

STATE OF DELAWARE

**DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL-
SITE INVESTIGATION AND RESTORATION BRANCH**

FINAL PLAN OF REMEDIAL ACTION



October 2006

**Speakman Townhomes
30th and Spruce Streets, Wilmington, DE**

DNREC Project No. DE-1347

This Final Plan of Remedial Action (Final Plan) presents the Department of Natural Resources and Environmental Control's (DNREC's) final cleanup alternative for the Speakman Townhomes Site in Wilmington. For Site-related reports and more information, please see the public participation section of this document.

The purpose of the Final Plan is to provide specific information about the soil and groundwater contamination and the cleanup alternatives DNREC has selected. In addition, as described in Section 12 of the Delaware Regulations Governing Hazardous Substance Cleanup (Regulations), DNREC has provided notice to the public and an opportunity for the public to comment on the Proposed Plan. No public comments were received during the public participation period for the Proposed Plan of Remedial Action. The Final Plan designates the selected remedy for the Site. All investigations of the Site, the Proposed Plan, and comments received from the public, DNREC's responses to the comments, and the Final Plan will constitute the Remedial Decision Record.

This Final Plan summarizes the remedial investigation and interim remedial actions that have already taken place at the Site. Each of these reports is included in the administrative record file. Copies of these documents can be obtained or viewed at the DNREC offices in New Castle, Delaware.

INTRODUCTION

The Site is located at the intersection of East 30th Street and North Spruce Street, Wilmington, New Castle County, Delaware (Figure 1). The property is bounded by 30th Street to the Southwest, residences and Market Street to the North, a document storage warehouse (Iron Mountain Storage) to the East and a uniform manufacturing and cleaning company (Nixon Uniform Services, Inc.) to the Southeast. The study area is approximately 8 acres in size. The Speakman Company (Speakman) utilized the property for manufacturing of bathroom fixtures from 1924-1980.

The proposed Site developers, Cornerstone West (Cornerstone) and The Ingerman Group (Ingerman), entered into a Voluntary Cleanup Program (VCP) agreement with DNREC pursuant to the provisions of the Delaware Hazardous Substance Cleanup Act, 7 Del. C. Chapter 91 (HSCA).

The goal for entering the Site into the VCP was to complete an investigation of the property to support the redevelopment of the Site and to obtain a Certificate of Completion of Remedy (COCR) pursuant to HSCA. It has been assigned the Site Investigation and Restoration Branch (SIRB) Identification Number of DE-1347. The Site was certified a Brownfield on February 10, 2005.

React Environmental Professional Services Group, Inc. (REPSG) and Environmental Alliance, Inc. (Alliance) completed a comprehensive Brownfields Investigation (BFI) of the Site on behalf of Cornerstone and Ingerman. The BFI was completed in February 2006, and DNREC approved the Final BFI Report dated March 31, 2006.

SITE DESCRIPTION

The Site is situated on a 0.93-acre asphalt parking lot, identified by New Castle County Record of Deeds as parcel number 2602310065, and a portion of a 6.94-acre manufacturing facility (parcel number 260233054). The Speakman Company (Speakman), a manufacturer of bathroom fixtures purchased the Site in pieces from 1924 to 1980. Precision Casting purchased the Site from Speakman in 1980 and sold it back to Speakman in 1984. Riverview Associates purchased the Site in December, 2001.

The Site had historically been used for brass castings manufacturing, electroplating, machining, assembly and a finishing shop. A 122,000 square-foot, three-story factory building complex is located at the northwest portion of the property, bordered by an asphalt parking area to the southeast. A sub-basement exists beneath portions of the manufacturing facility. The remainder of the property is unimproved land. Refer to Figure 2 for a Site map.

SITE INVESTIGATION HISTORY

REPSG/Alliance completed a BFI of the Site in February 2006 and the BFI was approved by DNREC, as amended March 31, 2006. This investigation involved the collection of samples

from solid waste, surface soil, subsurface soil, and groundwater beneath the Site. Various substances were detected in these samples at concentrations that exceed their respective Delaware Uniform Risk Based Remediation Standards (URS) for unrestricted (residential) use properties.

