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FINAL WORK PLAN FOR FREE PRODUCT RECOVERY AT BUILDING R-12 NWS EARL NJ  
6/28/1999  
FOSTER WHEELER ENVIRONMENTAL CORPORATION

**FINAL**  
**DRAFT WORK PLAN**  
**FOR FREE PRODUCT RECOVERY AT BUILDING R-12**  
**NAVAL WEAPONS STATION - EARLE**  
**COLTS NECK, NEW JERSEY**

*Issued:*

June 28, 1999

*Prepared for:*

Naval Facilities Engineering Command  
10 Industrial Highway  
Lester, PA 19113

*Prepared by:*

Foster Wheeler Environmental Corporation  
2300 Lincoln Highway  
One Oxford Valley - Suite 200  
Langhorne, PA 19047 - 1829

REMEDIAL ACTION CONTRACT N62472-94-D-0398  
DELIVERY ORDER NO. 0051

<u>Revision</u>	<u>Date</u>	<u>Prepared By:</u>	<u>Approved By:</u>	<u>Pages Affected</u>
0	June 28, 1999	C. Joblon	M. Heffron, P.G. D. Walsh, P.G.	N/A

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Appendix B	Technical Specifications for the Product Recovery System
Appendix C	Manufacturer's Specifications for the Product Storage Shed

## **1.0 INTRODUCTION/PROJECT OBJECTIVES**

Foster Wheeler Environmental Corporation (Foster Wheeler Environmental) has been contracted by the Northern Division, Naval Facilities Engineering Command (Navy) to recover free product from the subsurface utilizing the existing recovery wells adjacent Building R-12, at the Naval Weapons Station (NWS) Earle located in Leonardo, NJ. This Work Plan is being submitted to satisfy the pre-construction submittal requirements included in paragraph 1.2.1, Pre- and Post-Construction Documentation of the Statement of Services for Delivery Order No. 0051 under Remedial Action Contract No. N62472-94-D-0398. The Health and Safety Plan previously submitted for the Bioslurper Remediation shall be used for this effort.

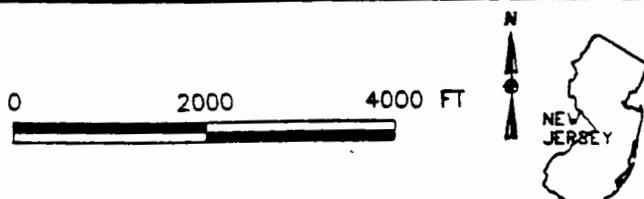
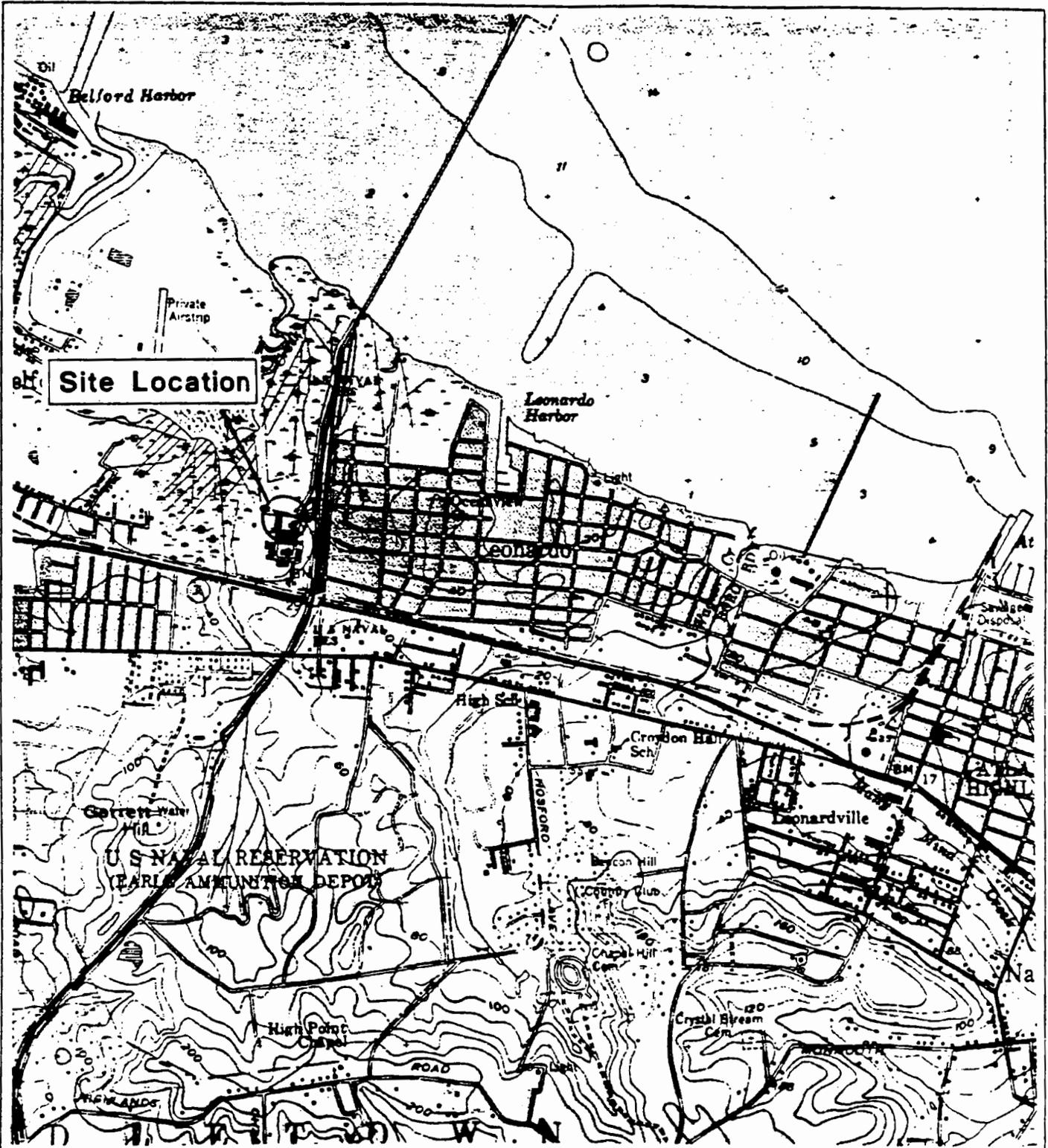
The project objective for the Product Recovery at Building R-12 is the collection and removal of recoverable free product by means of a sub-surface recovery system and the proper disposal of recovered product. The following tasks will be performed in order to meet this project objective: 1) Installation of a passive skimmer recovery system utilizing the three existing recovery wells; 2) Alternating the skimmer system between the wells; 3) System and product monitoring for the duration of operations; 4) Management of recovered product and coordination of off-site recycling/disposal; and, 5) Submittal of monthly and final summary reports. During the installation of the collection system, Foster Wheeler will also perform an inspection of the sub-grade rooms of Building R-12 for evidence of vapors or product.

## **2.0 PROJECT LOCATION AND DESCRIPTION**

Naval Weapons Station Earle (NWS-Earle) is located in Monmouth County in east-central New Jersey as presented on Figure 2-1, Site Location Map. The base consists of a Mainside area and a Water Front area occupying a total of approximately 11,134 acres. The Mainside of the base is located approximately 10 miles inland from the Atlantic Ocean. The Mainside and the Waterfront areas of the base are linked by a narrow tract of land that serves as a right-of-way for a government road and railroad line.

NWS Earle is responsible for furnishing ammunition to the Naval fleet, and coordinates all port services and logistical support for home-ported and visiting ships. The Base also conducts safety inspections, supervises ammunition loading for the United States Coast Guard, and provides marine fire fighting capability and standby tug services. The Waterfront consists of an ammunition depot, and associated piers for loading and servicing the naval fleet.

Building R-12 is located in the Waterfront area of NWS-Earle along Road R1 (Figure 2-2). The area of concern (AOC) is a small, grassy area located behind Building R-12, at the northeast corner of the building. The three monitoring wells that are to be incorporated into the product recovery system are located in close proximity to the building and each other. A communications tower is located nearby Building R-12. Refer to Figure 2-2 for a detailed map of the AOC at Building R-12.



Source: U.S.G.S. Topographic Maps (7.5 Minute)  
Sandy Hook, NJ Quadrangle

QUADRANGLE  
LOCATIDN

**NWS - Earle**  
Colts Neck, N.J.

Figure 2-1  
Building R-12

 **FOSTER WHEELER ENVIRONMENTAL CORPORATION**



The source of contamination and free product is believed from an underground storage tank (UST) near Building R-12 that has been abandoned in place.

## 2.1 PREVIOUS INVESTIGATIONS

A previous remedial investigation conducted by Tetra Tech NUS, Inc. (TtNUS) indicated that contamination and free product existed in the vicinity of the UST that was abandoned in place near Building R-12. The three recovery well locations were selected based on the free product plume delineated during the remedial investigation. A bail-down test conducted by TtNUS in February 1999, indicated that passive skimming is an acceptable and appropriate method for removing the free phase product from the area of concern. Results of the bail down test, and additional information used in selecting the remedial method, are included the TtNUS "Letter Report of Bail-down Test Results" (TtNUS Letter Report, 1999), in Appendix A of this Work Plan.

Additional information on the remedial investigation performed by TtNUS can be found in the following NJDEP approved reports:

- TtNUS, September 1998, Final Report-"Phase 1 Remedial Investigation Report for the Group 3 Underground Storage Tank Sites."
- TtNUS, November 1998, Final Report -"Remedial Action Work Plan and Classification Exception Area Documents for Buildings R6/7 and R-12."

## 2.2 SITE CONDITIONS

Local topography at Building R-12 is relatively flat, approximately 20 to 30 feet above sea level.

### 2.2.1 Site Geology

NWS-Earle is situated in the Coastal Plain Physiographic Province of New Jersey. The Coastal Plain consists of a series of seaward-dipping unconsolidated sediments of Cretaceous through Quaternary Age, deposited atop pre-Cretaceous bedrock. The Coastal Plain sediments were deposited in continental, coastal, and marine depositional environments, and consist of numerous sequences of sand and gravel, silt, and clay. These deposits generally strike northeast-southwest, and dip to the southeast at 10 to 60 feet per mile. The Coastal Plain section is nearly 900 feet thick beneath NWS-Earle.

Previous investigations that occurred at Building R-12 indicate that soils in that area are part of the Englishtown Formation. The Englishtown Formation consists of tan and gray, fine and medium-grained sand, with local clay beds. Site borings describe the soils as mainly silty, clayey fine-grained sand and silty fine-grained sand with some silty clay layers (TtNUS Letter Report, 1999).

## 2.2.2 Groundwater

Shallow groundwater at Building R-12 occurs at a depth of between 9 and 11 feet below ground surface.

## 2.2.3 Nature and Extent of Contamination

The product thickness, the volume, and extent of free product floating in top of the water table surface is detailed in the TtNUS Letter Report. To summarize, the product plume is estimated to be between 0.27 and 0.34 feet thick. The lateral extent of the product plume is estimated to cover an area of 560 square feet. The plume encompasses the three recovery wells installed by TtNUS and some area slightly to the northwest. (The general flow direction of local shallow groundwater is to the northwest.) According to the TtNUS Report, the volume of free product is estimated to be 471 gallons. According to the TtNUS Report, the maximum recoverable product is expected to be closer to 421 gallons.

The probable source for the sub-surface contamination is believed to be the UST that was abandoned in place, adjacent to Building R-12.

The recovery system will be designed to remediate the full extent of the recoverable product in the vicinity of Building R-12. Remediation will be accomplished by utilizing a passive skimmer system to collect the free product from the sub-surface.

## 3.0 SCOPE OF WORK

The scope of work detailing the management, installation, and operation of the product collection system is described below.

### 3.1 TASK 1 - PROJECT PLANNING/MANAGEMENT

Project Planning/Management activities include the preparation of pre-construction submittals, coordinating utility requirements, mobilization to the site, and providing home office support functions during the estimated period of performance. The sub-tasks involved in Project Planning/Management are described below.

#### 3.1.1 Sub-task 1A - Pre-Construction Submittals

Foster Wheeler Environmental will prepare and submit the following pre-construction documents to the Navy:

#### ***Work Plan***

The Work Plan presents Foster Wheeler Environmental's approach to executing the project, including the site description, statement of work, procurement approach, system information,

materials, engineering data, transportation and disposal data, and if required, sampling and analytical protocols.

### ***Health and Safety Plan (HASP)***

The HASP developed and approved for the Bioslurper Remediation will be used for the Product Recovery System Project. The HASP includes Foster Wheeler Environmental's approach to providing for the health and safety of its employees during the project.

#### **3.1.2 Sub-task 1B - Mobilization**

Mobilization will consist of shipping the necessary equipment, contacting appropriate Navy personnel at NWS Earle to arrange for contractor passes, and coordinating support requirements for installation of the skimmer system. A utility survey shall be conducted to locate all utility lines in the AOC. Utilities, primarily electric, shall be locked and tagged out, and/or terminated at the source. Subsurface utilities shall be located by NWS-Earle Public Works personnel.

#### **3.1.3 Sub-task 1C - Home Office Support**

Foster Wheeler Environmental's Langhorne, Pennsylvania office will provide home office support for the duration of the project. Home office support includes the preparation of the required monthly progress, financial, and technical reports.

### **3.2 TASK 2 - REPORT PREPARATION/SUBMISSION**

Foster Wheeler Environmental shall prepare a monthly summary report detailing the product recovery totals, and management and operation of the passive skimmer system. When operations have ceased and the project is complete, Foster Wheeler will submit a final report to close out the project.

