT — Page 1 of 8 Pages

Hole No. FD86-3 Diam. (Casing) 3" — Boring Started 11/12/86

Co-ordinates: X see X plan — Boring Completed 11/18/86

Drilled by Cambridge & Moss, Todd + Saarinen — Report Submitted

Purpose of Exploration determine foundation conditions for the design of a new dam

Elevation Top of Hole 5.6 M.S.L. — Casing Left in Place 0 Feet

Total Overburden Drilled 16.5 Feet

Elevation Top of Rock -10.9 M.S.L.

Elevation Bottom of Hole -19.4 M.S.L.

Total Rock Drilled 8.5 Feet

Total Depth of Hole 25.0 Feet

Core Recovered 92 %

Core Recovered 7.85 Ft.: ____ Diam. 2 1/8 in.

Soil Samples 1 3/8 in. Diam. 6 No.

Soil Samples ____ in. Diam. ____ No. — Water Table Depth river level

Depth From	Depth To	Method of Drilling and Type of Bit Used
0.0	15.0	3" driven casing followed by 2 5/16"
		roller bit with water*
15.0	16.5	1 3/8" ID split spoon sampler
16.5	25.0	NX diamond core with water
		*includes sampling on 5' intervals
		using 1 3/8" ID split spoon sampler

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____ — Page ____

Prepared by Theresa A. Beddoe (Field Data) — (Lab. Data)

Submitted by Atlantic Testing Labs, Ltd.

NED FORM DEC 63 121 — REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site Rippowam River Page 2 of 8 Pages
Boring No. FD86-3 Desig. A Diam. (Casing) 3"
Co-ordinates: X see X plan

Elevation Top of Boring 5.6 M.S.L.
Total Overburden Drilled 16.5 Feet
Elevation Top of Rock -10.9 M.S.L.
Total Rock Drilled 8.5 Feet
Elevation Bottom of Boring -19.4 M.S.L.
Total Depth of Boring 25.0 Feet
Core Recovered 92 % No. Boxes 1
Core Recovered 7.85 Ft: ___ Diam. 2 1/8 In.
Soil Samples 1 3/8 In. Diam. 6 No.
Soil Samples — In. Diam. — No.

Hammer Wt. 140# Boring Started 11/12/86
Hammer Drop 30"
Casing Left 0' Boring Completed 11/18/86
Subsurface Water Date ___ Page —
Obs. Well no
Drilled By Cambridge & Moss, Todd & Saarinen
Mfg. Des. Drill Skid-mounted CME45
Inspected By: Beddoe
Classification By: Beddoe
Classification By: —

DEPTH 0'	DEPTH 1"=2'	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. CORE RECVY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
		S-1	1 3/8"	REC 10%	3 8 10 16	Sample using 1 3/8" ID split spoon sampler. Drive 3" casing to 5.0' using 300# hammer. Clean to 5.5' using 2 15/16" OD roller bit. Note that casing settled to 5.5' during cleaning	Medium brown f. GRAVEL and c. SAND, trace SILT (sat, nonplastic) medium dense GP
2.0'							
5.5'							Med. grey cmf SAND, trace f. GRAVEL, trace SILT (sat, nonplastic) medium dense SW
		S-2A	1 3/8	70%	6 6	Sample as above. Drive casing to 7.5' clean with roller bit to 7.5'	
7.5'		S-2B			8 8	Fill with No. 3 Sand (sample included) 5.5-7.5'. Pull casing back to 5.5' Conduct permeability test, 5.5' to 7.5' Drive casing to 10.0'. Clean out with roller bit to 10.0'	Med. grey-brown f. SAND, trace SILT, trace f. GRAVEL (sat, nonpl) medium dense SP
10.0							

GENERAL REMARKS:

Elevation estimated from Attachment #3 of the Delivery Order.
All soil sampling performed in accordance with ASTM D1586

FORM 1 58(Test)

Boring No. FD86-3

Site	Boring No.	Page
Rippowam River	FD86-3	3 of 8

DEPTH 10.0	DEPTH 1" = 2'	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT / CORE RECOVY	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
		S-3A	$1\frac{3}{8}$"	REC 60%	7 8 12	Sample using 1 3/8" ID split spoon sampler Drive 3" casing to 12.0' using 300# hammer. Clean to 12.0' using 2 15/16" OD roller bit	Grey f. SAND, trace f. GRAVEL, trace SILT (sat, nonplastic) medium dense SP
12.0		S-3B			13	Fill casing with No. 3 sand 10-12'. Pull casing back to 10'. Conduct permeability test, end of explorations 11/18/86.	Grey cmf SAND, little cf GRAVEL, trace SILT (sat, nonpl) medium dense SW
						explorations start 11/13/86 Drive casing to 14' where encounter refusal. Clean to 15' with roller bit.	Consistency during drilling similar to till or decomposed rock
15.0		S-4	$1\frac{3}{8}$"	65%	25 24 169	Sample as above	Silver grey f. GRAVEL and mf SAND, trace SILT (sat, nonpl) dense GP - Decayed Rock.
16.5		R-1	$2\frac{1}{8}$"	72%	X	NX diamond core with water explorations end 11/13/86	with 1" layer light brown mf SAND, trace SILT Grey micaceous gneiss 43" Rec (72%) 7 Peices, 21+ chips and fragments RQD = 52%
						explorations begin 11/18/86 Drillers Cambridge + Moss Replaced by Todd + Saarinen.	
21.5		R-2	$2\frac{1}{8}$"	121%	X	Note recovery >100% due to a piece of R-1 being recovered in R-2. ~ 10% water loss	Grey micaceous gneiss 4.25' Rec (121%) 7 Peices, 30+ chips and fragments RQD = 76%
25.0						Conduct pressure test.	
						Boring terminated at 25.0' 11/18/86.	

