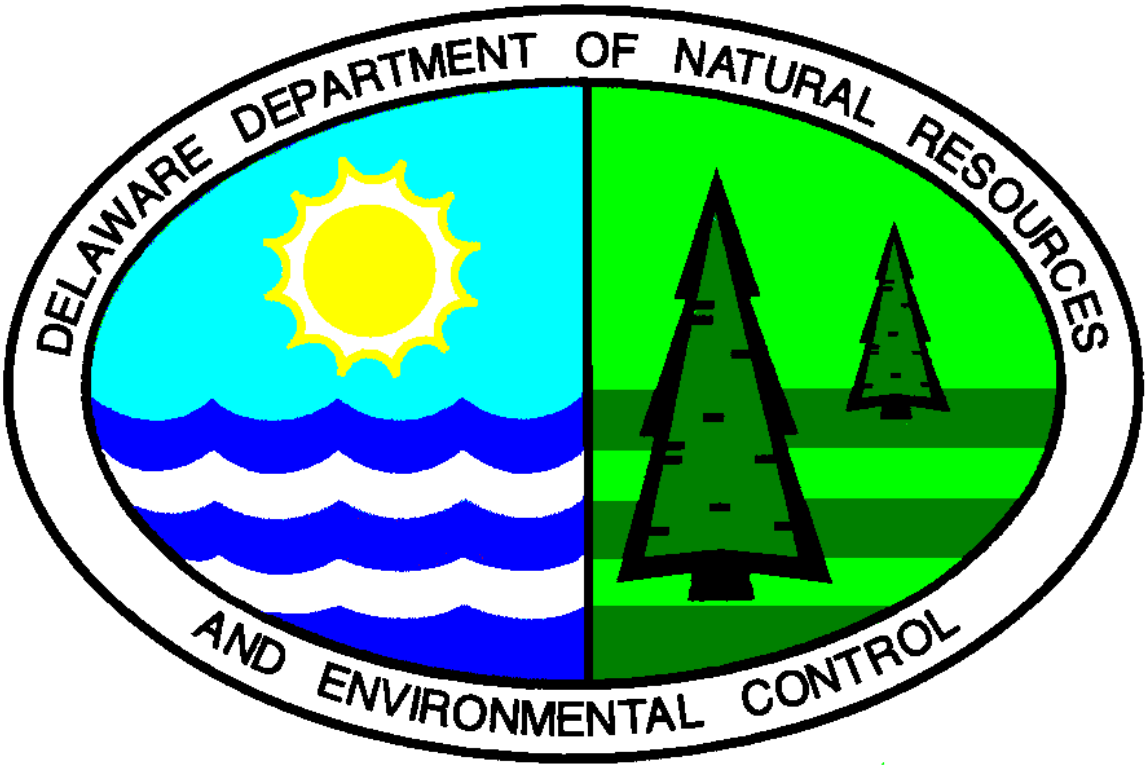
PROPOSED PLAN OF REMEDIAL ACTION



DRAVO SHIPYARD

Operable Unit II
RDC/Harbor Associates Properties
Wilmington, Delaware

DNREC Projects No. DE-1092 & DE-1096

August 1999

Department of Natural Resources and Environmental Control
Division of Air and Waste Management
Site Investigation and Restoration Branch

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I. INTRODUCTION

In April and June 1998, the Department of Natural Resources and Environmental Control ("DNREC" or "Department") under the authority granted by the Hazardous Substance Cleanup Act ("HSCA") (7 Del. C., Ch. 91) reached an agreement with the Riverfront Development Corporation ("RDC") and Harbor Associates to oversee environmental investigation, remediation activities, and redevelopment activities at the former Dravo Shipyard Site located on Madison Street in Wilmington, Delaware (Figures 1 and 2). The former Dravo Naval Shipyard is scheduled to be redeveloped into a catalog outlet shopping mall, an exhibition center, and related facilities by the Riverfront Development Corporation of Delaware and the Harbor Associates, Inc.

The scope of this Proposed Plan of Remedial Action is the soil and subsoil for the geographic area of the Operable Unit II, plus the groundwater media for Operable Unit I, II and III.

This document is the Department's Proposed Plan of Remedial Action for the Dravo Shipyard property as defined in Figure 2. This Proposed Plan is issued under provisions of the HSCA and the Regulations Governing Hazardous Substance Cleanup ("Regulations"). It presents the Department's assessment of the potential unacceptable health and environmental risks posed by the Dravo Shipyard Site and plans for further action.

The Proposed Plan of Remedial Action also includes a comparison of the remedial alternatives with respect to but not limited to: current and potential land use, natural resource use, proximity of human populations, use of surrounding properties, specific environmental issues, protection of public health, welfare, and the environment, and compliance with applicable laws and regulations.

