WORK PLAN I: TANKS AND LEVEE

REMEDIAL ACTION DESIGN FOR BRIDGEPORT RENTAL AND OIL SERVICES (BROS)

BRIDGEPORT, NEW JERSEY

U.S. ARMY CORPS OF ENGINEERS
KANSAS CITY DISTRICT, MISSOURI

MAY 1985

TAMS TIPPETTS-ABBETT-McCARTHY-STRATTON
ENGINEERS, ARCHITECTS AND PLANNERS

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WORK PLAN I
TANKS AND LEVEE

Remedial Action Design
Bridgeport Rental and Oil Services
Logan Township, New Jersey

Introduction

The selected remedy to clean-up the Bridgeport Rental and Oil Services (BROS) site is given in the Record of Decision for the site. It is based on the Remedial Investigation Report and Feasibility Study (RI/FS) prepared by NUS in 1984 and supporting documents.

The TAMS/E&E joint venture's (JV) Scope of Work for clean-up of BROS is divided into ten specific tasks. However, in dealing with the practical matter of site remediation, two construction contracts have been anticipated. The first contract ("Phase I") will address clean-up, dismantling, and removal of 95 tanks and their contents, and stabilization of the existing levee. The second contract ("Phase II") will consider lagoon clean-up and related activities including incineration.

The objective of Phase I construction is to initiate remedial activity at the site as soon as possible and to prepare the site for the second phase of the work which will require considerable working room for process plants, an on-site incinerator, etc. Stabilization of the levee will maintain its short term integrity until lagoon clean-up and closure is completed.

The current Phase I schedule calls for completion of draft (95%) plans and specifications by August 1, 1985; final

documents by September 1; bidding and bid evaluation during September and October; and contract award on or about November 1.

A Predesign Conference was held at the JV's headquarters in New York City on May 7, 1985 to discuss this Work Plan and associated documents. This document includes revisions to Work Plan I submitted on April 17, 1985, as per the COE comments presented at the Predesign Conference.

A. TANKS

1. Obtain and Review Existing Data

On April 8, 1985 JV representatives visited the NUS office near Pittsburgh to obtain data, drawings and other information relevant to the site. NUS provided reproducible copies of the drawings incorporated in the RI/FS reports, and a number of reports and copies of relevant project documents and note books. Other data were reviewed and/or collected from the Philadelphia District, COE, including aerial photographs, site topography and design reports.

Basic information will be obtained by a thorough review of the RI/FS reports, CDM's report ("Major On-Site Storage Tanks at the BROS Site") and other available documents. The CDM report details a July 1982 investigation of the BROS site. Sampling of materials contained in several tanks is reported and a detailed inspection of eight tanks was made.

Tanks are listed by identification number in the NUS RI/FS documents. A brief description of each tank is indicated by NUS including dimensions, capacity, orientation, physical appearance and estimated volume of contained materials.

The NUS and CDM information is being used to develop a basic format for compiling data acquired during JV field

investigations. Both the existing information and our new input will be integrated into a common data base for engineering analyses and preparation of plans and specifications.

2. Site Specific Safety Plan (SSSP) (See submittal of May 1985)

A copy of the SSSP has been submitted under separate cover and is in conformance with the appropriate COE and EPA procedures and regulations.

3. Site Specific Quality Management Plan (SSQMP) (See submittal of May 1985)

A revised copy of the SSQMP has been submitted under separate cover and is in conformance with the appropriate COE and EPA procedures and regulations.

4. Sampling Plan (See submittal of May 1985)

A revised copy of the Sampling Plan has been submitted under separate cover and is in conformance with the appropriate COE and EPA procedures and regulations.

5. Predesign Conference - New York

A Predesign Conference was held in the JV's New York headquarters on May 7, 1985 to discuss the Work Plan I, SSSP, SSQMP and Sampling Plan submitted on April 17 for the Tanks and Levee. The COE comments presented at this Conference have been incorporated in the appropriate documents.

6. Field Sampling of Material in Tanks

The objective of this effort is to determine the nature and quantity of material contained in the tanks through a program of sampling and analyses.

Fourteen tanks have been selected for material sampling. These tanks are numbered 018, 021, 030, 036, 037, 039, 050, 055, 060, 063, 068, 069, 086, and 088. The volume of materials contained in these tanks represents about 95% of the materials contained in all 95 tanks. For details refer to the Sampling Plan document.

7. Tank Field Survey

This task consists of a detailed visual inspection of the tank farm and will be conducted by a 3-man team. In accordance with the SSSP, the team will be provided with level C protection, but this level of protection may be altered to reflect actual conditions. Continuous monitoring of air quality will provide the basis for changes in level of protection.

