

Five-Year Review Report

Second Five-Year Review Report

for

Vestal Water Supply Well 1-1 Superfund Site

Town of Vestal

Broome County, New York

September 2003

PREPARED BY:

U.S. Environmental Protection Agency

Region II

New York, New York

Five-Year Review Report

Table of Contents

List of Acronyms	iii
Executive Summary	v
Five-Year Review Summary Form	vi
I. Introduction	1
II. Site Chronology	1
III. Background	1
Physical Characteristics	1
Land and Resource Use	2
History of Contamination	2
Initial Response	3
IV. Remedial Actions	3
Remedy Selection	3
Remedy Implementation	4
System Operations/Operation and Maintenance (O&M)	6
V. Progress Since the Last Five-Year Review	8
VI. Five-Year Review Process	8
Administrative Components	8
Community Involvement	8
Document Review	9
Data Review	9
Site Inspections	10
Interviews	11

VII. Technical Assessment	11
<i>Question A</i> : Is the remedy functioning as intended by the decision documents?	11
<i>Question B</i> : Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?	12
<i>Question C</i> : Has any other information come to light that could call into question the protectiveness of the remedy?	13
Technical Assessment Summary	13
VIII. Recommendations and Follow-up Actions	13
IX. Protectiveness Statement(s)	13
X. Next Review	14
XI. Attachment 1 - Bibliography for Vestal Water Supply Well 1-1 Superfund Site ..	15

Tables

Table 1 - Chronology of Site Events	T.1
Table 2 - Annual System Operations/O&M Costs for OU-1	T.2
Table 3 - Annual System Operations/O&M Costs for OU-2, Area 2	T.3
Table 4 - Total VOC Concentrations in Monitoring Wells	T.4

Figures

Figure 1-1 Site Map	A.1
Figure 1-2 Site Features and Structures	A.2
Figure 2-1 Monitoring Well Locations	A.3

List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
DCE	Dichloroethene
EPA	United States Environmental Protection Agency
gpm	Gallons Per Minute
LTRA	Long-Term Response Action
MCLs	Maximum Contaminant Levels
NCP	National Contingency Plan
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
O&M	Operation and Maintenance
OU	Operable Unit
PID	Photo Ionization Detector
ppb	Parts Per Billion
ppm	Parts Per Million
PRP	Potentially Responsible Party
RA	Remedial Action
RAO	Remedial Action Objective
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SVE	In-Situ Vacuum Extraction
TCA	1,1,1-Trichloroethane
TCE	Trichloroethene
UAO	Unilateral Administrative Order

USACE

United States Army Corps of Engineers

VOC

Volatile Organic Compound

Executive Summary

The remedies for the Vestal Water Supply Well 1-1 Superfund Site (Site) in the Town of Vestal, New York include treatment of contaminated groundwater via air stripping, and the treatment of contaminated soil via in-situ vacuum extraction in two distinct areas, i.e., Area 2 and 4, located in the Stage Road Industrial Park. Remedial Action Reports were signed on March 30, 1995 and May 15, 2001 for the remedial action completions of the air stripping facility and the in-situ vacuum extraction system for Area 2, respectively. The Site achieved construction completion status with the signing of the Preliminary Close Out Report for the in-situ vacuum extraction system for Area 4 on September 11, 2003. Because the remedial action for groundwater will require more than five years to complete, this five-year review is being conducted as a matter of EPA policy. The triggering action for this policy review is the completion of the first five-year review for the Site on September 30, 1998.

The assessment of this five-year review found that the first operable unit (OU 1) and second operable unit (OU 2) remedies were constructed in accordance with the respective requirements of the OU 1 and OU 2 Records of Decision. The remedies are functioning as designed. For OU 1, the immediate threats from direct exposure to contaminated groundwater have been addressed through capturing and treating the groundwater, and the groundwater remedy is expected to be completed when groundwater cleanup goals are achieved through air stripping. The OU 2 (source area) remedial action is expected to be completed when the soil cleanup goals are achieved through soil vapor extraction in Area 4, which is expected to require three years. The cleanup goals for the OU 2 remedy at Area 2 have been achieved.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site Name (from WasteLAN): Vestal Water Supply Well 1-1