The Department will provide public notice and opportunity to comment on the Proposed Plan in accordance with Section 12 of the Regulations. At the conclusion of the comment period, the Department, after review and consideration of the comments received, shall issue a final plan of remedial action, which shall designate the selected remedial action.

II. SITE DESCRIPTION AND HISTORY

Site Description

The former Dravo Shipyard consists of approximately 120 acres, and is located southwest of the City of Wilmington business district (Figure 1). Approximately 48 acres of the Dravo Shipyard encompasses the areas that are under agreement to be investigated under the Voluntary Cleanup Agreements between DNREC and RDC, and DNREC and Harbor Associates. The Harbor Associates property encompasses approximately 33 acres and is located on the western and southern portion of the former Dravo Shipyard Site. The RDC property encompasses approximately 14.5 acres and is located on the eastern portion of the former Dravo Shipyard Site. Contained within the former Dravo Shipyard Site is an underground utility vault system that runs along Madison Street, with arterials to the former naval shipyard buildings. The utility vaults are not currently in use. The total area described under this Proposed Plan of Remedial Action for the Dravo Shipyard Operable Unit II constitutes approximately 18 acres of land and the groundwater media from Operable Units I, II and III (approximately 48 acres) (Figure 1). The area of investigation is detailed in Figure 2.

Site History

The entire redevelopment area was historically the site of shipbuilding and other heavy industrial activities. Much of the area was reclaimed from marshland by filling with slag and other industrial waste products. Because of its previous industrial use soil in the area has been impacted by environmental contaminants including total petroleum hydrocarbons (TPH), heavy metals (lead, arsenic), polychlorinated biphenyls (PCBs) and polynuclear aromatic hydrocarbons (PAHs).

III. INVESTIGATION RESULTS

A total of three environmental investigations have been performed on the site project area. In July and November 1997, DNREC performed two Brownfield Preliminary Assessment IIs. Soils throughout the property were found to contain significant amounts of organic and inorganic contaminants from historical operations at levels well above screening benchmarks. Primary contaminants of concern were found to be PAHs and Lead. Results indicated that relatively widespread PAH contamination of the shallow and deep soils to be present in the project area. Toxic Characteristics Leaching Procedures (TCLP) analysis indicated that one surface soil sample exceeded the regulatory level for Lead as a hazardous waste.

During September through December 1998, EA Engineering, under contract with the Riverfront Development Corporation and Harbor Associates, performed the Remedial Investigation for the Operable Unit II area. Soil samples were collected in a 100 foot grid pattern from the geographic Operable Unit II area and from the location of the Bioretention swale extension in 50 linear foot fashion (Figure 3). Soil samples were screened initially by the DNREC – SIRB mobile lab for carcinogenic polynuclear aromatic hydrocarbons (C-PAH) using Ohmicron immunoassay kits and for Total metals, including arsenic, cadmium, chromium, lead, and mercury using an X-ray fluorescence instrument. Additional volatile and semivolatile screening was performed by DNREC-SIRB and the DNREC-Division of Water Resources Environmental Services Laboratory (DNREC – ESS). Groundwater samples were collected from the DNREC installed wells and the EA installed wells per HSCA protocol's and analyzed by EA Laboratories in Sparks, Maryland (Figure 4). Six (6) groundwater samples were collected from the monitoring wells.

A total of 109 soil samples were collected during the test pitting activities and Bioretention swale sampling (Appendix B). As a result of the mobile laboratory screening, a total of 27 soil samples were submitted to EA Laboratories in Sparks, Maryland, for analysis of select parts of the United States Environmental Protection Agency (US EPA) Target Analyte List (Inorganics) and Target Compound List (Organics) (TAL/TCL) (Appendix A). Samples were selected by EA and DNREC on the basis of moderate or high screening results (Appendix C).

According to the screening analysis performed at the DNREC mobile laboratory, the contaminants of concern detected were Carcinogenic Polycyclic Aromatic Hydrocarbons (C-PAH) and arsenic. Lead and PCBs did not exceed DNREC's unlimited reuse criterion (Table 1). The site specific reuse criterion developed for the site categorized soils on the basis of contaminant content detected in screening and fixed laboratory analysis. The soils are grouped according to level of contaminant, such as metals, semi-volatile and volatile organics, into categories of use or reuse. Category A has been determined to be those soils suitable for unlimited reuse or residential use. Category B soils are suitable for industrial/commercial reuse within the project area. This category of soils requires a minimum of one foot clean fill and geotextile marker fabric of a minimum quality of Amoco ACF 4508 or its equivalent as determined by DNREC to be placed over the 'B' soils. Category C soils may be reused on the site, but must be covered by building foundations or asphalt/concrete and additional soils. Category Z soils must be disposed of off site. Of the 27 samples submitted for confirmatory analysis, no samples exceeded DNREC's commercial/industrial reuse criterion (Category C)(Appendix D).