A general reconnaissance of the tank farm will occur initially to confirm that each tank is properly numbered and is at the location shown on existing plans. Reported buried tanks will be confirmed by visual identification of fill, vent lines and hatches, or by use of a metal detector.

Following this survey, the exterior of each tank will be visually inspected. The general condition of the tank, extent of corrosion, possible damage and/or signs of leakage will be reported. Tank foundations and surrounding surface area will be examined. Locations of external tank fittings such as valves, drains, vents and manholes will be recorded. Measurements will be made to confirm the general dimensions of the tanks and the wall thickness obtained from previous reports will be confirmed using an ultrasonic device. As part of the inspection of tank exteriors underground piping will be located by either direct visual observation or through use of a metal detector.

Visual observations of tank interiors will be made when the size of the tank warrants such inspection. The observations will be made from the tank openings using appropriate illuminating equipment. The inspection will be preceded by monitoring of the gas space to determine personnel protection levels required. In general, presence of residues on the interior surfaces and extent of corrosion will be reported. If applicable and/or visible, the size and number of columns, beams and other structural members will be reported and schematically drawn as part of the inspection record.

To facilitate collection of data and to insure proper record keeping, log sheets (see Plate 2) will be completed for each tank during the inspection. A photographic record will be made to show major findings of the inspection. At least 2 views of each tank will be photographed.

Should one or several of the larger tanks appear to be suitable for temporary storage of on-site materials they would be considered for more comprehensive inspection.

8. Laboratory Analysis of Material in Tanks

Tank material samples will be analyzed for the following:

- Ignitibility
- Corrosivity
- Reactivity
- EP toxicity
- Priority pollutant metals
- Organic sulfur
- BTU
- Ash content
- Total PCB (non-aqueous)
- Total PCB (aqueous)
- Total organic carbon (TOC)
- Filterable solids

- Total solids
- Percent moisture
- Specific gravity
- 2,3,7,8-TCDD
- GC/MS scan

Details of the analytical program are to be found in the Sampling Plan document.

9. Engineering Analysis

All available information obtained from previous reports and from the field survey will be compiled along with photographs to establish documentation for each tank. Important characteristics of the tanks, including age, size, location, foundation, condition, volume, etc. will be tabulated using computer methods.

Tank descriptions will be compared with industry standard designs and tanks will be classified by size and type. Since design computations or shop drawings are not presently available, special attention will be given to custom made tanks to assess their actual condition. Data regarding the integrity of the tanks, tank supports and structural members, and foundation conditions will be integrated into an analysis of their condition. This analysis will be performed to determine procedures for safe demolition and to assess problems that may be encountered during tank removal. The need for temporary supports, special equipment and other restrictions on the demolition contractor will be determined. Geotechnical techniques will be applied to determine allowable soil bearing pressures and to assure that these pressures are not exceeded during dismantling operations.

Pipe running from various tanks to the BROS lagoon will be evaluated in terms of excavation and removal difficulty, availability of isolation valves, and relationship to other

facilities on the BROS site. Particular problems in disconnecting tanks and their attendant drain lines will be evaluated. Similarly, difficulties associated with removing valves, vents, hatches and other tank fixtures will be considered.

Tank foundations will also be categorized during the field investigation phase, including foundation type, geometry, depth, and condition. The relation of any particular tank to its supporting structure and demolition constraints resulting therefrom will be determined. Demolition and removal of the tank and building foundations will also be included in the Contract Documents. It is assumed that building and tank foundations consist of either spread, ring and/or slab-on-grade structures. If pile foundations are encountered during the inspection, then discussions will be held with the COE to determine if cut-off or complete removal would be required.

Further analyses may be performed on those tanks considered suitable for temporary storage and on units whose structural integrity would present a demolition problem. Prior to performing the analysis, criteria for possible utilization of a tank(s) will be established.

Results of laboratory analyses on tank samples will be used to characterize stored materials in terms of quantities of oil, aqueous type substance, and sludge. For each sampled phase, a chemical data base will be developed for inclusion within tank cleanout specifications. The chemical data base will be expanded to include information from previous sampling efforts. A description of interior surface scale conditions will be generated from the laboratory analysis and from field inspections performed at the time the tanks are sampled.

On the basis of the accumulated chemical data base, a statement on disposal options, cleanout limitations, degree of hazard, and site constraints will be prepared for inclusion in tank specifications. In order to prepare this part of the

specification, a number of factors related to the cleanout will be analyzed:

- compatibility of stored materials during blending operations

- disposal options available for various stored materials based on toxicity analyses

- limitations on tank cleanout due to tank interior conditions

- disposal of tank shells, valves, piping, etc.