EPA ID (from WasteLAN): NYD980763767

Region: 2

State: NY

City/County: Town of Vestal, Broome County

SITE STATUS

NPL Status: Final Deleted Other (specify) _____

Remediation Status (choose all that apply): Under Construction Operating Complete

Multiple OUs? YES NO

Construction completion date: Expected 09/30/2003

Has site been put into reuse? OU 1 - N/A. OU 2 - Area 2 is available for reuse. Area 4 is undergoing remediation

REVIEW STATUS

Lead agency: EPA State Tribe Other Federal Agency _____

Author name: Sharon Trocher

Author title: Remedial Project Manager

Author affiliation: EPA

Review period: 09/30/1998 to 09/01/2003

Date(s) of site inspection: 05/06/2003 and 06/24/2003

Type of review:

- Post-SARA Pre-SARA NPL-Removal only
 Non-NPL Remedial Action Site NPL State/Tribe-lead
 Regional Discretion Statutory

Review number: 1 (first) 2 (second) 3 (third) Other (specify) _____

Triggering action:

- Actual RA Onsite Construction at OU # _____ Actual RA Start at OU# __1__
 Construction Completion Previous Five-Year Review Report
 Other (specify) _____

Triggering action date (from WasteLAN): 09/30/1998

Due date (five years after triggering action date): 09/30/2003

Does the report include recommendation(s) and follow-up action(s)? yes no

Is human exposure under control? yes no

Is contaminated groundwater under control? yes no not yet determined

Is the remedy protective of the environment? yes no not yet determined

Acres in use or available for use: restricted: 1 unrestricted: _____

**Vestal Water Supply Well 1-1 Superfund Site
Town of Vestal, New York
Second Five-Year Review**

I. Introduction

This five-year review was conducted in accordance with the Comprehensive Five-Year Review Guidance, OSWER Directive 9355.7-03B-P (June 2001). The purpose of a five-year review is to ensure that implemented remedies are protective of public health and the environment and that they function as intended by the decision documents. This report will become part of the site file.

The U.S. Environmental Protection Agency (EPA) Region II, conducted the five-year review of the remedies implemented at the Vestal Water Supply Well 1-1 Superfund site (Site) in the Town of Vestal, New York. This review was conducted by the Remedial Project Manager (RPM) for the Site. This is the second five-year review for the Site.

The Site is being addressed in two phases, or operable units (OUs). OU 1, which involves groundwater extraction and treatment, has been constructed and is currently operating. OU 2 addresses two discrete sources ("Area 2" and "Area 4") of groundwater contamination. Remediation of the contaminated soil in Area 2 has been completed. The remedy to address the contaminated soil in Area 4 has been constructed and is currently operating.

II. Site Chronology

See Table 1 for Site chronology.

III. Background

Physical Characteristics

Vestal Water Supply Well 1-1 is located in the Town of Vestal, Broome County, New York, about five miles southwest of the City of Binghamton, on the South Bank of the Susquehanna River (see Figure 1-1). The Site is generally flat and lies within the flood plain of the Susquehanna River. The western portion of the Site is located between the Susquehanna River and New York State Route 17 and includes a well field, a fire department training center, state-owned forest lands, and a recreational field. The eastern portion of the Site contains the Stage Road Industrial Park which is located approximately 1000 feet southeast of Well 1-1 (see Figure 1-2). The Stage Road Industrial Park contains several active industrial facilities. Several marshy areas and drainage ditches encompass and interlace the industrial park. Two areas, Areas 2 and 4 (see Figure 2-1) located in the industrial park are sources of groundwater contamination at Well 1-1. Approximately 27,000 people reside in the Town of Vestal, and approximately 17,000 rely on public water supplies for drinking water.

Land and Resource Use

Land use on the eastern portion of the Site has evolved from agriculture to light and medium industrial. Land use on the western portion currently includes open spaces, a fire department training center and a well field. It is anticipated that the mix of land uses similar to that described will continue into the future. In establishing cleanup requirements for the Site, EPA considered the possibility of exposure from ingestion of groundwater at concentrations detected in the monitoring wells. Exposure to contaminated soils were only considered for future on-Site construction workers since it was assumed that the Site will remain commercial or light industrial.