FIELD LOG OF TEST BORING IN ROCK

SITE Rippowam River, Stamford CT ROLE NO. FD86-3 PAGE 4 of 8

DATE	DEPTH FT. FROM	DEPTH FT. TO	RUN PT.	RUN REC'V'Y PT.	REC'V'Y %	DRILLING BEHAVIOR: FEED	DRILLING BEHAVIOR: WATER	DRILLING BEHAVIOR: REASON FOR PULL	ACTUAL DRILLING TIME	BIT NO. SIZE AND TYPE	ADDITIONAL REMARKS
11/13+18/86	16.5	21.5	5.0	3.6 (43")	72%	3' high 2' medium	no water loss	end of run	40 min	NX diamond	Run #1 top 2.5' good coherent rock bottom foot highly fractured
11/18/86	21.5	25.0	3.5	4.25'	121%	medium	10% water loss	termination of boring	25 min	NX diamond	Run #2 6" at top of run highly fractured rock from Run #1 rock is soft, 24.0'-24.5' drilled quickly note recovery >100% due to a peice of R-1 being recovered in R-2

TOTAL BED ROCK DRILLED 8.5 FEET

TOTAL BED ROCK RECOVERED 7.85 FEET

BED ROCK RECOVERY 92 PERCENT

DRILLER Todd & Saarinen

INSPECTOR Beddoe

NED FORM DEC 63 130

REPLACES EDITION OF APR 63 WHICH MAY BE USED UNTIL EXHAUSTED

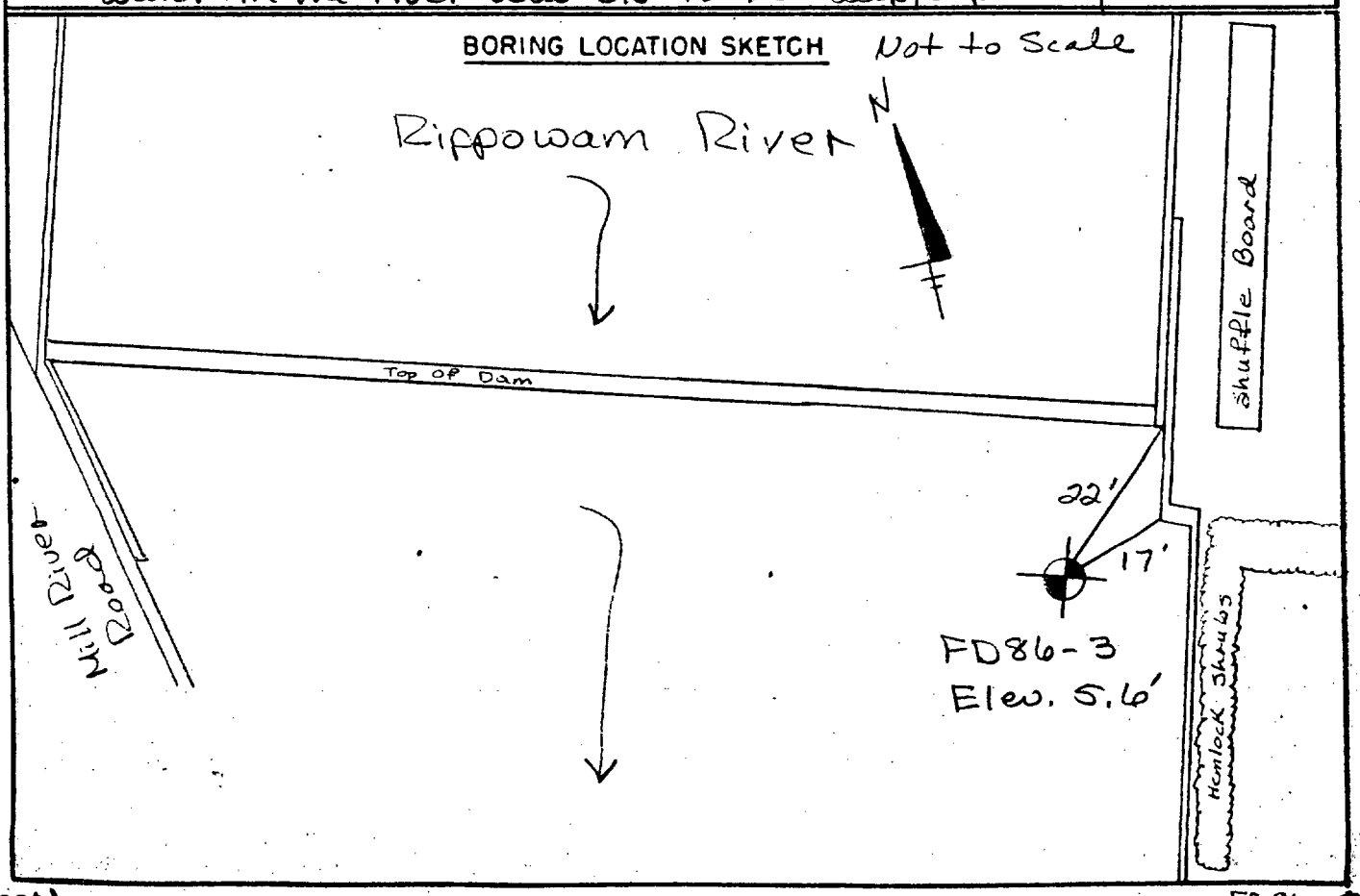
Site: Rippowam River
Boring No: FD86-3

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS

Note: Depths are in feet below original ground
water in the River was 0.5' to 4.0' deep, depending on the tide.