- site constraints during cleanout

- personnel access limitations during cleanout.

In summary, during the engineering analyses phase a comprehensive review of all tank data will be taken and applied to preparation of cleanout, demolition, removal and disposal specifications. The analyses will establish constraints attendant to removal of tanks, stored materials, buildings and foundations. The Construction Contractor will be required to survey and remove all piping at the site. Removal restrictions will be required on piping, which if removed, may impact on existing structures, i.e., levee.

10. Plans

Engineering plans will be prepared as part of the contract documents in accordance with COE standards. Using available site drawings as a basis, the preliminary drawing list consists of:

- Title sheet, location plan
- Index and legend sheet
- Site plan
- Site topography
- Tank farm plan
- Typical tank details and schematic
- Temporary support requirements (3 sheets)
- Tank sampling results and cleanout requirements (3 sheets)

11. Specifications

The specifications include non-technical (contractual) and technical sections. The former will be prepared by the COE and the latter by the JV. The following comments on bid procedures are offered for the COE consideration. Bid procedures must be carefully considered to ensure the selection of the lowest responsive and responsible bidder. Standard COE procurement methods for formally advertised competitive bidding can address these concerns. In addition to completing the bid form it will be recommended that bidders be required to submit the following for evaluation:

- available equipment
- qualifications of company and individuals
- evidence of similar relevant experience
- data on subcontractors
- letters of commitment from subcontractors responsible for transportation of hazardous materials and disposal facilities
- method statement and tentative schedule

The method statement is the only item above which may not be part of standard COE procedure. It is important to determine that each bidder has considered the practicalities of performing the work as well as calculating a bid price. The statement should include equipment to be used, anticipated production rates, sequence of operations, crew sizes, etc. A review of their method statement will allow the COE to decide whether each bidder has a realistic approach to completing the project in accordance with the plans and specifications, and can help prevent the selection of a contractor who might be a source of claims and change orders. If it is determined that a method statement is not in conformance with COE standard procurement procedures, then alternate requirements may be specified to insure selection of a responsible bidder. These items will be discussed at the Design Conferences scheduled in July.

The JV will prepare the technical provisions as a performance-type specification. A general description of each type of work to be performed, its restrictions or limitations and its acceptance criteria will be stated.

We propose to discuss with the COE several alternative contract forms: contracts based on unit prices for the individual work items; fixed price contracts; and lump sum contracts. This discussion is recommended because an extensive survey and sampling program is not being conducted to define in detail the quantities of materials to be treated (tank surfaces) and removed (tank contents and steel plate). Bidders could be conservative in estimating these quantities for lump sum bids. Alternatively, a fixed unit price contract could be bid based on conservative quantity estimates, with unit price corrections for quantity variations from the estimate.

As an example of the unit price form we would consider here, payment for dismantling and removal could be based on the amount bid for each tank type and size category. This will

eliminate the need to pay for steel removal on a "per pound" basis with the added complication of estimating total weights for bidding and actual weight measurements for payment.

Anticipated payment items under the unit price approach are:

Description	Unit
Mobilization/demobilization	lump sum
Safety plan implementation	lump sum
Tank contents removal and disposal (by material type)	gallon
Material Testing (disposal manifest)	each
Tank surface cleanout (by tank size category and cleanout requirement)	each
Tank and foundation removal and disposal (by tank size category)	each
Excavation	cubic yard
Compacted Backfill	cubic yard
Underground piping survey, removal and disposal	linear feet
Building cleanout	each
Building and foundation removal and disposal	each

Appropriate COE guidelines for safety plans and quality plans will be appended to the specifications.

12. Code "C" Estimate (July 1 - July 26)

A detailed estimate, 95% complete, will be prepared in accordance with "Preparation of Construction Cost Estimates for Hazardous Waste Cleanup Projects", Kansas City District, COE, January 1985. This will include:

- An explanation of the methodology for construction: work required; methods used; sequence of construction

operations; construction crew details; health and safety plan.

- safety equipment for personnel protection
- special personnel requirements
- medical exams required
- data on laboratory samples
- materials costs
- offsite disposal costs
- mobilization

13. ~~Engineering Analysis Design~~ INITIAL/PRELIMINARY TANK Conference - New York

The JV will meet with Corps and EPA personnel during the week of July 1, 1985 to discuss the progress performed to date. The results of field sampling, tank inspection, drilling of levee boreholes, laboratory analyses and engineering analysis and the site drawings will be presented for review and comment. OUTLINES OF P&S WILL also be provided.

14. Final Design Conference - Kansas City

The JV will meet with Corps and EPA personnel two weeks after submittal of the draft plans and specifications and the 95% estimates to review the contract documents. It is expected that this conference will be held on August 9, 1985.