Well 1-1 is one of three production wells in Water District 1 that are intended to provide drinking water to several water districts in the Vestal area. In 1954, Well 1-1 was constructed with the capacity of 1.4 million gallons per day as a backup well to supplement the Vestal water supply which was provided at that time by the Town of Endicott, located across the Susquehanna River. A few years later, Water District 1 became an independent Water supplier for the Town of Vestal, utilizing wells 1-1, 1-2, and 1-3 with a combined capacity of 4.6 million gallons per day. In 1980, after significant concentrations of chlorinated solvents, primarily 1,1,1-trichloroethane (TCA), trichloroethene (TCE) and 1,2-dichloroethene (1,2-DCE) were discovered in Well 1-1, the well pumpage was diverted to the Susquehanna River. Well 1-2 became physically impaired in 1988, and has since been replaced by a new Well 1-2A. Before the construction of Well 1-2A, Well 1-3 had served for several years as the District's primary water supply. Additionally, reserve capacity is provided by an emergency interconnection to another Water District and holding tank in District 1.

The aquifer underlying the Site is extremely permeable, resulting in high production capacities, this characteristic also allows for the rapid migration of contaminants introduced to the aquifer. There also exist many variations in the subsurface geology in this area, giving rise to highly complex groundwater hydrology. The direction of groundwater flow is generally from southeast to northwest.

History of Contamination

A chemical spill at the IBM plant in Endicott, New York in 1978 led to a testing program of all drinking water wells in the vicinity for organic compounds. As a result of this testing, chlorinated solvents were discovered in Well 1-1, and the well was taken out of service in 1980 and pumped to the Susquehanna River. A subsequent investigation had since determined that the presence of chlorinated solvents in Well 1-1 is not related to the spill at the IBM plant. The source of the groundwater contamination was determined to be two areas located in the Stage Road Industrial Park. Area 2 was formerly used as a truck parking area located between Stage Road and the abandoned Erie Lackawanna railroad tracks. Area 4 currently is the parking lot for American Board Companies, Inc. which manufactured electronic circuit boards.

Initial Response

After chlorinated organic solvents were discovered in Well 1-1, the well pumpage was diverted to the Susquehanna River in 1980 in order to hydraulically “capture” and discharge a plume of contaminated groundwater before the contaminants could reach the remainder of the well field. The New York State Department of Environmental Conservation (NYSDEC) commenced a remedial investigation/feasibility study (RI/FS) of the Site in April 1985 under a Cooperative Agreement with EPA. This investigation confirmed the presence of volatile organic compounds (VOCs) in the groundwater southeast and east of Well 1-1. On June 27, 1986, EPA issued a Record of Decision (ROD) for OU 1 which addressed the contaminated groundwater. The OU 1 ROD also recommended that a second RI/FS be undertaken to evaluate suspected source areas of contamination upgradient of Well 1-1.

EPA assumed the lead role for the second operable unit source investigation and initiated the RI/FS in November 1988. The results of the RI/FS revealed significant VOC contamination in subsurface soils located in two areas in the Stage Road Industrial Park. Elevated concentrations of TCA, TCE, 1,2-DCE and tetrachloroethene were detected in source Areas 2 and 4. The ROD for OU 2 was signed on September 27, 1990 and addressed the two discrete source areas, Areas 2 and 4.

EPA proposed the Site for listing on the National Priorities List (NPL) on December 30, 1982 (47 FR 58476) and formally added it to the NPL on September 8, 1983 (48 FR 40658).

IV. Remedial Actions

Remedy Selection

The OU 1 ROD which addresses the contaminated groundwater at the Vestal Site was signed on June 27, 1986, and the OU 2 ROD which addresses the source areas was signed on September 27, 1990. Remedial Action Objectives (RAOs) were developed as a result of data collected during the Remedial Investigations to aid in the development and screening of remedial alternatives considered in the Feasibility Studies.

OU 1

The following are the RAOs selected in the OU 1 ROD:

- Contain the plume of contamination to mitigate further contamination of public water supplies;
- Provide a safe, reliable water supply to the Town of Vestal; and
- Ensure that the quality and best use of the Susquehanna River are not impaired.

The following are the major components of the selected remedy for the OU 1 ROD:

- Construction of a packed column air stripping system on Well 1-1 in order to return the well to full service as Vestal Water District 1's primary water supply; and
- Initiation of a supplemental RI/FS to further investigate the extent of soil contamination in suspected source areas and to evaluate possible source control measures.