Surface Soil

The metals found in the surface soils (0-2 feet) above the unrestricted use URS values included aluminum, antimony, arsenic, barium, cadmium, chromium VI, copper, iron, lead, manganese, nickel, silver, vanadium, and zinc. The semi-volatile organic compound (SVOC) substances that were identified in surface soil above the unrestricted use URS values were benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. The volatile organic compound (VOC) substance identified in surface soil above the unrestricted use URS values was trichloroethylene (TCE). Table 1 summarizes the results and the maximum concentration of each substance identified above the URS value for unrestricted Site use.

TABLE 1
SURFACE SOIL (0 to 2 feet below ground surface)

Aluminum	24,600	7,800	4,800-12,000
Antimony	22	3.1	<0.5
Arsenic	76.7	11	11
Cadmium	6.56	3.9	1-3
Chromium VI	439	270	N/A
Copper	50,800	310	15-40
Iron	29,600	2,300	3,000-22,000
Lead	4,900	400	30-100
Manganese	234	160	60-350
Nickel	391	160	5-15
Vanadium	310	55	15-40
Zinc	7,040	2,300	60-90
Benzo(a)anthracene	35	0.9	N/A
Benzo(a)pyrene	27	0.09	N/A
Benzo(b)fluoranthene	32	0.9	N/A
Dibenzo(a,h)anthracene	4.5	0.09	N/A
Indeno(1,2,3-cd)pyrene	14	0.9	N/A
Trichloroethylene	64	5	N/A

Subsurface Soil

The SVOC substances that were identified in subsurface soils (soil at a depth greater than 2 feet below grade and above the groundwater level) above the unrestricted use URS values were benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene. The

metals detected in subsurface soils at a concentration in excess of the unrestricted use URS were aluminum, antimony, arsenic, barium, cadmium, copper, iron, lead, manganese, nickel, vanadium and zinc. TCE was the only VOC compound identified in subsurface soils above URS. Table 2 below summarizes the results and the maximum concentration of each substance identified in the subsurface soils above the unrestricted use URS value.

TABLE 2
SUBSURFACE SOIL (> 2 feet below ground surface)

Aluminum	22,900	7,800	4,800-12,000
Antimony	5.86	3.1	<0.5
Arsenic	34.5	11	11
Barium	786	550	40-80
Cadmium	15.8	3.9	1-3
Copper	3,370	310	15-40
Iron	157,000	2,300	3,000-22,000
Lead	765	400	30-100
Manganese	658	160	60-350
Nickel	258	160	5-15
Vanadium	87.2	55	15-40
Zinc	4,230	2,300	60-90
Benzo(a)anthracene	1.3	0.9	N/A
Benzo(a)pyrene	0.83	0.09	N/A
Benzo(b)fluoranthene	1	0.9	N/A
Dibenzo(a,h)anthracene	0.12	0.09	N/A
Trichloroethylene	29	5	N/A

The metals found dissolved in groundwater above the URS values include iron and manganese. The VOCs identified in groundwater above the unrestricted use URS values were naphthalene, TCE, and vinyl chloride. The SVOCs found in groundwater samples at concentrations in excess of the URS values were bis(2-ethylhexyl)phthalate and benzo(b)fluoranthene. Table 3 summarizes the results for groundwater and the maximum concentration of each substance identified above the URS value.

TABLE 3
GROUNDWATER

Iron (dissolved)	MW-004	579	300
Manganese (dissolved)	MW-004	2,360	50
2-methylnaphthalene	MW-004	38	12
Bis(2-ethylhexyl)phthalate	MW-008/9	110	6
Benzo(b)fluoranthene	MW-008	1	0.09
Naphthalene	MW-004	26	20
Trichloroethylene	MW-001	89	5
Vinyl chloride	MW-004	2	2

CLEANUP PLAN OBJECTIVES

In keeping with the HSCA Regulations, Site-specific Remedial Action Objectives (RAOs) must be established for all plans of remedial action. The Regulations require DNREC set objectives for land use, resource use, and cleanup levels that are protective of human health and the environment.