BORING LOCATION SKETCH Not to Scale



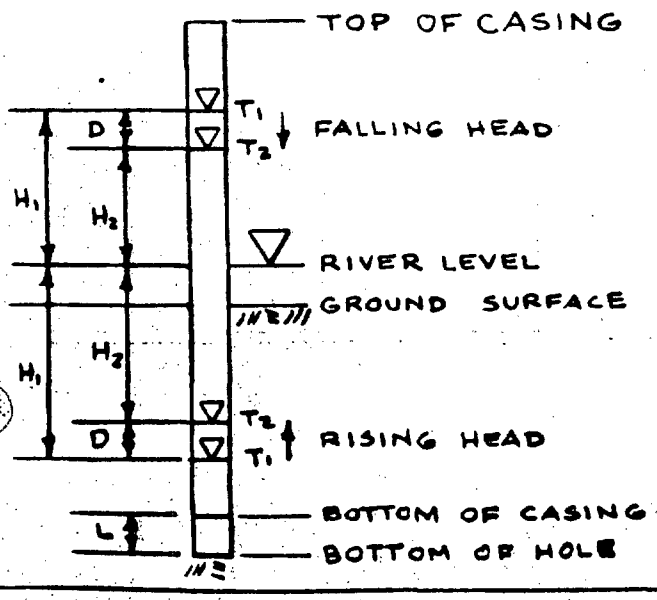
FIELD PERMEABILITY TEST RESULTS

DATE: 11/12/86	BORING NO: FD86-3	DEPTH: 5.5'-7.5'	INSPECTOR: Beddoe
D_o = 8.9	D_i = 7.6	L = 61.0	$H_1 = mL/D_o = 20.6$; m = 3

FALLING HEAD				RISING HEAD			
ELAPSED TIME ($t_2 - t_1$)	D ($H_2 - H_1$)	H_2 ($H_1 - D$)	K_H	ELAPSED TIME ($t_2 - t_1$)	D ($H_2 - H_1$)	H_2 ($H_1 - D$)	K_H
30	6.0	142.6	6.0×10^{-4}	60	7.6	29.2	1.7×10^{-3}
60	12.4	136.2	6.4×10^{-4}	120	14.0	22.8	1.8×10^{-3}
135	27.9	120.7	6.8×10^{-4}	180	18.7	18.1	1.7×10^{-3}
180	35.6	113.0	6.7×10^{-4}	240	22.9	13.9	1.8×10^{-3}
240	40.7	102.9	6.7×10^{-4}	300	26.7	10.1	1.9×10^{-3}
300	54.0	94.6	6.6×10^{-4}	60	7.6	29.2	1.7×10^{-3}
30	6.4	142.2	6.4×10^{-4}	120	14.0	22.8	1.8×10^{-3}
60	12.7	135.9	6.5×10^{-4}	180	18.7	18.1	1.7×10^{-3}
120	24.8	123.8	6.7×10^{-4}	240	22.9	13.9	1.8×10^{-3}
180	35.2	113.3	6.6×10^{-4}	300	26.7	10.1	1.9×10^{-3}
240	44.5	104.1	6.5×10^{-4}	Results are for two separate			
300	52.1	96.5	6.3×10^{-4}	tests.			
Results are for two separate							
tests.							

NOTES: Test performed in sands (SW-SP). No. 3 sand filter was used. Unable to perform second test requested in Attachment No. 5, #4.6.8-9 because of unsafe conditions due to 9.5' of casing above the ground.

SCHEMATIC



SYMBOLS

D_o = OUTSIDE DIAMETER OF CASING (CM)
D_i = INSIDE DIAMETER OF CASING (CM)
L = LENGTH OF SAMPLE (CM)
m = TRANSFORMATION RATIO
H = PIEZOMETRIC HEAD
T = TIME (SEC.)
K_h = HORIZONTAL PERMEABILITY (CM/SEC)
D = CHANGE IN H

$$K_h = \frac{D_i^2 \ln\left[\frac{mL}{D_o} + \sqrt{1 + \left(\frac{mL}{D_o}\right)^2}\right]}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$$

$$K_h = \frac{D_i^2 \cdot \ln\left(\frac{2mL}{D_o}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2} \quad \text{for } \frac{mL}{D_o} > 4$$

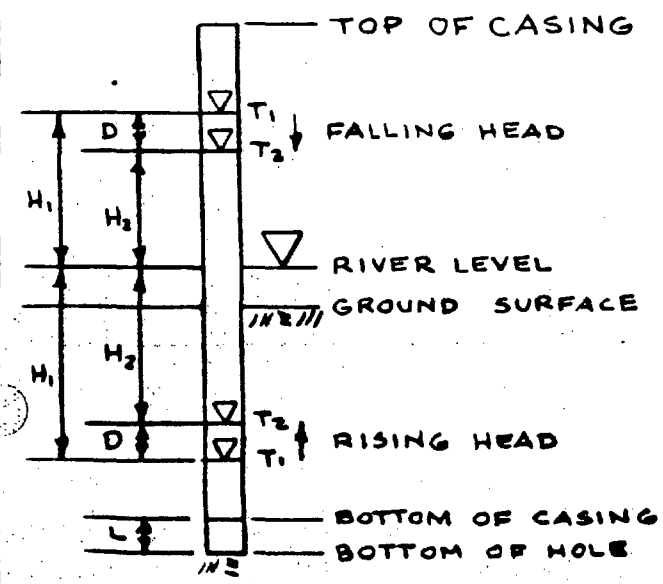
FIELD PERMEABILITY TEST RESULTS

TE: 11/12/86	BORING NO: FD86-3	DEPTH: 10'-12'	INSPECTOR: Beddoe
D_o = 8.9	D_i = 7.6	L = 61.0	$\cancel{H_1}$ = mL/D_o = 20.6	m = 3