OU 2

The following are the RAOs selected in the OU 2 ROD:

- Ensure protection of groundwater from the continued release of VOC contamination from soil;
- Ensure protection of Well 1-1 water quality from any inorganic groundwater contamination not addressed in the first operable unit, if necessary; and
- Ensure protection of human health, presumably that of Site workers who are exposed to contaminated soils through excavation.

The following are the major components of the selected remedy for the OU 2 ROD:

- In-situ vacuum extraction (SVE) of volatile organic contamination from soil in source Areas 2 and 4 within the Stage Road Industrial Park, followed by carbon adsorption, with subsequent treatment and disposal of contaminated carbon at a permitted off-Site facility;
- A monitoring program to evaluate progress of the SVE remedy;
- A monitoring program to periodically assess inorganic contaminants in the aquifer upgradient of Well 1-1 (the decision to implement a monitoring program for organic contamination was contained in the EPA's June 27, 1986 ROD for OU 1);
- A contingency remedy for Well 1-1 involving treatment of inorganic contaminants and groundwater to be implemented, if necessary in the future.

Remedy Implementation

EPA performed the remedial design/remedial action (RD/RA) for OU 1 and for Area 2 of OU 2 because no viable potentially responsible parties (PRPs) were identified. In March 1991, EPA issued a unilateral administrative order (UAO) to three PRPs for the performance of the RD/RA at Area 4. Although the Area 4 RD was completed in September 1994 pursuant to the UAO, the PRPs indicated that financial constraints would prevent their implementation of the RA; therefore, EPA assumed performance of the Area 4 RA. In May 1999, EPA negotiated an ability to pay settlement with the PRPs for past and future costs incurred by EPA.

OU 1

The RD for the air stripper was approved by EPA in September 1987. The construction of the air stripping facility was started in May 1989 and completed by EPA in July 1990. However, due to problems at existing Well 1-1, EPA replaced Well 1-1 with a new well, Well 1-1A. The RD for

Well 1-1A was completed in May 1992, and construction of Well 1-1A was completed in December 1993. Well 1-1A has a pumping capacity of approximately 1000 gallons per minute (gpm) and operates in a range of flow rates from 400 to 750 gpm.

In March 1995, EPA issued a Remedial Action Report which determined that Well 1-1A and the associated air stripping facility were fully functional and operational as a potable water supply. However, the NYSDEC, which had previously agreed through a cooperate agreement with EPA to provide Long-Term Response Action (LTRA) for this facility, was unable to secure a contract with the Town of Vestal to perform LTRA on behalf of the State. In May 1995, the NYSDEC informed EPA that it no longer desired cooperative agreement funds to perform LTRA. Therefore, EPA performs the LTRA and discharges the treated water to the Susquehanna River to restore the aquifer, since the Town of Vestal has indicated that it no longer requires treated water from Well 1-1A for potable purposes.

The monitoring for OU 1 consists of both treatment plant performance monitoring and groundwater monitoring. The performance monitoring criteria are designed to monitor the performance of the air stripper treatment system and determine whether the treated water meets the requirements for discharge to the Susquehanna River. The performance evaluation requires monthly sampling and analysis of the influent and effluent of the Well 1-1A treatment system. The groundwater monitoring criteria are designed to monitor the effectiveness of capture of the groundwater contamination plume and to determine the progress of groundwater restoration and compliance with the groundwater quality standards. The evaluation requires annual sampling and analysis of groundwater from monitoring wells in the contamination plume area and measurements of groundwater elevation during sampling to develop a potentiometric surface map reflecting the current aquifer conditions.