### **3.3 TASK 3 – INSTALLATION AND OPERATION OF A PASSIVE PRODUCT RECOVERY SYSTEM**

This task requires the specification, procurement, installation, and operation of a passive product recovery system to collect free product from the subsurface. The system to be installed is the SkimRite™ Standard System consisting of the following components:

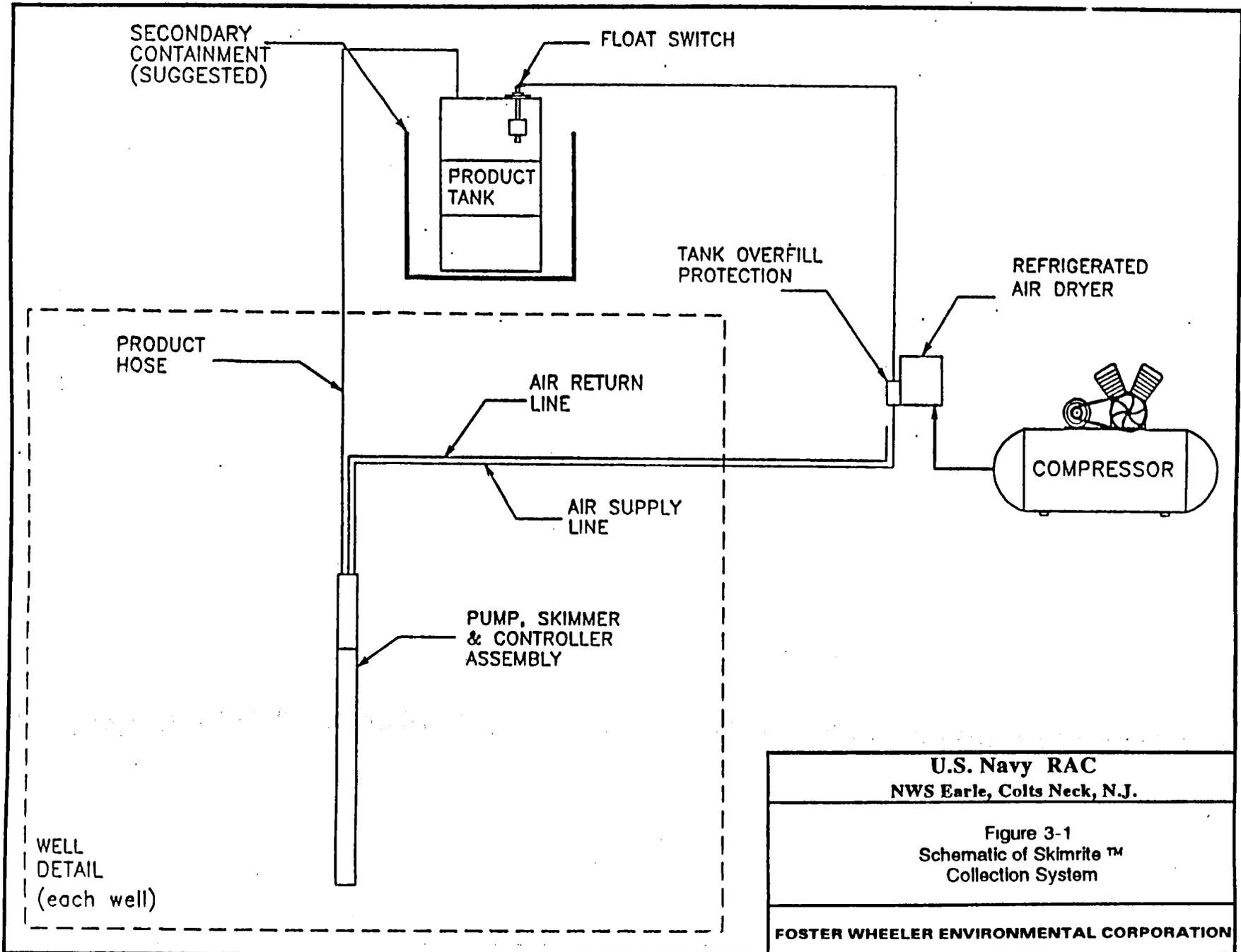
- SkimRite™ PSC (Pump, Skimmer, and Controller) unit
- 1.5 HP Air Compressor
- Air/Dryer/Filter with Product Tank Overfill Protection
- 150 ft. of 3/8 inch ID polyethylene discharge hose
- 150 ft. of 5/16 inch OD nylon air supply line
- 150 ft. of 3/8 inch OD nylon vent line
- 2 inch locking well cap

Figure 3-1 depicts the system components. The SkimRite™ free-product recovery system has been developed by Enviro Products, Inc. based in Lansing, Michigan. The technical specifications for this system are presented in Appendix B of this Work Plan. The system incorporates a pump, skimmer, and controller into a single downhole tool measuring 1.75 inches in diameter and 66 inches in length. The downhole assembly is suspended in the well via product and air-supply tubing connected to a locking well cap. A floating hydrophobic skimmer buoy in the downhole tool removes hydrocarbon product to a sheen, while accommodating water level fluctuations up to a total range of 24 inches. A 1.5 HP compressor, with a 3.8 gallon air tank, is used to operate the system at a rate of approximately 5 gallons/hour. The actual rate of product recovery is dependent upon product thickness, viscosity, and recharge rate into the well.

Recovered product is discharged through a 3/8 inch polyethylene hose connecting the SkimRite™ tool to an above ground drum. An intrinsically-safe tank overfill protection device (float switch assembly) is used to monitor the product level within the drum. When the float switch senses the product level to be 8 inches below the top of the drum, the system is shutdown. A schematic of the system is presented in Figure 3-1.

Installation of the SkimRite™ system at Wells R12-RC-01, R12-RC-02, and R12-RC-03 will involve the following steps:

- Using an oil/water interface probe, measure the depth to LNAPL product prior to placing the SkimRite™ system in each well.
- Feed a length of 3/8 inch ID polyethylene hose, 5/16 inch OD nylon air supply line, and 3/8 inch nylon air vent line (equivalent to the measured depth to water/product less 30inches), through the locking well cap. This will ensure the downhole probe and skimming buoy is centered at the product/air interface.
- Connect the product line and air lines to the downhole probe using stainless steel hose clamps.
- Lower the SkimRite™ tool down the well and position the locking well cap on the wellhead.
- Position the air compressor and controller box/regulator adjacent to Building R-12. The compressor and controller/box regulator will be housed within a prefabricated 4 ft. x 2 ft. x 2 ft. painted steel outdoor enclosure, manufactured and supplied by Enviro Products, Inc. A 120 VAC, 30 amp, single-phase electrical line from Building R-12 will supply power to the air compressor. The electrical service connection will be provided by a Foster Wheeler licensed electrician. Since the compressor will be located more than 25 ft. from the wellhead and collection vessel, NFPA and NEC do not require that the compressor be explosion-proof.



U.S. Navy RAC  
NWS Earle, Colts Neck, N.J.

Figure 3-1  
Schematic of Skimrite™  
Collection System

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- Connect the air supply and vent lines to the controller box/regulator, as per Enviro Products instructions. The air supply vent line and overflow signal wire will be enclosed in a polyethylene hose run between the wellhead and compressor. Feed the product recovery hose from the well-head into the storage shed, through the side of the product storage shed. Connect the product line to the product recovery drum. Leave at least 5 ft. of slack line to allow for subsequent downhole depth adjustments, as needed.
- Connect a short section of 3/8 inch OD nylon vent line to the air dryer (controller/regulator box) to drain moisture from the system.
- Connect the air supply line from the compressor to the controller box/regulator. The prefabricated outdoor enclosure supplied by Enviro Products will be equipped with an air-activated valve that is used to drain condensate from the compressor holding tank. The valve operates from the bleed air on the compressor and therefore does not require electric power.
- Install the overfill protection float switch to the product recovery tank/drum and wire to the controller box. The float switch shall mount in a 2 inch bung opening on the top of the product recovery tank/drum.
- Plug the air compressor power cord into the power supply and start the compressor. Follow Enviro Product instructions regarding oil-fill levels and pressure-relief settings for compressor operation.

Foster Wheeler anticipates that recovered product will be collected in a 55-gallon drum which will be placed inside a product storage shed. The shed will be equipped with spill containment protection. Appendix C provides the manufacturer's specifications for the product storage shed. Additional empty/replacement drums will be staged on-site as necessary.

The system will operate continuously for 16 months. The pump will be moved between wells during this period. During the first week, Foster Wheeler personnel will check the system on a daily basis to verify operation and measure the amount of free product in the drum. Following initial start-up, the system will be checked once every two weeks to ensure optimal 24-hour operation, and to exchange/replace the storage drum upon filling to capacity.

At the conclusion of the 16-month operation period, the system components will be disassembled, decontaminated and placed in storage. The hoses will be disposed of as petroleum contaminated materials.

### 3.4 TASK 4 – PRODUCT MEASUREMENT/SYSTEM MAINTENANCE

The following tasks shall be performed once a day during the first week of operation, and then once every two weeks:

- Check the product level inside the 55 gallon product accumulation drum.
- Check the oil level in the air compressor to ensure proper lubrication of the unit, and re-fill/top-off, as needed.
- Check the air supply and product lines to ensure there is no kinking or damage to the lines.
- Use an interface probe to obtain depth to product and depth to water data from the recovery wells. The water/product level in each well will be measured to ensure the down-hole SkimRite™ tool is centered at the water/product air-interface. Water table fluctuations of plus or minus one foot (two feet total range) can be accommodated without repositioning the SkimRite™ tool.
- The SkimRite™ tool shall be alternated between each well on a monthly basis.

Operation and maintenance activities will be documented in the monthly project report.

### 3.5 TASK 5 – INSPECTION OF BUILDING R-12

The sub-grade rooms in Building R-12 shall be checked for evidence of free-product during the initial installation of the skimmer system. The floor drains and sumps shall be visually inspected for evidence of free-product infiltration (seepage). A FID organic vapor detector and an Lower Explosive Limit (LEL) meter shall be used to monitor the sub-grade rooms in Building R-12 to ensure that there are no harmful organic vapors or explosive conditions within the building. This monitoring will only be conducted during the initial installation of the system.

## 4.0 FIELD SAMPLING AND ANALYSIS PLAN

### 4.1 INTRODUCTION

Foster Wheeler Environmental Corporation (FWENC) is submitting this Sampling and Analysis Plan (SAP) for waste characterization of the recovered oil at the Naval Weapons Station (NWS) Earle Waterfront located in Leonardo, NJ. The analytical results will be used to properly recycle the recovered waste oil. This work is being performed under Delivery Order No. 0034 to Navy Contract N62472-94-D-0398

The SAP presents the procedures to be followed during product sampling. The SAP specifically addresses the following areas:

- Analytical Requirements
- Responsibilities of Site Personnel
- Sample Analytical Program
- Sample Packing and Shipping

- Documentation
- Field Sampling Program
- Quality Assurance/Quality Control
- Procedures for Field Changes and Corrective Actions

Site-specific Standard Operating Procedures have been included (Section 3.0) to describe the sampling procedures. Any modifications necessary to these SOPs due to field conditions or other unforeseen situations shall be recorded in the site logbook, documented on the appropriate Change Request Forms (CRF) by site personnel, and approved by the Senior Project Engineer/Manager (See Section 8.5).

#### 4.2 PERSONNEL RESPONSIBILITIES

The project team will include the following personnel:

The Senior Project Engineer/Manager (SPEM) has final responsibility for the development of the SAP and management of the project team.

The Project Superintendent (PS) is responsible for assuring that proper collection, packaging, preservation, and shipping of samples is performed in accordance with the SAP. In addition, the PS is responsible for coordinating with the subcontracted laboratory during sample analysis and for reviewing the analytical data received from the laboratory.

The Site Health and Safety Officer (SHSO) is responsible for the safety of all site personnel as detailed in the site-specific Health and Safety Plan (HASP), presented under separate cover.

The Laboratory Subcontractor is responsible for supplying all services, equipment, and material required to perform the analysis of the environmental samples. The laboratory subcontractors are responsible for following all specified methodology protocols, including quality assurance/quality control (QA/QC) requirements. In addition, the laboratory subcontractors are responsible for the proper disposal, including all associated costs, of the environmental samples upon completion of the analytical work.

#### 4.3 FIELD SAMPLING ACTIVITIES

This section addresses the field investigation activities, including:

- Sample Tracking System
- Sample Analytical Requirements
- Sample Packaging and Shipping
- Sample Documentation

#### 4.3.1 Sample Tracking System

The objective of the sample identification system is to provide a framework for developing sample numbers that are unique to that sample and convey information regarding sample type that will enable data users to easily identify sample locations.

The first two number of the sample tracking system shall refer to this site specific location, which in this case is Building R-12. All soil sample identifiers shall begin with the letter and number R-12. For example R-12WC01 would refer to Building 12 waste characterization sample one. A "D" would be added to the sample nomenclature to indicate a duplicate sample. For the purposes of this sampling effort, the following characters shall be assigned to identify the various matrices:

WC = Waste characterization

A cumulative sampling master log will be maintained as the field program progresses. The samples taken will be referenced to each sampling location in the site logbook.

All location information for the samples will be recorded in the field sampling logbook (Section 8.6.1).

#### 4.3.2 Sample Analytical Requirements

Table 4-1 specifies location, number of samples, matrix, laboratory analyses, and rationale for each sample type.

**TABLE 4-1  
NAVAL WEAPONS STATION-EARLE  
DELIVERY ORDER 0051  
SAMPLING AND ANALYSIS REQUIREMENTS**

<i>Media</i>	<i>Analyses</i>	<i>Frequency</i>	<i>Quantity</i>	<i>Method</i>	<i>Rationale</i>
Oil	BTU, Flash-point	One initial sample.	1	Ign: SW-846 Method 1020	Characterization of oil for recycling
Oil	Total Organic Halogens, PCBs, and suspended solids	One initial sample.	1	TOX: SW846 Method 3540A/9020A PCBs-SW846, 8080	Characterization of oil for recycling.

\* Quantities includes duplicate quality assurance samples

If necessary, preservatives will be added to the sample bottleware by the subcontracted laboratory prior to shipment to the site. These reagents should be reagent (AR) grade and should be diluted to the required concentration with double-distilled, deionized water.

#### 4.3.3 Sample Packaging and Shipping

The objective of the sample packaging and shipping requirements are to maintain sample integrity from the time a sample is collected until it is received at the analytical laboratory. Chain-of-Custody (COC) forms, sample labels, custody seals, and other sample documents will be completed to maintain sample integrity. Specific procedures for packaging and shipping of environmental samples are presented below. These procedures were obtained from the NJDEP Field Sampling Procedures Manual.

