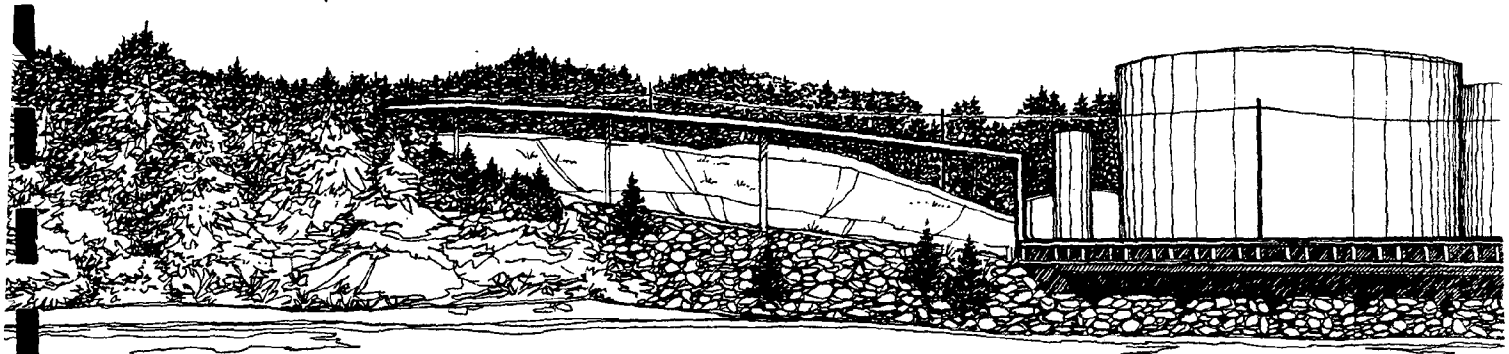
PORTSMOUTH HARBOR
OIL POLLUTION CONTROL PROJECT



JULY, 1981 - JUNE, 1983

NEW HAMPSHIRE WATER SUPPLY AND POLLUTION CONTROL COMMISSION

CONCORD, NEW HAMPSHIRE

PORTSMOUTH HARBOR

OIL POLLUTION CONTROL PROJECT

NEW HAMPSHIRE

WATER SUPPLY AND POLLUTION CONTROL COMMISSION

CONCORD, NEW HAMPSHIRE

July, 1981 - June, 1983.

This project was funded by a grant under the Coastal Energy Impact program, Coastal Zone Management Act of 1972, as amended, administered by the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.

The State of New Hampshire

Water Supply and Pollution Control Commission
Hazen Drive — P.O. Box 95
Concord, N.H. 03301

November 30, 1983

Mr. David G. Scott, Acting Director
Office of State Planning
2 1/2 Beacon Street
Concord, New Hampshire 03301

Dear Mr. Scott:

Transmitted herewith, in accordance with the amended Memorandum of Agreement dated April 9, 1982 between the Office of State Planning and the Water Supply and Pollution Control Commission, is a report covering activities associated with the Portsmouth Harbor Oil Pollution Control Project from July, 1981 through June, 1983.

The report includes discussion of the following subjects:

1. Oil Pollution Control Equipment
2. Trajectory Model Project
3. Training Activities
4. Oily Debris Disposal Study
5. Baseline Hydrocarbon Study
6. Contingency Planning
7. Tidal Current and Boom Deployment Study

We believe the Coastal Energy Impact Program funding provided through your office enabled the Commission to develop a much needed oil pollution control program in the coastal area of New Hampshire, as well as helping to develop many work products of great value to the entire State.

Sincerely,

William A. Healy, P.E.
Executive Director

WAH/RAN/cd

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G. Boom Configurations and Photographs of Deflection Booming Strategies

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I. INTRODUCTION AND SUMMARY

The Piscataqua River - Great Bay Estuary contains an abundance of valuable marine life which provides important commercial and recreational resources in both New Hampshire and Maine. These resources must be protected from the serious and debilitating effects of oil spills if the area is to be preserved. The area is particularly vulnerable to oil spills because several terminal facilities are located along the New Hampshire shoreline giving rise to the tanker and barge traffic associated with such operations. A particularly troublesome aspect of spills in Portsmouth Harbor is the very swift current (6-9 knots) of the Piscataqua River which will carry oil or other spilled materials considerable distances on each tidal cycle, fouling miles of shoreline and quickly encroaching on extremely ecologically sensitive areas of Great Bay. The New Hampshire Water Supply and Pollution Control Commission, under the provisions of RSA 146-A, is the agency designated to implement oil pollution prevention and control measures as well as to assume primary jurisdiction of cleanup operations in the event of an oil spill incident.

The Portsmouth Harbor Oil Pollution Control Program was established to initiate and develop the capability to promptly and effectively respond to oil spills which threaten the waters of the coastal zone of New Hampshire. The objectives of the program were to develop an oil transfer operation inspection program, develop emergency response capabilities, develop an inventory of oil spill control resources available in the coastal zone, identify additional equipment needs, develop a comprehensive contingency plan to deal with oil spills, and identify re-

search needs relating to oil spill prevention, control and cleanup methods. A report covering initial project activities was prepared in June of 1981. The report also identified a number of areas where work should continue and contained several recommendations concerning future goals of the program.

During the period July, 1981 through June, 1983, further effort was focused on the areas of interest which were identified, resulting in the following accomplishments:

- The acquisition of additional oil pollution control equipment to enhance the Commission's initial emergency spill response capability.
- Completion of the oil spill trajectory model project.
- Additional training of Commission staff members as well as the sponsoring of training courses for local fire, police, public works and terminal personnel.
- The implementation of certain recommendations made in the oily debris management plan.
- Sample preparation and some analysis in connection with the baseline hydrocarbon study.
- Completion of a tidal current and boom deployment study which resulted in site specific deflection boom designs and containment strategies each for each terminal on the Piscataqua River.

The results of the work outlined above as well as other program activities are discussed in detail in the body of this report.

II. OIL POLLUTION CONTROL EQUIPMENT

Subsequent to the initial purchase of the oil spill response equipment identified in Appendix E of the June, 1981 report entitled "Portsmouth Harbor Oil Pollution Control Project", an additional $100,000 of CEIP funding became available for equipment acquisition. An inventory identifying all of the equipment now owned by the Commission, its location and the individual responsible for its maintenance can be found in Appendix B. Photographs of the equipment are also included.

The only items originally contemplated but not purchased were the mops and wringers (estimated cost of $100), and the sawdust, hay bales and polyethylene (estimated cost of $1200). Since sawdust, hay bales and polyethylene are subject to deterioration and possible rodent infestation, long-term storage is not advisable.

The Oil Pollution Control Division now supports the operation of the Commission's 36 foot patrol boat "Admiral William C, Vose II" which is docked at Great Bay Marina in Newington, N.H. This vessel provides the program with the capability for offshore and winter season duty as well as the ability to handle loads beyond the capability of the 18 foot workboat. Its use under some conditions, however, may be restricted by the absence of radar and incomplete interior cabin.

Most of the equipment has been used in various applications ranging from emergency response (booms, absorbents and hatch funnels) to subsequent recovery of spilled product from both surface and groundwater (skimmers and scavengers). Extensive use of the PSI boom was made during the field verification phase of the tidal current and boom deployment study discussed in Section VIII of this report. Experience with the equipment purchased shows that judicious use was made of the funds allocated for this purpose.

III. TRAJECTORY MODEL PROJECT

The purpose of this project was to develop a computer model of the Piscatqua River - Great Bay Estuary capable of predicting the potential trajectory of an oil spill so that containment and cleanup response efforts can be undertaken in a manner which will protect threatened resources and minimize the impacts of the spill. The model was developed through the combined efforts of Normandeau Associates, Inc. (NAI) and faculty members of the Mechanical Engineering Department of the University of New Hampshire (UNH).

This work began with an effort to define characteristics of the Piscataqua River - Great Bay system which controls movement of oil spills. This included both a literature review and a field program. The literature review produced general background information and data on currents and tidal flushing in the estuary. The field program was developed to provide additional localized current and tidal height information throughout one tidal cycle and data on advection of materials floating at the surface.

A key component of the oil trajectory analysis is current speed and direction throughout the system. The oil spill model employs a data file which stores current data for more than 1000 points between Portsmouth Harbor and the interior end of Great Bay. These data are stored for five-minute time increments throughout a 48-hour period. Both average tidal conditions and a maximum tide are described on two current data files. Three different techniques were used to develop the current data for different portions of the estuary. The dynamic movement of the oil

spill is analyzed by the primary oil spill model called "SLICK." This model uses the current file and other data to define the advective motion of the spill, its spreading and its deposition on the shore. Operation of the model requires input of the location, size and type of spilled oil, information on wind and tidal conditions and the time. Output consists of a computer displayed map giving the spill size and location at subsequent times.

A report and detailed user's manual dated December, 1981 was the work product associated with this effort.

Examples of trajectory model outputs are included in Appendix C, and additional uses of the model are discussed in Section VII of this report.

IV. TRAINING ACTIVITIES

Staff training activities during the July, 1981-June, 1983 project period consisted of attendance both at a week long oil and hazardous materials incident response course in Cincinnati, Ohio offered by the U.S. Environmental Protection Agency, and the 1982 Hazardous Materials Conference in Milwaukee, Wisconsin at which many technical papers dealing with all phases of oil and hazardous materials incidents were presented.

Other training activities included three sessions of a Commission sponsored course for oil terminal personnel as well as local fire, police and public works employees. The course was taught by the Chief Engineer of Jet-Line Services, Inc. and consisted of a three and one half day program of classroom instruction and hands-on training in the field. A detailed course outline and list of attendees are included as Appendix D. A comprehensive training manual was also produced as part of this work.

V. OILY DEBRIS DISPOSAL STUDY

During the project period, the Center for Natural Areas, under contract with the Office of State Planning, prepared an oil spill debris disposal management plan for coastal New Hampshire. The results of the study along with the consultant's recommendations are presented in a report dated February, 1982.

One of the recommendations relative to combustible oil debris was incineration at the facility in Durham, N.H. operated by the Lamprey Regional Solid Waste Cooperative. Accordingly, an agreement between the Commission and the Cooperative for this service was negotiated (see Appendix E).

VI. BASELINE HYDROCARBON STUDY

Part of the research effort associated with the project involves analysis of approximately 135 samples to develop data on background levels and types of hydrocarbons present in the sediments and biological life in the Piscataqua River - Great Bay estuary. The samples for this work were collected by the Fish and Game Department during its marine resources inventory of the area.

The appropriate analytical methods have been chosen and all of the samples have been prepared for analysis by solvent extraction techniques. Gas chromatograph/mass spectrometer work has been performed on one group of thirteen samples. A map showing the sampling station locations and the data from the first set of samples are included as Appendix F.

It is believed that the information generated by this study will be quite valuable for further research use as well as future spill impact assessment work.

VII. CONTINGENCY PLANNING

Work is underway to integrate the different program elements into a comprehensive oil spill management tool for the Great Bay/Piscataqua River system.

The first task will be to incorporate into the trajectory model grid system, the following site information.

Identification

-Site name

-Water body

-Municipality

Characteristics

-Size

-Ecosystem

-Vulnerability

Site-Specific Factors

-Resource information

-Access points and routes

-Descriptive information on physical setting

-Other information

Once the site information has been completed, the different areas will be ranked for protection/cleanup methodology using the following criteria.

Risk of Spill Damage

-Proximity to oil routes, transfers and storage areas

-History of past spills in the area

"Value" of an area

-Ecological sensitivity and diversity

-Economic considerations

-Social and aesthetic importance

-Seasonal factors

Recoverability

-Natural capacity to recover from oil contamination

-Difficulty of performing adequate cleanup

After the critical resource areas have been identified, the ability to protect that area will be determined based upon, the accessability to the site from land and water, and the feasibility and effectiveness of countermeasures.

A response plan for protection and cleanup will be developed for each of the priorty sites where it has been determined that effective actions (such as deflection booming) are possible.

The necessary types and amounts of equipment, along with suitable storage locations will then be identified.

This information will be incorporated into a comprehensive Coastal Contingency Plan which will enable the On-Scene Commander to maximize the response effort and minimize the overall impact of spilled oil.