15. Finalize Contract Documents

Comments from the design conference will be incorporated into the plans and specifications and will be finalized within 14 days after the conference. The cost estimate will be

finalized and submitted not later than 21 calendar days after the design conference.

A senior level project team will perform a "plan-in-hands" field check of the plans and specifications.

16. Support Services During Bidding

Senior level project personnel will be available to assist the Corps during the bid review process.

B. LEVEE

1. Collect and Review Existing Data

The initial phase of work will be to establish a file of available geologic/geotechnical data and investigations performed to date, and to review this data as it is collected. The information will be obtained from NUS (Zone I Contractor), Environmental Protection Agency (Region 2), Corps of Engineers (Kansas City and Philadelphia Districts), New Jersey Department of Environmental Protection, and the U.S. Coast Guard. The information would include, among other items, the RI/FS Reports (NUS, 1984) Report on dike stability (Weston, 1981), field notes of visual inspection performed by Haley and Adrich, Inc. and NJDEP (1982), construction records of the U.S. Coast Guard, aerial photographs by ADR Associates (August, 1984), and other available topographic, hydrologic and geologic information.

It is reported that Weston, Inc. drilled 5 boreholes in the levee during their investigation on dike stability. Soil samples were obtained from these boreholes including undisturbed, split spoon and bag samples. It is expected that a JV geotechnical engineer will visually inspect the remaining soil

samples obtained during the investigation, prior to the exploration program proposed herein.

2. Site Specific Safety Plan (See Section A)

3. Site Specific Quality Management Plan (See Section A)

4. Sampling Plan (See Section A)

5. Initial Site Inspection

A site inspection will be made by a JV geotechnical engineer following review of existing data and development and acceptance of the JV SSSP. A detailed examination of the levee will be conducted during the inspection. Information gathered at this time will be used in establishing the detailed exploration and sampling program, and in the correlation and interpretation of existing data.

It is expected that during the site visit or during the drilling program, the JV representative will record water levels in each of the operational wells existing at the site. These wells will also be monitored during the course of the field program.

6. Additional Topographic Data (Surveys)

Insofar as can be determined, there presently exist NUS and CDM topographic maps developed for the levee and site. The CDM maps were developed from aerial photographs dated August 15, 1984 after lagoon water level had been lowered, and reflect levee conditions at that time. In order to insure that these topographic data are still accurate (surface runoff may have altered the configuration of the dike since 8/15/84), corroborative surveys of the levee will be made. In addition, a baseline stationing system will be developed along the centerline of the levee crest. The results of this survey will be

plotted on the existing CDM topographic map of the levee. If it is determined that the existing and documented elevations are not in reasonable agreement, then arrangements will be made to re-fly the site and to develop new topographic base maps for the levee and entire BROS site. Arrangements will be made with Aerial Data Reduction Associates, 9285 Commerce Highway, P.O. Box 557, Pennsauken, N.J. 08110, i.e., the firm that prepared the CDM plots, to perform this work.

At no cost to Gov. Inlieu of Field survey.

7. Subsurface Exploration and Sampling Program

The available project documents indicate that a potential leakage problem (formation of boils) occurred along the southeast portion of the dike at lagoon level El 15.75 feet. Furthermore, the Weston Report on dike stability revealed that the dikes are unsafe under high lagoon level conditions. In order to further assess potential seepage and stability problems and recommend suitable temporary remedial measures, a subsurface exploration and sampling program will be required.

It is expected that the JV will perform the drilling operations using JV drilling equipment and forces. A JV geotechnical engineer or geologist will develop the program and supervise the drilling work. The field work and sample handling and custody requirements will be performed in accordance with the SSSP, SSQMP and Sampling Plan, which are submitted under separate cover.

The anticipated program consists of approximately 28 borings drilled through the levee and into the underlying stratified foundation soils. The borings will be drilled using a rotary mounted truck rig from crest and downstream (outer lagoon) surfaces along the dike. It is expected that boring depths will range between 10 and 20 feet in depth. Disturbed samples will be taken in all boreholes at specified intervals using a two inch (O.D.) split spoon sampler at locations and depths shown in Sheets 1 and 2 (Boring Locations). The samples

will be shipped to the JV laboratory at E&E offices in Buffalo, N.Y. for chemical and physical properties testing. The Standard Penetration Test (SPT) will be performed at each sampling location in order to obtain a record of blow counts (N-values) at the sampling depths for use in design.

It has been reported that during previous subsurface explorations, rubble and concrete were encountered in some levee boreholes. The presence of these materials may present problems during the proposed exploration program, and if encountered, a field decision will be made to determine whether the obstructions should be penetrated using coring techniques or to abandon the hole. All field changes will be documented in accordance with standard COE practices.