##### 4.3.3.1 *Environmental Samples*

Low-concentration samples will meet the volume limits for the limited quantity packaging exceptions under 49CFR173 and should be packaged for shipment as follows:

1. A sample label is attached to the sample bottle. The label should be taped over with clear packing tape to preserve legibility.
2. A picnic cooler (such as a Coleman or other sturdy cooler) is typically used as a shipping container. In preparation for shipping samples, the drain plug is taped shut from the inside and outside, and a large plastic bag is used as a liner for the cooler. Approximately 1 inch of packing material, such as asbestos-free vermiculite, perlite, or styrofoam beads, is placed in the bottom of the liner. The cooler containing methanol-preserved volatile soil samples must have the following markings on the cooler: Limited Quantity, This End Up. Each sample shall not contain more than one (1) liter of methanol or one (1) gallon of fuming acid, and the total weight of the cooler and packaging materials must not exceed 64 pounds.
3. The sample bottles are placed in the lined picnic cooler. Cardboard separators, and/or additional packing material, should be placed between the bottles to prevent breakage during shipping.
4. Aqueous samples for low or medium-level analysis must be shipped cooled to 4°C with ice. No ice is used in shipping high-level aqueous samples, or soil samples, or dioxin samples.
5. The lined cooler is filled with packing material (such as asbestos-free vermiculite, perlite, or styrofoam beads), and the large inner liner is taped shut. Sufficient packing materials should be used to prevent sample containers from making contact during shipment.
6. The paperwork being shipped to the laboratory is placed inside a plastic bag. The base is sealed and taped to the inside of the cooler lid. A copy of the COC form should be included

in the paperwork sent to the laboratory. The last block on the COC form should indicate the overnight carrier and airbill number. The airbill must be filled out before the samples are handed over to the carrier. The laboratory should be notified if the shipper suspects that the sample contains any substance for which the laboratory personnel should take safety precautions.

7. The cooler is taped shut with strapping tape (filament-type).
8. At least two signed custody seals are placed on the cooler, one on the front and one on the back.
9. The name and address of the shipper and consignee are placed on the exterior of the container in addition to the shipping papers. Commercial address labels may be used.
  - The DOT Proper Shipping Names and UN# are placed on the outside of the cooler:  
For methanol preserved samples: Methanol, PG II, UN1230, or  
Flammable Liquid, NOS (Methanol),  
PG II, UN1230
  - The words "Limited Quantity" are written on the cooler adjacent to the Proper Shipping Name and UN#. A DOT Hazard Class Label is not required for limited quantity samples.
  - Markings indicating "This End Up" with upward pointing arrows are placed on two (2) sides of the container. Commercially printed labels shall be used
10. The cooler is handed over to the overnight carrier (or lab courier). A Dangerous Goods airbill is necessary for shipping environmental samples if preserved with methanol or acid. A standard airbill can be used to ship the samples if there are no preservatives.
11. Arrow symbols indicating "This Way Up" should be placed on the cooler in addition to the marking and labels described above.
12. Restricted-article/Dangerous Goods airbills are used for shipment indicating the following:
  - Number of packages or number of coolers.
  - Proper shipping name and packaging group. If unknown, use FLAMMABLE SOLID, N.O.S. or FLAMMABLE LIQUID, N.O.S.
  - Hazard Class; if unknown, use flammable solid or flammable liquid.
  - Words "Limited Quantity" if inner containers meet the volume limits for limited quantities under 49CFR173.
  - Identification number; if unknown, use UN1325 (for flammable solids) or UN1993 (for flammable liquids).
  - Net quantity per package or amount of substance in each cooler.

- Radioactive materials section (leave blank).
- Passenger or cargo aircraft (cross off the non-applicable). Up to 25 pounds of flammable solid per cooler can be shipped on a passenger or cargo aircraft. Up to 1 quart of flammable liquid per cooler can be shipped on a passenger aircraft, and up to 10 gallons of flammable liquids per cooler can be shipped on a cargo aircraft. Use Hazardous Materials Table (49CFR172.101) column (9) to verify quantity restrictions for other Proper Shipping Names.
- Name and title of shipper (printed).
- An emergency telephone number at which the shipper can be reached within 24-48 hours.
- Emergency Response Guide Number
- Shipper's signature.

NOTE: The penalties for improper shipment of hazardous materials are severe. A fine of \$25,000 and five years imprisonment can be imposed for each violation.

#### 4.3.3.2 *Hazardous Samples*

Medium- and high-concentration samples are defined as hazardous and must be packaged as follows:

1. A sample label is attached to the sample bottle. The label should be taped over with clear packaging tape to preserve legibility.
2. Each sample bottle is placed in a plastic bag, and the bag is sealed. For medium-concentration water samples, each VOA vial is wrapped in a paper towel, and the two vials are placed in one bag. As much air as possible is squeezed from the bags before sealing.
3. Each bottle is placed in a separate paint can, the paint can is filled with vermiculite, and the lid is fixed to the can. The lid must be sealed with metal clips, or with filament or evidence tape; if clips are used, the manufacturer normally recommend six clips.
4. Arrows are placed on the can to indicate which end is up.
5. The outside of each can must contain the proper DOT shipping name and identification number for the sample. The information may be placed on stickers or printed legibly. If the nature of the sample is known, 49 CFR 171-177 is consulted to determine the proper labeling and packaging requirements. A liquid sample of an uncertain nature is shipped as a flammable liquid with shipping name "FLAMMABLE LIQUID, N.O.S." and the identification number "UN1993." A solid sample of uncertain nature is shipped as a flammable solid with the shipping name "FLAMMABLE SOLID, N.O.S." and the identification number "UN1325."

6. The cans are placed upright in a cooler lined with a plastic garbage-type bag, with the drain plug taped shut inside and out. Asbestos-free vermiculite, perlite, or styrofoam is placed in the bottom of the cooler. Two sizes of paint cans are used: half-gallon and gallon. The half-gallon paint cans may be stored on top of each other; however, one-gallon cans are too high to stack. The cooler is filled with packing material and the plastic liner is taped shut.
7. The paperwork going to the laboratory is placed inside a sealable plastic bag and taped to the inside of the cooler lid. A copy of the COC form must be included in the paperwork sent to the laboratory. The sampler keeps one copy of the COC form. The laboratory should be notified if the sample is suspected of containing any substance for which laboratory personnel should take safety precautions.
8. The cooler is closed and sealed with strapping tape. At least two custody seals are placed on the outside of the cooler (one on the front and one on the back).
9. The following markings are placed on top of the cooler:
  - Proper shipping name (49 CFR 172.301)
  - DOT identification number (49 CFR 172.301)
  - Shipper's or consignee's name and address (49 CFR 172.306)
  - "This End Up", with upward pointing arrows, legibly written if shipment contains liquid hazardous materials (49 CFR 172.312). Commercial labels shall be used.
10. The following labels are required on top of the cooler (49 CFR 172.406e):
  - Appropriate hazard class label (placed next to the proper shipping name)
  - "Cargo Aircraft Only" (if applicable as identified in 49 CFR 172.101)
11. Arrow symbols indicating "This Way Up" should be placed on the cooler in addition to the marking and labels described above.
12. Restricted-article/Dangerous Goods airbills are used for shipment indicating the following:
  - Number of packages or number of coolers.
  - Proper shipping name and packaging group. If unknown, use FLAMMABLE SOLID, N.O.S. or FLAMMABLE LIQUID, N.O.S.
  - Hazard Class; if unknown, use flammable solid or flammable liquid.
  - Words "Limited Quantity" if inner containers meet the volume limits for limited quantities under 49CFR173.

- Identification number; if unknown, use UN1325 (for flammable solids) or UN1993 (for flammable liquids).
- Net quantity per package or amount of substance in each cooler.
- Radioactive materials section (leave blank).
- Passenger or cargo aircraft (cross off the nonapplicable). Up to 25 pounds of flammable solid per cooler can be shipped on a passenger or cargo aircraft. Up to 1 quart of flammable liquid per cooler can be shipped on a passenger aircraft, and up to 10 gallons of flammable liquids per cooler can be shipped on a cargo aircraft). Use Hazardous Materials Table (49CFR172.101) column (9) to verify quantity restrictions for other Proper Shipping Names.
- Name and title of shipper (printed).
- An emergency telephone number at which the shipper can be reached within 24-48 hours.
- Emergency Response Guide Number
- Shipper's signature.

NOTE: The penalties for improper shipment of hazardous materials are severe. A fine of \$25,000 and five years imprisonment can be imposed for each violation.

#### 4.3.4 Sample Documentation

The following documentation is associated with sample collection and transfer:

- Field Logbooks
- Site Logbooks
- Master Sample Log
- Sample Label
- Chain-of-Custody Form
- Custody Seals
- Shipping Airbill.

### 5.0 HEALTH AND SAFETY REQUIREMENTS

The approved Health and Safety Plan (HASP) for the Bioslurper Systems shall be used for the Building R-12 Remedial Action. The Bioslurper remedial action involved the temporary installation and operation of an identical skimmer system prior to the start-up of the Bioslurper system. As required by paragraph 1.2.1, Pre- and Post-Construction documentation, the HASP includes organizational information, a potential hazards assessment, protective equipment requirements, air monitoring, site controls and protective zones, medical surveillance procedures, emergency response and spill control measures, and training requirements.

## **6.0 WASTE REMOVAL/REGULATORY COMPLIANCE**

This section addresses how the waste oil generated during the skimming operation will be handled on site and recycled off site. All wastes generated by these activities will be recycled/disposed based on the laboratory analyses of the oil. The oil is anticipated to be non-hazardous.

### **6.1 RECOVERED PRODUCT**

Foster Wheeler anticipates that recovered product will be collected in 55-gallon drums which will be placed inside a product storage shed. Upon significant accumulation of oil in a drum, an oil recycling subcontractor shall come to the site to pump out the oil for off-site recycling.

Samples will be collected from the recovered product for waste classification. The samples will be submitted to an off-site laboratory for analysis for BTU content, flash point, PCBs, total organic halogens, and suspended solids.

### **6.2 MANIFESTS/SHIPPING PAPERS**

Foster Wheeler Environmental shall provide completed Non-Hazardous Waste Manifests and/or Bills of Lading and transport documentation to the Navy for review and signature.

### **6.3 WASTE TRANSPORT AND DISPOSAL**

Foster Wheeler Environmental shall subcontract for waste transport and recycling/disposal services. The T&D subcontractor shall be competitively procured from firms with which Foster Wheeler Environmental has pre-placed Basic Ordering Agreements. This assures the Navy that solid and/or hazardous wastes will be sent to an EPA/NJDEP-approved facility. All disposal facility transporters for both hazardous and solid waste, to be used for disposal of the Navy's wastes, will be evaluated for regulatory compliance and approved for use in accordance with Foster Wheeler Corporation Regulatory Compliance Procedures. Approved facilities and transporters will be submitted to the Navy for final approval.

### **6.4 HAZARDOUS WASTE MANAGEMENT**

RCRA regulated hazardous wastes, if present, will be placed into appropriate DOT approved containers for disposal. FWENC will prepare Waste Profiles, Hazardous Waste Manifests, LDR Notification Forms and other shipping documentation for Navy review and signature prior to off-site disposal. Copies of TSDf signed manifests and all disposal documentation documents will be forwarded to the Navy.

If on-site storage of hazardous wastes is required, the proposed hazardous waste storage area will meet generator requirements for less than 90 day storage of hazardous waste as per 40 CFR 262.34:

- All stored hazardous wastes will be removed from the project site for off-site disposal within 90 days of first being accumulated.
- Each container will be marked with the date on which the accumulation period begins.
- All hazardous waste storage areas will be marked with signs stating "Hazardous Waste."
- For waste containers containing free liquids, the container storage areas will have a containment system capable of collecting and holding spills, leaks and precipitation. The containment system shall have an impervious base underlying the containers which is free of leaks, gaps or cracks. The capacity will be sufficient to contain the entire volume of the largest container or 10% of the entire volume of all of the containers whichever is largest. Run on into the containment system will be prevented. Spilled or leaked waste and accumulated precipitation will be removed from the containment system in as timely a manner as necessary to prevent overflow of the containment system.
- For waste containers which do not contain free liquids, a secondary containment system will not be provided, however the storage area will be designed and operated to drain and remove liquid resulting from precipitation or the containers will be elevated and removed from contact with accumulated precipitation.
- Containers holding reactive or ignitable waste will be stored at least 50 feet (15 meters) from the property line.
- Each container of hazardous waste will be marked and labeled in accordance with US DOT requirements under 40 CFR 172.
- Hazardous Waste Containers will meet US DOT requirements under 40 CFR Parts 173, 178, and 179.
- Each container of hazardous waste of 110 gallons or less will be marked in accordance with US DOT requirements under 49 CFR 172.304 with the following:

HAZARDOUS WASTE-FEDERAL LAW PROHIBITS IMPROPER DISPOSAL. If found contact the nearest police or public safety authority or the Environmental Protection Agency.

Generator name and Address \_\_\_\_\_

Manifest Document Number \_\_\_\_\_

- Waste will be placed in containers in good condition. If container begins to leak, the contents will be transferred from the defective container into a good container.
- The containers used will be made of, or lined, with a material that does not react with and is compatible with the waste.

Act ID	Description	Orig Dur	Rem Dur	Early Start	Early Finish	1999											
						JU	JUL	AUG	SEP	OCT	NOV	DEC					
1000	Submit Draft Work Plan	1d	0	29JUN99 A	29JUN99 A	▲ Submit Draft Work Plan											
1040	Navy Review of Work Plan	1d	0	30JUN99 A	30JUL99 A	▲ Navy Review of Work Plan											
1050	Respond to Comments and Submit Final	1d	0	30JUL99 A	06AUG99 A	▲ Respond to Comments and Submit Final WP											
1070	Install Skimmer Pump	1d	0	09AUG99 A	10AUG99 A	▲ Install Skimmer Pump											
1080	Test Run the System	1d	0	19AUG99 A	26AUG99 A	▲ Test Run the System											
1180	Operate and Maintain the System	1d	0	26AUG99 A	31MAR00 A	▲											
1190	Submit Final Report	1d	0	31MAR00 A	31MAR00 A	▲											

- ▲ Early start point
- ▼ Early finish point
- Early bar
- ▼ Late finish point
- Total float bar
- Progress bar
- Critical bar
- Summary bar
- ▲ Progress point
- ▲ Critical point
- ◻ Summary point
- ◆ Start milestone point
- ◆ Finish milestone point

**FIGURE 7-1**  
**NWS-EARLE**  
**BUILDING R-12**  
**SCHEDULE OF ACTIVITIES**

Date	Revision	Checked	Approved
28JUN99	0	M.H.	