The analytical results for the groundwater beneath the site revealed uniform contamination of iron and manganese in the wells and one exceedence of aluminum in MW-5 (Appendix D). The groundwater results also detected concentrations of arsenic above the carcinogenic DNREC Uniform Risk-Based Remediation Standards, but all levels were below the non-carcinogenic value for arsenic.

IV. REMEDIAL ACTION OBJECTIVES

According to HSCA regulation 8.4(1), during a remedial investigation, remedial action objectives must be established. For the Dravo Shipyard Harbor Associates Site, remedial action objectives were designed based on the following factors:

- The site is currently zoned as commercial and industrial land. Numerous vacant lots and former industrial buildings are also present.
- The future site use is expected to be paved roadway, asphalt parking lots, shopping centers and very limited open space.
- The site is adjacent to the Christina River.
- Surrounding land uses are mixed, including warehousing, commercial and residential.
- Soil at the site has been impacted by various chemical constituents. Based on the nature and extent of the contaminants, PAHs and arsenic have been chosen as the primary contaminants of concern.
- The groundwater at the site has been impacted with select metals, including arsenic, aluminum, iron and manganese.
- The primary exposure pathways are inhalation, potential ingestion of groundwater from the site, direct contact and incidental ingestion with/of impacted soil and erosional transport to the Christina River.

Qualitative Remedial Objectives

Based on the above factors, the following qualitative remedial action objectives were developed:

- Control potential human contact (dermal, inhalation and ingestion) with contaminated soil.
- Control potential human contact (ingestion) with contaminated groundwater.
- Control potential contaminated soil erosion to the Christina River.

Quantitative Remedial Objectives

Based on the above qualitative remedial action objective, the following quantitative remedial action objectives for the soil and subsoil environmental media were developed:

- Prevent human contact with soil having an arsenic concentration greater than 3 mg/Kg.
- Prevent human contact with soil having a lead concentration greater than 400 mg/Kg.
- Prevent human contact with soil having a CPAH concentration greater than 1 mg/Kg.
- Prevent human contact with soil having a poly-chlorinated biphenyls (PCB) concentration greater than 0.5 mg/Kg.
- Prevent human contact with soil having a benzene-toluene-ethyl benzene-xylene (BTEX) concentration greater than 10 mg/Kg.
- Prevent human contact with soil having a C5 through C8 Aliphatic Hydrocarbons concentration greater than 100 mg/Kg.
- Prevent human contact with soil having a C9 through C12 Aliphatic Hydrocarbons concentration greater than 1000 mg/Kg.
- Prevent human contact with soil having a C9 through C18 Aliphatic Hydrocarbons concentration greater than 1000 mg/Kg.
- Prevent human contact with soil having a C19 through C36 Aliphatic Hydrocarbons concentration greater than 2500 mg/Kg.
- Prevent human contact with soil having a C9 through C10 Aromatic Hydrocarbons concentration greater than 100 mg/Kg.
- Prevent human ingestion of groundwater at the site containing metal contaminant concentrations greater than the DNREC Uniform Risk-Based Remediation Standards.
- Prevent release of contaminated sediment from the second phase of the Bioretention swale to the Christina River in exceedence of the DNREC Uniform Risk Based Remediation Standards for protection of the environment.

The quantitative remedial action objectives are based on the DNREC "Remediation Standards Guidance Under the Delaware Hazardous Substance Cleanup Act" (February 1998). These objectives are protective of potential human and environmental receptors.

V. PROPOSED REMEDIAL ACTION PLAN

Potential Remedial Alternatives

To accomplish the described remedial action objectives, three (3) potential remedial alternatives were reviewed for the soil and subsoil environmental media for the project area. These are listed below and discussed further in the following section:

1. No further action. Contaminants identified during the RI/FS investigation are not remediated. Site redevelopment proceeds based upon local zoning requirements.

2. Containment of affected materials within the redevelopment process in compliance with DNREC HSCA Regulation.

3. Complete removal of materials exceedence the DNREC unlimited reuse criterion.

Alternative 1: No Further Action.

The proposed redevelopment project would occur based upon local zoning requirements. Under this option no further remediation of contaminants would be required.

Alternative 2: Containment of Affected Materials in Compliance with DNREC HSCA Regulations.

Under this alternative, soil planned to be excavated for the redevelopment project will be handled in accordance with the DNREC established soil reuse categories which includes:

A - Unlimited Contractor re-use Outside of Riverfront Redevelopment Area (This soil category has little to no concentration of contaminants. These levels are suitable for unrestricted residential use).

B - Construction Re-use within Redevelopment Project (requires a geotextile marker fabric of a minimum quality of Amoco ACF 4508 or equivalent as determined by DNREC and a minimum of one foot of clean fill or in the stormwater retention basins high density PVC liner).

C - Re-use Limited to under roadways, concrete or building foundations.