FALLING HEAD				RISING HEAD			
ELAPSED TIME ($t_2 - t_1$)	D ($H_2 - H_1$)	H_2 ($H_1 - D$)	K_H	ELAPSED TIME ($t_2 - t_1$)	D ($H_2 - H_1$)	H_2 ($H_1 - D$)	K_H
300	0.9	14.3	9.5×10^{-5}	60	19.4	46.3	2.6×10^{-3}
60	0.9	168.0	3.9×10^{-5}	120	34.6	31.1	2.7×10^{-3}
120	1.6	167.3	3.5×10^{-5}	180	45.4	20.3	2.9×10^{-3}
180	1.9	167.0	2.8×10^{-5}	240	52.1	13.6	2.9×10^{-3}
240	2.2	166.7	2.4×10^{-5}	60	19.4	46.3	2.6×10^{-3}
300	2.5	166.4	2.2×10^{-5}	120	34.6	31.1	2.7×10^{-3}
60	0.9	168.0	3.9×10^{-5}	180	45.4	20.3	2.9×10^{-3}
120	1.3	167.6	2.8×10^{-5}	240	52.1	13.6	2.9×10^{-3}
180	1.6	167.3	2.3×10^{-5}	Results are for two separate tests.			
240	1.9	167.0	2.1×10^{-5}				
300	2.2	166.7	1.9×10^{-5}				
Results are for three separate tests.							

OTES: Test performed in sands (SW-SP). No. 3 sand filter was used.

SCHEMATIC



SYMBOLS

D_o = OUTSIDE DIAMETER OF CASING (CM)
D_i = INSIDE DIAMETER OF CASING (CM)
L = LENGTH OF SAMPLE (CM)
m = TRANSFORMATION RATIO
H = PIEZOMETRIC HEAD
T = TIME (SEC.)
k_h = HORIZONTAL PERMEABILITY (CM/SEC)
D = CHANGE IN H

$$K_h = \frac{D_i^2 \ln\left[\frac{mL}{D_o} + \sqrt{1 + \left(\frac{mL}{D_o}\right)^2}\right]}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$$

$$k_h = \frac{D_i^2 \cdot \ln\left(\frac{2mL}{D_o}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2} \quad \text{for } \frac{mL}{D_o} > 4$$

Corps of Engineers, U.S. Army

New England Division
Foundation and Materials Branch

Waltham, Massachusetts

FIELD LOG OF PRESSURE TEST FOR CORE BORING IN ROCK

Site Rippowam River Exploration No. FD86-3 Page 8 of 8 Tested by Beddor

Elev. Top of Hole 5.6' Depth Top of Rock 16.5' Elev. Top of Rock -10.9 Date 11/18/86

PRESSURE DROP TEST									CONSTANT PRESSURE - FLOW TEST					
Core Rec. %	Depth		Elapsed Time (min.+sec.) - Pressure Drop, psi						Pres. psi	Time min.	Meter Reading		Volume of Flow	
	From	To	50	40	30	20	10	0			Start	End	Gal.	Gal/min.
92%	18.65'	25.0'	0:03					0:00	10	1.0	90.0	99.6	9.6	9.6
									10	2.0	90.0	108.7	18.7	9.35
									10	3.0	90.0	117.8	27.8	9.27
									10	4.0	90.0	126.9	36.9	9.23
									10	5.0	90.0	136.0	46.0	9.2
									20	1.0	144.5	153.3	8.8	8.8
									20	2.0	144.5	162.2	17.7	8.85
									20	3.0	144.5	171.0	26.5	8.83
									20	4.0	144.5	179.8	35.7	8.83
									20	5.0	144.5	188.7	44.2	8.84

Additional Data and Remarks: ① placed 2.15' long packer at top of rock + tested to bottom of hole ② 6.0' from ground surface to top of fill pipe ③ pressure drop test performed twice using different methods to terminate water flow with the same results: 50 psi pressure drop in 3 seconds. ④ majority of water flow probably occurs through the highly fractured zone at 19'-21'.

NED DEC 63 50

REPLACES EDITION OF OCT 51 WHICH MAY BE USED UNTIL EXHAUSTED

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. D.D.# 0015

Site Rippowam R., Stamford, CT — Page 1 of 9 Pages

Hole No. FD86-4 Diam. (Casing) 3" — Boring Started 11/24/86

Co-ordinates: X see X sketch — Boring Completed 11/25/86

Drilled by Todd & Saarinen — Report Submitted

Purpose of Exploration determine foundation conditions for the design of a replacement dam

Elevation Top of Hole 15.2 M.S.L.
Total Overburden Drilled 29.5 Feet
Elevation Top of Rock -14.3 M.S.L.
Elevation Bottom of Hole -19.8 M.S.L.
Total Rock Drilled 5.5* Feet
Total Depth of Hole 35.0 Feet
Core Recovered 100* %
Core Recovered 1* Ft.: ____ Diam. 2 3/8 in.
Soil Samples 1 3/8 in. Diam. 4 No.
Soil Samples ____ in. Diam. — No.

Casing Left in Place 0 Feet

Water Table Depth 10.1'

* Note length of cored bedrock = 1.0'

Depth From	Depth To	Method of Drilling and Type of Bit Used
0.0	5.0	3 1/4" ID Hollow Stem Auger
5.0	10.0	3" spun casing with water, followed by 2 5/16" roller bit with water
10.0	19.0	3" driven casing followed by 2 5/16" roller bit*
19.0	19.5	2 5/16" roller bit with water*
19.5	24.5	NX diamond core with water*
24.5	32.0	2 5/16" roller bit with water*
32.0	33.0	NX diamond core with water
33.0	35.0	2 5/16" roller bit with water

INDEX

Ground Water — ~~Back of~~ Page 6
Boring Location Sketch — ~~Back of~~ Page 6
Overburden Record — Page 2-4
Rock Drilling — Page 3-5
Field Permeability Test Results — Page 7-9
Page
Page

* includes sampling on 3.5' intervals using 1 3/8" ID split spoon sampler

Prepared by Theresa A. Geddes (Field Data) — (Lab. Data)

Submitted by Atlantic Testing Labs, Ltd.