- Define and discuss the problem or deficiency
- Review alternative solutions, including their effects on schedule and budget
- Implement plan to resolve the problem or deficiency

### 8.3 SUBMITTALS

The Quality Control Manager is responsible for maintaining the submittal register and reviewing and certifying that submittals are in compliance with the contract requirements. All submittals will be accompanied by a transmittal form, which will identify the submittal and provide a unique tracking number.

### 8.4 TESTS AND INSPECTIONS

Foster Wheeler Environmental will perform preparatory, initial, and follow-up inspections.

### 8.5 CHANGES

If circumstances develop during the project which make it necessary or advisable to revise the Work Plan in order to accomplish project objectives, a Change Request Form (CRF) will be forwarded to the Navy for approval. Events such as a change in the site conditions or system performance may result in a CRF. Changes may be discussed with the Navy Design Manager telephonically and followed up with a CRF to avoid negative impacts on the project budget. A typical CRF used to document field changes is provided as Figure 8-1.

### 8.6 DOCUMENTATION

Documentation of operations, record keeping, photographic evidence of work performed, and any engineering or analytical results will be provided to the Navy in the Closure Report for the excavation, disposal, and site restoration activities.

#### 8.6.1 Operations Record keeping

All field inspection and testing activities will be documented in a project logbook. The project logbook will be maintained in accordance with the relevant Foster Wheeler Guidelines. The Project Manager will maintain records of quality control operations and activities for subcontractors and suppliers.

#### 8.6.2 Photographic Documentation

Still 35mm color photographs will be taken as needed to record work progress. At a minimum, photographs will be taken of the existing conditions before work begins, and during the excavation, backfilling, and site restoration activities. Photograph location, date and description of the activity recorded will be entered in a photo documentation log. The photographs and log will be submitted with the Closure Report.

## **Appendix A**

**TtNUS “Letter Report of Bail-down Test Results”, 1999**



**TETRA TECH NUS, INC.**

600 Clark Avenue, Suite 3 ■ King of Prussia, PA 19406-1433  
(610) 491-9688 ■ FAX (610) 491-9645 ■ www.tetrattech.com

C-51-2-9-42

February 25, 1999

Mr. Brian Helland, Code 1812  
Senior Environmental Engineer  
Northern Division  
Naval Facilities Engineering Command  
10 Industrial Highway Mail Stop 82  
Lester, Pennsylvania 19113

Reference: Contract No. N62472-90-D-1298 (CLEAN)  
Contract Task Order No. 206

Subject: Letter Report of Results  
Building R-12 Bail-down Test  
NWS Earle - Colts Neck, New Jersey

Dear Mr. Helland:

Tetra Tech NUS (TtNUS) is pleased to provide this letter report of results for the bail-down test conducted at Building R-12, at the Naval Weapons Station Earle. You will note that we performed the work between February 10 and February 15, 1999.

**Background Information:**

TtNUS installed 3 recovery wells, R12-RC-01, R12-RC-02, and R12-RC-03, in early June, 1998. The well locations were selected based on the results of a remedial investigations performed by TtNUS that delineated the extent of contamination and free-phase product within the immediate vicinity of the abandoned-in-place UST at the northeast side of Building R-12. Refer to Figure 1 in Attachment A, for the well locations, and a summary of the results for soil and groundwater samples from the previous investigations. Refer to Figures 2, 3, and 4 in Attachment A for copies of the well construction diagrams.

Previous investigations have indicated that the abandoned UST at Building R-12 lies in Cretaceous sediments of the Englishtown Formation, which consists of tan and gray, fine- to medium-grained sand with local clay beds. Site borings describe the soils as mainly silty, clayey fine-grained sand and silty fine-grained sand with some silty clay layers. The depth to groundwater in the UST vicinity was 9 to 11 feet below grade. Additional details regarding the remedial investigations are included in the following New Jersey Department of Environmental Protection (NJDEP)-approved reports:

- TtNUS, September 1998, Final Report – "Phase I Remedial Investigation Report for the Group 3 Underground Storage Tank Sites."
- TtNUS, November 1998 Final Report – "Remedial Action Work Plan and Classification Exception Area Documents for Buildings R-6/7 and R-12."

**Bail-down Test Summary:**

The purpose of the bail-down test was to characterize the product recovery rate in the recovery wells and to estimate the true product thickness in the formation around the UST. This information can be used to make conclusions and recommendations regarding further testing (e.g., pilot tests, bailing) and the selection of appropriate product removal methods.

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 Mr. Brian Helland  
 Naval Facilities Engineering Command  
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The bail-down test was initiated on February 10, 1999. Pre bail-down product and groundwater levels were recorded at each well. Available free product was then extracted from each well with a peristaltic pump. Immediately following extraction, product and groundwater levels were recorded at increasing time intervals over a 123-hour period.

During the first 5 hours after the initial bail-down, product and groundwater level measurements were recorded in the 3 recovery wells at increasing minute and hourly intervals. Figure 5 in Attachment A presents a plot of the free product recovery data for this period. Table 1 in Attachment B identifies product and groundwater level measurements recorded during the initial 5-hour recovery period. Two additional product and groundwater level measurement events were conducted approximately 21-hours and 123-hours respectively, after the initial bail-down. Table 2 in Attachment B identifies and compares key measurements throughout the duration of the test.

Weather conditions during the bail-down and measurement events were dry and cold, with temperatures ranging between the 30°F and 50°F. Note that all product, groundwater, and decontamination liquids were containerized at the site and delivered to the bilge-water oil-water separator for final disposal. It should also be noted that based on the well construction diagrams, the depth to product in all three recovery wells was at least four feet below the elevation of the top of the well screen.

The following table summarizes the observed free product recoveries at each well and provides an estimated daily recovery rate for the noted time intervals following the bail-down:

Measurement Event	Product Thickness (ft.)	% Recovery (of static thickness)	Estimated Daily Recovery Rate(gal/day)
(Pre-bail-down)			
RC-01	1.1	N/A	N/A
RC-02	1.97	N/A	N/A
RC-03	2.38	N/A	N/A
RC-01 (+5 hours)	0.26	24	0.82
RC-02 (+4 hours)	0.43	22	1.7
RC-03 (+3 hours)	0.43	18	2.2
RC-01 (+21 hours)	0.36	33	0.26
RC-02 (+20 hours)	0.53	27	0.41
RC-03 (+19 hours)	0.52	22	0.43
RC-01 (+123 hours)	0.8	73	0.1
RC-02 (+122 hours)	0.68	36	0.09
RC-03 (+121 hours)	0.63	26	0.08

The EPA (1996) suggests that the daily recovery rate applicable to skimming type recovery systems can be estimated from the time it takes to achieve 80 percent of the maximum recovered thickness (following bail down). For wells RC-01 and RC-02 approximately 80 percent of the maximum recovered thickness (e.g., 0.53 ft of 0.68 ft for well RC-02) occurred at about 20 hours after bailing. Therefore, expected recovery rates for RC-01 and RC-02 are about 0.4 gallons per day as shown in the above table. For RC-01 the 80 percent recovery level occurred between 21 and 123 hours after bailing and a skimming recovery rate between 0.26 to 0.1 gallons per day is expected.

#### Product Thickness in the Formation:

The product bail-down test data were used to estimate the true thickness of the mobile hydrocarbon layer in the formation based on the methods of Hughes, et al (1988). Using this method the thickness of the mobile free product in the formation is graphically determined as the distance between the point of the initial product recovery rate change and the static depth to the top of the hydrocarbon layer prior to bailing (see Figures 6,

7, and 8 in Attachment A). The Hughes method test results estimate true product thicknesses of 0.27 ft., 0.34 ft., and 0.29 ft., at wells RC-01, RC-02, and RC-03, respectively.

#### **Aeral Extent of Free Product Plume:**

The estimated areal extent of free product floating on top of the water table surface is outlined on Figure 1 in Attachment A. The lateral limits of the product plume were interpolated based on the relatively low concentration of dissolved VOCs and TPH in soils and the absence of free product in monitoring wells surrounding the abandoned UST location. The limits of the plume are shown to encompass the three recovery wells that display product accumulation and to be slightly skewed to the northwest, in the general direction of groundwater flow. The free product plume outlined on Figure 1 has an approximate area of 560 square feet, or 0.01 acres.

The following site conditions are expected to limit the lateral extent of free product plume:

- Low groundwater gradient in the area, estimated to be 0.005 ft/ft during previous investigations;
- Higher viscosity of fuel oil compared to water;
- Fine-grained nature of the site soils;
- Thin accumulation of product in the formation.

#### **Volume of Free Product:**

The volume of free product in the formation was calculated based on the area of the product plume and the estimates of the true product thickness in the formation derived from the bail down tests. In addition, a percentage of the volume of product that fills the pore space will not be recovered due to residual saturation of the product, therefore a recoverable volume of product was also estimated. The details of these calculations are provided in Attachment C. The results estimate the total volume of free product to be 471 gallons and the recoverable volume to be 421 gallons. In practice, because many of the physical variables can not be predicted or accurately accounted for in the calculations, the actual recovery efficiency may be only 50 percent (i.e., 236 gallons) or less of the total volume present.

#### **Conclusions:**

TtNUS concludes that the passive recovery rates (i.e., no induced groundwater gradient) in each well are likely to be low (<0.4 gallons per day). The thickness of product floating on the water table is thin (<0.35 ft.) and the volume of product in the formation is expected to be less than 500 gallons. Site conditions suggest that the product plume is unlikely to migrate much further than the present established limits.

Aggressive product recovery schemes involving groundwater depression and dual phase extraction or total fluids recovery are not warranted based on the observed site conditions. In particular, due to the thin layer of product, the physical barrier created by the UST, and the fine-grained nature of the soils, groundwater depression is likely to result in product immobilization due to smearing and residual saturation of product in the cone of depression.

Site conditions appear amenable to bioslurping, mechanical skimmers, or passive skimmers. The main differences between these methods are indicated by cost and the time frame for completion. Higher technology designs such as bioslurping and mechanical skimmers include higher costs for design, equipment, installation, operation and maintenance, and may necessitate treatment or disposal of contaminated groundwater or air discharge permits. These technologies, on the other hand, are expected to increase the overall rate of recovery and may provide overall greater effectiveness. Passive skimming is a low cost, low design, simple installation approach that will require low maintenance. This technology does

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however require frequent labor input to remove product from the skimming devices and will likely result in a longer period of recovery.

**Recommendations:**

Since further migration of the observed free-product plume appears to be limited, and since an accelerated regulatory agency mandated time frame for product recovery is not being pursued, TtNUS recommends mechanical or passive skimmer-technology. However, this recommendation does not consider the Navy's plans for future use and disposition of the site. If the Navy requires an accelerated final disposition regarding free product at the site, active product removal methods, which would be more costly, could be considered. Further recommendations regarding the selection of the appropriate equipment, operating, and maintenance scenarios would require additional input from the Navy regarding target costs, time-frames, and site use planning and management.

In addition, given the close proximity of Building R-12 with the free-product plume, and the observed groundwater flow direction, TtNUS recommends periodic inspection of the sub-grade rooms in R-12 for vapors and/or the presence of product in floor drains or around foundations.

As always, TtNUS appreciates the opportunity to provide technical services to the Navy. Please contact me if you have additional questions or comments, or if you need additional copies of the report.

Sincerely

  
Richard J. Gorrell  
Project Manager

RJG/ejc

c: Lawrence Burg, Navy - NWS Earle  
John Trepanowski, P.E. - TtNUS  
Garth Glenn - TtNUS  
Russ Turner - TtNUS

**ATTACHMENT A**  
**MAPS and FIGURES**



<b>ADVANCED DRILLING, INC.</b>		<b>PROJECT</b> Navel Weapons Station Earl		<b>CLIENT</b> Tetra Tech NUS, Inc.		<b>PROJECT NO.</b> ADV 562	<b>HOLE NUMBER</b> R12MW3
<b>MUNICIPALITY</b> Colts Neck		<b>COUNTY</b> Monmouth	<b>STATE</b> New Jersey	<b>COORDINATES</b> 29 : 22: 327		<b>WELL PERMIT NO.</b> 29 38484	
<b>START DATE</b> 6-1-98	<b>COMPLETION DATE</b> 6-1-98	<b>DRILLER</b> Roger Logel		<b>DRILLER LICENSE NO.</b> M 1166		<b>BORING DIA.</b> 10.25	<b>TOTAL DEPTH</b> 19 Ft.
<b>LOT</b> N/A	<b>BLOCK</b> N/A	<b>DRILLING METHOD</b> Hollow Stem Augers		<b>SAMPLE TYPE</b> From Cuttings		<b>DEPTH OF GROUNDWATER</b> 5 Feet	
<b>PROTECTIVE CASING</b> Flush		<b>NOTES</b>					

Soil Boring Cross-Reference R12MW3  
 Town and City Colts Neck  
 County and State Monmouth, New Jersey