REMEDIAL INVESTIGATION RESULTS

A detailed discussion of the sampling results is included in the Final BFI Report. Tables 1-3, presented in the Site Investigation History section of the BFI report, summarize the results for surface soil, subsurface soil, and groundwater. Reported values include samples collected in areas targeted for Interim Response Removal Action (described below). It is important to note that lead, chromium VI, and indeno(1,2,3-cd)pyrene in surface soil and lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene in subsurface soil will no longer be compounds of concern following the Interim Response Removal Actions.

The URS values referenced above are guidance values based upon very conservative assumptions of exposure and risk. In lieu of their usage, the Regulations allow the performance of a Site-specific risk assessment, which takes into account Site-specific factors of exposure and risk.

INTERIM RESPONSE REMOVAL ACTIVITIES

Before Building Demolition (Completed)

A stained soil area (referred to as AOC N during the BFI), located in an open area on the northwest side of the factory building, contains concentrations of lead in excess of the unrestricted use URS. An excavation of these lead-impacted soils has been completed. Soils in AOC N were also found to contain TCE, chromium VI, benzo(a)anthracene, benzo(a)pyrene,

benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene in excess of unrestricted use URS. Post-excavation sampling has been conducted at AOC N to verify attainment of the URS for unrestricted use for lead (400 ppm) at the limits of excavation. Excavated soils have been submitted for waste characterization to determine if hazardous waste disposal at a Resource Conservation Recovery Act (RCRA) certified facility is required. Excavated soils will be disposed off-Site at an appropriately licensed facility.

REPSG/Alliance has surveyed and sampled material in a tunnel (a concrete-lined trough) located beneath the former foundry room floor. The tunnel contains approximately 80 cubic yards of hazardous sand (based on Toxicity Characteristic Leaching Procedure (TCLP) lead analysis of a composite sample) and an estimated 8,000-gallons of (assumed non-hazardous) water. Completed remediation includes pumping out of standing water, removing the sands via vacuum-loader, staging and disposal of sands, and power-washing of tunnel interior and mechanical equipment.

The BFI identified and delineated areas of lead in soil in excess of 400 ppm (the unrestricted use URS criterion level). Although the risk assessment demonstrated that lead detected in Site soils does not present an unacceptable risk to human health on Site-wide basis, these areas were proposed for excavation. The following locations on Figure 2 (with sample depths indicated) were accessible pre-demolition and have been excavated:

Sample	Depth excavated
NTE 016	0.5'
NTE 013	0.5'
AOC H -001	0.5'
AOC M-001	2.0'
NTI 001	0.5'

Excavated soils have been submitted for waste characterization to determine if hazardous waste disposal at a RCRA certified facility is required. Excavated soils will be disposed off-Site at an appropriate licensed facility.

After Building Demolition (To be Completed)

Soils beneath the former building #5 boiler room (referred to as AOC 5 during the BFI), centrally located within the factory complex, contain elevated concentrations of total chromium, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene (referred to as the Compounds of Concern ("COC"s) of AOC 5. Post-excavation sampling at AOC 5 will be conducted to verify concentrations of the compounds of concern (COCs) at the limits of excavation. Sample results will be compared against unrestricted URS values. If post-excavation sampling results indicated that remaining soils exceed the target levels for COCs, additional excavation will be required, followed by additional post-excavation sampling. Excavated soils will be submitted to waste characterization to determine if hazardous waste disposal at a RCRA certified facility is required. Excavated soils will be disposed off-Site at an appropriately licensed facility.