VIII. TIDAL CURRENT AND BOOM DEPLOYMENT STUDY

Field inspection by members of the United States Coast Guard Atlantic Stike Team and preliminary work performed by the Commission staff indicated that deflection booming techniques could be successfully employed in the complex tidal currents found in the Piscataqua River. Accordingly, a study was devised to develop containment boom designs and deployment strategies for each of the five docks which would meet the following criteria:

1. Provide for a rapidly deployable containment system to be anchored in place and angled to the prevailing current to reduce oil loss due to boom failure which occurs when currents perpendicular to the boom reach velocities in excess of 0.8 knots.

2. Provide a spill containment system designed to contain a "most probable occurrence" (maximum spill to date at any terminal facility is 25,000 gallons).

3. Require a minimum number of personnel for deployment.

4. Provide for deflection strategies which take into account current reversals due to the tidal fluctuation.

5. Insure adequate containment under varying hydrological conditions.

In order to achieve these objectives, the following scope of work was established:

1. Identify tidal current velocities and directions, and localized spill trajectories at each terminal which will be used as the basis for designing an effective boom deployment strategy at each terminal (Terminals - Northeast Petroleum, Mobil Oil, Sprague /Public Service Company, Fuel Storage Corporation/Defense Fuel Supply, C. H. Sprague & Son).

2. Identify booming arrangements designed for maximum oil containment and recovery. This must be site specific for ebb and flood tide at the bow and stern of a docked tanker at each terminal and

account for changes in boom configuration required at tidal reversal. Amounts of boom, angle to currents, number of anchoring points, etc. must be specified.

3. Identify and verify suitable boom storage areas for most rapid deployment by a minimum number of terminal personnel at each terminal.

4. Identify and verify access points for oil recovery and removal using skimming equipment, vacuum trucks, etc.

The Ocean Engineering Program at the University of New Hampshire was selected to conduct the study, the results of which appear in a December, 1982 report entitled "Emergency Oil Spill Containment and Removal Strategies for Piscataqua River Terminals". The study indicated that feasible diversion and containment strategies were theoretically possible at each of the five terminals.

Field testing, verification and modification of the proposed diversion boom designs was conducted by Commission staff and Jetline Services, Inc. (under contract with the Commission) in the spring of 1983. Not all of the designs were verified for each tidal condition at each terminal, however, enough field work was conducted to substantiate the current velocity and modeling work performed in the study, and the most critical boom designs at each of the terminals. The work was performed using Parker Systems Mark II (Model O-HD) 18" oil spill containment boom (see brochure in Appendix G)), and other Commission equipment (anchors, buoys, etc.).

A summary of the tests conducted at each terminal is presented below:

1. Northeast Petroleum Corporation

The outside ebb and outside flood boom configurations were tested at this location. On April 26, 1983 the outside ebb design, consisting of 1,700' of boom deployed at slack tide in accordance with the design

shown in Figure 1, Appendix G. was tested. A forty pound anchor with 100' of line was placed at the lead of the boom approximately 150' off the dock in the channel. Two intermediate anchors (22 lb.) were placed at positions 6 and 10. At 1331 hours the tide shifted to ebb. At 1339 hours the lead anchor detached from the bottom and slowly began drifting down- river. A second 40 lb. anchor, attached to position 2, was set and held. The lead anchor was detached and 100' of boom was allowed to hang. The position of the boom held until 1401 hours when the lead anchor dragged approximately 100' before holding again. Countercurrents were noted in the cove below the terminal at both ebb and flood tides. It is recommended that the boom be tied to the vessel to avoid the drifting of the lead anchor, but even though the lead anchor was out of position, the boom configuration held during maximum ebb currents demonstrating that it would be effective in containing oil as designed.

On April 29, 1983, 1,000' of boom was deployed according to the outside flood configuration shown in Figure 2, Appendix G. Two 40 lb. anchors were placed at the lead and the boom was set at 0930 hours. The flood tide currents began to increase at approximately 1030 hours. The boom held without incident through maximum flood currents, except over the last 100' boom section (postion 11-12). The actual currents exceeded predictions and it was evident that oil would entrain under the boom. It is therefore recommended that an additional 500' be added to this design to extend the end of the boom to the next cove up-river where currents are diminished and a suitable recovery point exists.

2. Sprague/Public Service Company

The outside ebb configuration was verified at this terminal on April

27, 1983 at 1513 hours. The design as shown in Figure 3 Appendix G calls for 550' of boom, however, it was felt that 400' of boom was sufficient to boom the stern of the ship. In this location it is advantageous to use the shortest boom length possible because of the variability of the currents and eddys in the river. Therefore, the first two hundred feet of boom were eliminated and the lead anchor was set to place the boom at position 3. This boom configuration held through maximum currents without requiring modification. It was noted that the boom undulated in a snakelike manner in response to the eddys which moved through the area. This would have no effect on the ability of the boom to contain oil.

3. Mobil Oil Corporation

The boom configurations for Mobil on the inside and outside ebb and for the inside flood are all very similar. The most critical is the outside ebb (Figure 4 Appendix G), which was field verified on April 28, 1983 at 1448 hours. As designed, the configuration terminates downriver below the Reliance dock and calls for 900' of boom. For the reasons given in the prior example for Sprague, the boom was shortened by 200'. Two 40 lb. anchors were placed at the lead in a "V" formation and the boom was deployed as modified. Field testing revealed one major problem with the boom configuration. At the shoreside end of the boom, the currents exceeded predictions over the last 200' of boom. Oil would obviously entrain under the boom as a large "belly" developed in this area. This problem was recognized early in the field testing and a second 400' length of boom angled more sharply into shore was deployed on the inside of the dolphin downriver of the ship's stern. The shoreside end of the

boom was tied off at a chain link fence. This modification proved successful through maximum currents on the ebb tide and will be incorporated in the design for the inside ebb. The inside flood design was not verified and this modification may not be applicable.

4. Fuel Storage Corporation

On May 5, 1983 the inside ebb configuration was field verified. The lead was tied to the dock and 1,200' of boom was deployed at 0830 hours as shown in Figure 5 Appendix G. The boom did not reach the shore and 300' was added to the section in place to complete the booming operation. One intermediate anchor (22 lb.) was placed at position 8 as shown. During the ebb tide currents perpendicular to the boom at positions 11 to 13 were greater than predicted and oil would obviously entrain under the boom. It was, therefore, necessary to angle the boom more sharply to the currents and bring it in closer to a mooring buoy off the end of the dock as shown. During additional booming exer- cises held June 6 and 8, 1983 with personnel from the University of New Hampshire, boom was deployed in the modified location and was tied to the mooring buoy with approximately 10' of line, eliminating the need for an anchor. This configuration worked without difficulty and was rapidly deployed.

5. Sprague/ATC

On May 4, 1983 the inside flood configuration was verified (Figure 6. Appendix G). Approximately 1/2 mile of boom (2,500') was deployed at 1430 hours and held through maximum current. The lead was tied to the dock and two inter- mediate anchors were placed at positions 11 and 19. The intermediate anchors carried no tension load through the entire

trial. This configuration without modification was entirely successful and if boom is stored at the dock it can be deployed in a reasonable time during a spill emergency.

Photographs and schematics of the boom configurations are included in Appendix G.

IX. CONCLUSION

The purpose of this project was to develop an oil pollution control program for the Piscataqua River - Great Bay Estuary area to minimize the potentially serious effects and unavoidable loss of environmental as well as recreational resources which could result from the spillage of oil. The important elements of such a program are described and discussed in this report as well as the initial report prepared in June of 1981. All of the program objectives identified since the inception of the program have been addressed and most have been accomplished.

While resources to provide the capability to respond promptly to spill incidents in the coastal zone have been acquired, it should be recognized that absolute avoidance of spill related damage cannot be achieved due to the nature of the tidal conditions in the Piscataqua River. The program has, however, greatly enhanced the Commission's ability to prevent or substantially mitigate the effects of oil spills and although Coastal Energy Impact Program funding is no longer available, the program will continue under the New Hampshire Oil Pollution Control Fund.

Program elements which will receive further attention are described in the following paragraphs.

Contingency Planning

As discussed in Section VII of the report, additional work is needed to incorporate information developed by different program elements such as the trajectory model project, the Fish and Game Department resources inventory, and future activities planned under the UNH Sea Grant Program,

as described below, into a comprehensive oil spill management tool for the Great Bay - Piscataqua River system.

UNH Sea Grant Program

A project which builds on and expands the information developed by the tidal current and boom deployment study has been approved to receive funding under the Sea Grant Program. The work includes the development and application of a general computer model to determine the feasibility of installing booms at selected locations in the Great Bay - Piscataqua River system to protect sensitive resources from spills at terminals which escape the first line of defense, or those not associated with terminal activities.

Baseline Hydrocarbon Study

As indicated in Section VI of the report, work will continue to develop data on background levels and types of hydrocarbons present in the sediments and biological life in the estuary.

Regulations

Revisions to the Commission's 1974 "Regulations for Prevention and Control of Oil Spills and for Oil Terminal and Vessel Handling of Petroleum Products" have been drafted and reviewed for consistency with current U.S. Coast Guard requirements. Commission staff has met with the Portsmouth Harbor Oil Spill Committee Operations Subcommittee for the purpose of presenting the results of the deflection booming studies and proposing additional requirements based on this work specifically related to pollution control activities during oil transfer operations. Incorporation of this new approach into the regulations is planned prior to readoption of the revisions.

In conclusion, the Coastal Energy Impact Program Funding provided by the Office of State Planning in conjunction with the Oil Pollution Control Fund and the Sea Grant Program has enabled the Commission to develop a much needed oil pollution control effort in the coastal area of New Hampshire as well as providing many work products of great value to the entire State.

APPENDIX A

OFFICE OF STATE PLANNING
STATE OF NEW HAMPSHIRE
2 BEACON STREET CONCORD 03301
TELEPHONE 603-271-2155

Amendment to Memorandum of Agreement

between

Office of State Planning

and

Water Supply and Pollution Control Commission

Subject: Amendment No. 2 - Oil Spill Control Program

Date: April 9, 1982

This Agreement amends the Memorandum of Agreement (MOA) of March 14, 1980 and February 17, 1981 between the Office of State Planning (OSP) and the Water Supply and Pollution Control Commission. This amended agreement continues the MOA and describes additional activities which have been agreed to between OSP and WSPCC to insure close coordination in the development of an oil spill control program with significant emphasis on the unique needs of coastal waters. For the purposes of the amended Agreement OSP and WSPCC agree to cooperate as follows:

1. Extension of the MOA for the period December 15, 1981 to December 31, 1982, subject to approval of Governor and Council.

2. A reprogramming of project funds and an increase of project funds to be provided to WSPCC by $100,000 for a total amount under the Agreement of $249,161. The Final Budget totals will be as follows:

Personnel/Benefits	17,083
Current Expenses	11,641
Equipment	36,302
Travel	5,047
Contractual	77,100
Other Expenses - oil spill equipment	100,000
Indirect	1,988
Total	249,161

3. The purchase by WSPCC of $100,000 in oil spill control equipment as described in Exhibit A of the Amendment and in the Federal Grant for the equipment. WSPCC will adhere to the terms and conditions of the grant which are incorporated herein by reference, having been provided

to WSPCC and on file in that office. No other equipment will be purchased without the prior written approval of OSP. WSPCC shall maintain separate records for this equipment and show it separately on all billings to OSP. Finally, WSPCC shall maintain a central inventory file clearly identifying all equipment purchased under this grant, where it is located and the individual responsible for the equipment. Where consumable, replacement mechanism should be identified.

4. A continuation by WSPCC of the Portsmouth Harbor Oil Spill Project by conducting the following continuing or additional activities:

    a) site specific booming study to be conducted by the University of New Hampshire for WSPCC subject to the review and approval of any subcontracts by OSP.

    b) purchase of laboratory supplies necessary for hydrocarbon analysis of sediment collected as part of the Fish and Game Marine Resources Inventory on Great Bay.

    c) staff training in spill prevention and control.

    d) additional activities on the oil spill trajectory model leading to integration of model with marine resource inventory being conducted by the Department of Fish and Game.

5. WSPCC will provide progress reports to OSP on June 30, 1982 and September 30, 1982, and provide a Final Report on all project activities on December 31, 1982 including copies of all work products done by consultants.