Installation Date (s) 6-1-98

Drilling Method Hollow Stem Augers  
 Driller Roger Logel  
 Drilling Fluid None

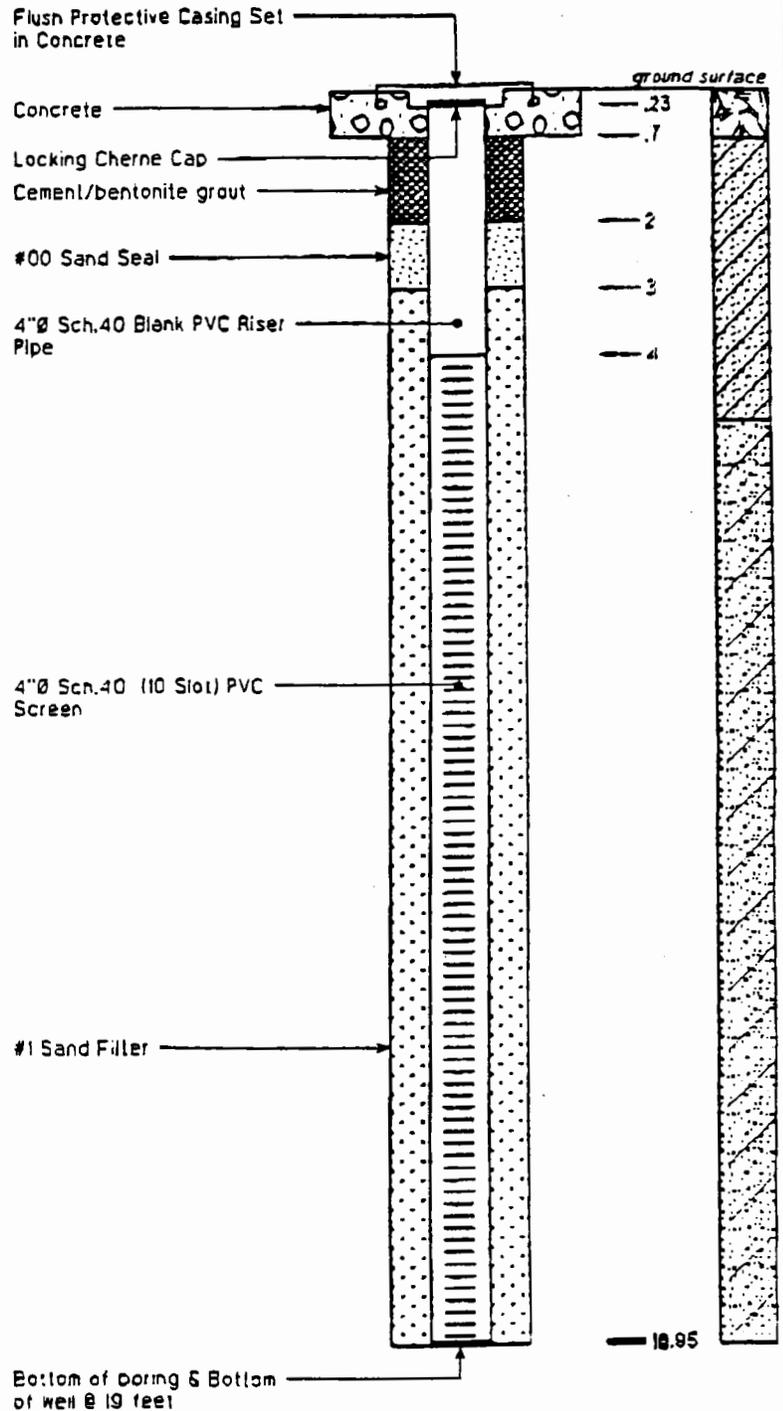
Static water level after drilling ft.  
 Well developed for hours at gpm  
 Method of development Not recorded

Well Purpose Monitoring

Remarks \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Prepared By Roger Logel  
 Date Prepared 6-13-98

**FIGURE 2**



<b>ADVANCED DRILLING, INC.</b>		<b>PROJECT</b> Navel Weapons Station Earl		<b>CLIENT</b> Tetra Tech NUS, Inc.		<b>PROJECT NO.</b> ADV-562		<b>HOLE NUMBER</b> R12MW2	
<b>MUNICIPALITY</b> Colts Neck		<b>COUNTY</b> Monmouth		<b>STATE</b> New Jersey		<b>COORDINATES</b> 29 : 22: 327		<b>WELL PERMIT NO.</b> 29 38463	
<b>START DATE</b> 6-2-98		<b>COMPLETION DATE</b> 6-2-98		<b>DRILLER</b> Roger Logel		<b>DRILLER LICENSE NO.</b> M 1166		<b>BORING DIA.</b> 10.25	
<b>LOT</b> N/A		<b>BLOCK</b> N/A		<b>DRILLING METHOD</b> Hollow Stem Augers		<b>SAMPLE TYPE</b> From Cuttings		<b>DEPTH OF GROUNDWATER</b> 5 Feet	

<b>PROTECTIVE CASING</b> Flush	<b>NOTES</b>
-----------------------------------	--------------

Soil Boring Cross-Reference R12MW2  
 Town and City Colts Neck  
 County and State Monmouth, New Jersey  
 Installation Date (s) 6-2-98  
 Drilling Method Hollow Stem Augers  
 Driller Roger Logel  
 Drilling Fluid None

Static water level after drilling      ft.  
 Well developed for      hours at      gpm  
 Method of development Not recorded

Well Purpose Monitoring

Remarks       
      
      
    

Prepared By Roger Logel  
 Date Prepared 7-13-98

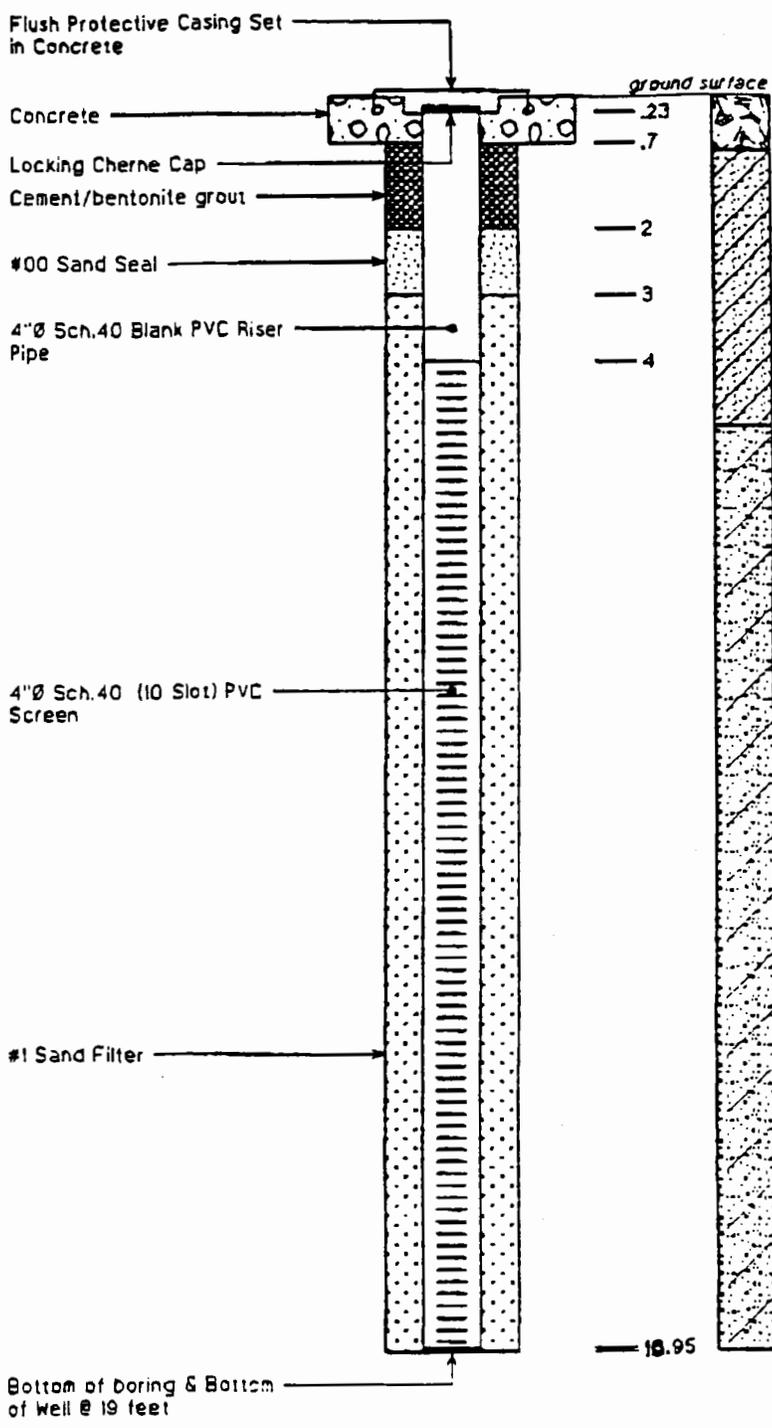


FIGURE 3

<b>ADVANCED DRILLING, INC.</b>			<b>PROJECT</b> Navel Weapons Station Earl		<b>CLIENT</b> Tetra Tech NUS, Inc.		<b>PROJECT NO.</b> ADV 562		<b>HOLE NUMBER</b> R12MW1		
<b>MUNICIPALITY</b> Colts Neck			<b>COUNTY</b> Monmouth		<b>STATE</b> New Jersey		<b>COORDINATES</b> 29 : 22 : 327		<b>WELL PERMIT NO.</b> 29 38462		
<b>START DATE</b> 6-2-98		<b>COMPLETION DATE</b> 6-2-98		<b>DRILLER</b> Roger Logel			<b>DRILLER LICENSE NO.</b> M 1166		<b>BORING DIA.</b> 10.25		<b>TOTAL DEPTH</b> 18 Ft.
<b>LOT</b> N/A		<b>BLOCK</b> N/A		<b>DRILLING METHOD</b> Hollow Stem Augers			<b>SAMPLE TYPE</b> From Cuttings		<b>DEPTH OF GROUNDWATER</b> 5 Feet		

**PROTECTIVE CASING**  
Flush

**NOTES**

Soil Boring Cross-Reference R12MW1  
 Town and City Colts Neck  
 County and State Monmouth, New Jersey  
 Installation Date (s) 6-2-98  
 Drilling Method Hollow Stem Augers  
 Driller Roger Logel  
 Drilling Fluid None

Static water level after drilling 11.  
 Well developed for \_\_\_\_\_ hours at \_\_\_\_\_ gpm  
 Method of development Not recorded

Well Purpose Monitoring

Remarks \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Prepared By Roger Logel  
 Date Prepared 7-13-98