AOC 6 located beneath a former machine shop, contains concentrations of lead in excess of unrestricted use URS. Lead in soil in excess of 400 ppm has been delineated by sampling performed in February 2006 to encompass an area not exceeding 15 cubic yards. An interim remedial action involving excavation of soil will be completed at the Site following demolition of the existing onsite factory building. An estimated 15 cubic yards of lead-contaminated soil will be excavated from AOC 6. Since delineation sampling has already been performed which verifies that concentrations are not in excess of unrestricted URS, post-excavation sampling will not be conducted at AOC 6. Excavated soils will be submitted to waste characterization to determine if hazardous waste disposal at a RCRA facility is required. Excavated soils will be disposed off-Site at an appropriate licensed facility.

The BFI identified and delineated areas of lead in soil in excess of 400 ppm (the unrestricted use URS criterion level). Although the risk assessment demonstrated that lead detected in Site soils does not present an unacceptable risk to human health on Site-wide basis, soils that locally contain lead concentrations greater than 400 ppm and that are not already below existing basement foundations will be excavated. Excavated soils will be properly disposed off-Site in accordance with a DNREC-reviewed Contaminated Materials Management Plan.

RISK ASSESSMENTS

The purpose of the risk assessment is to estimate the potential health and environmental impacts of exposure to toxic chemicals at the Site. Risk assessments estimate the increased occurrence of health effects resulting from exposure to contamination. For example, a one in a million increase level of risk (1×10^{-6}) corresponds to one person in a million having an increased risk of a cancer occurring based on exposure to contamination. DNREC requires a risk assessment meet the increased cancer risk of one in one hundred thousand (1×10^{-5}) and a non-carcinogenic risk (or Hazard Index) equal to 1.0 or less.

The risk assessment assumed exposure to Site surface soil for typical exposure assumptions of an unrestricted use property (i.e. residential). The risk assessment assumed Interim Response Activities (previous section) have been completed, thereby removing chromium VI and indeno(1,2,3-cd)pyrene from surface soil evaluation and benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene from subsurface soil evaluation.

The risk assessment that was conducted for the Site identified the following potentially unacceptable risks at the Site:

- 1) The risk assessment identified potentially high carcinogenic and non-carcinogenic risks based upon unrestricted direct contact exposure to surface soil. The substances primarily contributing to the high carcinogenic risk is TCE. The substance primarily contributing to the non-carcinogenic risk is copper.
- 2) The risk assessment identified potentially high carcinogenic and non-carcinogenic risks associated with the unrestricted ingestion of groundwater at the Site. The substances contributing the highest carcinogenic risks are TCE and vinyl chloride. The substances contributing to the high non-carcinogenic risk are iron and manganese.

- 3) The risk assessment identified potentially high inhalation risks based upon potential vapor intrusion into future residential buildings. The substance contributing the inhalation risk is TCE.
- 4) Use of groundwater for domestic purposes at the Site would be unacceptable.

REMEDIAL ACTION OBJECTIVES

The evaluation of the nature and extent of contamination at the Site included comparing the soil and groundwater analytical data to applicable DNREC Soil and Groundwater Remediation Standards as provided in the DNREC Remediation Standards Guidance under the Delaware Hazardous Substance Cleanup Act (DNREC, 1999). For soil, the criteria applicable to the Site are the Unrestricted Use Setting, Non-Critical Resource Area Criteria (DNREC Criteria). An Unrestricted Use setting is defined in DNREC regulations as a setting where current or future use will not be restricted in any way to ensure protection of human health.

According to Section 8.4(1) of the Regulations, Site-specific remedial action objectives (RAOs) must be established for all plans of remedial action. The Regulations provide that DNREC will set objectives for land use, resource use, and cleanup levels that are protective of human health and the environment.

Qualitative objectives describe, in general terms, what the ultimate result of the remedial action, if necessary, will be. The following qualitative objectives are proposed for the Site:

- 1) Minimize and control exposure to surface soil at the Site.
- 2) Minimize and control human exposure to impacted groundwater.
- 3) Minimize and control exposure to impacted indoor air quality, resultant from vapor intrusion from soils and groundwater at the Site.