All other provisions will be retained as provided for in the Memorandum of Agreement of February 17, 1981.

by _____ 4/9/82
Ronald Poltak Date
Director
Office of State Planning

by _____ 4/12/82
William A. Healy, P. E. Date
Executive Director
Water Supply and Pollution
Control Commission

EXHIBIT A

EQUIPMENT

Probe Scavenger & Pump system (2 units)	$ 19,000
Vikoma Komara 12 K Skimmer (disc) (1 unit)	25,000
Vikoma Kebab 600 Skimmer (disc) (3 units)	8,000
2 inch Centrifugal Self-priming pump (2 units) 2 inch Diaphram pump (2 units)	4,700
Hoses, adapters, hardware, tool kit, parts	2,000
Oil Mop, Mark II-4D (1 unit)	20,000
Containment Boom, Mark II, Model ORD (12 in) 1,000 ft.	7,600
Jimbeaux Mops & Wringers (4 units)	1,300
Bag Tanks (2-onshroe, 1-towable)	6,500
Hazorb Universal Sorbent	500
Power Weed Cutters (2 units)	500
Anchor, chain, bouys	1,200
26" Slurp Skimmer w/33 ft. suction hose (2 units)	3,200
MSA Combustible Gas Indicator (1 unit)	500
	$100,000

The State of New Hampshire

Water Supply and Pollution Control Commission
Hazen Drive — P.O. Box 95
Concord, N.H. 03301

STAFF

WILLIAM A. HEALY, P.E.
Executive Director

DANIEL COLLINS, P.E.
Deputy Executive Director and
Chief Engineer

AMENDMENT TO MEMORANDUM OF AGREEMENT

between

OFFICE OF STATE PLANNING

and

WATER SUPPLY AND POLLUTION CONTROL COMMISSION

November 16, 1982

Pursuant to the Agreement between the Water Supply and Pollution Control Commission and the Office of State Planning dated March 14, 1980, approved by the Governor and Council on April 9, 1980, and amendments to the Agreement dated February 17, 1981 and April 9, 1982, we agree to further amend the Memorandum of Agreement as follows:

1. Extension of the Memorandum of Agreement from a completion date of December 31, 1982 to June 30, 1983.

All other provisions will be retained as provided for in the original Memorandum of Agreement and its amendments.

BY _____ 11/17/82
William A. Healy, P.E. Date
Executive Director

BY _____ 11/19/82
Ronald F. Poltak Date
Director

APPENDIX B

EQUIPMENT	LOCATION	RESPONSIBLE PERSON
1 - Boat - Pointer 18' Commercial Hull	B	MJG
1 - Outboard Engine - Johnson 90 hp	B	MJG
1 - Boat Trailer - Shoreline	B	MJG
2 - Deck Suit - Imperial	B	MJG
1 - 4-Wheel Drive Pickup - Dodge	P	MJG
1 - 5-Minute Air Capsule - Robert Shaw	T	MJG
1 - Explosimeter - MSA 2A	T	MJG
2 - Respirators - American Optical	T/C	MJG/DWZ
2 - Binoculars - 7 x 35mm	T/C	MJG/DWZ
1 - Scanner & Accessories - Fannon Currier	P	MJG
1 - Radiotelephone - Modar-Triton 55/75	T	MJG
2 - VHF Marine Portable Radio - Standard	P	MJG
700' - Oil Containment Boom 18"	B	MJG
2 - Hatch Funnel 20" - Safeco	GB/C	MJG/DWZ
1 - Probe Scavenger - Oil Recovery Systems	C	DWZ
2 - Filter Scavenger - Oil Recovery Systems	C	DWZ
2 - Depression Pump System - Oil Recovery Systems	C	DWZ
1 - Komara 12K Skimmer - Vikoma	B[1]	MJG
2 - Kebab 600 Skimmer - Vikoma	B/C	MJG/DWZ
2 - 1 1/2" Centrifugal Pump - Honda	B/C	MJG/DWZ
1 - 2" Centrifugal Pump - Honda	B	MJG
1 - Diesel Centrifugal Pump - Petter/ASM	B	MJG
2 - Double Diaphram Pump - Wilden	B/C	MJG/DWZ
100' - 3/8" Air Hose - Goodyear	B/C	MJG/DWZ
200' - 2" Petroleum Hose - Uniroyal	B/C	MJG/DWZ
200' - 1 1/2" Petroleum Hose - Uniroyal	B/C	MJG/DWZ
200' - 1" Petroleum Hose	B/C	MJG/DWZ
2 - 250 Gallon Bag Tank - Petro-Flex	B/C	MJG/DWZ
1 - 1,000 Gallon Bag Tank - Petro-Flex	B	MJG
2 - Power Weed Cutters - Stihl	GB/C	MJG/DWZ
2,000' - 18" Oil Containment Boom - PSI	B[2]	MJG
1 - Two-Way Radio - General Electric	T	MJG
2 - Weir Skimmer - Slurp	B/C	MJG/DWZ
3 - PVC Liners - 110' x 20' - 20 mil	B	MJG
1 - Box Trailer - 7' x 12' - Haulmark	B	MJG
Anchors, Chains, Buoys, Line	B[3]	MJG
Assorted Sorbents	B[3]	MJG
Tool Box, Non-Sparking Tools	T	MJG
Assorted Hose Fittings	B	MJG

Key

T = Truck
B = Benn's Marina, Dover Point
GB = Great Bay Marina, Newington
C = WSPCC, Concord Office
P = WSPCC, Portsmouth Office
MJG = Michael J. Gallen, WSPCC - Portsmouth Office
DWZ = Donald W. Zeaman, WSPCC - Concord Office

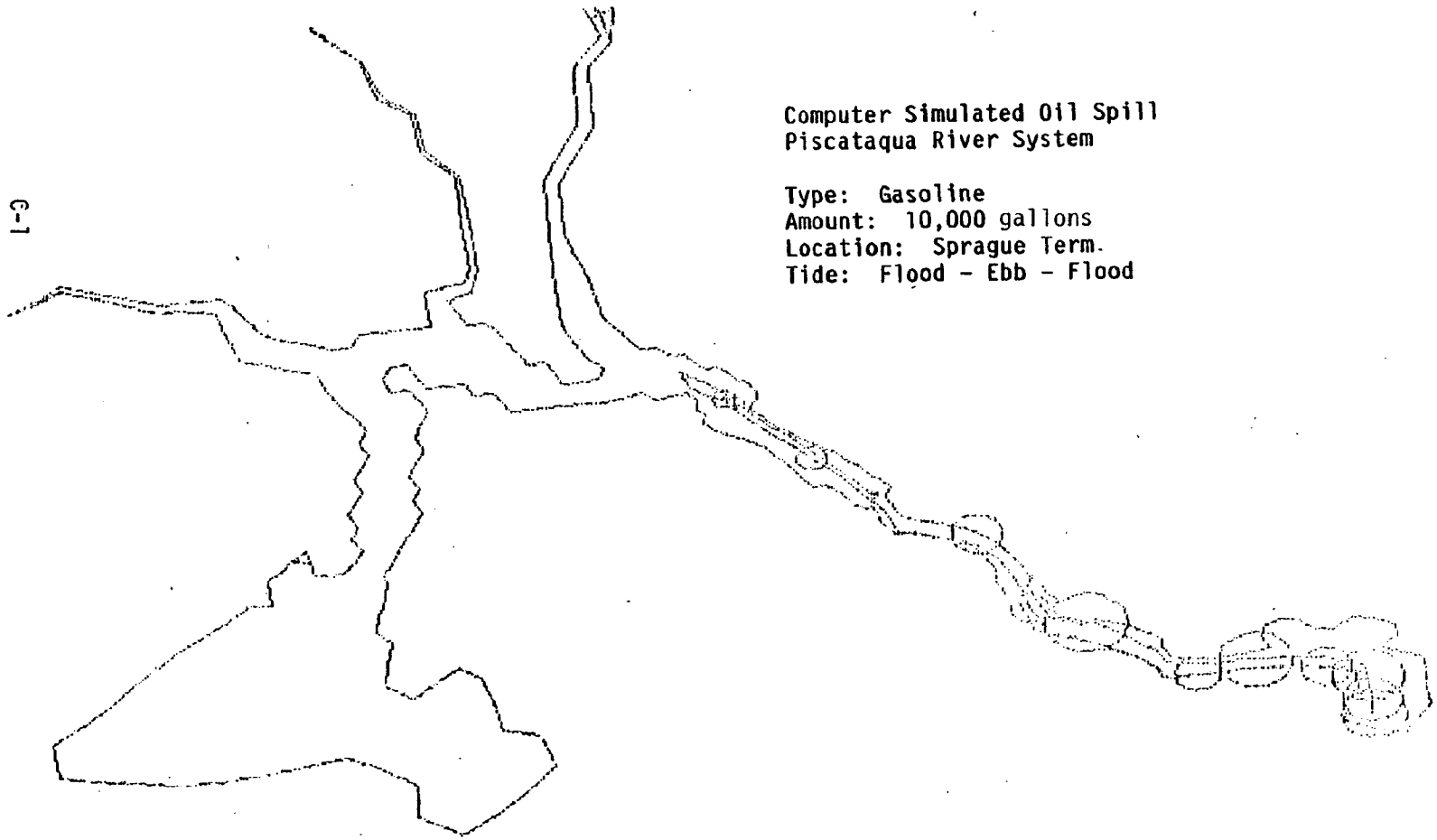
Notes

1. In the near future the skimmer is to be located on the Public Service Company/Reliance dock, downriver of the Mobil terminal.

2. In the near future, 1,000' will be located on the Public Service Company/ Reliance dock and 1,000' will be located at Sprague/ATC dock for easy water access to the terminals.

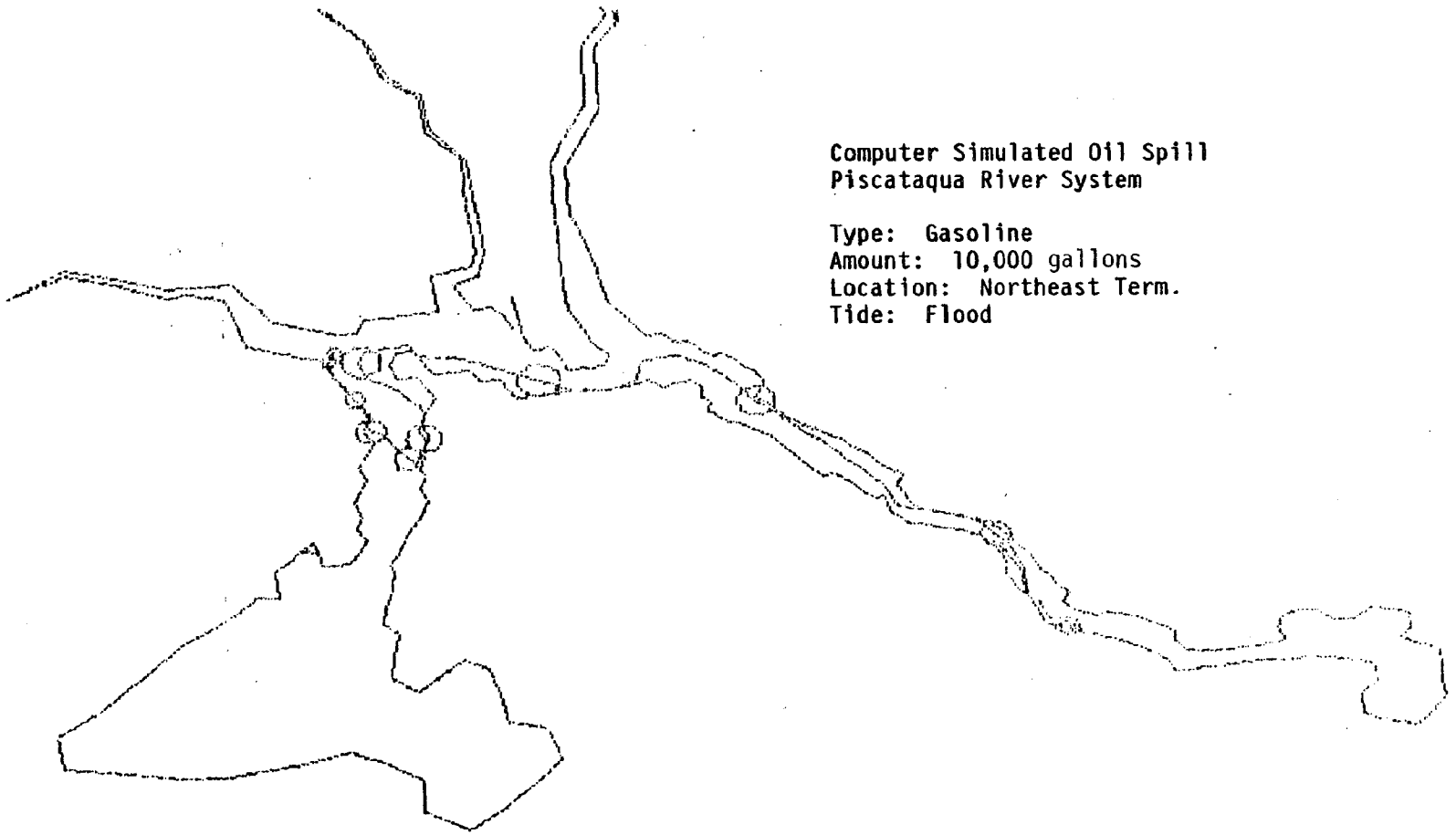
3. Consumable item. Replacement mechanism is through the Oil Pollution Control Fund. If the party responsible for the spill is identified, the state will bill to recover costs.