Z - Off-Site Treatment or Disposal

In addition to the categories for selective re-use of contaminated soils at the site, the following shall also apply:

- Provide deed restrictions for all project involved parcels for non-residential usage,
- Require notification and approval from DNREC prior to any future intrusive activity in the project area and,
- Placement of a Groundwater Management Zone (GMZ) at the site to prevent future use of the groundwater beneath the site.
- Development of an Operation and Maintenance Plan (O & M) to maintain the containment system

Alternative 3: Complete Removal of Affected Materials.

Under this alternative, approximately 80 percent of soil in the site area, to a depth averaging 10 feet below grade, would be excavated and would be transported through Wilmington for off-site disposal and an equal amount of clean fill would be transported back for use in this redevelopment project. The excavated soil would represent all soils found to exceed the DNREC Unlimited Reuse Criterion (Level A) determined through soil screening analysis and confirmatory laboratory analysis. Extensive dewatering would occur under this option, as the affected soils extend below present water table levels.

VI. EVALUATION OF REMEDIAL ALTERNATIVES

The remedial alternatives were evaluated in accordance with the criteria set forth in the HSCA Regulations. The application of these criteria are as follows;

Protection of human health, welfare, and the environment: Alternative 1 does not protect human health or the environment as the site conditions would remain as found during the RI. Although, a majority of the soils samples exhibited concentrations equal to residential conditions (Level A), PAHs were detected in select samples requiring restrictive reuse and disposition (Levels B & C). As the anticipated future use of site will be a public meeting place, the public has the potential to be exposed to the impacted soil.

Alternative 2 mitigates risk to human health and the environment by eliminating the exposure pathways of the affected material to both the public and the environment. The proposed containment (concrete, asphalt, building structures, walkway, top soil, and the placement of the liner within the second phase of the Bioretention swale), the removal of the existing impacted storm water management system, and implementation of GMZ for

the property would eliminate public and environmental exposure to impacted soil, sediment, and ground water.

Alternative 3 eliminates the source of the risk and is beneficial to the public and the environment.

Compliance with all applicable local, state, and federal laws and regulations : Alternative 1 does not comply with all applicable laws and regulations. Alternatives 2 and 3, if implemented properly, comply with all applicable laws and regulations.

Community acceptance: Alternative 1 is not expected to receive community acceptance as the potential for continued public and environmental exposure would occur. Alternatives 2 and 3 are expected to meet community acceptance, however, more information may be obtained through public comment.

Monitoring required: Alternative 1 would require ongoing monitoring to ensure that the impacted soil and ground water are not effecting human health and the environment.

Alternative 2 will require some monitoring during the construction of the proposed pedestrian walkway and the Bioretention swale due to the potential for COC exposure. Alternative 2 will also require an operations and maintenance plan for future monitoring of the remedy. The plan would include items like a routine inspection of the containment, action items in case of future excavations in areas of contaminated material, etc.

Alternative 3 would not require additional monitoring as the COC would be treated and disposed of properly.

Technical practicability: Alternative 1 and Alternative 2 are technically practical. Alternative two is technically practical because the impermeable cap will contain the PAHs and arsenic. In this case, the impermeable cap will consist of the concrete building foundations and asphalt parking lots.

Alternative 3 technically can be performed, although it is significantly more expensive and technically much more difficult than Alternative 2. To remove the full extent of impacted soil would require extensive dewatering and excavation (depth to groundwater from 3.80 to 10.02 ft bgs). The unconfined aquifer and river are in hydraulic communication, which would necessitate high water pumping rates from excavations for extended periods to accomplish the remedial objective. These activities along with the depth to groundwater may cause the potential for COC to be detected in groundwater which is likely to be transported to the Christina River.

Restoration time frame: Alternative 1 would require no time duration.

Alternative 2 is expected to require more than one year to construct the new buildings, parking lots, the walkway, and the second phase of the Bioretention swale. The schedule for Alternative 2 begins with the construction of a detention pond and Building 1000 and the parking lots from October 1999 through 31 May 2000. The Bioretention swale would be developed in March 2000. The construction of Buildings 1100 and 1200 is undetermined at this time.

Alternative 3 would require a minimum of six months to complete. Activities that would need to be completed during this timeframe include:

- Award of the contract,
- Contractor mobilization and demobilization to the site,
- The installation of sheet piling along the excavation to prevent the entrance of groundwater to the excavation area,
- The removal and stockpiling of the soil on-site,
- Transportation of the soil to a soil remediation facility.

After these activities were completed, then the activities described in Alternative 2 could commence.

Cost to Implement: There are no costs associated with the implementation of Alternative 1.

For Alternative 2, the following costs are estimated:

- The estimated cost of the Bioretention swale is $1,1000,000.
- The estimated cost of Buildings 1000, 1100, and 1200 is $12,000,000.
- The estimated cost for the parking lots and other remediation are $7,000,000.