OU 2

The remedial designs of the SVE systems for Areas 2 and 4 were completed in September 1994. Construction of the SVE system for Area 2 started in October 1996. The SVE system was designed to remove VOCs from unsaturated soil. Initial concentrations of compounds of concern in untreated subsurface soil in Area 2 ranged from 40 to 150,000 parts per billion (ppb). The system was designed with horizontal wells (12) to treat the upper vadose zone and vertical wells (36) down to the groundwater. A semi-permeable Site cover consisting of six-inches of clay was constructed over the treatment area to minimize vertical leakage of air. The extracted soil gas was treated using two vapor-phase granular activated carbon canisters connected in series prior to release into the atmosphere. The SVE system operations began in January 1997, after installation and system start-up activities were completed. In December 1997, four additional vertical SVE wells were installed to enhance treatment of contaminated soil in the eastern portion of Area 2 for a total of 40 vertical wells. The SVE system operation was terminated in November 2000, after the results of the Interim Soil Sampling Program confirmed that the SVE system successfully achieved ROD cleanup goals. Actual operation of the SVE system was for approximately 30 months since the SVE system was shut down for four extended periods due to operating problems

that occurred as a result of extremely high rainfall and subsequent elevation of the groundwater table. The volume of treated soil was approximately 17,000 cubic yards or 47.6 million pounds of soil. The total targeted VOCs removed were approximately 1,046 pounds.

EPA and U.S. Army Corps of Engineers (USACE) have determined that the remediation of contaminated soil in Area 2 has been completed and met the cleanup goals specified in the OU 2 ROD. In addition, construction in Area 2 was performed consistent with the RD Final Performance Specifications and conforms with the remedy selected in the OU 2 ROD.

Soil sampling was performed in September and October 2001 in Area 4 to further delineate the area of contamination and to refine the remedial design completed in September 1994. The highest initial concentrations of contaminants of concern (COC) detected in the untreated subsurface soil in Area 4 were 2,840,000 ppb of TCE and 2,250,000 ppb of TCA. Construction of the SVE system was started on April 1, 2003 and was completed on June 27, 2003. SVE system construction activities included installation of 55 vertical wells and an air conduit network assembly, construction of two distribution buildings, electrical hook-up, connection of distribution buildings to existing equipment building located in Area 2, and upgrading the equipment in the equipment building. The manifolds and individual well piping were constructed for rotational flexibility between injection and withdrawal of air to allow increased control of air flow within the treatment area.

On a monthly basis, the flow rate, blower temperatures and vacuum/pressure are recorded at each SVE well and air samples are taken from "system sample" locations (i.e., influent to carbon adsorber, mid-carbon, effluent to carbon adsorber) and analyzed for site-related VOCs. A full round of off-gas air sampling is collected once per quarter and analyzed for VOCs. The full round of sampling includes air samples taken from all SVE vacuum wells and the three "system sample" locations. The data collected are used to 1) assess the operating condition of the SVE system, 2) evaluate system performance, 3) substantiate operational changes to increase system efficiency, 4) determine when the carbon and air quality control system require replacement, and 5) determine when interim and post-treatment soil sampling events should be collected. Data collected are also being used to troubleshoot any problems which may occur to the system.

EPA and NYSDEC have determined that all RA construction activities were performed in accordance with plans and specifications. This determination was documented in a Preliminary Close Out Report which was issued on September 11, 2003. After groundwater cleanup levels and Area 4 soil cleanup objectives have been met, EPA will issue a Final Close Out Report.

System Operation/Operation and Maintenance

OU 1

EPA's contractor is conducting long-term operation and maintenance activities for the air stripping facility according to the February 1996 Operation and Maintenance (O&M) Manual approved by EPA. The primary activities associated with O&M include the following:

- Inspection and maintenance of Well 1-1A pump packing, pre-lube line and pump motor oil and check for pump vibration/heat;
- Inspection, maintenance and lubrication of motors and pumps and inspection of blowers' air filters;
- Periodic manual removal of calcium carbonate deposits from several key locations where the deposition impedes flow;
- Inspection of tower packing, clearwell level and record flow rate;
- Verification that the high level and low level shut off switches for the clearwell are working properly;
- Verification that the motor control center and the alarm/control panel are working properly, and inspection and testing the auto dial-out system; and
- Monthly sampling of plant influent and effluent and annual sampling of groundwater monitoring wells.

Three major repairs have been performed at this treatment facility. In October 1999, the treatment well pump was replaced since the pump bearings had deteriorated. In December 2001, the pump shaft separated from the pump motor. Upon removal of the pump, it was determined that the pump bowls were severely corroded due to electrolysis. To help protect the new pump from corrosion, the pump was replaced with a nickel oxide-coated pump with enclosed impellers. In October and December 2002, the air stripper was evaluated since the air stripper was not achieving the discharge criteria. As a result, the blower was replaced. The evaluation report also mentioned slight-to-moderate fouling of the air stripper by calcium carbonate, which will be addressed when the performance of the air stripper is affected.