These objectives are consistent with the existing vacant condition of the Site, City of Wilmington zoning policies, State regulations governing water supply, and worker health and safety. The Site is located within the Groundwater Management Zone (GMZ) for the City of Wilmington. The GMZ will prohibit the installation of any water wells on, or groundwater usage at the Site without prior written approval of DNREC.

Quantitative objectives define specific levels of remedial action to achieve protection of human health and the environment. Based on the qualitative objectives, the quantitative objectives are:

- 1) Prevent human exposure to surface soil that contains identified substances that contribute to the exceedance of the carcinogenic risk target of 1×10^{-5} , that contribute to the exceedance of the non-carcinogenic Hazard Index of 1.0, and/or that contain lead in excess of 400 ppm; and
- 2) Prevent human exposure to groundwater at the Site.

FINAL PLAN OF REMEDIAL ACTION

Based on the BFI and Risk Assessment completed for the Site, a potentially unacceptable risk to human health exists based on the exposure to soil at the Site assuming a future residential setting. The exposure to groundwater, assuming use for domestic purposes also is not acceptable. In order to address these conditions, DNREC's proposed remedy for the Site includes the following actions:

Interim Action

As described in the preceding section, soils in excess of 400 ppm total lead, which are not located beneath existing basement foundations, will be removed and disposed off-Site. Soils impacted with compounds of concern at AOC 5 will be excavated and disposed off-Site. Hazardous materials located in a former foundry tunnel area will be removed and properly disposed, and the tunnel area will be cleaned prior to demolition.

Remedial Action

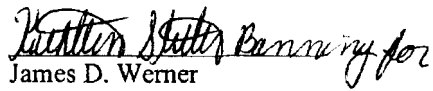
- Installation of an impervious cap consistent with the construction of concrete slab-on-grade structures, concrete partial sub-grade structures, and asphalt parking lots and drives during redevelopment, and installation of a soil cap in areas not planned for impervious cover. The protective containment caps will prevent direct contact exposure to the underlying soil. Sub-grade spaces will be constructed as garages and accessory space. A minimum of 4 feet of buffer space between the water table and the sub-grade foundations will sufficiently prevent direct contact exposure to groundwater. Habitation of sub-grade spaces is regulated in accordance with local building codes.
- Installation of vapor barrier in future inhabited buildings as required. The vapor remedy will consist of a high-grade synthetic membrane barrier to be installed on foundation (on-grade and sub-grade) slabs, perimeter cracks, and joints and a simple synthetic membrane barrier to be installed on sub-grade walls. These measures are intended to prevent intrusion of vapors migrating into habitable buildings.
- Placement of a restrictive covenant consistent with the Uniform Environmental Covenants Act (Title 7, Del. Code Chapter 79 Subtitle II) on the property within ninety-days following DNREC's adoption of the Final Plan; The deed restriction shall (a) restrict current and future activities conducted by future residents; (b) prohibit any digging, drilling, excavating, grading, constructing, earth moving, or any other land disturbing activities on the property without the prior written approval of the DNREC; and (c) prohibit the installation of any water well on, or use of groundwater at, the Site without the prior written approval of DNREC, as well as noting the Site's location within a GMZ.
- Finalization of a DNREC approved Operations and Maintenance (O&M) Plan for the Site within 90 days following the issuance of the Final Plan. The O&M Plan will include procedures for evaluating the integrity of the capped area.

PUBLIC PARTICIPATION

The Department actively solicited written public comments and suggestions on the Proposed Plan of Remedial Action. The comment period began September 20, 2006 and ended at the close of business October 9, 2006. DNREC received no public comments for the Proposed Plan of Remedial Action for Speakman Townhomes Site during the public participation phase.