NED FORM DEC 63 121 — REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site Rippowam River Page 2 of 9 Pages
Boring No. FD86-4 Desig. D Diam. (Casing) 3"
Co-ordinates: ☒ see boring ☒ location sketch

Elevation Top of Boring 15.2 M.S.L.
Total Overburden Drilled 29.5 Feet
Elevation Top of Rock -14.3 M.S.L.
Total Rock Drilled 5.5* Feet
Elevation Bottom of Boring -19.8 M.S.L.
Total Depth of Boring 35.0 Feet
Core Recovered 100* % No. Boxes 1
Core Recovered 1* Ft: ___ Diam. 2 3/8 in.
Soil Samples 1 3/8 in. Diam. 4 No.
Soil Samples ___ in. Diam. ___ No.

Hammer Wt. 140# Boring Started 11/24/86
Hammer Drop 30"
Casing Left 0' Boring Completed 11/25/86
Subsurface Water Date ___ Page 6
Obs. Well no
Drilled By Todd & Saarinen
Mfg. Des. Drill skid-mounted CME45
Inspected By: Beddoe
Classification By: Beddoe
Classification By: ___

DEPTH		CORE/SAMPLE			BLOWS PER FT.	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
0'	1" = 2'	NO.	SIZE	DEPTH RANGE	CORE RECVY		
				REC		3 1/4" ID Hollow Stem Auger to 5'	concrete to 4'
4'							
5'						Pull Auger	consistency during drilling indicates a gravelly material
						Spin 3" ID casing to 10' using water	
10'						clean out to 10' using 2 15/16" roller bit with water	

GENERAL REMARKS: * length of cored bedrock = 1.0'
Elevation estimated from Attachment #3 of the delivery order.
All soil sampling performed in accordance with D1586

M 71 58(Test) Boring No. FD86-4

Site	Boring No.	Page 3 of 9
Rippowam River	FD86-4	

DEPTH 10'	DEPTH 1' 2'	CORE/SAMPLE NO	SIZE	REC	BLOWS PER 6"	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
12'		S-1	$1\frac{3}{8}$"	40%	23 17 20 19	Sample using a 1 3/8" ID split spoon sampler.	Med. brown cmf SAND, some f GRAVEL, trace SILT (sat., nonplastic) dense SW
15'						Drill to 15' with $2\frac{15}{16}$" roller bit and water. Unable to advance 3" casing by spinning. Pull casing. Drive 3" casing to 15' using 300# hammer, clean out to 15' with roller bit.	Note change to finer material at 12'.
17'		S-2	$1\frac{3}{8}$"	2%	19 12 15 12	Sample as above	Medium brown cmf SAND, trace SILT (sat.) nonplastic) med. dense SW
19.5'						Drill to 17.5' as above Hole remained open. Conduct permeability test, 15'-17.5' Drive casing to 19' through soft material where encounter refusal.	Top of boulder @ 19.0'
24.5		R-1	$2\frac{3}{8}$"	60%		Drill to 19.5' using roller bit. NX diamond core using water, 19.5-24.5. Breakthrough boulder at 22.5'. end of explorations 11/24/86	Run #1 grey gneiss 36" Rec = 60% 3 pieces 2 fragments RQD = 58% Bottom of boulder @ 22.5' granular material
26.5		S-3	$1\frac{3}{8}$"	75%	52 40 34 40	start of explorations 11/25/86 Conduct permeability test, 22.5'-24.5' in open hole. Sample as above.	Med. wet brown mf SAND, some f GRAVEL, trace SILT (wet, nonplastic) very dense SP
27.0						Drill using roller bit to 30.0'	

Site	Boring No.	Page 4 of 9
Rippowam River	FD86-4	

DEPTH		CORE/SAMPLE NO.	SIZE	~~DEPTH RANGE~~ REC	~~BLOWS PER 6" / CORE RECOVERY~~	6" SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
27.0	1'=2'						
28.0'						Drill using 2 15/16" roller bit with water to 30'	change at 28' from rust-brown cuttings with wash water to light grey cuttings with wash water
29.5'							
30.0'							Top of weathered rock 29.5
30.1'		S-4	1 3/8"	50%	100/1 1/2"	Sample using 1 3/8" ID split spoon sampler. Drill with roller bit to 32'	Medium grey f GRAVEL and cmf SAND, little SILT (sat., nonplastic) dense GP (weathered rock)
32.0							
33.0		R-2	2 3/8"	100%		NX diamond core with water to 33.0' when core barrel plugged. Drill with roller bit from 33.0' to 35.0'. Top of solid bedrock at 33.0'	Run 2 Gneiss 1 piece, 70+ chips 100% Rec RQD=0% Top of solid bedrock at 33.0'
35.0'						Boring terminated at 35.0' 11/25/86	

FIELD LOG OF TEST BORING IN ROCK

SITE Rippowam River, Stamford CT HOLE NO. FD86-4 PAGE 5 of 9

DATE	DEPTH FT. FROM	DEPTH FT. TO	RUN FT.	RUN REC'V'Y FT.	REC'V'Y %	DRILLING BEHAVIOR: FEED	DRILLING BEHAVIOR: WATER	DRILLING BEHAVIOR: REASON FOR PULL	ACTUAL DRILLING TIME	BIT NO. SIZE AND TYPE	ADDITIONAL REMARKS
11/24/86	19.5	21.5	5.0	3.0	60	medium	no water loss first 3' 100% water loss, last 2'	end of run	38 min	NX diamond	Run #1 boulder for 3' (3 pieces) breakthrough into granular soils - last two feet (no recovery)
11/25/86	32.0	33.0	1.0	1.0	100	medium	no water loss	plugged core barrel	20 min	NX diamond	Run #2 top of coherent rock intersected by very bottom of core run.