A sample boring log is presented in Plate 3.

8. Laboratory Soil Testing

A laboratory soils testing program will be established and carried out to aid in evaluating the engineering properties of the levee and foundation soils. The test will be made on representative disturbed soil samples. The following soil tests will be performed, as a minimum, for the project:

Test	No. of Samples
Visual Classification	All Samples
Water Content Determination	80
Grain-size Analyses	80

Based on a review of the subsurface exploration and lab test results, additional soil tests may be required to more adequately assess the engineering properties of the soils. These test may include relative density determination, moisture-density relationships and/or permeability tests. Although

strength tests on undisturbed samples would normally be required for stability analyses, these tests will not be performed; instead, empirical correlations will be used to determine strength parameters based on N-values and index tests.

9. Geotechnical Investigations Report - Levee

Following the performance of the aforementioned field and laboratory investigations and a careful review of these data, a brief geotechnical investigations report will be prepared. The report will include a boring and monitoring well location plan, subsurface conditions, laboratory test data and recommended soil properties for engineering analyses. This report will become part of the project documents for construction.

10. Engineering Analyses

Cross-sections at various locations along the dike will be established following the survey and subsurface exploration programs. These cross-sections will be developed at critical levee sections. It is estimated that 4 cross-sections will be analyzed as described herein.

Stability analyses of critical levee sections will be made for the following cases: (1) existing low lagoon level condition, and (2) full lagoon level condition with steady seepage flow conditions. Other conditions such as earthquake and rapid drawdown are not considered applicable, and will not be analyzed for this work. The stability analyse will be done by two-dimensional computer methods and verified by graphical analyses.

The seepage pattern through the levee will be established for full lagoon conditions ("worst condition") to determine the safety of the levee at the critical cross-sections. The seepage studies will be incorporated into the two-dimensional

stability analyses, and will also be used to estimate exit gradients and piping potential.

The results of the engineering analyses will be used to determine the necessary remedial measures for levee strengthening. Various remedial alternatives may be required, either singly or in combination, and may include:

- o Widening of inner lagoon slope
- o Placement of impervious clay or prefabricated liner
- o Construction of stabilizing berms
- o Slope protection for erosion control
- o Provisions for drains, collectors and pumps

The selected remedial alternative will be based on its cost-effectiveness and ease of construction. A letter report will be submitted to the COE outlining the recommended alternative. Following the engineering studies, a material source survey in the vicinity of the site may be required. The survey will be made to locate and list sources of material for levee strengthening to be included in the Contract Documents.

11. Draft Plans and Specifications

Draft plans and specifications will be prepared for the levee strengthening based on the COE Standard Guide Specifications and the "Instructions for Preparation of Bidding Documents for Construction Contracts." In addition to the Plans previously described in Section A for the tanks, the following plans will be prepared:

- Boring Location Plan (1 sheet)
- Boring Logs (3 sheets)
- Typical Levee Cross-Sections (1 sheet)
- Remedial Earthwork & Strengthening (2 sheets)

Specifications will include a bidding schedule, general and technical provisions, and statement of bidding requirements as stated in Section A for tanks. It is anticipated that the levee strengthening will be a lump sum bid item incorporated in the tank removal contract.

12. Code "C" Estimate

A Code "C" estimate will be prepared in accordance with "Preparation of Construction Cost Estimates for Hazardous Waste Cleanup Projects", Kansas City District, COE, January, 1985. This will include those items previously listed in Section A.