Alternative 3 includes the removal of soil exceeding Level A conditions. Eighty percent of the samples exhibited PAH or Arsenic concentrations Level A conditions. This would require that approximately 15 acres of soil to be excavated. The cost to implement Alternative 3 is estimated at $1.2 M to excavate (at $5.00 per cubic yard), $9 M to thermally treat soil offsite ($25/ton), and $2.9 M to backfill and compact ($8.00 per ton). This cost estimate does not include the effort required to dewater the excavation area to allow the excavation to extend below the water table.

Reduction in toxicity, mobility, and volume: Alternative 1 does not reduce the toxicity, mobility, or volume of the contaminants detected in the soil thus allowing the COC to remain.

Alternative 2 eliminates mobility of the detected COC to the public and the environment due to the installation of an impermeable cap: asphalt parking lots, concrete walkways, buildings constructed on concrete slabs, and the lined Bioretention swale. These paved areas produce a containment system that prevents the inflow of water that could help transport these contaminants to receptors of concern for both the public and the environment. In addition, because the COC are not volatile compounds, there will be no other transport mechanism.

Alternative 3 eliminates toxicity, mobility, and volume of the detected COC due to the complete removal and proper disposal of all material exceeding Level A conditions.

Long term effectiveness: Alternative 1 does not offer any long term effectiveness.

Alternative 2 offers long term effectiveness for the life of the redeveloped property and the storm water management system. The liner to be installed in the Bioretention swale has a design life of approximately 100 years. Future changes (if any) to site conditions as well as general "wear and tear" to the containment may alter the effectiveness of this remedy, thus an Operation and Maintenance (O & M) Plan will be developed to periodically inspect the remedy.

Alternative 3 offers long term effectiveness as the contaminants would be removed.

Short term effectiveness: Alternative 1 does not offer this protection. Alternatives 2 and 3 are both protective of the public health, welfare, and environment in the short term.

VII. PROPOSED REMEDIAL ACTION PLAN

Based on the above criteria, Alternative 1 (no further action) is not a viable alternative because it will not protect human health or the environment or comply with current laws. Alternatives 2 and 3 (containment and complete off-site disposal of all soils) are considered viable alternatives. Alternative 3 (off-site disposal) may cause short term exposures to the public due to hauling large quantities of contaminated soil off-site. Further, there is little to no apparent increased protectiveness with Alternative 3 as compared with Alternative 2, but there is a substantial increase in cost with Alternative 3.

Therefore, the most appropriate remedial action is Alternative 2 (containment of impacted soil). Alternative 2 will provide a cost effective means of meeting all the remedial objectives while satisfying the evaluation criteria. Alternative 2 will also remove the potential exposure pathway of human contact with impacted soil by isolating the source.

VIII. PUBLIC PARTICIPATION

The Department actively solicits public comments or suggestions on the Proposed Plan and welcome opportunities to answers questions. Please direct written comments to:

DNREC Site Investigation and Restoration Branch
Attn: Ann L. Breslin
391 Lukens Drive
New Castle, DE 19720

The public hearing will be held on Wednesday, September 15, 1999 at the City/County Building, 800 N. French Street, Wilmington, at 6:00 p.m. For additional information, contact Ann Breslin at (302) 395-2600.