APPENDIX C



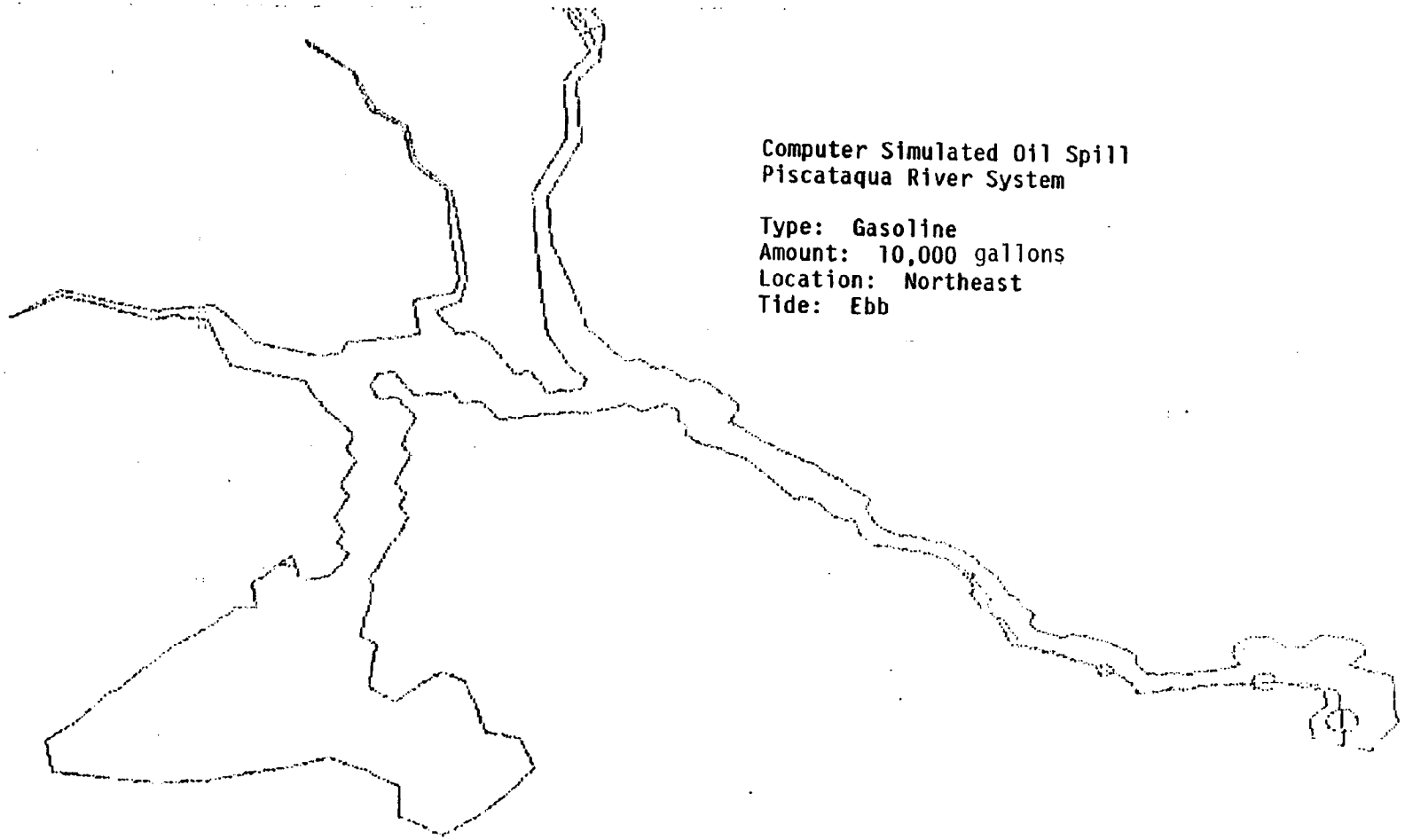
Computer Simulated Oil Spill
Piscataqua River System

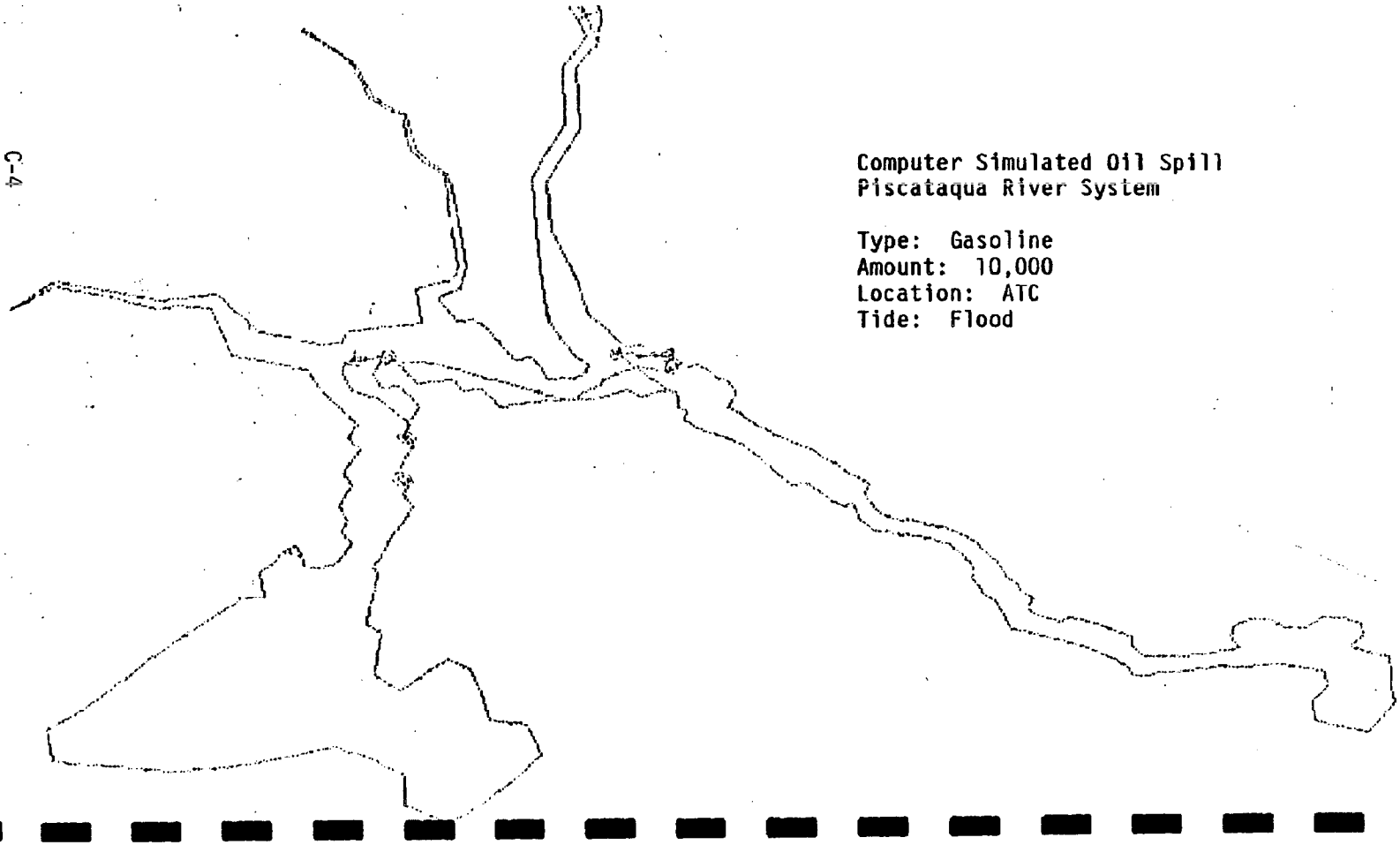
Type: Gasoline
Amount: 10,000 gallons
Location: Sprague Term.
Tide: Flood - Ebb - Flood



Computer Simulated Oil Spill
Piscataqua River System

Type: Gasoline
Amount: 10,000 gallons
Location: Northeast Term.
Tide: Flood


Computer Simulated Oil Spill
Piscataqua River System
Type: Gasoline
Amount: 10,000 gallons
Location: Northeast
Tide: Ebb



Computer Simulated Oil Spill
Piscataqua River System

Type: Gasoline
Amount: 10,000
Location: ATC
Tide: Flood

APPENDIX D

OIL POLLUTION CONTROL

COURSE OUTLINE

A. PROPERTIES AND CHARACTERISTICS OF OIL

1. Pour Point
2. Specific Gravity
3. Oil Spreading
4. Oil Evaporation
5. Ignition and Combustion
6. Containment of Flammable/Combustible Spills

B. SPILLS OF OIL ON LAND

1. Soil Characteristics
2. Characteristics of Oil Movement on Land
3. Vertical Oil Movement
4. Horizontal Oil Movement

C. CONTAINMENT AND RECOVERY OF OIL ON LAND

1. Oil Moving Horizontally on Land
2. Oil Sorbed by Soil Above the Water Table
3. Oil Contamination in Groundwater of Little Horizontal Movement
4. Oil Contamination in Groundwater of Active Horizontal Movement
5. Oil Spills in Underground Nonconformeties
6. Shoreline Cleanup Techniques

D. SPILLS OF OIL ON WATER

1. Wind and Current Factors
2. Prediction of Spill Movement
3. Procedure for Calculating Spill Drift
4. Creek and River Spills
5. Spill Movement in Bays, Lakes and Estuaries

E. CONTAINMENT OF OIL ON WATER

1. Containment Boom

   a. Basic boom components and their function
   b. Physical factors affecting a boom

c. Logistical factors affecting a boom
d. Spills in streams and creeks
e. Spills in estuaries and marine environments
f. Booming techniques near shore
g. Spills around docks and floating objects
h. Cold weather cleanup

2. Anchor Strategies

a. Anchoring techniques
b. Practical advice
c. High current boom

3. Impromptu Spill Containment Devices

a. Wiers
b. Filter fences

F. CLEANUP OF OIL ON WATER

1. Sorbents

a. Properties of sorbents
b. Sorbent type and packaging
c. How and when sorbents are used
d. Handling and disposal of contaminated sorbents

2. Skimmers

a. Basic skimmer concepts
b. Type - advantages and disadvantages
c. Logistical factors affecting a skimmer
d. Practical advice

3. Dispersants/Surfactants/Chemicals

a. Type and use of chemicals
b. Rules for using chemicals
c. Practical advice

4. Communications

a. Components of spill response - communication strategies
b. Alerting systems and systems used during cleanup operations
c. Rules for using communication equipment
d. Practical advice

5. Contractors

   a. Services offered by contractors
   b. The role of the contractor
   c. Practical advice

G. REGULATORY AND LEGAL CONSIDERATIONS

1. Important Spill Prevention Regulations
2. Important Oil Spill Laws and Regulations
3. Roles
4. Practical Advice
5. Documenting/Sampling

H. CONTINGENCY PLANS

1. Type of Information
2. Organization for Implementation of the Plan
3. Activation
4. Practical Advice

OIL POLLUTION CONTROL TRAINING COURSE

First Session July 27-30, 1981

Lon H. Cheney
Dover Fire & Rescue
9-11 Broadway
Dover, N.H. 03820

George Crombie
Durham Town Office
13 Newmarket Road
Durham, N.H. 03824

James Coleman
ATC Petroleum
290 Gosling Road
Portsmouth, N.H. 03801

Pete Lavoie
Dover Public Works Dept.
River Street
Dover, New Hampshire 03820

James Collins
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Thomas V. Cravens
Portsmouth Water Works
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Portsmouth, N.H. 03801

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P.O. Box 60
Portsmouth, N.H. 03801

Robert Dinco
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Falmouth, MA 02536

Lionel Cote
Public Service Co. of N.H.
P.O. Box 60
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Marc Guerin
Jet Line Services
106 Main Street
So. Portland, Maine 04106