TOTAL BED ROCK DRILLED 1.0 FEET

TOTAL BED ROCK RECOVERED 1.0 FEET

BED ROCK RECOVERY 100 PERCENT

DRILLER Todd & Saarinen

INSPECTOR Beddoe

NED FORM DEC 63 130

REPLACES EDITION OF APR 63 WHICH MAY BE USED UNTIL EXHAUSTED

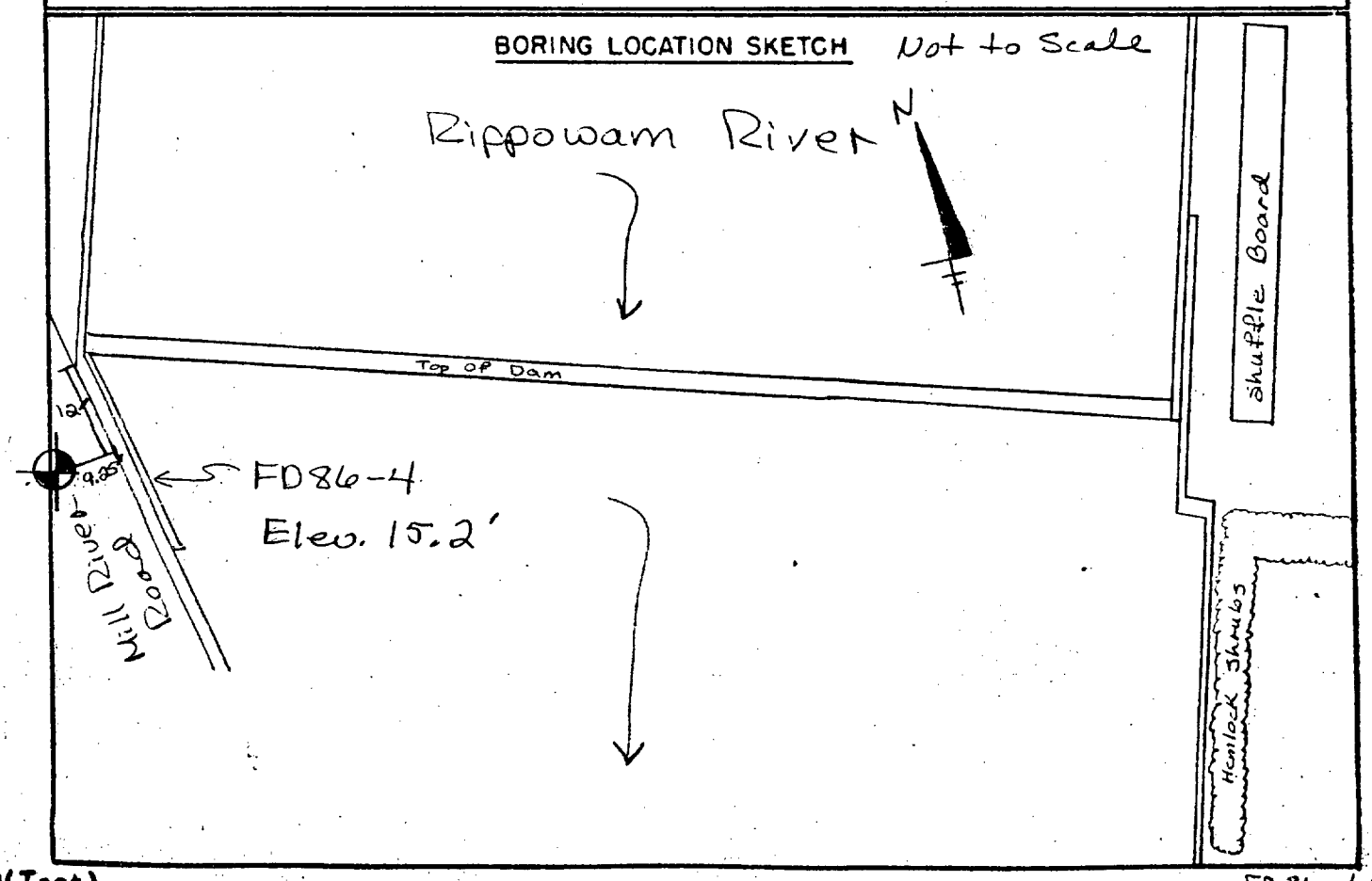
Site: Rippowam River
Boring No: FD86-4

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
11/24	2:00	15.0'	17.5'	9.8'	5.4'	before permeability
11/25	7:00	19.0'	24.5'	10.1'	5.1'	tests

Note: Depths are in feet below original ground

BORING LOCATION SKETCH Not to Scale



FIELD PERMEABILITY TEST RESULTS

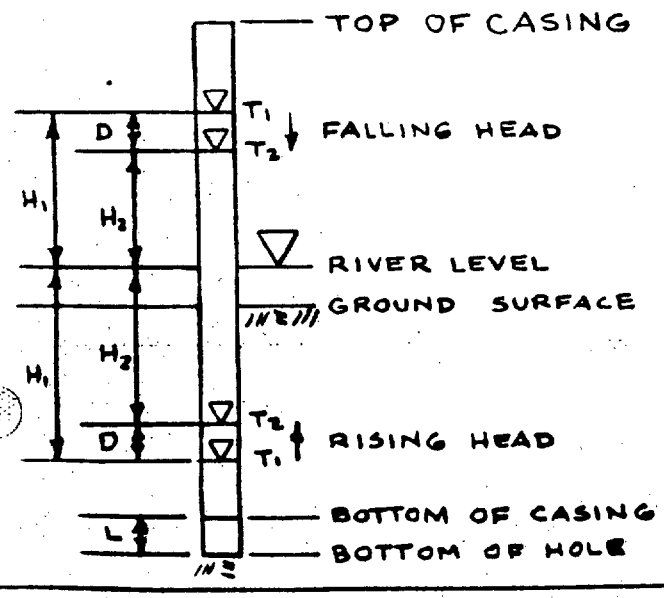
E: 11/24/86	BORING NO: FD86-4	DEPTH: 15.0-17.5	INSPECTOR: Beddoe
D_o = 8.9	D_i = 7.6	L = 76.2	~~H_1~~ = mL/D_o = 25.7	m = 3