13. Engineering Analysis Design Conference - New York

See Section A

14. Final Design Conference - Kansas City

See Section A

15. Finalize Contract Documents

See Section A

16. Support Services During Bidding

See Section A

PROJECT SCHEDULE FOR
WORK PLAN I: TANKS AND LEVEE STRENGTHENING

BRIDGEPORT RENTAL AND OIL SERVICES
BRIDGEPORT, NEW JERSEY

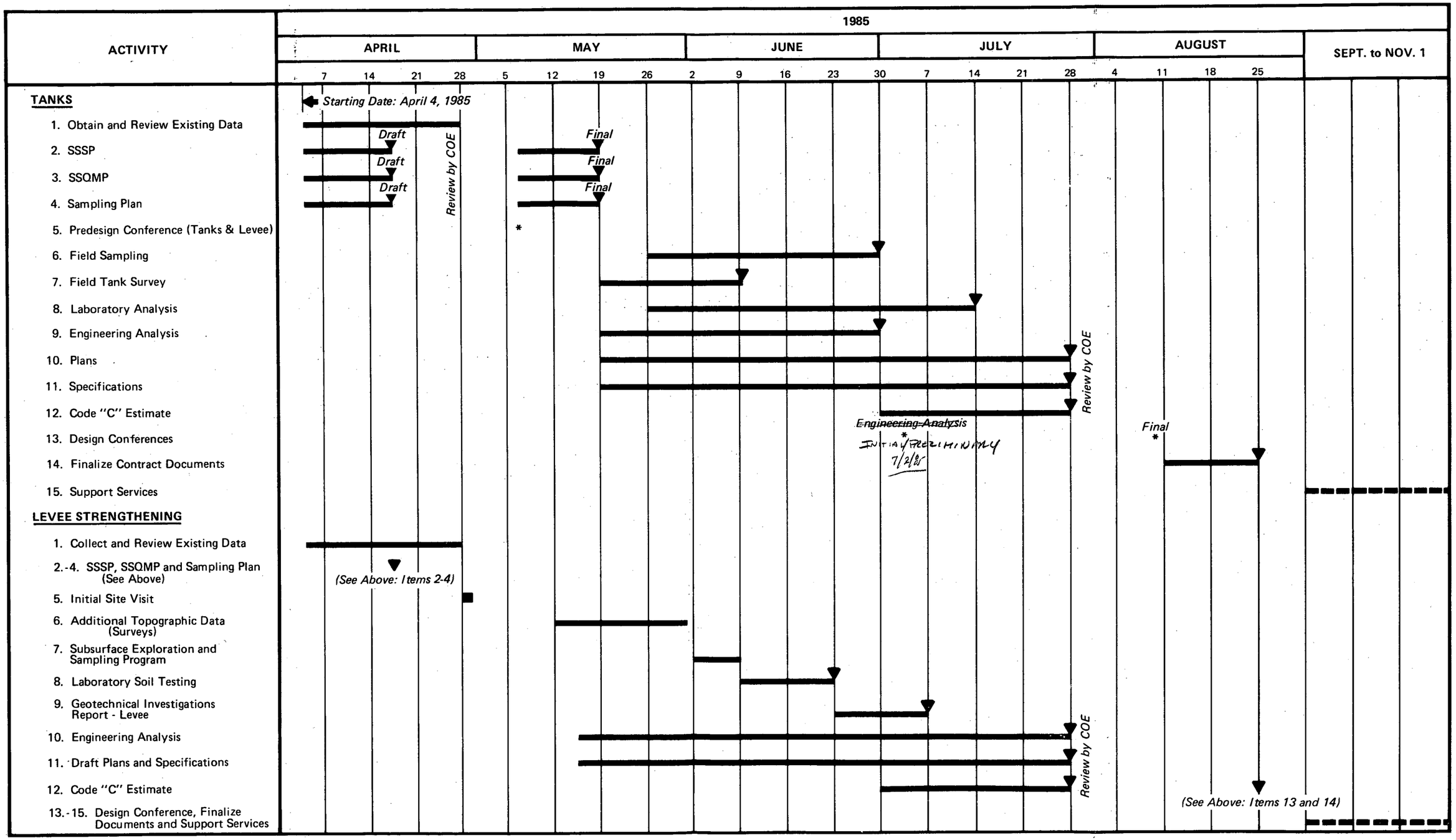


PLATE 1

Date:

Time:

BRIDGEPORT RENTAL AND OIL SERVICES (BROS)

TANK INSPECTION LOG

Unit Number: Photograph Number:

Geometry: Axis V - H

Dimension Height:

Circumference: Diameter:

Type of Construction:

External Supports: Description/Sketch

Internal Supports: Description/Sketch

Foundation: Description/Sketch

Date:

Unit Number:

BROS

TANK INSPECTION LOG

Openings number:

description:

Thickness measurements

Comments General condition

Inspection Team

_____

_____

_____

_____

Signed _____

Team Leader

Date _____

PLATE 2 (Cont.)