William E. Murdock
Public Service Co. of N.H.
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Portsmouth, N.H. 03801

Donald Zeaman)
Michael Gallen) NHWS&PCC
Thomas Beaulieu)

George E. Smith, Jr.
N.H. State Port Authority
555 Market Street
Portsmouth, N.H. 03801

Jim Trueman
Newington Police Department
Newington, N.H. 03801

OIL POLLUTION CONTROL TRAINING COURSE

Second Session August 3-6, 1981

David A. Keeler
Dover Fire & Rescue
9-11 Broadway
Dover, N.H. 03820

Donald Janik
Brackett Point
Greenland, N.H. 03840

Robert C. Allen
Public Service Co. of N.H.
Schiller Station
Gosling Road
Portsmouth, N.H. 03801

George R. Morrison
N.H. Fish & Game Department
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Concord, N.H. 03301

James G. Kathios
Public Service Co. of N.H.
Schiller Station
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Charles R. Kipouras
U.S. Coast Guard Marine Safety Office
P.O. Box 108
Portland, Maine 04112

Michael Norton
U.S. Coast Guard Marine Safety Office
P.O. Box 108
Portland, Maine 04112

Roger E. Gauthier
Exeter Water Department
Portsmouth Avenue
Exeter, N.H. 03853

Sgt. Wayne Vetter
N.H. Fish & Game Department
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Greenland, N.H. 03840

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C. H. Sprague & Son
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Newington, NH 03801

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106 Main Street
So. Portland, ME 04106

John A. Cannon
7 1/2 Fisher Street
Dover, NH 03820

Larry Wahl
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Newington, NH 03801

Phillip Souliere
Northeast Petroleum Corp.
Box 105
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Dudley D. Hardy
Public Service Co. of N.H.
Schiller Station
Portsmouth, NH 03801

Marvin Dahlen
Public Service Co. of N.H.
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Stillman E. Matott
Public Service Co. of N.H.
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Portsmouth, NH 03801

Jim E. Locke
Public Service Co. of N.H.
Newington Station
Box 60
Portsmouth, NH 03801

APPENDIX E

Agreement Between the
New Hampshire Water Supply and Pollution Control Commission
and
The Lamprey Regional Solid Waste Cooperative
For the Storage and Disposal of Oily Debris
Under the New Hampshire Oil Spill Program

Whereas, the Water Supply and Pollution Control Commission (hereinafter called the Commission) is responsible under State law for the prevention and control of oil spills and, pursuant to this responsibility, is developing an Oil Spill Control Program with significant emphasis on the unique needs of coastal waters.

Whereas, the Lamprey Regional Solid Waste Cooperative, (hereinafter called the Cooperative) a regional refuse disposal district is able and willing to participate in the state oil spill program by providing incineration of oily debris.

Now, Therefore, the Cooperative and the Commission for and in consideration of the mutual promises and agreements hereinafter stated and the performance thereof, do hereby promise and agree as follows:

1. Term of Agreement; Effective Date

1.1 Term of Agreement: This Agreement is for certain services as herein described to be provided by the Cooperative in cooperation with the state oil spill prevention and control program. These services are to be performed from March 1, 1983 to February 28, 1995.

1.2 Effective Date: This Agreement, and all obligations of the parties hereunder, shall become effective on the 1st day of March, 1983, or on approval of the Governor and Council of the State of New Hampshire, whichever is later (hereinafter referred to as the "Effective Date").

2. Disposal of Oily Debris

The Cooperative shall maintain in good operating condition a solid waste disposal incinerator to dispose of combustible oily debris beginning no later than the effective date of this Agreement. Such combustible oily waste shall be disposed of in accordance with existing permits received by the Cooperative and as provided for in accordance with the provisions in this Agreement.

3. Financial Aid

3.1 To ensure the availability of the Cooperative's incinerator for the disposal of combustible oily debris, the Cooperative shall receive financial assistance in an amount up to $29,125 from the Office of State Planning under the Coastal Energy Impact Program (CEIP) to construct a reinforced concrete floor at the incinerator, as required to enable the plant to safely handle the oily debris.

3.2 Contractual arrangements between the Office of State Planning and the Cooperative for construction of the reinforced concrete floor shall be a separate agreement and shall not be subject to the provisions of this Agreement.

3.3 In the event that financial assistance in an amount up to $29,125 for the concrete floor is not forthcoming from the Office of State Planning, this Agreement shall be null and void.

4. Disposal Services, Oily Debris, Liable Party

4.1 For the duration of this agreement the Cooperative shall dispose of all combustible oily debris provided to it by the Commission where no liable party can be identified. The debris shall be delivered to the Cooperative's incinerator at an acceptable rate as determined by the Cooperative.

4.1.1 For the purposes of this Agreement, "combustible oily debris" means oil, petroleum products and their by-products of any kind and in any form, in conjunction with other combustible materials including floating organic materials such as seaweed, driftwood or floatsam; land vegetation; naturally occurring nonbiodegradable materials; manufactured products used to clean up or contain oil spills. Such material shall be in such form as can be received and processed by the equipment presently installed at the Cooperative.

4.1.2 For the purpose of this Agreement "liable party" means that the oil spill is attributed to a particular source or that responsibility for the spill is assigned to a specific party.

4.3 In the event a liable party is identified after disposal of oily debris under the terms of the Agreement, the Cooperative may charge the liable party a reasonable fee for disposal service.

4.4 The Cooperative shall also establish a reasonable fee schedule for disposal of oily debris provided by oil spillers and private cleanup contractors.

5. Procedures for Storage and Incineration

5.1 The Cooperative shall have sole authority over the operation of the incinerator and the handling of oil spill waste at the plant.

5.2 Operating procedures with respect to delivery of debris to the incinerator and other procedural requirements necessary for the proper disposal of oily debris shall be agreed upon between the Cooperative and the Commission within 60 days after the effective date of this Agreement. Subsequent modifications to the procedures shall be agreed to by both parties as necessary.

6. Review of Memorandum of Agreement

The Cooperative and the Commission shall review the terms of this Agreement in 1990 to determine whether an amendment or modification is warranted based on the first seven years of experience of disposing of oily debris by the Cooperative. The Cooperative and Commission may review the terms at any time upon mutual agreement of the two parties.

7. Conditional Nature of Agreement

Notwithstanding anything to the contrary contained in this Agreement, it is understood and agreed by the parties hereto that all obligations of the Commission hereunder including, without limitation, the continuance of any payments hereunder, are contingent upon the availability and continued appropriation of funds allocated to the Commission for services and payments to be provided. In no event shall the Commission be liable for any payments hereunder in excess of such appropriations, and the Commissionshall have the right to terminate this Agreement in whole or in part.

8. Additional Assistance

The Cooperative and the Commission shall continue to discuss ways to cooperate in the proper storage and disposal of oily waste under the State Oil Spill Prevention and Control Program. These discussions shall include the need for additional facilities, financial aid, technical assistance and other cooperative efforts to further the safe and environmentally sound disposal of oily debris.

9. Independent Capacity

The parties agree that the Cooperative and any agents or employees of the Cooperative in the performance of this contract shall act in an independent capacity and not as officers, employees or agents of the State or the Commission.

10. Indemnification

The Cooperative agrees to indemnify, defend and save harmless the State, its officers, agents, and employees from any and all claims and losses accruing or resulting to any person, firm, or corporation who may be injured or damaged by the Cooperative in the performance of this Agreement. Nothing herein, however, should be construed as a waive of the soverign immunity of the state.

11. Amendment

The Agreement may be amended or modified only in writing signed by the parties hereto.

Dated at Concord, New Hampshire the 12th day of April 1983, and In Witness Whereof the parties have hereunto signed, sealed and acknowledged this Agreement.

STATE OF NEW HAMPSHIRE
WATER SUPPLY AND POLLUTION CONTROL COMMISSION

By William A. Healy
William A. Healy, P.E., Executive Director

LAMPREY REGIONAL SOLID WASTE CORPORATIVE

By Rance G. Collins
Rance Collins, Chairman

State of New Hampshire

County of Rockingham

On this the 3rd. day of March, 1983, before me, Dorothea Burr the undersigned officer, personally appeared Rance G. Collins, who acknowledged himself to be the Chairman, of the Lamprey Regional Solid Waste Corp. and that he, as such Chairman, being authorized so to do, executed the foregoing instrument for the purpose therein contained.

In witness whereof I hereunto set my hand and official seal.

Dorothea L Burr
Notary Public/~~Justice of the Peace~~

My Commission expires: November 1986

Approved as to form, execution and substance:

OFFICE OF THE ATTORNEY GENERAL

By [illegible] 3/28/83
~~Assistant~~ Attorney ~~General~~ - Date

I hereby certify that the foregoing Agreement was approved by the Governor and Council of the State of New Hampshire at their meeting on: April 6, 1983. By [illegible] Title SECRETARY OF STATE

CERTIFICATE

I W. Douglas Scammon, Secretary of the Lamprey Regional Solid Waste Cooperative, do hereby certify that: (1) I am the duly appointed Secretary of the Lamprey Regional Solid Waste Cooperative, a regional refuse disposal district established pursuant to the laws of the State of New Hampshire (RSA 53-A); (2) I sign and maintain or cause to be maintained and am familiar with the minutes of the cooperative; (3) I am duly authorized to issue certificates with respect to the contents of such minutes; (4) At the regular scheduled meetings of the Joint Board of the Cooperative held on February 24th., 19 83 which meeting was held in accordance with New Hampshire laws and bylaws of the Cooperative, the Joint Board voted to enter into an Agreement with the Water Supply and Pollution Control Commission for the purpose of participating in the New Hampshire Oil Spill Program by disposing of combustible oily debris in the Cooperative incinerator. The Joint Board further authorized the Chairman to execute all the documents which may be necessary for the contract; (5) the foregoing acceptances and authorizations have not been revoked, annuled, or amended in any manner whatsoever, and remains in full force and effect as of the date hereof; (6) the following person has been elected to and now occupies the office indicated below:

Karen E. Allen Chairman

and (7) the Cooperative has no seal.

IN WITNESS WHEREOF, I have hereunto set my hand as the Secretary of the Lamprey Regional Solid Waste Cooperative this 4th day of March, 19 83.

W. Douglas Scammon Secretary

State of New Hampshire
County of Rockingham

On this fourth day of March, 19 83, before me Edna B. Weeks, the undersigned officer, personnally appeared and W. Douglas Scammon who acknowledged himself to be the Secretary of the Lamprey Regional Solid Waste Corp., and that he, as such Secretary, being authorized so to do, executed the foregoing instrument for the purpose therein contained.