FALLING HEAD				RISING HEAD			
ELAPSED TIME ($t_2 - t_1$)	D ($H_2 - H_1$)	H_2 ($H_1 - D$)	K_H	ELAPSED TIME ($t_2 - t_1$)	D ($H_2 - H_1$)	H_2 ($H_1 - D$)	K_H
10	66.0	249.0	8.8×10^{-3}	Rising head test not attempted			
20	113.0	202.0	8.3×10^{-3}	as water drawdown could not be			
30	147.3	167.7	7.8×10^{-3}	accurately measured			
10	66.0	249.0	8.8×10^{-3}				
20	119.4	195.6	8.9×10^{-3}				
30	149.9	165.1	8.0×10^{-3}				

Results are for two tests.
Falling head test with H_1 = 467.4 cm
Fell too quickly to measure.

NOTES: Test performed in well-sorted sands, Hole remained open, no filter pack required.

SCHEMATIC



SYMBOLS

D_o = OUTSIDE DIAMETER OF CASING (CM)
D_i = INSIDE DIAMETER OF CASING (CM)
L = LENGTH OF SAMPLE (CM)
m = TRANSFORMATION RATIO
H = PIEZOMETRIC HEAD
T = TIME (SEC.)
k_h = HORIZONTAL PERMEABILITY (CM/SEC)
D = CHANGE IN H

$$K_h = \frac{D_i^2 \ln\left[\frac{mL}{D_o} + \sqrt{1 + \left(\frac{mL}{D_o}\right)^2}\right]}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$$

$$K_h = \frac{D_i^2 \cdot \ln\left(\frac{2mL}{D_o}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2} \quad \text{for } \frac{mL}{D_o} > 4$$

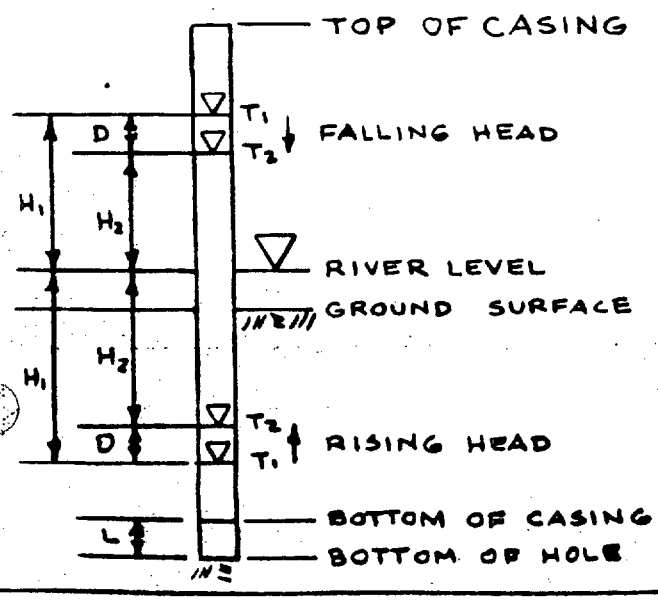
FIELD PERMEABILITY TEST RESULTS

E: 11/25/86	BORING NO: FD86-4	DEPTH: 22.5'-24.5'	INSPECTOR: Beddoe
D_o = 8.9	D_i = 7.6	L = 61.0	mL/D_o = 20.6	m = 3

FALLING HEAD				RISING HEAD			
ELAPSED TIME (t_2-t_1)	D (H_2-H_1)	H_2 (H_1-D)	K_H	ELAPSED TIME (t_2-t_1)	D (H_2-H_1)	H_2 (H_1-D)	K_H
15	20.3	333.3	1.7×10^{-3}	Rising head test could not be performed as we were unable to pump the water 5' below the static water table.			
30	33.0	320.6	1.4×10^{-3}				
60	53.3	300.3	1.2×10^{-3}				
90	71.1	282.5	1.1×10^{-3}				
15	17.8	335.8	1.5×10^{-3}				
30	27.9	325.7	1.2×10^{-3}				
60	43.2	310.4	9.6×10^{-4}				
90	61.0	292.6	9.3×10^{-4}				
15	33.0	473.0	2.0×10^{-3}				
30	48.3	457.7	1.5×10^{-3}				
60	81.3	424.7	1.3×10^{-3}				
90	104.1	401.9	1.1×10^{-3}				

OTES: Test performed in poorly sorted gravelly sands. Hole remained open; no filter pack required.

SCHEMATIC



SYMBOLS

D_o = OUTSIDE DIAMETER OF CASING (CM)
D_i = INSIDE DIAMETER OF CASING (CM)
L = LENGTH OF SAMPLE (CM)
m = TRANSFORMATION RATIO
H = PIEZOMETRIC HEAD
T = TIME (SEC.)
k_h = HORIZONTAL PERMEABILITY (CM/SEC)
D = CHANGE IN H

$$K_h = \frac{D_i^2 \ln\left[\frac{mL}{D_o} + \sqrt{1+\left(\frac{mL}{D_o}\right)^2}\right]}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$$

$$K_h = \frac{D_i^2 \cdot \ln\left(\frac{2mL}{D_o}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2} \quad \text{for } \frac{mL}{D_o} > 4$$