Annual O&M costs for OU 1 include operation and maintenance of the air stripping facility, sampling and monitoring efforts, utilities, and major repairs and are shown in Table 2. As seen in Table 2, the annual O&M costs were slightly higher in 1998, 1999 and 2002. Additional O&M costs incurred in 1998, 1999 and 2002 were the costs of providing a budget estimate and procuring long-term response subcontractors, replacing Well 1-1A pump, and replacing for a second time Well 1-1A pump and repairing and installing monitoring wells, respectively. The O&M costs are well below the originally estimated annual O&M costs of \$540,000 since Foster Wheeler Environmental's level of effort, the subcontractor's actual O&M cost, and the maintenance of the treatment facility were all less than anticipated.

OU 2

The SVE system for Area 2 operated from January 1997 until November 2000 when the operation was terminated after the system successfully achieved ROD cleanup goals. O&M activities for the Area 2 SVE system were similar to the current O&M activities for the Area 4 SVE system which are discussed below. O&M costs for O&M activities for the Area 2 SVE system are shown in Table 3 and included operation and maintenance of the SVE system, sampling and monitoring efforts, repairs and utilities. The original estimated annual O&M cost was \$248,000. The 1998 and 2000 actual costs are much lower than expected since the SVE system was shut down for approximately six and four months, respectively, as a result of

extremely high rainfall and subsequent elevation of the groundwater table. During shut down, O&M costs including maintenance, field personnel, monthly soil vapor sampling, utilities, carbon changes and the disposal of water were not incurred.

USACE and its contractor are also performing the long-term operation and maintenance activities for Area 4. The primary O&M activities associated with Area 4 include the following:

- Inspect, maintain and lubricate motors, heat exchangers and discharge and purge pumps;
- Inspect the piping system and all control and relief valves;
- Remove any sediment from the water knock-out tank and verify that the low-level and high-level shut off switches are working properly;
- Sample process air and monitor system parameters, including pressures, vacuums, flow rates and temperatures;
- Evaluate the analytical data to determine if the system needs to be reconfigured to obtain optimal performance of the system; and
- Verify that the control system is working properly. Perform inspection of sensor switches, control relays, and programmable logic controller on a quarterly basis. Inspect and test the auto dial-out system monthly.

V. Progress Since the Last Five-Year Review

The previous Five-Year Review report did not contain recommendations or follow-up actions which impact protectiveness.

VI. Five-Year Review Process

Administrative Components

The five-year review team consisted of Sharon Trocher (RPM), Marian Olsen (risk assessor) and John Malleck (Section Chief). This is an EPA-lead Site. EPA's contractor for OU 1 LTRA and OU 2 is Foster Wheeler Environmental Corporation and USACE, respectively. USACE procured Severson Environmental Services Inc. (Severson) to implement the OU-2, Areas 2 and 4 remedial actions. Gerard Burke of the NYSDEC was notified of the five-year review on January 6, 2003.

Community Involvement

The EPA Community Relations Coordinated for the Site, Cecilia Echols, published a notice in the *Press & Sun-Bulletin*, on February 7, 2003, notifying the community of the initiation of the five-year review process. The notice indicated that EPA would be conducting a five-year review of the remedies for the Site to ensure that the implemented remedies remain protective of public health and the environment and are functioning as designed. It was also indicated that once the five-year review is completed, the results will be made available in the local Site repository. In addition, the notice included the Remedial Project Manager's address and telephone for questions related to the five-year review process or the Site. A similar notice, notifying the public that the review was completed will be sent when the review is finished.

Document Review

This five-year review consisted of a review of relevant documents including O&M records and monitoring data (see Attachment 1).

Data Review

Groundwater Monitoring

The air stripper treatment system is monitored to determine its performance and whether the treated water meets the requirements for discharge to the Susquehanna River. Groundwater samples of the influent and the effluent of Well 1-1A's air stripper have been collected and analyzed for VOCs on a monthly basis since November 1996. With the exception of the episode in 2002 when the facility was shut down due to exceeding discharge criteria, the performance monitoring indicates that the influent exceeds the surface water discharge criteria for Site volatile organic compounds of concern while the treated effluent is below the surface water discharge criteria for all VOCs. These results indicate that the air stripper is effectively treating the water pumped from Well 1-1A to applicable criteria. To date, approximately 2.2 billion gallons of groundwater have been treated at Well 1-1A.