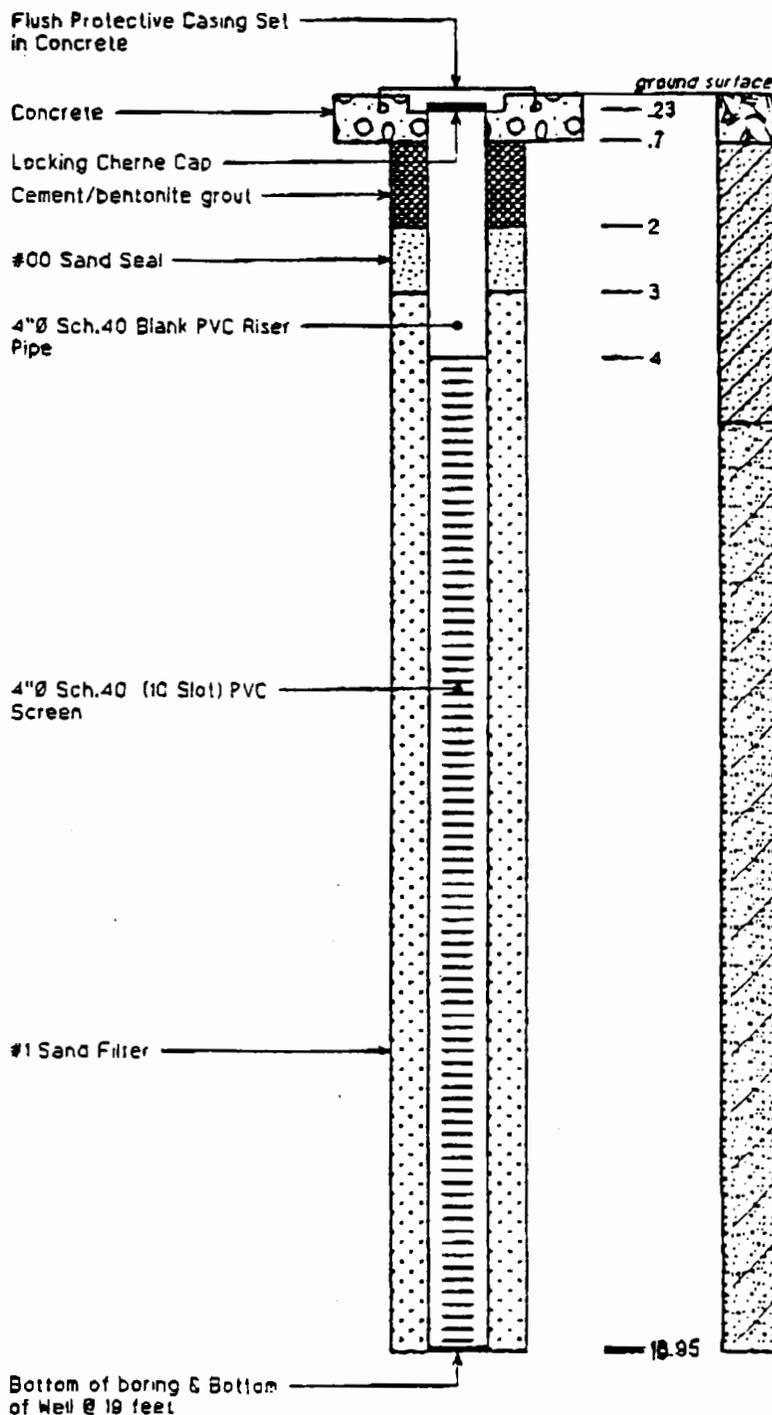
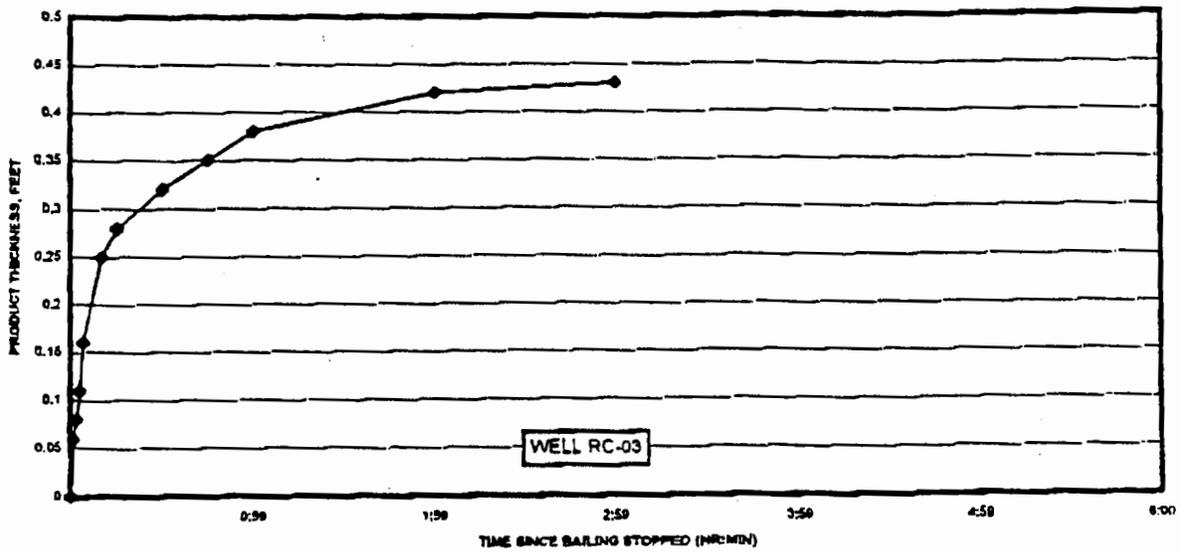
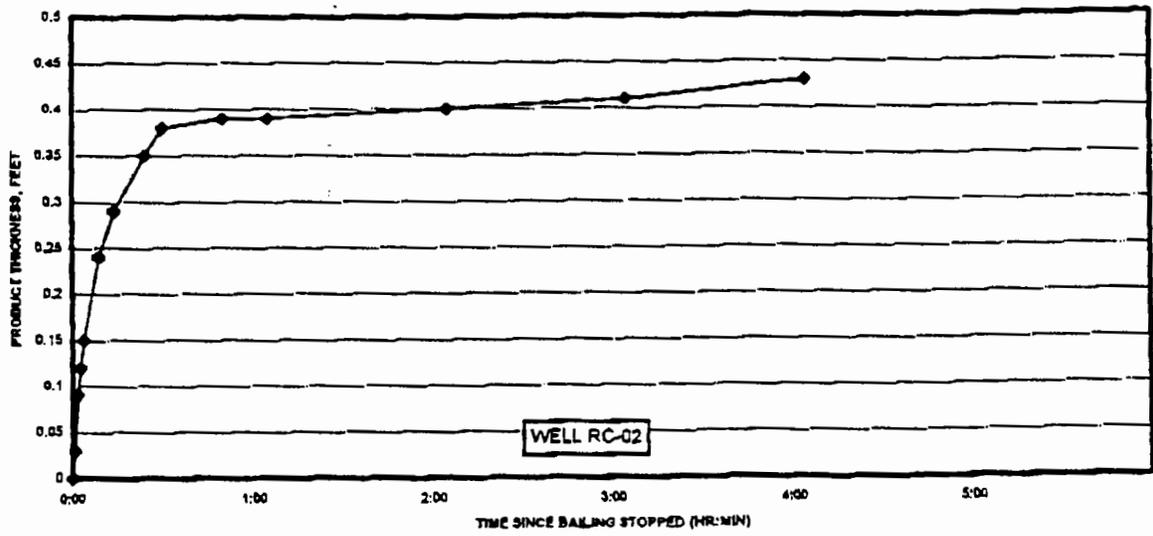
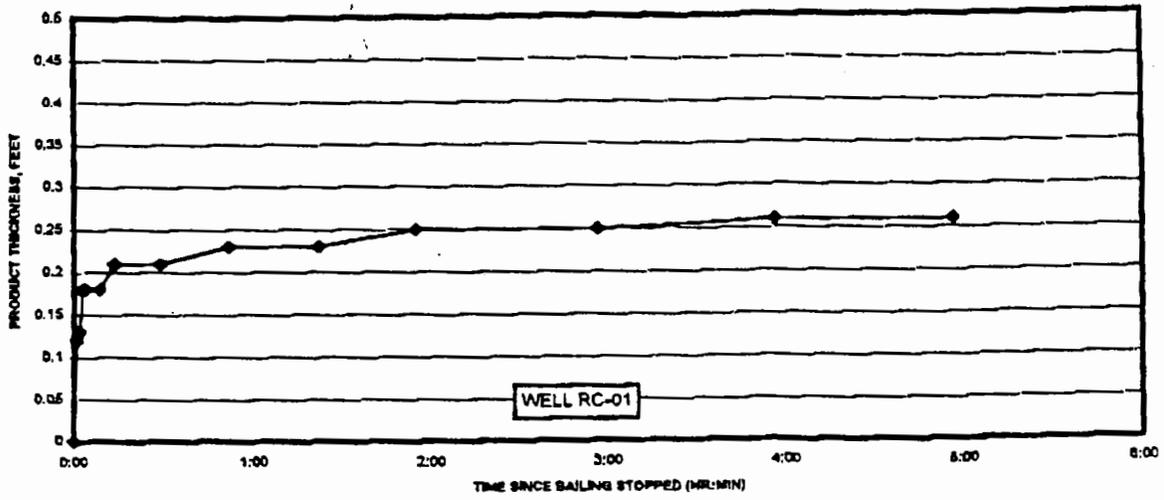
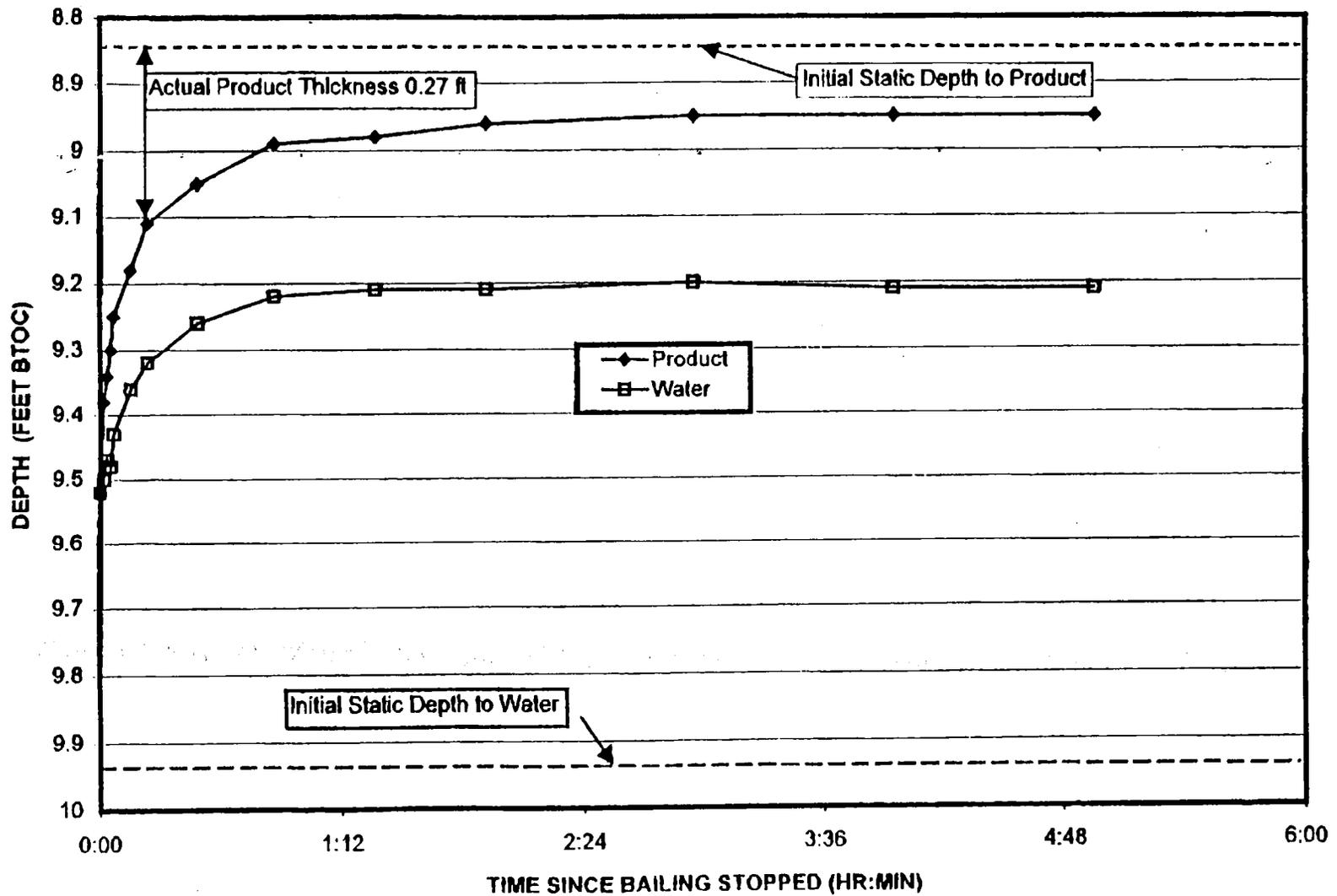


FIGURE 4

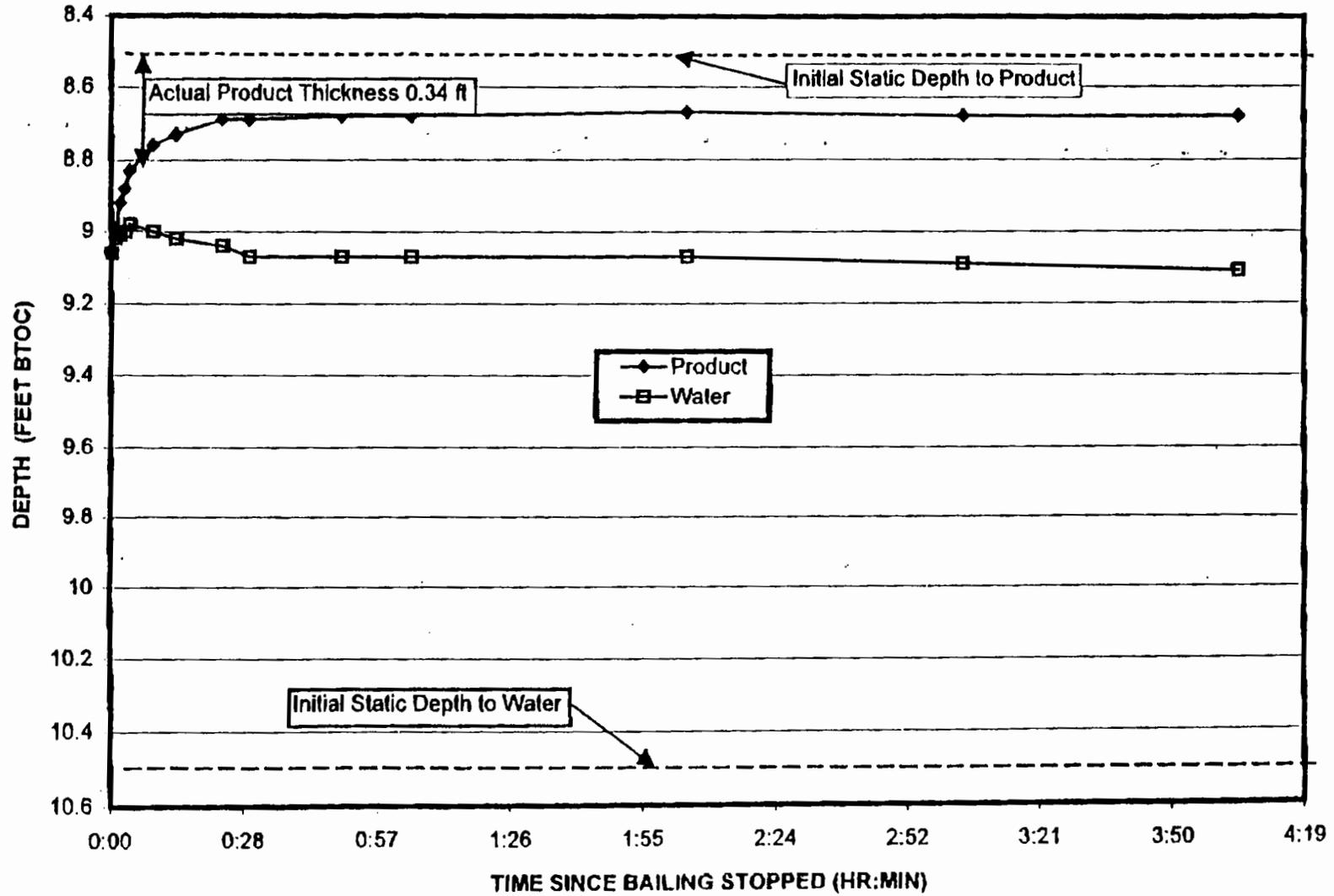
ATTACHMENT  
 Figure 5  
 Product Recovery Thickness vs. Time  
 Building R-12  
 NWS Earle Colts Neck, New Jersey



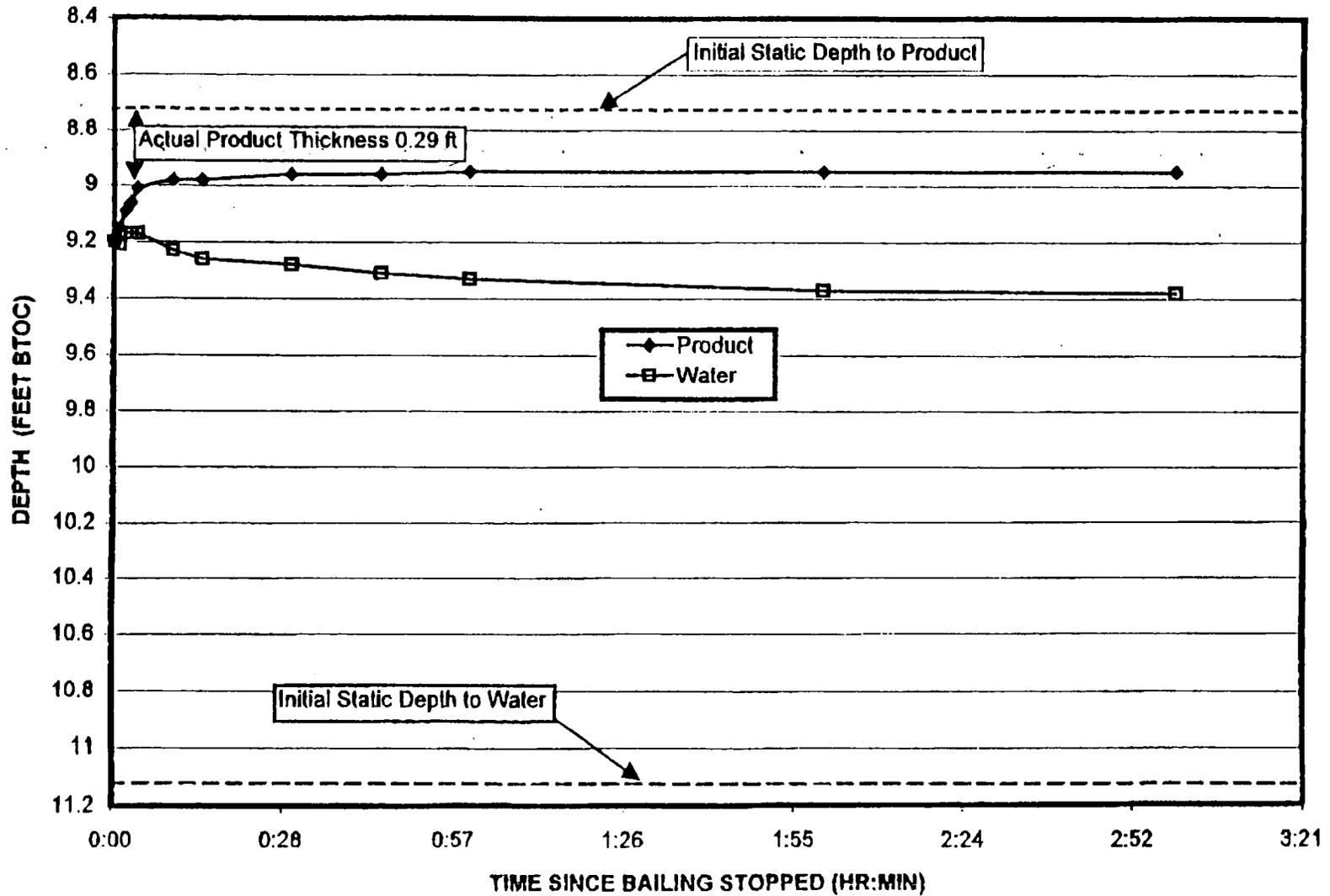
ATTACHMENT A  
Figure 6  
Depth to Product/Water vs. Time After Bailing  
Recovery Well RC-01, Building R-12  
NWS Earle Colts Neck, New Jersey