FIELD PERMEABILITY TEST RESULTS

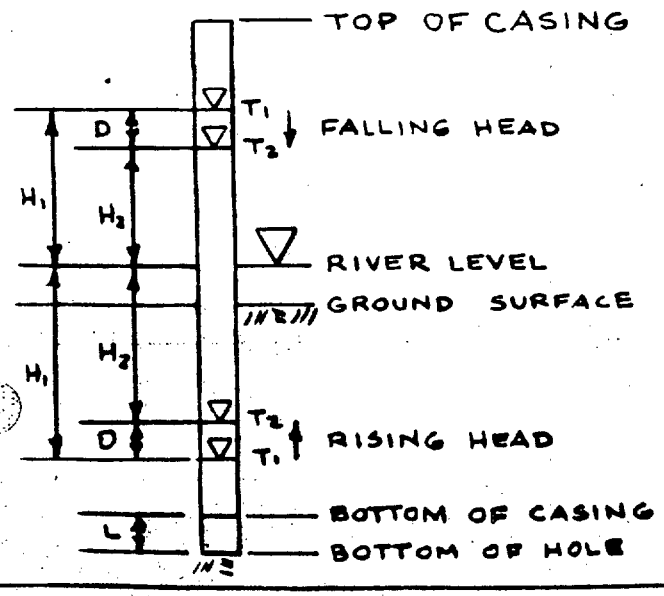
TE: 11/25/86	BORING NO: FD86-4	DEPTH: 22.5'-24.5'	INSPECTOR: Beddoe
D_o = 8.9	D_i = 7.6	L = 61.0	H_1 = mL/D_o = 20.6	m = 3

FALLING HEAD				RISING HEAD			
ELAPSED TIME ($t_2 - t_1$)	D ($H_2 - H_1$)	H_2 ($H_1 - D$)	K_H	ELAPSED TIME ($t_2 - t_1$)	D ($H_2 - H_1$)	H_2 ($H_1 - D$)	K_H
15	27.9	478.1	1.7×10^{-3}				
30	45.7	460.3	1.4×10^{-3}				
60	68.6	437.4	1.1×10^{-3}				
90	96.5	409.5	1.0×10^{-3}				

Results are for four separate tests

NOTES: Test performed in poorly sorted gravelly sands. Hole remained open; no filter pack required.

SCHEMATIC



SYMBOLS

D_o = OUTSIDE DIAMETER OF CASING (CM)
D_i = INSIDE DIAMETER OF CASING (CM)
L = LENGTH OF SAMPLE (CM)
m = TRANSFORMATION RATIO
H = PIEZOMETRIC HEAD
T = TIME (SEC.)
k_h = HORIZONTAL PERMEABILITY (CM/SEC)
D = CHANGE IN H

$$K_h = \frac{D_i^2 \ln\left[\frac{mL}{D_o} + \sqrt{1 + \left(\frac{mL}{D_o}\right)^2}\right]}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$$

$$K_h = \frac{D_i^2 \cdot \ln\left(\frac{2mL}{D_o}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2} \quad \text{for } \frac{mL}{D_o} > 4$$

SECTION 9

OTHER RECORDS TAKEN

Street Opening Permit
City of Stamford, CT

Jel

STREET OPENING PERMIT

Office of City Engineer
City of Stamford

PERMIT No. 26479

Date 11/19/86

FOR THE PURPOSE: (refer to symbols below) O / *

In consideration of the sum of $ 0.00, the receipt of which is acknowledged, and in accordance with Chapt. 18, Art. II, Div. 2, Code of Ordinances, permission is hereby granted to:

PROPERTY OWNER: *TEST BORING

CONTRACTOR: ATLANTIC TESTING LAB. LTD.

ADDRESS: BOX 29 CANTON NY

Bus. Tel.: ___-___-___ Emerg. Tel.: 315 386 4578

to open the pavement or surface of the street R.O.W. at one place only, in front of:

LOCATION: MILL RIVER RD. APPROX.70'N.OF BRIDG

APPROX. AREA: 1 sq. ft. APPROX. CONSTR. COST $ 0.00

Est. Const. Period 1 days. Approx. Start Date: 11/19/86

Reviewed by:

Fire ___ Date: ___ tel.: ___

Traffic [illegible] Date: 11/19/86 tel.: ___

Issued by:

City Engineer Frank J. Soldano/ga Date: 11/19/86

Act. Start Date: ___ Perm. Trench Date: ___

Permit Conditions:

1. This permit becomes void if not used within sixty (60) days.
2. [redacted]
3. Temporary repair in all types of pavement is required as soon as backfill is completed; and, must be maintained until permanent repair is accepted by the City.
4. All permanent repairs must be completed within four (4) months.
5. All construction shall be in accordance with City Engineering Standards. Copy available upon request.
6. **Permit must always be at the job location for review.**
7. Permit is subject to revocation at any time by the issuing Authority or in the event of the failure by the permittee to comply with any of the terms of this permit.
8. Penalties for violations of any condition of this permit shall be in accordance with Sec. 18-64, Code of Ordinances.

Purpose symbols:	(I)nstall	(R)etire	(O)ther
Purpose types:	(A)ccessway	(T)elephone	(G)as
(C)able tv	(S)anitary	(E)lectric	(P)it
(D) storm	(W)ater		

DEPT. OF TRAFFIC & PARKING PERMIT CONDITIONS

General

- All signs must conform to Manual Standards as to size and color.
- Compliance with Traffic Commission recommended practice. Manual available at office.

Special Conditions

☒ Operations Limited: 7-9 AM / 4-6 PM (M-F)
No activity during specified times. All lanes and sidewalks clear. } SATURDAY, SUNDAY & HOLIDAYS

☒ Manual traffic control required.
Police officer; ~~Flagperson.~~ Martinelli 358-~~[illegible]~~ 4425

☒ Traffic signal in area. Contact signal supervisor prior to excavation. Call 358-4686.

☐ Special detour required. Contractor to maintain all signs & markings required.

Maintain two way traffic at all times

1 White - Applicant 2 Yellow - Office 3 Pink - Finance