FORM NO. 149-S-59

BORING NO. _____

SHEET ____ OF ____

BRIDGEPORT RENTAL AND OIL SERVICES
ECOLOGY AND ENVIRONMENT
TIPPETTS-ABBETT-McCARTHY-STRATTON

FIELD LOG - SUBSURFACE EXPLORATION

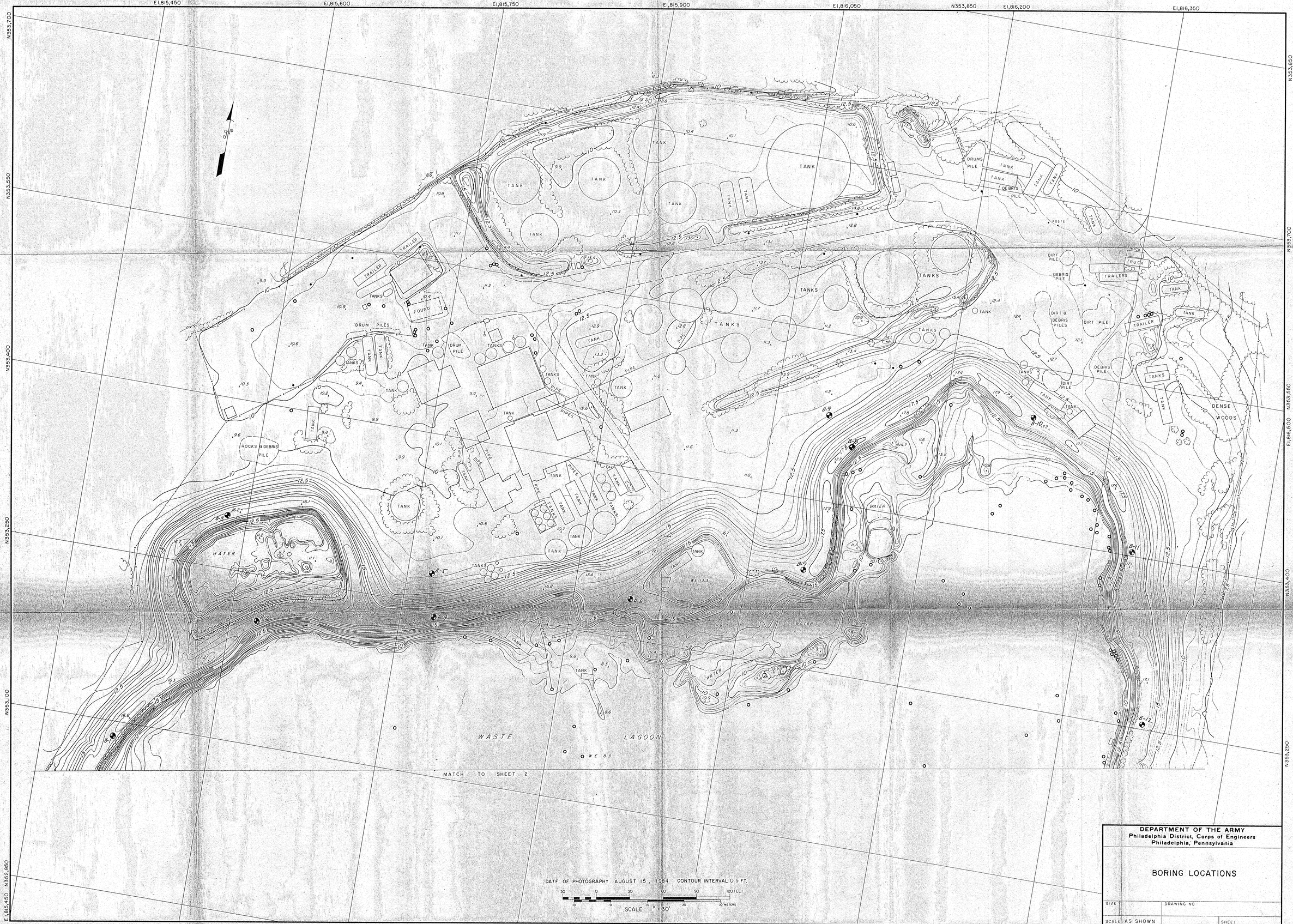
JOB NO. _____ JOB TITLE _____

LOCATION _____ COORDINATES _____

DRILL _____ ANGLE _____ REFERENCE ELEV _____ DATUM _____

DRILLING CONTRACTOR _____ DRILLER _____ INSPECTOR _____

DEPTH IN FEET (ELEVATION)	BLOWS ON SAMPLER FOR INCHES (% RECOVERY)	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	DATE AND TIME	DEPTH IN FEET		SAMPLE NO.	SAMPLE INT.	CHEMICAL ANALYSES			
								FROM	TO			OVA	HNu	pH	Cond.



DEPARTMENT OF THE ARMY
Philadelphia District, Corps of Engineers
Philadelphia, Pennsylvania