DECLARATION

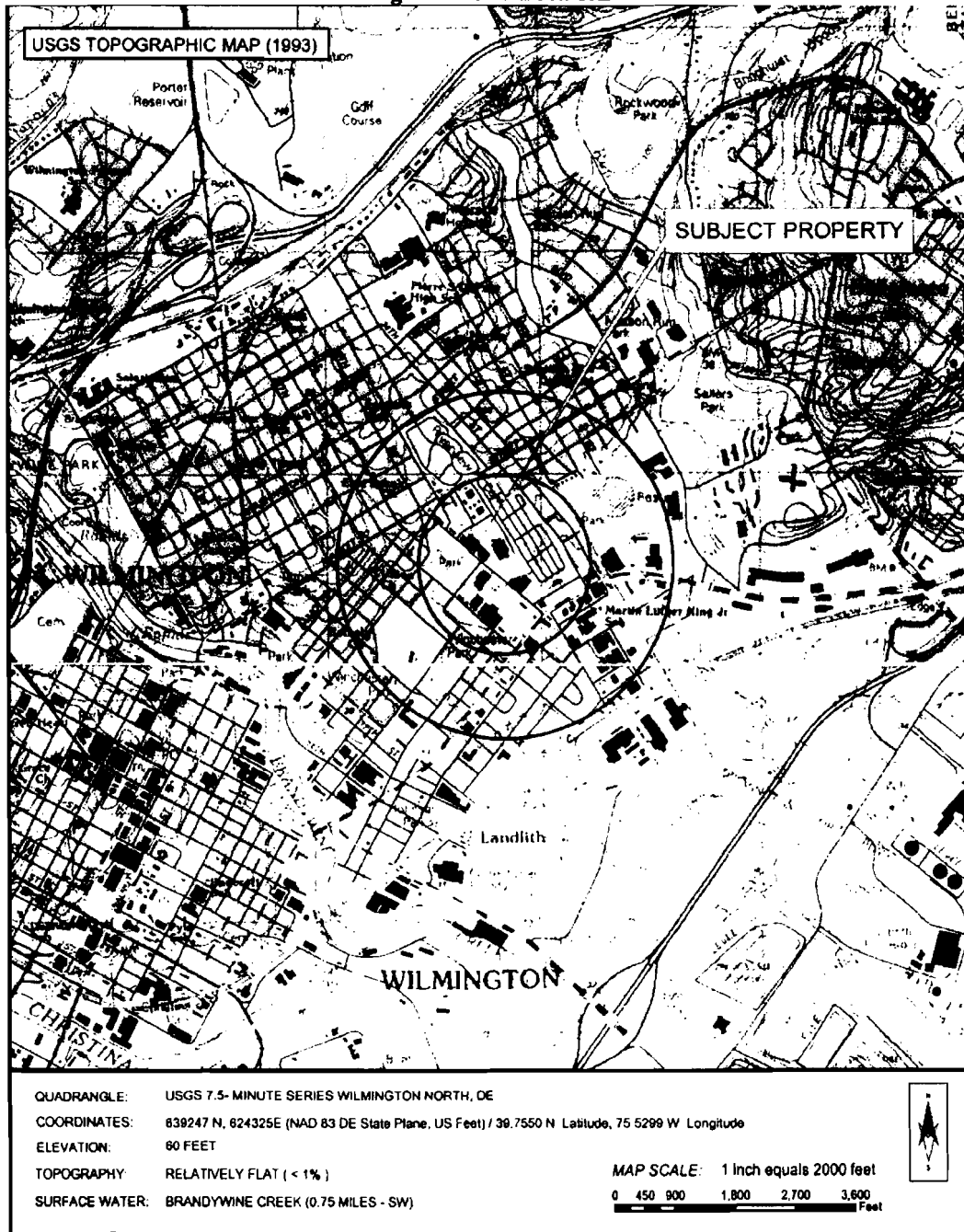
The Final Plan of Remedial Action for the Speakman Townhomes Site is protective of human health, welfare, and the environment and is consistent with the requirements of the Delaware Hazardous Substance Cleanup Act.