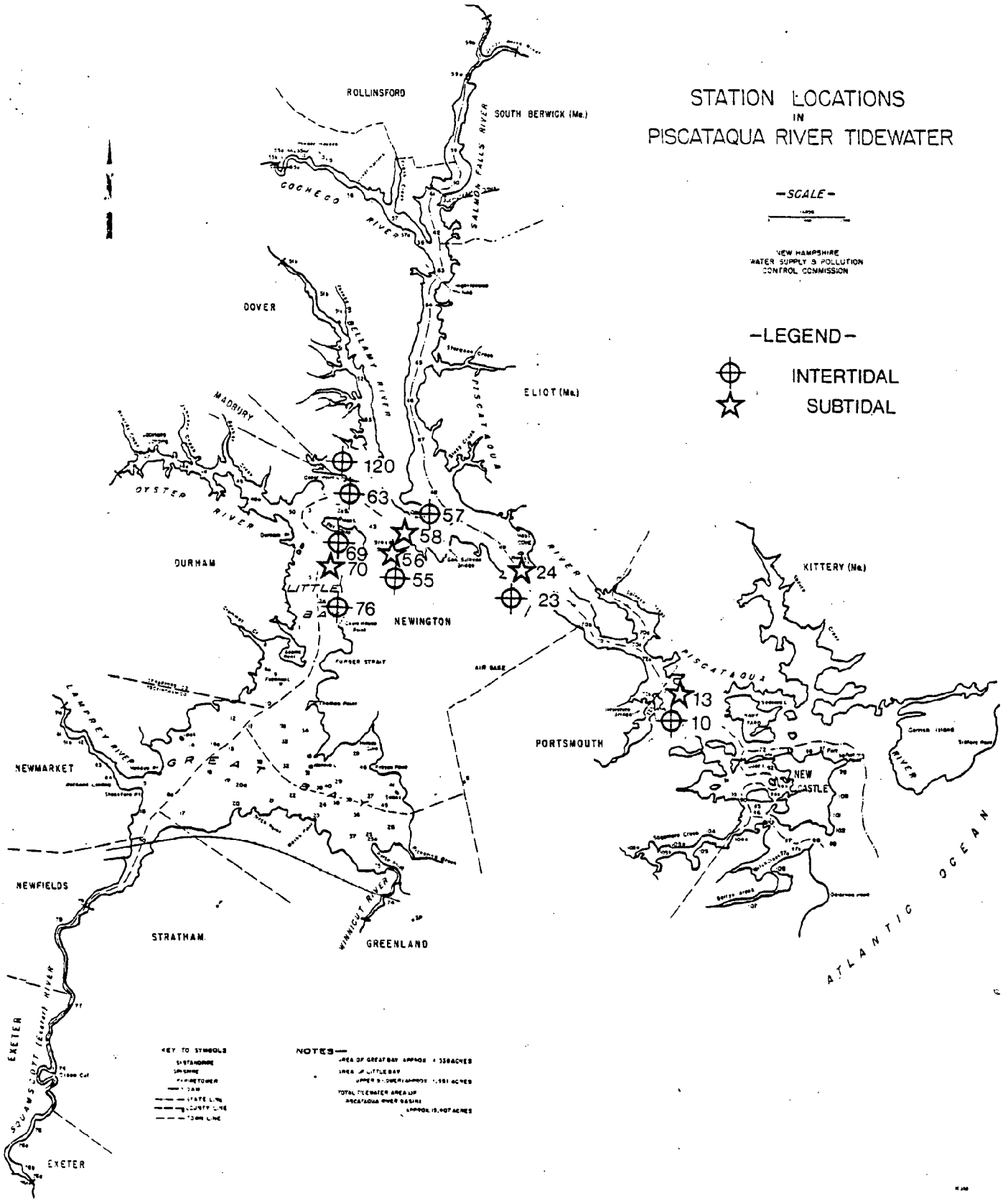
In witness whereof I hereunto set my hand and official seal.

Edna B. Weeks
~~Justice of the Peace~~/Notary Public

EDNA B. WEEKS, Notary Public
My Commission Expires March 25, 1986

(seal)

APPENDIX F


STATION LOCATIONS
IN
PISCATAQUA RIVER TIDEWATER
-SCALE-
NEW HAMPSHIRE
WATER SUPPLY & POLLUTION
CONTROL COMMISSION
-LEGEND-
INTERTIDAL
SUBTIDAL
ROLLINSFORD
SOUTH BERWICK (Me.)
SALMON FALLS RIVER
COCHECO RIVER
DOVER
BELLAMY RIVER
ELIOT (Me.)
PISCATAQUA
MADBURY
OYSTER RIVER
120
63
57
58
69
56
70
55
24
23
76
DURHAM
LITTLE
BAY
NEWINGTON
PISCATAQUA RIVER
KITTERY (Me.)
13
10
PORTSMOUTH
LAMPREY RIVER
GREAT BAY
NEWMARKET
NEW CASTLE
NEWFIELDS
WINNICUT RIVER
STRATHAM
GREENLAND
ATLANTIC OCEAN
EXETER
SQUAMSCOTT (EXETER) RIVER
EXETER
KEY TO SYMBOLS
NOTES—

FISH AND GAME DEPARTMENT SAMPLES

PISCATAQUA RIVER - GREAT BAY ESTUARY

SAMPLE NOS. 1-13, FEBRUARY, 1981

Poly Aromatic Hydrocarbon Concentrations

Ng/g dry sediment

STATION #	23	24	55	56	57	10	13	58	63	69	70	76	120
NAPHTHALENE	104	80		32			60	36			13	28	30
MENAPHTHALENE	66	120		24		57	52				20		20
MENAPH	22	40		8		48	16				8		8
DIMENAPH	48	42		22		17	60				24	14	24
DIMENAPH	26	40		10		34	34						12
FLUORENE	6	24	5	16		20	196				15	60	60
PHENANTHRENE	52	180	26	16	22	64	73	116	180	13	122	41	514
ANTHRACENE	28	74	15	132		66	526	64	190		74		270
FLUORANTHRENE		340		210	42		920		96	22	250		250
PYRENE		300	188		37		500		636	670	316	75	
CHRYSENE	889	410	186	880		2300	1222	780	1010	80	604	220	2162
BENZ(A)ANTHRACENE	800	400	188	620		2208	1240	899	2000	1200	414	221	1538
PERYLENE		400	188	516	38	1868					472	206	500

APPENDIX G

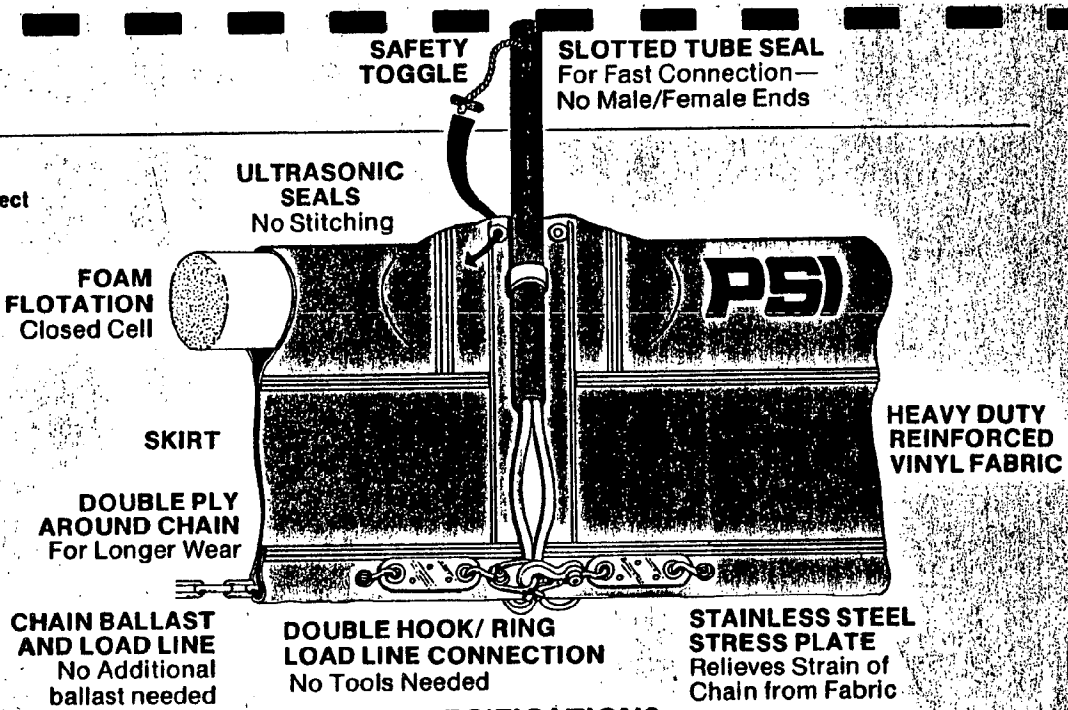
PSI BOOM SPECIFICATIONS

MARK II MODEL 0-HD

HEAVY DUTY BOOM

Bottom-Tensioned Curtain Boom

APPLICATION: • **Where Boom Is Repeatedly Deployed and Subject To *Constant* Abrasion and Weathering.**



SPECIFICATIONS

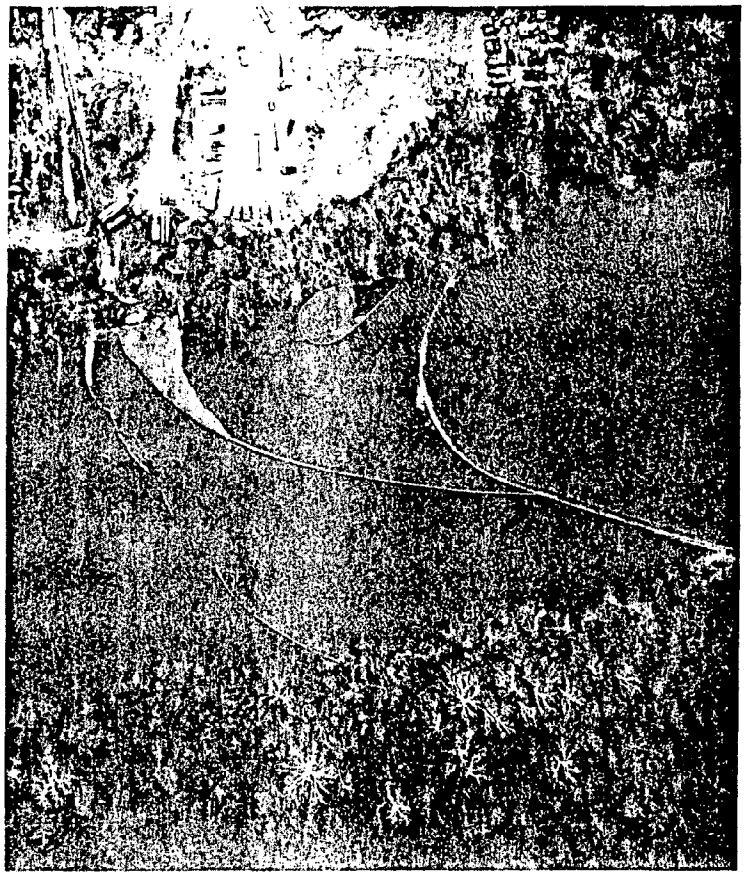
	ENGLISH	METRIC
FABRIC - (Nylon Reinforced Vinyl)	22 oz/yd²	746 g/m²
- Tongue Tear	100/100 lbs	45/45 kg
- Grab Tensile	500/450 lbs	227/204 kg
- Cold Crack	-40° F	-40° C
FLOTATION		
- Type	Solid Dow Ethafoam®	
- Diameter	6 in	15.2 cm
- Segment Length	6 ft	1.83 m
SKIRT DEPTH	12 in	30.5 cm
LOAD LINE/BALLAST		
- Type	Galvanized Proof Coil Chain	
- Size	¼ in	6.4 mm
STRESS PLATES	Stainless Steel	
SECTION LENGTH		
- Standard	100 ft	30.5 m
- Available	50 ft	15.25 m
WEIGHT PER FOOT	2.0 lbs	.91 kg

COLOR	International Orange
CONSTRUCTION	Ultrasonic Welding Double fabric around chain.
CONNECTIONS	Double Hook & Ring with slotted tube connection seal.
GROSS TENSILE STRENGTH	Over 15,000 lbs in chain and fabric (6,803 kg)
OPTIONAL:	Anchor points at 50' intervals Handholds at fold points Urethane fabric for more wear resistance

PSI reserves the right to alter specifications and/or designs without notice

Ethafoam is a registered trademark of Dow Chemical

Parker Systems, Inc. P.O. Box 1652/Norfolk, Virginia 23501/Phone (804) 485-2952



When there is oil, debris or other pollutants on the water that must be contained or kept from entering an area, **PSI** is the boom name to remember. Because of its unique design and its simple, no-tool connection seal, the **PSI** boom can change a major ecological problem into just a minor annoyance.

We manufacture an extensive line of standard boom, but we are also capable of manufacturing custom boom for any special needs. Just give us your requirements or specifications and we'll go to work on it immediately.

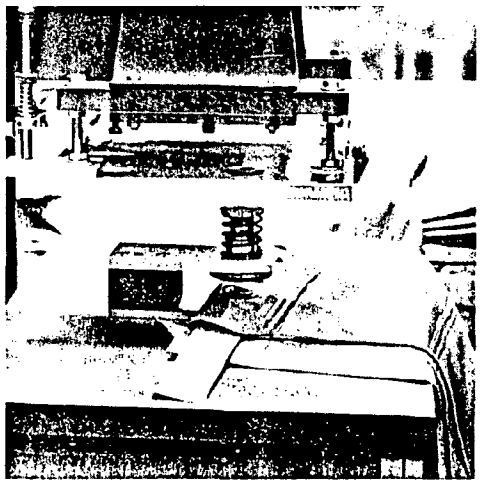
No matter what boom best suits your specific need, you can be assured that quality is built in from the ballast up and only the most suitable materials are used.