BORING LOCATIONS

SIZE	DRAWING NO
SCALE AS SHOWN	SHEET

SHEET 1 OF 2

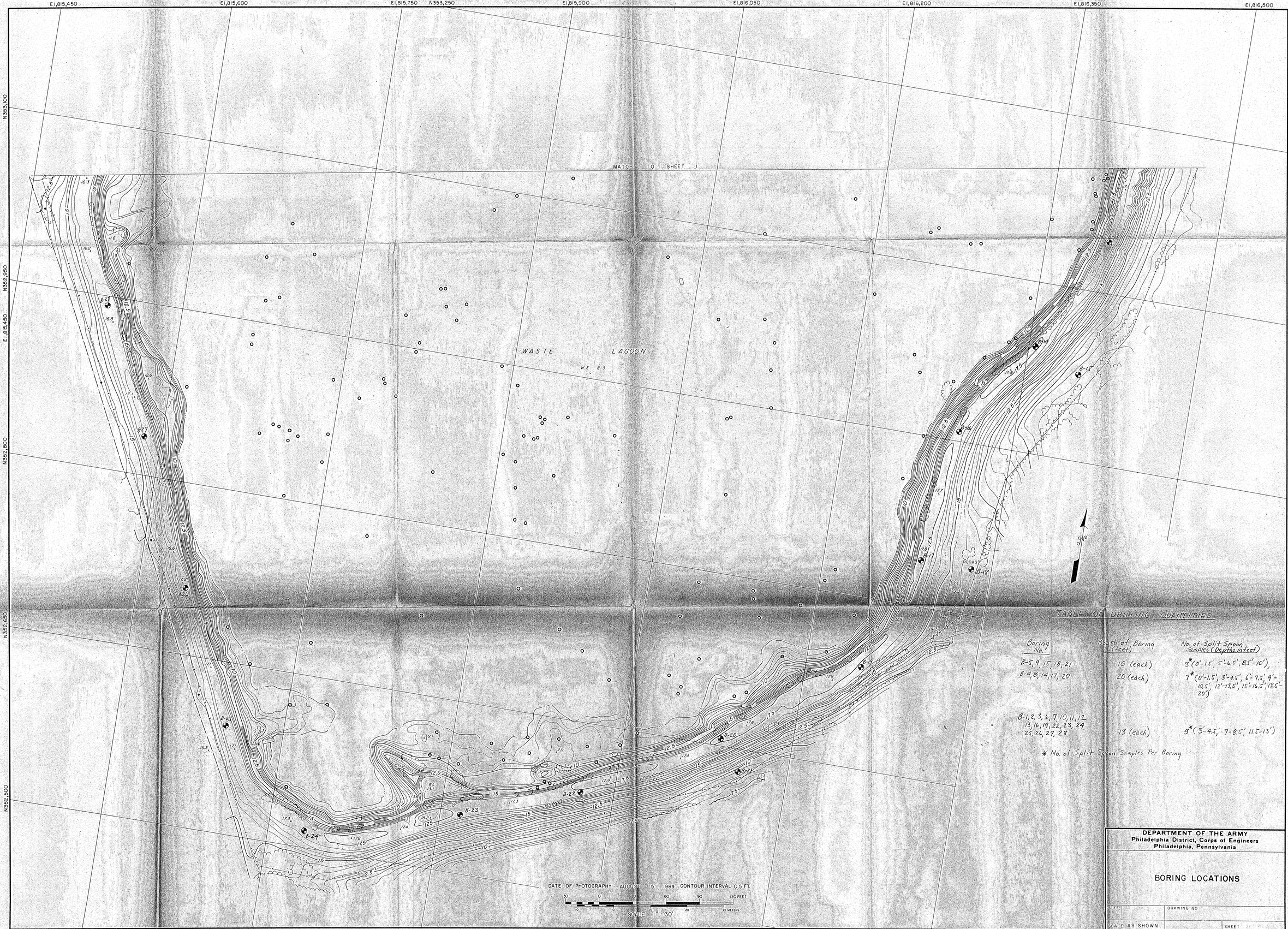


TABLE OF DRILLING QUANTITIES

Boring No.	Depth of Boring (feet)	No. of Split Spoon Samples (Depths in feet)
B-5, 9, 15, 18, 21	10 (each)	3* (0'-1.5', 5'-6.5', 8.5'-10')
B-4, 8, 14, 17, 20	20 (each)	7* (0'-1.5', 3'-4.5', 6'-7.5', 9'-10.5', 12'-13.5', 15'-16.5', 18.5-20')
B-1, 2, 3, 6, 7, 10, 11, 12, 13, 16, 19, 22, 23, 24, 25, 26, 27, 28	13 (each)	5* (3'-4.5', 7-8.5', 11.5-13')

* No. of Split Spoon Samples Per Boring

DEPARTMENT OF THE ARMY
Philadelphia District, Corps of Engineers
Philadelphia, Pennsylvania

BORING LOCATIONS

SIZE | DRAWING NO
SCALE AS SHOWN | SHEET 1

AERIAL DATA REDUCTION ASSOCIATES, INC.
PENNSAUKEN, N.J. FAIRFIELD, CT
RICHMOND, VA EAST PROVIDENCE, RI
ADR 9029-84