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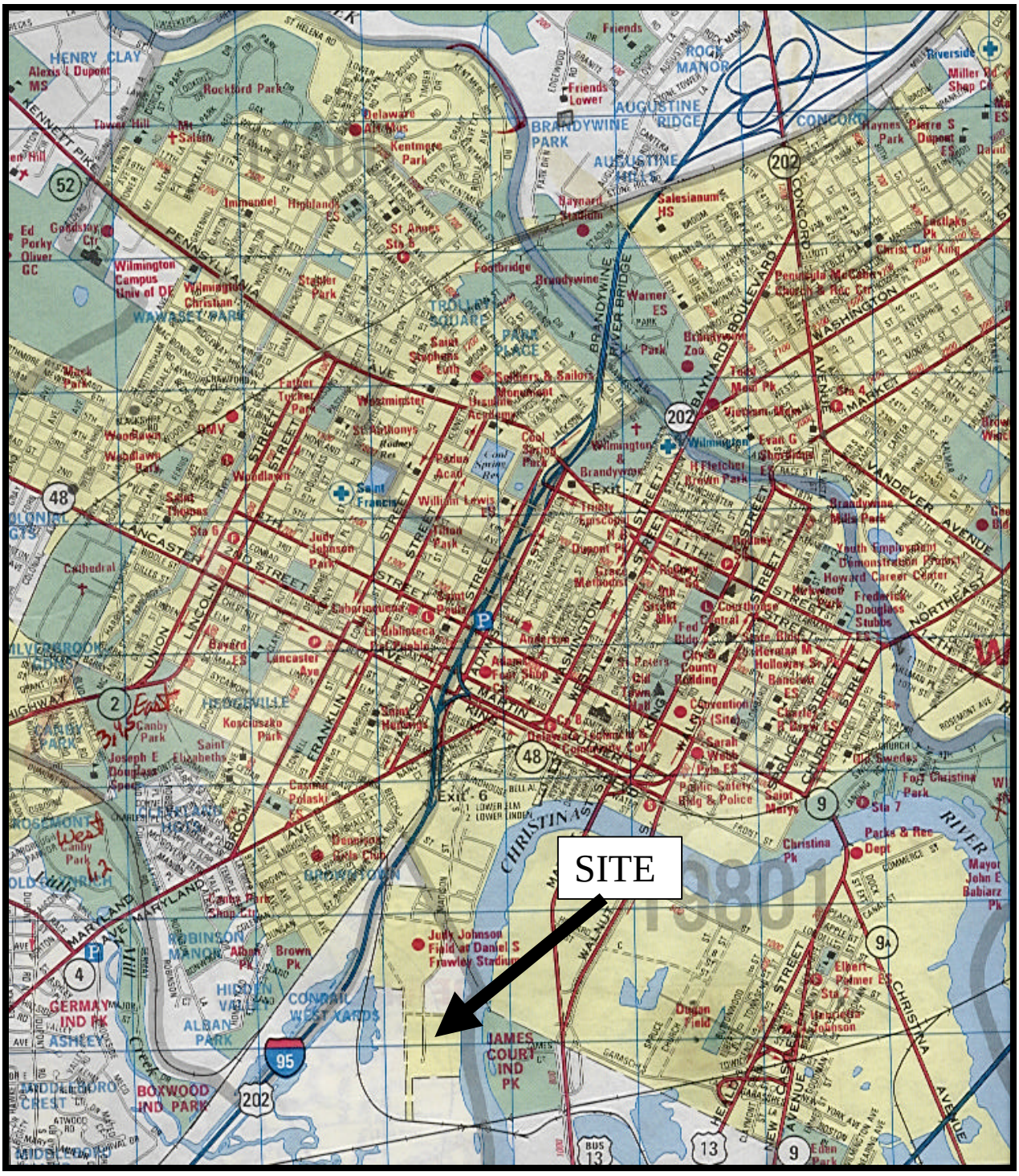

Scale: 1 inch = 2,000 feet

Figure 1 Site location map, Harbor Associates Property, Wilmington, DE (Source: ADC Street Map book, New Castle County, Delaware, 8 th Edition)