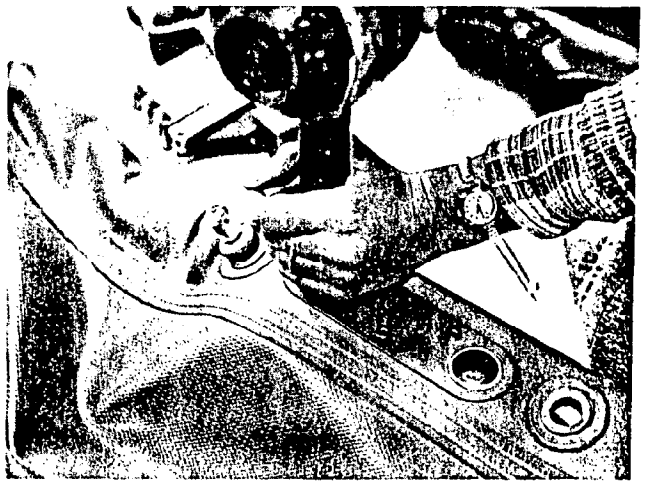
Order now and be ready before you have an emergency need for boom, because when you've got a problem, any delay could easily add thousands of dollars to the final cost.

Parker Systems, Inc. has served industry well for many years as "THE Oil Spill Equipment Supply House." We are now also rapidly becoming known as "THE Boom Supply House."

Send in the attached card; we'll call you for specifications, provide you with a quote and answer any questions. Let us work for you on your specific situation. If you're in a hurry, call us collect.

Remember, when you must lower the boom—make sure it's **PSI**.





PSI SPILL CONTAINMENT BOOM

BOTTOM-TENSIONED CURTAIN BOOM

- REGULAR DUTY BOOM

  Sturdy and economical standard PSI design using 18 oz. fabric and rolled foam flotation

- HEAVY DUTY BOOM

  Added strength and resiliance to withstand wear of repeated and continuous deployment.

- BASIN BOOM

  Reduced flotation diameter and skirt depth for easier handling and movement in settling ponds and basins.

- FENCE BOOM

  Folds flat for compact stowage and base of deployment.

BANTAM BOOM

- Mini Boom For Quick Response To Spills In Streams, Ponds. Compact Stowage, Easily Handled.

DREDGE BARRIER

- Custom Built For Each Application, For Control Of Turbidity And Silt During Dredging Or Filling Operations And Many Other Uses.

DEBRIS BARRIER

- Unique Open Weave Skirt Allows Water Movement But Holds Back Large Floating Or Suspended Pollutants Such As Vegetation, Trash, Marine Life.

DIVERSION BOOM

- Custom Designed, Flexible Fabric Pond Barrier. Diverts The Flow Of Polluted Liquids, Increasing Settling Times, And Reducing Purification Costs.

NORTHEAST PETROLEUM CORPORATION

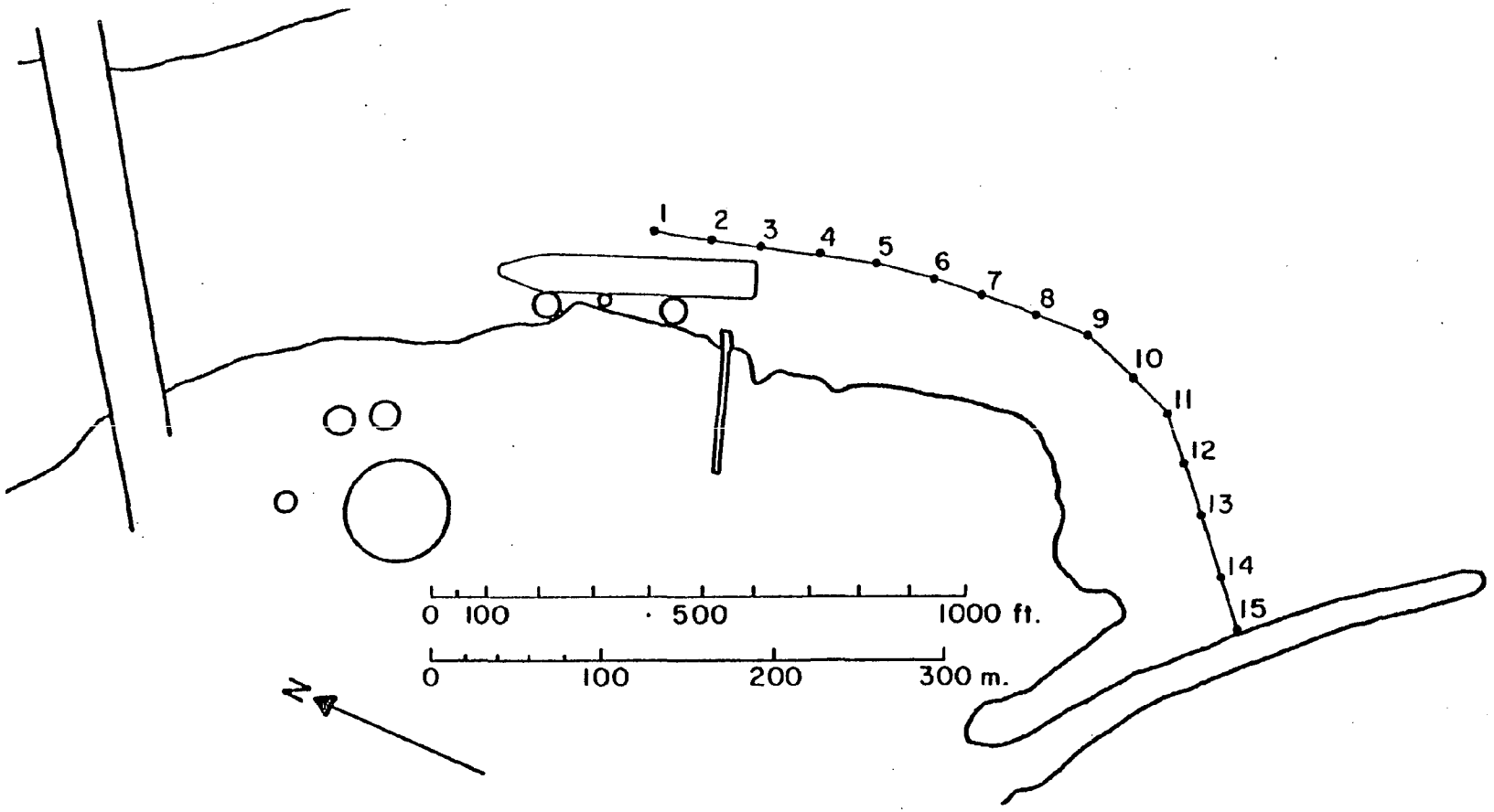


Fig. 1 Outside boom configuration for Northeast Terminal during ebb tide. Dots with numbers next to them indicate anchoring locations and are spaced approximately 100 ft apart.

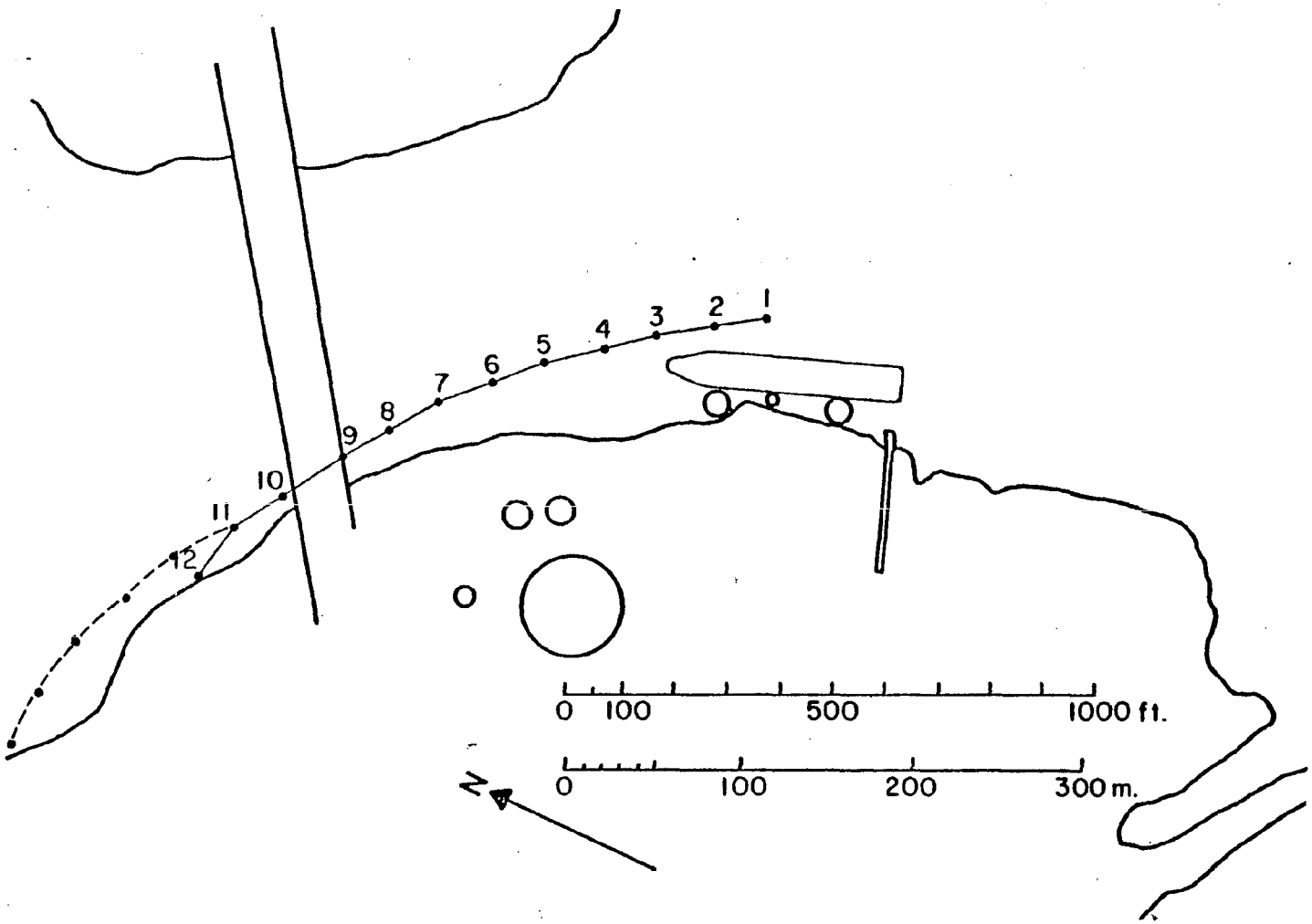


Fig. 2 Outside boom configuration for Northeast Terminal during flood tide.