The groundwater monitoring criteria are designed to monitor the effectiveness of capture of the groundwater contamination plume and to determine the progress of groundwater restoration and compliance with the groundwater quality criteria. The groundwater monitoring program includes annual groundwater sampling of groundwater monitoring wells located upgradient and side-gradient of Well 1-1A which are analyzed for VOCs (see Figure 2-1). The program also includes yearly sampling at three groundwater monitoring wells located in close proximity to Well 1-1A and monitoring of the influent and effluent of the air stripper at Well 1-1A. These samples are analyzed for inorganic compounds to measure any inorganic groundwater contamination and to determine if inorganic treatment is needed at Well 1-1A.

The results of the first three years of groundwater monitoring data and the 2002 groundwater monitoring data indicate that the pumping rate at Well 1-1A was effectively capturing the contaminated groundwater plume with minimal or no lateral migrations of Site COCs. In 2000 and 2001, damage to monitoring wells led to an inadequate monitoring well network for monitoring the aerial extent of groundwater contamination, although it is expected that Well 1-1A had been adequately capturing the groundwater contamination plume. In 2002, EPA repaired damaged monitoring wells and installed additional monitoring wells, and added these wells to the groundwater monitoring well network. Based on the groundwater sampling results, it can be concluded that continued pumping and treating is required for remediation of groundwater contamination and that the current pumping rate at Well 1-1A is effectively capturing the contaminated groundwater plume. As shown by the performance monitoring discussed above, the contaminated groundwater plume is being effectively treated by the air stripper at Well 1-1A. Table 4 summarizes the total VOC concentration detected in monitoring wells during the annual groundwater monitoring sampling (see Figure 2-1 for location of monitoring wells).

The 1996 through 2002 groundwater monitoring data indicate that the inorganic levels detected in the groundwater collected from three monitoring wells located in close proximity to Well 1-1A (two monitoring wells during the 2000 and 2001 sampling events) and the influent and effluent of the air stripper are below the groundwater quality criteria and that inorganic treatment at Well 1-1A is not needed. In 2000, one of the three monitoring wells used to monitor inorganic compounds was damaged and replaced in 2002.

Source Control Monitoring

Initial concentrations of COCs in untreated subsurface soil in Area 2 ranged from 40 to 150,000 ppb. Upon completion of SVE system operations, the concentration of COCs in subsurface soil was reduced to below 76 ppb. Based on analytical results of the soil samples, EPA concluded that the SVE system successfully treated soil in Area 2 to below ROD cleanup goals.

The construction of the SVE system in Area 4 was initiated on April 1, 2003 and was completed on June 27, 2003. Performance data are being collected monthly from monitoring ports located throughout the SVE system. Effluent sampling data are also being collected from after the air pollution control equipment to ensure that air emissions are below State and Federal requirements. As of September 8, 2003, approximately 600 pounds of TCA and TCE have been removed from the subsurface soil.

Site Inspections

OU 1

A Site inspection was performed on May 6, 2003. The following parties were in attendance.

Gerard Burke, NYSDEC
Heidi Roldan, Foster Wheeler Environmental Corp.
Dennis Shimer, Aguilar Environmental, Inc.
John Strang, NYSDEC
Sharon Trocher, EPA

The inspection of the groundwater treatment facility found a well-maintained and functional facility. However, the effluent pump control valve was leaking due to fouling by calcium carbonate. A portion of the treated groundwater was therefore fed via gravity to the collection basin for the flood control system for the Susquehanna River. Mr. Shimer, Foster Wheeler's subcontractor, indicated that he was awaiting delivery of a new valve. EPA is discussing with NYSDEC whether to discharge all treated groundwater to the collection basin instead of pumping the effluent directly to the river, as is the current procedure. This would save on cost of electricity and repairs to the effluent piping caused by fouling.

OU 2

A Site inspection was performed on June 24, 2003. The following parties were in attendance.