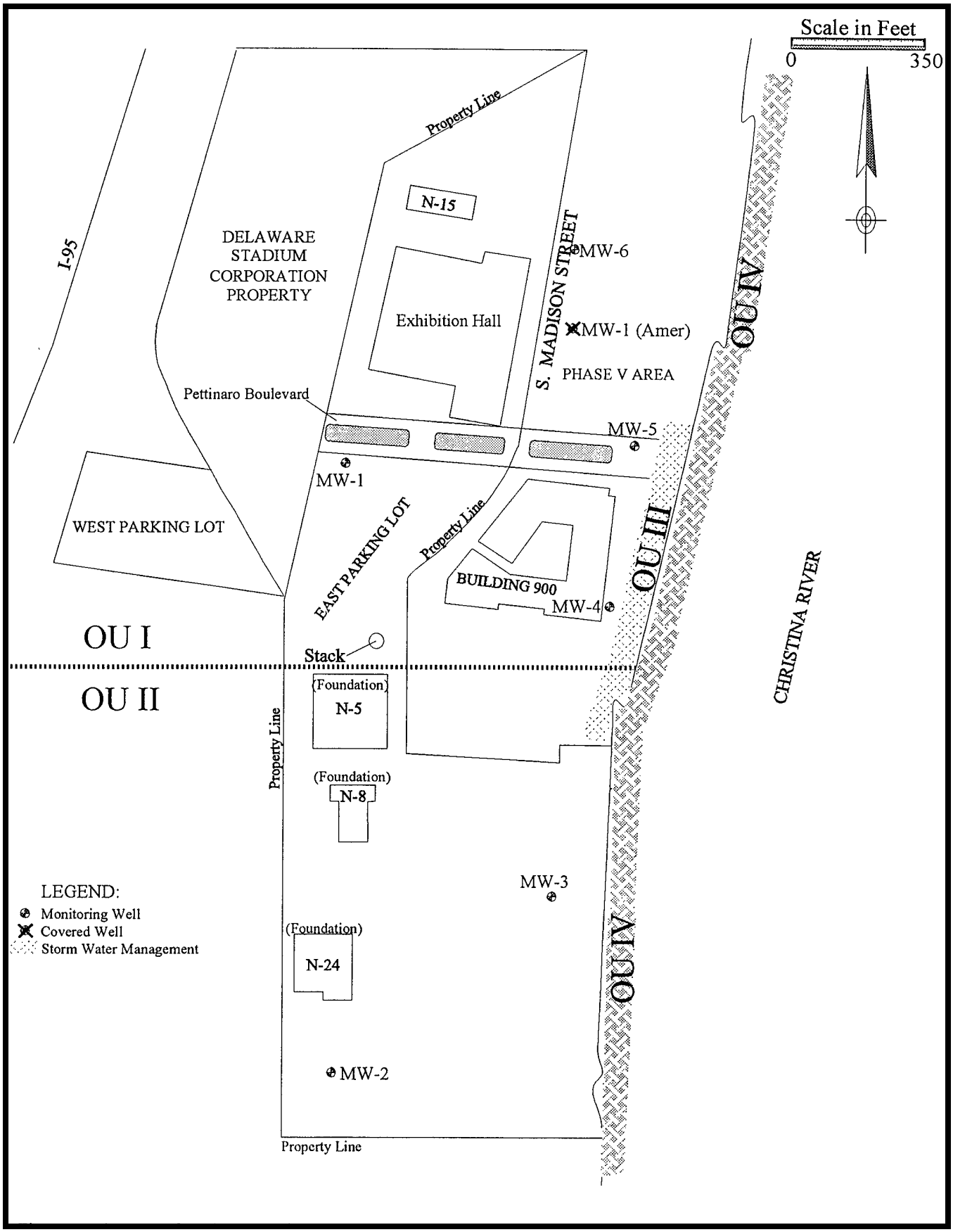

Figure 2 Site map of Harbor Associates and former Amer Properties

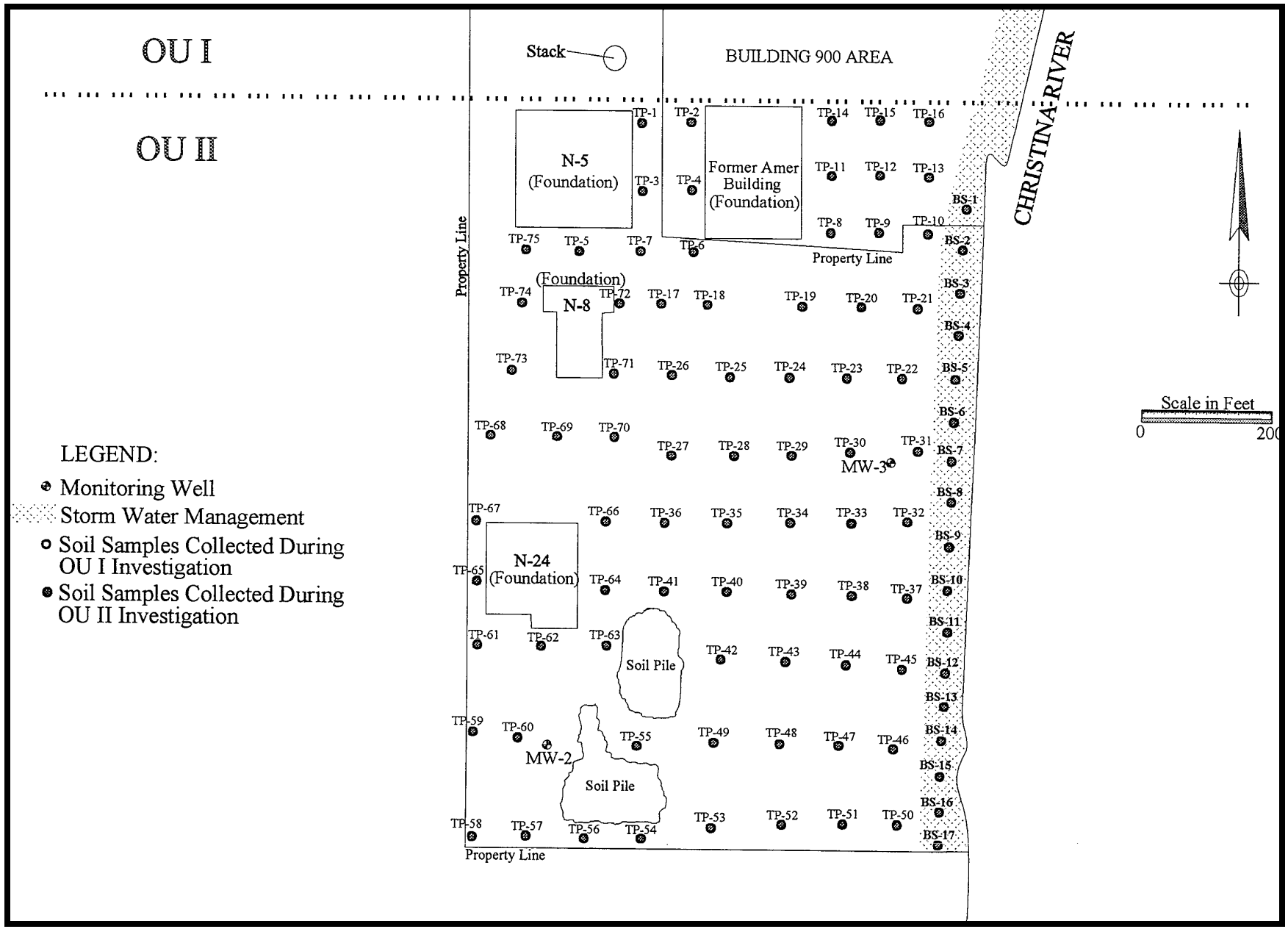