SPRAGUE/PUBLIC SERVICE COMPANY

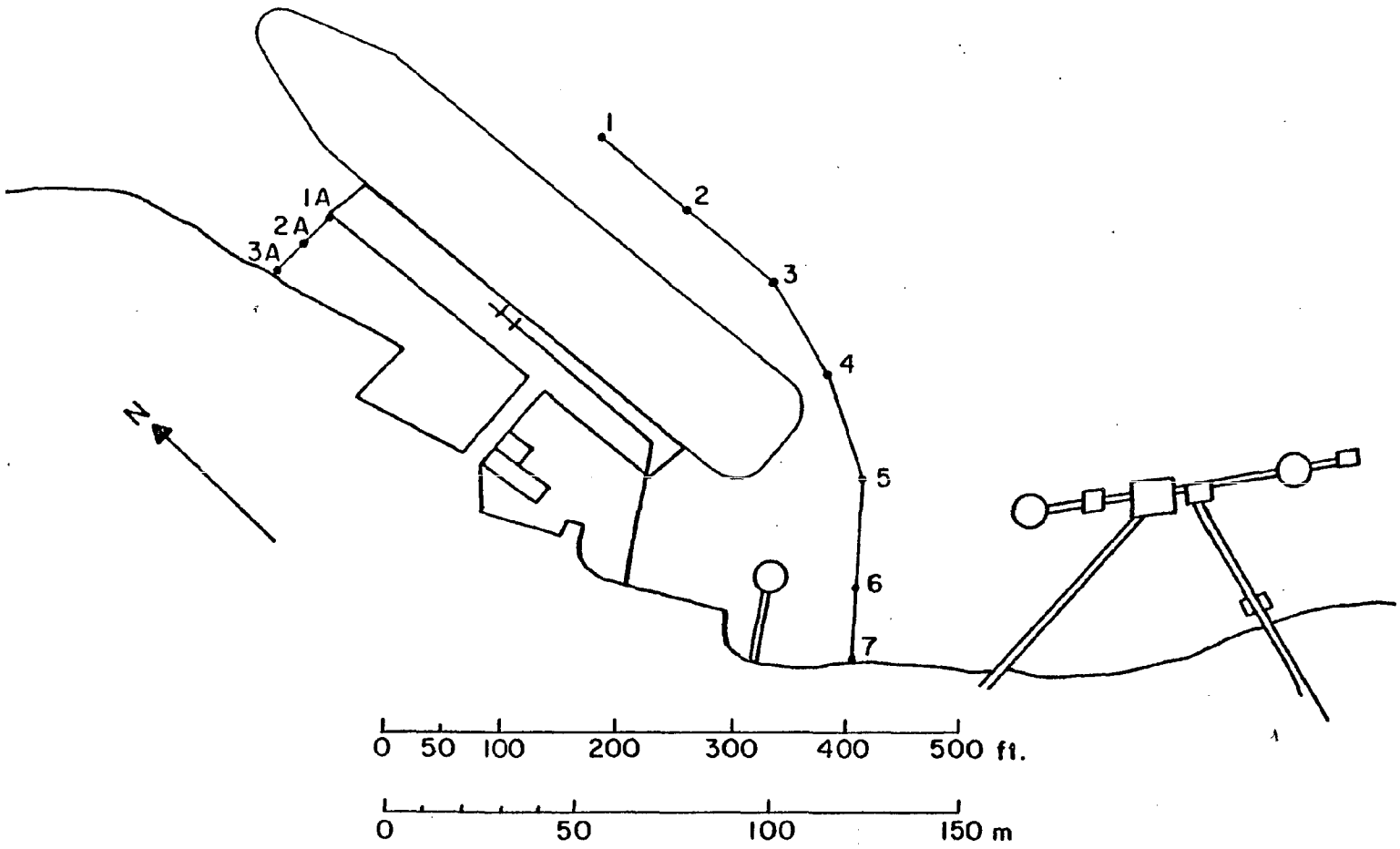


Fig. 3 Outside boom configuration for Sprague/Public Service Company Terminal during ebb tide. Dots with numbers next to them indicate anchoring locations, spaced approximately 100 ft apart. Boom (1A-3A) attached near the bow of the tanker is placed there to catch oil carried by counter currents.

MOBIL OIL CORPORATION

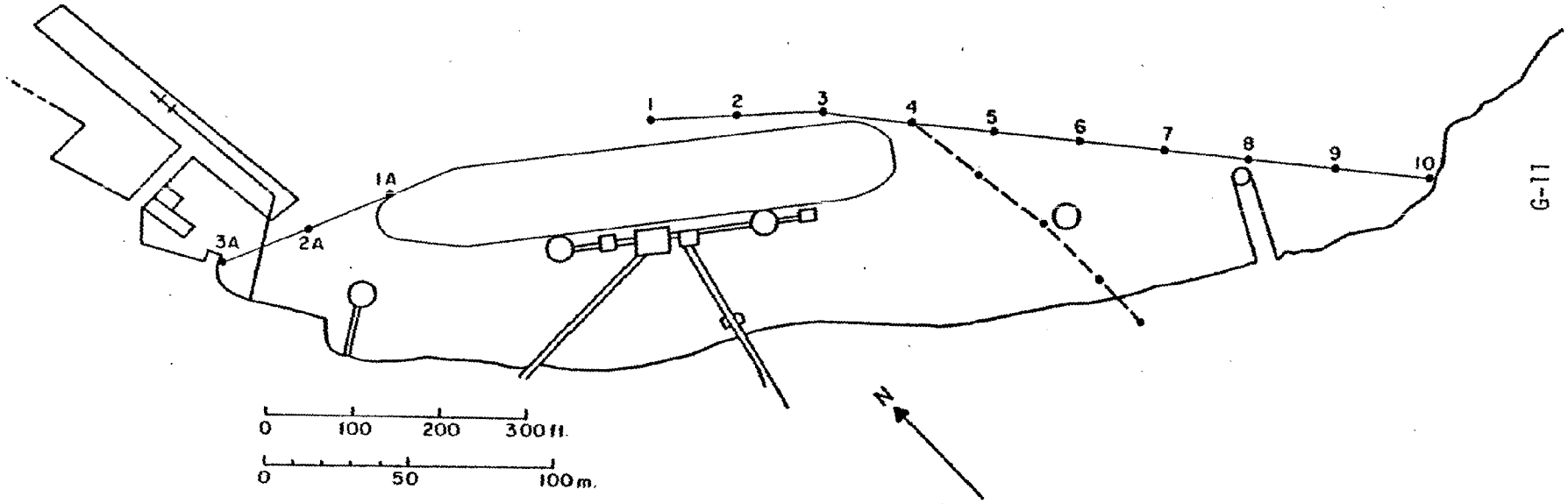


Fig. 4 Outside boom configuration for Mobil Oil Corporation Terminal during ebb tide. Dots with numbers next to them indicate anchoring locations and are spaced approximately 100 ft apart. Boom (1A-3A) attached to the bow of the tanker is placed there to catch oil carried by counter currents.

FUEL STORAGE CORPORATION

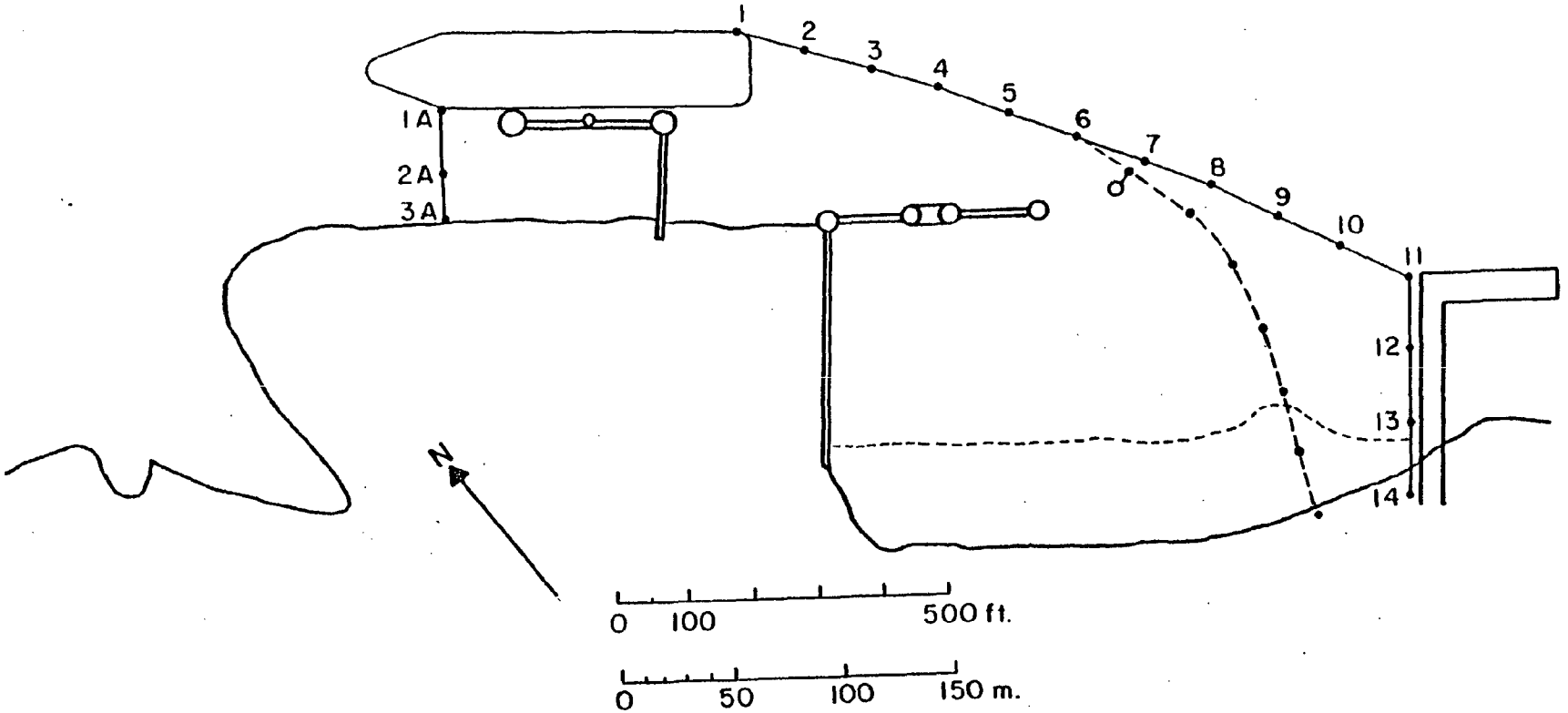


Fig. 5 Inside boom configuration for Fuel Storage Corporation Terminal during ebb tide.

SPRAGUE/ATC

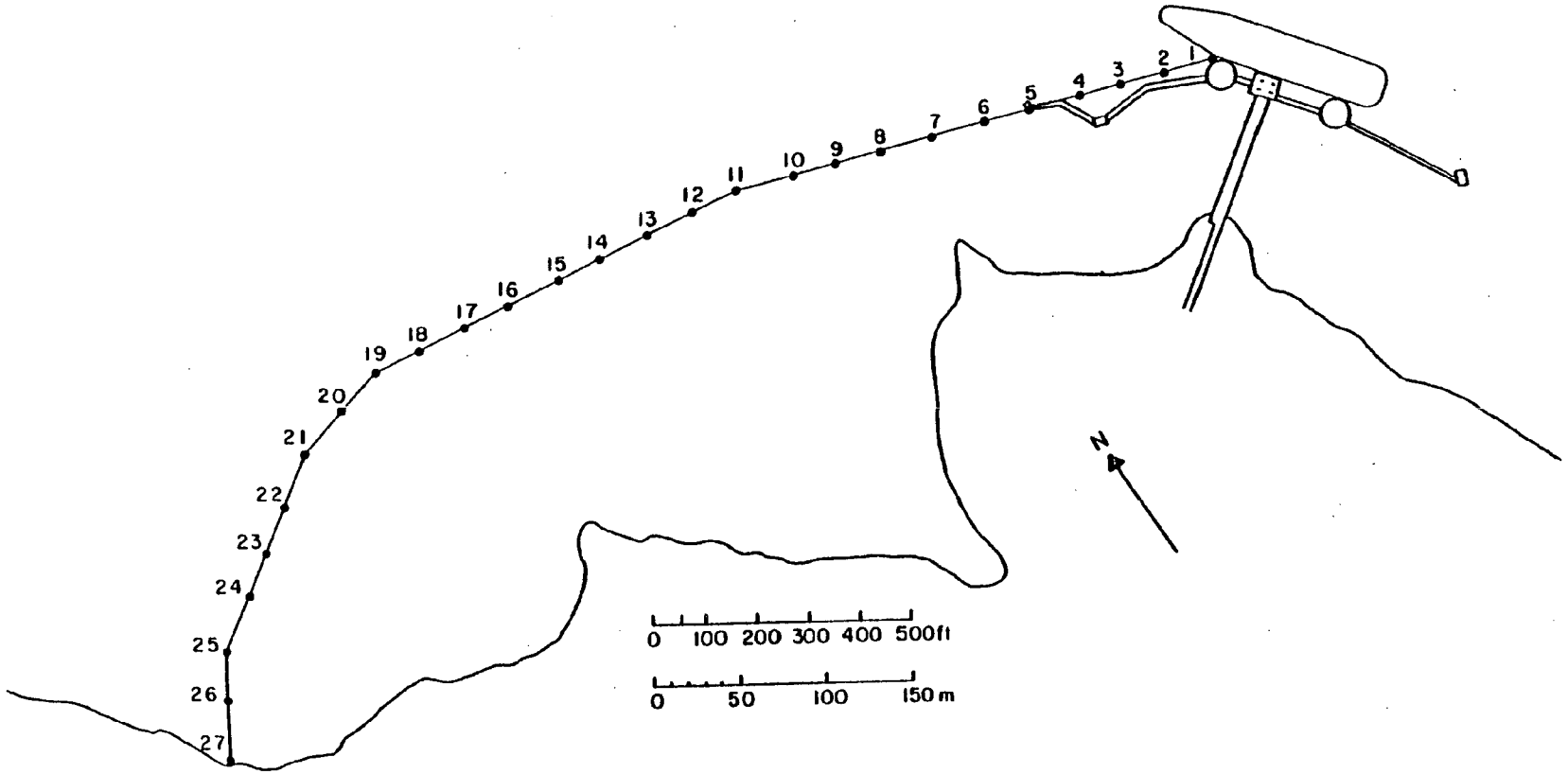


Fig. 6 Inside flood configuration for Sprague/ATC terminal during flood tide.

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