James D. Werner
Director of Air & Waste Management

10/18/06
Date

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Figure 1: Site Location



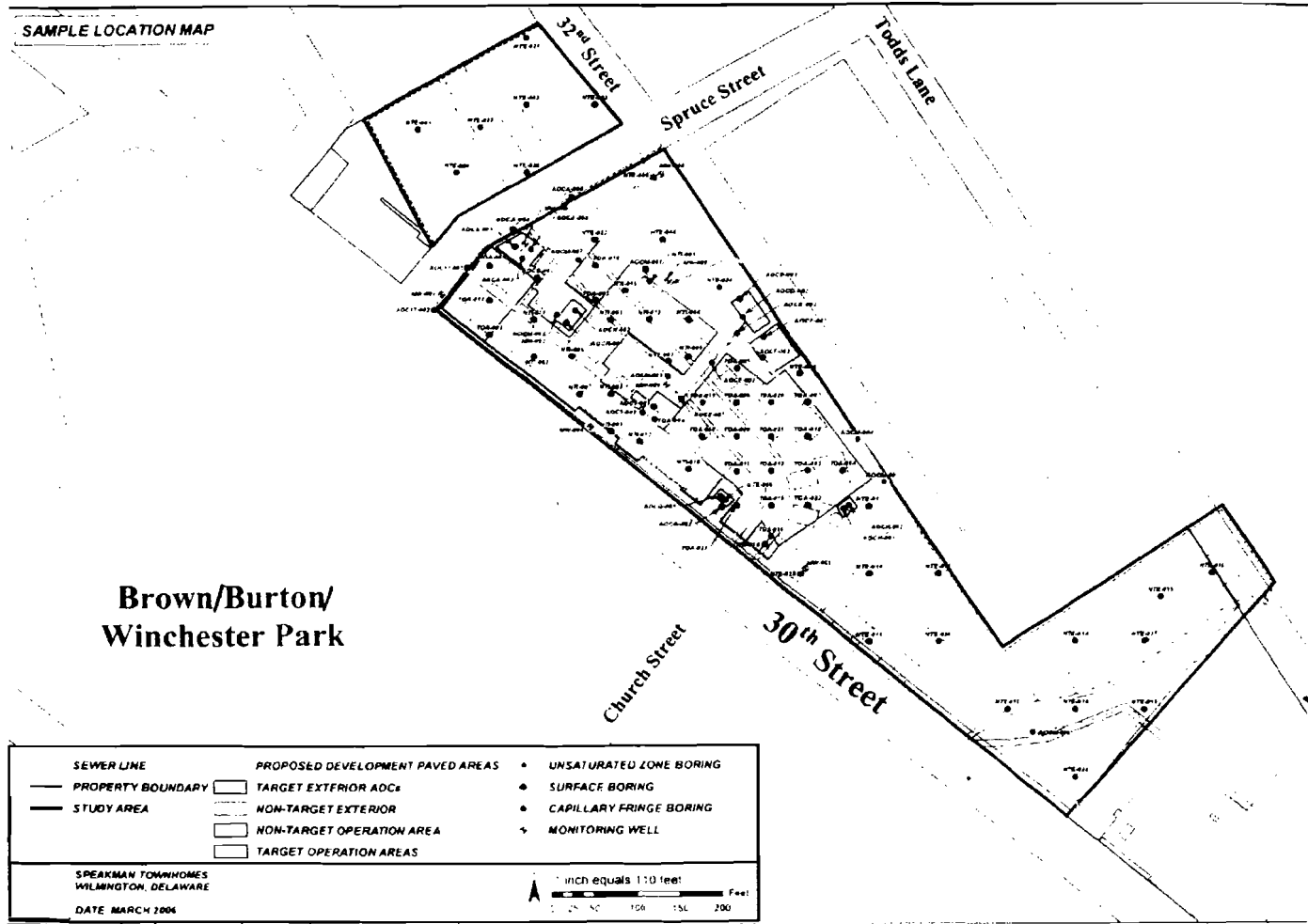


Figure 2: Site Layout and Sampling Locations