ATTACHMENT A  
Figure 7  
Depth to Product/Water vs. Time After Bailing  
Recovery Well RC-02, Building R-12  
NWS Earle Colts Neck, New Jersey



**ATTACHMENT A**  
**Figure 8**  
**Depth to Product/Water vs. Time After Bailing**  
**Recovery Well RC-03, Building R-12**  
**NWS Earle Colts Neck, New Jersey**



**ATTACHMENT B**  
**DATA SUMMARY TABLES**

ATTACHMENT B  
 Table 1  
 Bail-down Test Measurements  
 Building R-12  
 NWS Earle Colts Neck, New Jersey

Well/Time	Depth to Product <sup>(1)</sup>	Depth to Groundwater <sup>(2)</sup>	Product Thickness
RC-01/11:23	N/A	9.52	0
11:24	9.38	9.50	0.12
11:25	9.34	9.47	0.13
11:26	9.30	9.48	0.18
11:27	9.25	9.43	0.18
11:32	9.18	9.36	0.18
11:37	9.11	9.32	0.21
11:52	9.05	9.26	0.21
12:15	8.99	9.22	0.23
12:45	8.98	9.21	0.23
13:18	8.96	9.21	0.25
14:20	8.95	9.20	0.25
15:20	8.95	9.21	0.26
16:20	8.95	9.21	0.26
RC-02/12:25	N/A	9.06	0
12:26	8.99	9.02	0.03
12:27	8.92	9.01	0.09
12:28	8.88	9.00	0.12
12:29	8.83	8.98	0.15
12:34	8.76	9.00	0.24
12:39	8.73	9.02	0.29
12:49	8.69	9.04	0.35
12:55	8.69	9.07	0.38
13:15	8.68	9.07	0.39
13:30	8.68	9.07	0.39
14:30	8.67	9.07	0.40
15:30	8.68	9.09	0.41
16:30	8.68	9.11	0.43
RC-03/13:30	N/A	9.20	0
13:31	9.15	9.21	0.06
13:32	9.09	9.17	0.08
13:33	9.06	9.17	0.11
13:34	9.01	9.17	0.16
13:40	8.98	9.23	0.25
13:45	8.98	9.26	0.28
14:00	8.96	9.28	0.32
14:15	8.96	9.31	0.35
14:30	8.95	9.33	0.38
15:30	8.95	9.37	0.42
16:30	8.95	9.38	0.43

Notes:

- (1) Depth to product measured in feet, with a Kech Interface Probe, from top of inner PVC casing to surface of free product.
- (2) Depth to groundwater was measured in feet from the top of the inner PVC casing, to the surface of the water below the free-product.

ATTACHMENT B  
 Table 2  
 Bail-down Test Measurements  
 Building R-12  
 NWS Earle Colts Neck, New Jersey

Measurement Event	Depth to Product <sup>(1)</sup>	Depth to Groundwater <sup>(2)</sup>	Product Thickness (ft.)
<b>2/10/99 (Pre-bail-down)</b>			
RC-01	8.84	9.94	1.1
RC-02	8.49	10.46	1.97
RC-03	8.72	11.1	2.38
<b>2/10/99</b>			
RC-01 (+5 hours)	8.95	9.21	0.26
RC-02 (+4 hours)	8.68	9.11	0.43
RC-03 (+3 hours)	8.95	9.38	0.43
<b>2/11/99</b>			
RC-01 (+21 hours)	8.97	9.33	0.36
RC-02 (+20 hours)	8.69	9.22	0.53
RC-03 (+19 hours)	8.98	9.5	0.52
<b>2/15/99</b>			
RC-01 (+123 hours)	8.89	9.69	0.8
RC-02 (+122 hours)	8.62	9.03	0.68
RC-03 (+121 hours)	8.91	9.54	0.63

Notes:

- (1) Depth to product measured in feet, with a Kech Interface Probe, from top of inner PVC casing to surface of free product.
- (2) Depth to groundwater was measured in feet from the top of the inner PVC casing, to the surface of the water below the free-product.

**ATTACHMENT C**

**CALCULATIONS**

CLIENT NWS Earle - Colts Neck, New Jersey		JOB NUMBER CLEAN Task Order No. 206	
SUBJECT Building R-12, Calculation of the Volume of Free Product Around Abandoned UST			
BASED ON Product Bail Down Testing		DRAWING NUMBER ATTACHMENT C	
BY Allan Jenkins, TINUS	CHECKED BY R. Gorrell	DATE 2/22/99	

### PROBLEM

Calculate the Volume of Free Product and of Recoverable Free Product floating on the water table surface in the vicinity of the abandoned 2,000 gallon UST.

### GIVEN

Free product bail-down testing was conducted on the three recovery wells, RC-01, RC-02, and RC-03, that contained a measurable accumulation of free product. The results of the bail-down testing were interpreted using the methodology of Hughes, et.al. (1988) to estimate the true product thickness in the formation and the results are summarized in the following table. No other wells at the site demonstrated the presence of free phase hydrocarbons.

Well	Test Date	Static Product Thickness in the Well (Feet)	Estimated Product Thickness in the Formation (Feet)	Exaggeration Factor
RC-01	2/10/99	1.1	0.27	4.1
RC-02	2/10/99	1.97	0.34	5.8
RC-03	2/10/99	2.38	0.29	8.2

Free product in the formation at the site is interpreted to lie on top of the capillary fringe above the water table. Fine grained silty to clayey sand that exists at the site is expected to have a generally thick capillary fringe (14 to 59 inches, Testa and Paczkowski, 1989). The accumulated product in the well also depresses the water level in the well, thus the exaggeration factor is expected to be relatively high as shown in the above table.

### CALCULATION

#### Volume of Formation Containing Free Product:

The volume of the formation that contains free product is defined as the area of the free product plume multiplied by the estimated true product thickness in the formation. The areal extent of the free product plume was estimated to be 560 square feet (as described in the Bail Down Test letter report). Because of the small plume size and the narrow range of the true product thickness estimates no attempt was made to contour the thickness data within the plume area. The area was therefore multiplied by the average thickness to obtain the volume of the formation containing free product,  $V_f$ , as shown below:

True Product Thickness, ft.	Area, sq. ft.	Formation Volume, cu. ft. $V_f$
Average = 0.30	560	168

#### Total Volume of Free Product In the Formation:

The volume of free product in the formation is limited to the pore space in the formation that is open to fluid migration minus the volume of residual water (the original wetting fluid) that occupies a portion of the pore space. For calculation purposes the total available porosity and the field capacity for a typical fine grained sand were used for this calculation (as referenced below):

Total Porosity for fine sand (EPA 1994) = 0.457  
 Field Capacity for fine sand (EPA 1994) = 0.083  
 Available Pore Space = 0.457 - 0.083 = 0.374

CLIENT NWS Earle - Colts Neck, New Jersey		JOB NUMBER CLEAN Task Order No. 206
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BY Allan Jenkins, TTNUS	CHECKED BY R. Gorrell	DATE 2/22/99

The Total Volume of Free Product,  $V_t$ , is then,

$$V_t = \text{Formation Volume} \times \text{Available Pore Space} = 168 \text{ cu.ft.} \times 0.374 = 63 \text{ cu.ft., or} \\ = 471 \text{ gallons of product}$$

**Total Volume of Recoverable Free Product in the Formation:**

The recoverable volume of free product is less than the total volume of free product because a portion of the product will not drain from the pores under the influence of gravity. In general, as the viscosity of the hydrocarbon increases and the grain size decreases the specific retention of the free product (i.e., residual hydrocarbon) increases. A typical oil retention capacity for kerosene (i.e., assume similar for fuel oil) for a fine sand to silt formation is 8 gallons / cubic yard of formation (Testa and Paczkowski, 1989). Applying this retention factor to the total volume of free product calculated above results in the following estimate for the total volume of recoverable free product,  $V_r$ , as shown below:

$$V_r = V_t - (V_f \text{ cu.yd.} \times 8 \text{ gal/cu.yd.}) = 471 - (6.2 \text{ cu.yd.} \times 8 \text{ gal/cu.yd.}) = 421 \text{ gallons}$$

**INTERPRETATION OF RESULTS**

The calculations provided above are predicated on many factors for which significant errors in the data area possible, such as:

- difficulty in obtaining representative thickness measurements in wells during nonequilibrium conditions
- few number of monitoring wells containing free product
- determination of true vs. apparent product thickness based on well measurements only
- extrapolation of geologic and hydrogeologic information between monitoring points
- estimation or assumption of key factors including porosity, specific yield or oil retention values
- averaging of estimated true product thickness between data points
- effects of residual trapped hydrocarbons

Because of these factors the total and recoverable free product volumes provided above should be used only for estimating the scope and level of effort associated with developing remedial alternatives. In addition, active recovery of free product hydrocarbons and natural water level variations can cause significant volumes of residual free product to occur in the formation that can not be recovered by conventional methods. The relatively thin free product thickness in the formation coupled with the higher viscosity of fuel oil (compared to water) and the likelihood of some water level fluctuation suggests that the recovery efficiency will tend to be low.

**REFERENCES**

EPA/600/R-94/169a, The Hydrologic Evaluation of Landfill Performance (HELP) Model, Users Guide for Version 3, September 1994.

Hughes, J.P., Sullivan, C.R., and Zinner, RE., "Two Techniques for Determining the True Hydrocarbon Thickness in an Unconfined Sandy Aquifer": In Proceedings of the National Water Well Association of Ground Water Scientists and Engineers and the American Petroleum Institute conference on Petroleum Hydrocarbons and Organic Chemicals in Ground Water: Prevention, Detection and Restoration, Vol. I, November, 1988, p. 291-314.

CLIENT NWS Earle - Colts Neck, New Jersey		JOB NUMBER CLEAN Task Order No. 206
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BY Allan Jenkins, TtNUS	CHECKED BY R. Gorrell	DATE 2/22/99

Testa, Stephen M., and Paczkowski, Michael T. , Volume Determination and Recoverability of Free Hydrocarbon, Ground Water Monitoring Review, Winter 1989.

Testa, Stephen M., and Winegardner, Duane L., Restoration of Petroleum-Contaminated Aquifers, Lewis Publishers, 1991.

## **Appendix B**

### **Technical Specifications for the Product Recovery System**

# SkimRite™

## Another "Pure & Simple" Product

The engineers at Enviro Products, Inc. have really done their homework on this one!...

The SkimRite™ free product skimmer is the first system to fully integrate pump, skimmer & controller into a package suitable for 2" well applications.

Pneumatic Control Unit is factory adjusted for the most efficient pumping rate.

Fully integrated buoy and skimmer assembly ensures collection of free product only.

**Rental Now Available!**

Buoy Travels 24"

Small diameter bladder pump has revolutionized free product recovery in 2" wells.

*Enviro Products Means Service!*

**ENVIRO**  
**PRODUCTS**

1431 Rensen Street • Suite A • Lansing, Michigan 48910

**Environmental Equipment and Supplies**

31 Rensen Street, Suite A • Lansing, Michigan 48910  
7) 887-1222 • 1-800-ENVIRO 4 • Fax: (517) 887-8374

**EQUIPMENT DESCRIPTION****SkimRite™ Standard System**

The standard SkimRite™ system comes complete with the following components:

- SkimRite™ PSC (Pump, Skimmer & Controller) unit
- 1.5 HP Air Compressor
- Air Dryer/Filter with Product Tank Overfill Protection
- 100' of 3/8" I.D. polyethylene discharge hose
- 100' of 5/16" O.D. nylon air supply line
- 100' of 3/8" O.D. nylon vent line
- Choice of 2", 4" or 6" locking well cap

The SkimRite™ free product skimming system incorporates pump, skimmer, and controller into one unit that is 1.75 inches in diameter. The SkimRite™ is suspended in a well with a 2 inch or greater diameter using a locking well cap. The floating skimmer buoy removes product to a sheen while accommodating water table fluctuations as great as 24 inches. The minimum water level required in the well is 19 inches.

A 1.5 H.P. compressor with 3.8 gallon air tank is used to operate the system. The compressor's dimensions are 25" L X 18" W X 12" H and requires 120VAC, 17 Amps. Air consumption for each SkimRite™ PSC is 0.4 CFM. A 5/16 inch O.D. air supply line and a 3/8 inch O.D. air vent is connected to the top of the SkimRite™. The pumping rate using pure unleaded gasoline is greater than 5.0 GPH. The rate of recovery is dependent upon product thickness (See SkimRite™ Recovery Rate Data on product literature). Recovered product is discharged through a 3/8 inch I.D. polyethylene hose which is used with a locking well cap (choice of 2, 4, or 6 inch) to suspend the SkimRite™. Total power required by the system is 19 Amps, 120 VAC.

Air from the compressor is processed through an air dryer to remove moisture; a requirement for the SkimRite™ controller. The air dryer has a pre-filter to remove particulates and bulk moisture from the incoming air. A regulator is provided with the system to control air pressure supplied to the pump. The compressor and air dryer are connected by a flexible air line.