Figure 3 Site map showing soil sampling locat ions for OU II

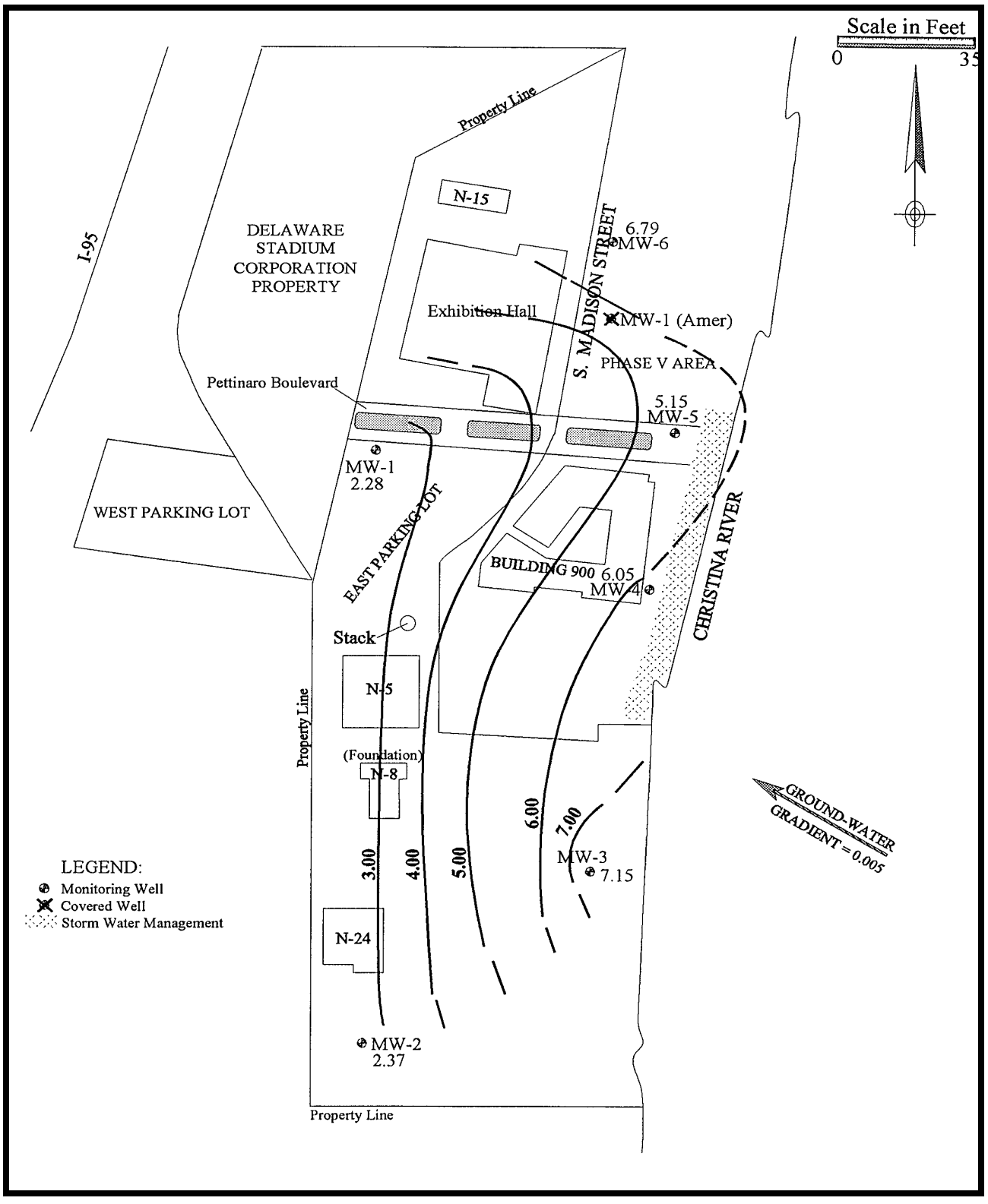

Figure 4 Site map showing groundwater elevations (ft) from the 29 January 1999 gauging event