An intrinsically safe tank overfill protection unit is used to monitor the product storage tank. This is incorporated into the same package as the air dryer. The tank is monitored using a float switch assembly which mounts in a 2 inch NPT bung opening on the top of the tank. The float switch senses the overfill level to be 8 inches below the top of the tank and shuts the system down if this level is reached. There is a 50 foot weather-resistant control cable provided.

*It is recommended that secondary containment be used around the product tank.*

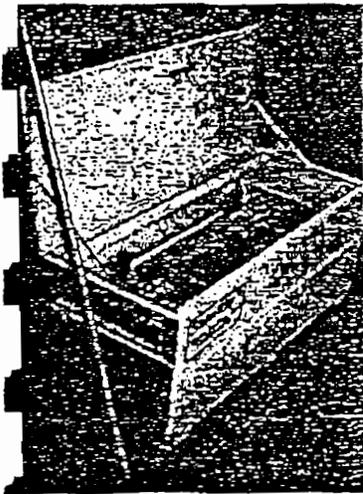
## Description:

Introducing the SkimRite™ system. The SkimRite™ is a unique free product skimmer system that incorporates pump, skimmer and controller into one package for use in 2" or larger wells. The SkimRite™ utilizes a small diameter bladder pump with proven durability and performance. The unique design uses a floating buoy which travels along the length of the pump to accommodate fluctuations in water table.

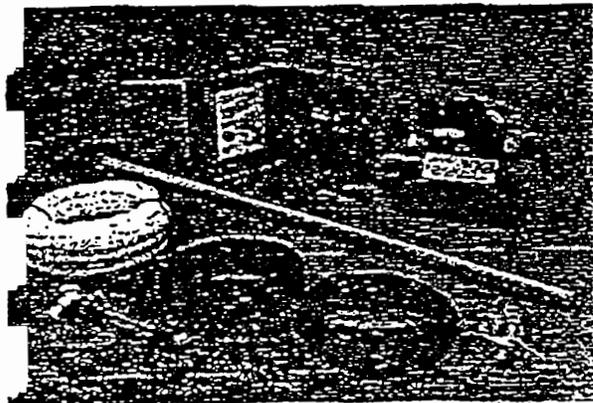
State of the art engineering has produced an extremely efficient air consumption to product ratio. Even while providing 120 gallons per day of pure product, the SkimRite™ requires only 0.4 CFM of compressed air.

## System Specifications:

Diameter..... 1.75"  
 Length..... 66.0"  
 Weight..... 10.5 lbs.  
 Air Consumption..... .40 CFM  
 Pumping Rate..... >5.0 GPH



Outdoor Enclosure  
(Optional)

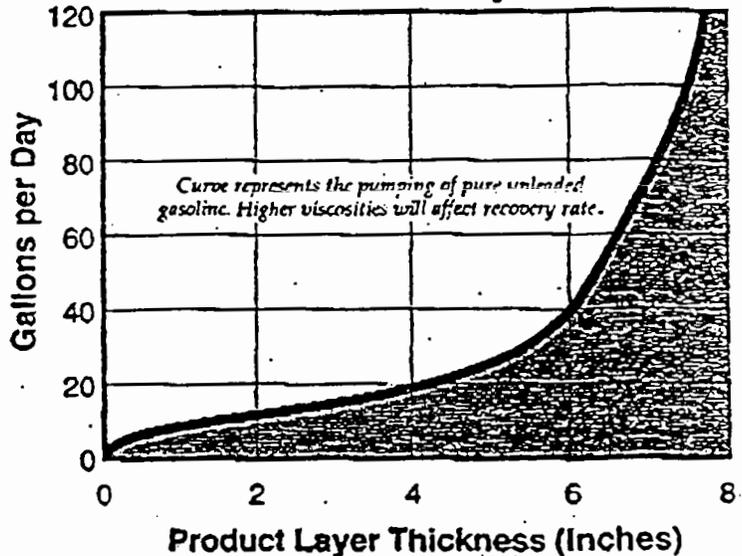


Complete System

## Features:

- Installs in minutes
- No controller adjustments necessary
- High recovery rate (greater than 120 GPD)
- One size for all wells 2" and larger
- Effective with petroleum fuels
- Accommodates groundwater fluctuations as great as 24"
- Compact size—full scale performance
- Lightweight and portable

## SkimRite™ Recovery Rate Data



## Standard System Includes:

- SkimRite™ PSC (Pump/Skimmer/Controller)
- 1.5 h.p. air compressor, 115 v.a.c. with air filtration
- Product tank overfill protection
- 100 ft. of 3/8" polyethylene discharge line
- 100 ft. of 5/16" nylon air line
- 100 ft. of 3/8" nylon vent line
- Choice of 2", 4", or 6" well cap

## Options:

- Multiple pump systems
- Outdoor enclosure for compressor
- Custom well head configurations to accommodate depression pumps, sensors, etc.
- Custom hose lengths
- RiteTank™—A revolutionary combination of a double wall tank, overfill protection, interstitial sensor, and an equipment storage enclosure.

For wells where a very low yield of free product is expected, consider using a PetroTrap™ EPI's passive skimmer system.

Full Product Warranty!



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# SkimRite™ OPTIONS/ACCESSORIES

## Additional SkimRite™ Pumps

(For Multiple Well Installation)

The SkimRite™ PSC will be provided for each additional well location. Each SkimRite™ PSC includes 100 feet of 3/8 inch vent line, 5/16 inch supply line, 3/8 inch product discharge hose and either a 2, 4 or 6 inch locking well cap. The standard system's 1.5 HP air compressor can service up to four SkimRite™ PSCs. For larger systems, a larger compressor can be specified (please contact Enviro Products, Inc. for this information).

## Manifold Block

The air supply for additional pumps is provided through a manifold block. The manifold block has valved outputs to allow up to four PSCs to be operated at one time.

## Outdoor Enclosure Option

The 48" L X 24" W X 24" H painted steel enclosure is used to house the system's air compressor and tank overflow/air dryer. All interior components are securely fastened to the enclosure. Electrical wiring is routed through conduit and junction boxes. The air and power connections are brought outside the enclosure and connected as panel-mount fixtures where possible. The enclosure is vented by forced air ventilation (a fan) which cools the internal components (Also see Heat Option). The SkimRite™ PSC stores securely inside a special compartment. This lockable steel enclosure is ideal for locations that are remote or where an additional measure of security is desired. This option includes the auto drain option described below.

## Heat Option

In addition to the installation detailed in the description for the Outdoor Enclosure Option, the enclosure is insulated and equipped with a heater and a thermostat to protect the equipment in cold environments. A thermal sensing unit is used to energize and de-energize a 500 watt convection heater with a 1706 BTU/hr rating. The thermostat is set at 50° F.

*This option requires an additional 6.25 Amps input at 120VAC.*

## Auto Drain Option for Compressor Tanks

The compressor will be equipped with an air-actuated valve that is used to drain condensation from the compressor holding tank. The valve operates from the bleed air on the compressor and therefore does not require electrical power. The auto drain will discharge accumulated moisture for two seconds after each compression cycle and will then rest. The addition of this auto drain feature extends the operating lifetime of the system and reduces required maintenance.

**APPENDIX B**

**SPECIFICATIONS FOR PRODUCT STORAGE SHED**

## **Appendix C**

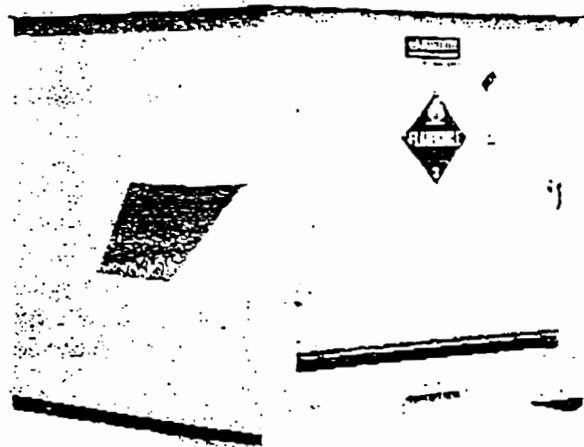
### **Manufacturer's Specifications for the Product Storage Shed**



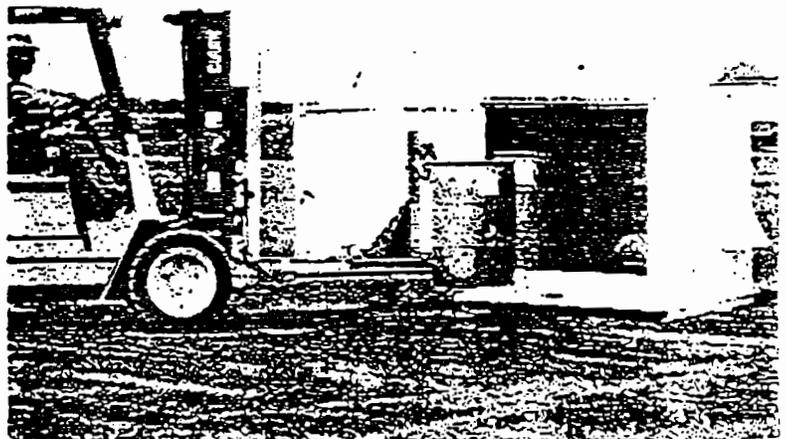
## *Vault-Like Non-Combustible Outdoor Cabinets for Hazardous Material Storage.*

Rugged, weatherproof vault-like cabinets provide safety, security, segregation, and secondary containment of flammable and combustible materials.

- ★ Heavy 12 gage steel walls and roof formed and welded for strength, fully factory assembled.
- ★ Exceeds EPA requirements for secondary containment.
- ★ Meets NFPA Fire Code for outdoor storage of flammable and combustible liquids.<sup>1</sup>
- ★ Available for quick delivery in 2, 4, and 6 - drum capacities. Ask for details on capacities over 6 drum.



4 55-gallon drum capacity Outdoor Cabinet



Large door opening facilitates loading and removal of drums, whether loading full skids or single drums.

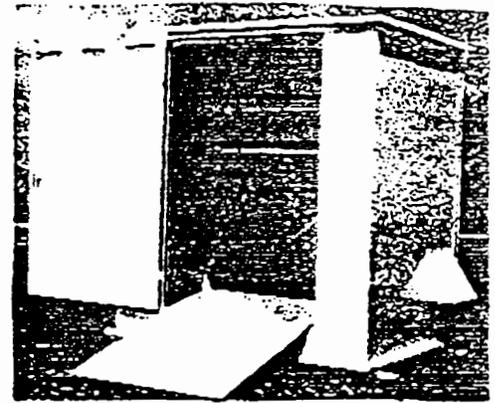
<sup>1</sup> Outdoor Storage Cabinets are FM approved except for the storage of Class 1A or dispensing of Class 1B flammable liquids as defined by NFPA 30.

**LABSAFETY**

401 S. WRIGHT ROAD  
P.O. BOX 1368  
JANESVILLE, WI 53547-1368  
CALL TOLL FREE 1-800-356-0783

Rugged, weatherproof vault-like cabinets may be used anytime flammable hazardous waste materials must be accumulated on site. Protects drums from rusting and physical abuse that might render them unacceptable under EPA regulations. RCRA requires the minimization of threats to the environment which would be caused by the release of hazardous waste. The Handbook for the Management of Hazardous Waste, published by the Environmental Resource Center, includes the following statements in a "Design Features and Operational Practices that minimize threats to the environment."

- \*Cover containers accumulated outdoors with a roof... to protect volatile materials from direct sunlight.\*
- \*Erect a fence with a means to control entry around the accumulation point to prevent the unknowing or unauthorized entry of personnel.\*
- \*Install a containment system designed to contain the volume of the largest container or ten percent of the volume of all containers.\*



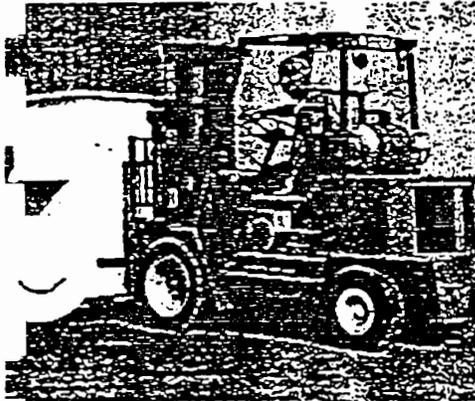
6 drum unit shown with optional ramps and shelves.

40CFR 264.175 requires that storage areas have a containment system with sufficient capacity to contain 10% of the volume of the containers or the volume of the largest container, whichever is greater.

Justrite Outdoor Cabinets meet all three of the above criteria - shelter, security and secondary containment.

**STANDARD FEATURES**

- Heavy 12 gage steel walls and roof formed and welded for strength
- Extra wide door with 3 point locking system
- Large spill containment sump (over 25% of listed storage capacity) surpasses EPA 40 CFR requirements. Hydrostatically tested to be liquid tight
- Fork lift channels for easy handling with standard 36" forks
- DOT placard; NFPA 704 rating signs
- LTL shippable by common carrier
- Exterior finish - weather resistant
- Interior finish - chemical resistant
- FM Approved <sup>1</sup>
- Steel grate flooring on 2 and 4 drum units; plywood flooring on 6 drum unit. Removable sectional flooring for easy sump inspection and cleaning



All units are easily relocatable with standard fork lift truck.

**DESIGN CHARACTERISTICS**

- Floor Load.....250 psf
- Snow Load.....40 psf
- Wind Load.....30 psf (110mph)

LAB SAFETY  
SUPPLY P.N.

13199

13200

13201

SPECIFICATIONS: Non-Combustible Cabinets							
Model	Drums	Dimensions (HxWxD)	Interior Dimensions (HxWxD)	Door Dimensions (WxH)	Capacity	Weight	Notes
22120	2 Drums	64HX68WX36D	50.5HX64WX32D	54W X 48H	1	60 Gal.	1000W
22140	4 Drums	64HX68WX66D	50.5HX64WX62D	54W X 48H	1	120 Gal.	1425W ←
22160	6 Drums	96HX90WX66D	82.5HX86WX62D	54W X 80EH	1	160 Gal.	1800W

ACCESSORIES					
Model	Part #1	Part #2	Part #3	Part #4	Part #5
22120	#28132	#28193	-	#28185	28180
22140	#28132	#28195	-	#28185	28180
22160	#28132	#28194	#28170	#28185	28180

*baskets*