Frank Bales, USACE
Vanessa Bishop, USACE
Doug Callahan, Envirogen
James Drumm, NYSDEC
Josh Earsing, Severson
Larry Elia, Severson
Paul Hitcho, Severson

Al La Greca, Severson
Cassandra Marshall, Severson
Ed Oddo, Severson
Nick Patsis, USACE
John Strang, NYSDEC
Sharon Trocher, EPA

At the time of the inspection of the Area 4 SVE system, the system was undergoing startup activities, which began on June 23, 2003. Photo Ionization Detector (PID) readings from individual well sampling points estimated that the VOCs ranged from approximately 1.5 parts per million by volume (ppm_v) to 1540 ppm_v. At the time of the inspection, several SVE wells were full of water or had limited air flow (less than 5 standard cubic feet per minute) because of record setting rainfall experienced in June 2003. As the soil dries, the air flow through the system will increase. All equipment was functioning as intended.

Interviews

No interviews were conducted for this review. However, EPA or its contractors have been in contact with the Town of Vestal regarding major events, such as shut down of the air stripper for major repairs, installation of new monitoring wells, and start-up of remedial actions. During these conversations, the Town of Vestal did not express any major concerns regarding the remedial actions at the Site.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The review of documents, applicable or relevant and appropriate requirements (ARARs), risk assumptions, and the results of the Site inspections indicate that the air stripper is functioning as intended by the ROD. The packed column air stripper was designed to reduce COCs from levels well above their maximum detected concentrations to less than one ppb, which is below the groundwater quality criterion of either five or seven ppb depending on the specific contaminant. The air stripper is performing as designed as verified by review of the monthly sampling data collected since November 1996 from the plant influent and effluent. Additionally, the groundwater plume of contamination is effectively being captured as determined by annual sampling and hydraulic monitoring of the groundwater monitoring wells.

The soil sampling confirmed that the SVE system in Area 2 successfully treated the contaminated soil to ROD cleanup goals. However, the SVE system was highly vulnerable to water infiltration, resulting in frequent system shutdowns. The SVE wells in Area 4 were modified to minimize system shut down due to high water table levels. EPA expects that the SVE system in Area 4,

which was based on the design of the Area 2 SVE system, will also achieve the ROD cleanup goals. To ensure protection of the groundwater, the ROD cleanup goals for the soil are conservative cleanup levels and are well below the New York State Technical Administrative Guidance Memorandum levels.

Operation and maintenance of the air stripper and SVE system have, on the whole, been effective. However, the air stripper facility was shut down for repairs from August 31, 1999 to October 13, 1999 for replacement of the Well 1-1A pump, December 9, 2001 to April 2, 2002 for replacement of the Well 1-1A pump, and September 25, 2002 to December 30, 2002 for evaluation of the air stripper and replacement of the air blower. The pump modifications implemented in 2002 should minimize corrosion and future plant shutdowns required to repair the pump. However, it is expected that as the facility continues to operate, additional repairs due to normal wear on the facility will be required.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?

The remedy to address the contaminated groundwater has been constructed and is currently operating. This remedy captures and treats the contaminated groundwater.

The remedy to address the contaminated soil in Area 2 has been completed and met the specified cleanup goals in the OU-2 ROD. This remedy was designed to address potential impacts of contaminants on the groundwater and also reduce the potential future risk from human exposure to excavated soils. The removal of VOCs from the soil from this area has removed this potential route of exposure.

The remedy to address the contaminated soil in Area 4 has been constructed and is currently operating. This remedy is designed to address impacts of contaminants in soil as a source to groundwater.

The evaluation of groundwater in this review focused on two primary exposure pathways, direct ingestion (as a potable water source) and the possibility of vapor intrusion into buildings constructed over the plume. The evaluation of the direct contact pathway showed that nearby residents are on public water supplies, and since they are not using the contaminated wells for drinking water purposes there is no current exposure. Therefore, the remedy is protective for the direct ingestion route of exposure. The contaminants of concern are primarily volatile organic chemicals. The Maximum Contaminant Levels (MCLs) in groundwater for these chemicals have not changed since the ROD was signed and the MCLs remain protective.

Soil vapor intrusion was evaluated based on the conservative (health protective) assumption that there are residences located above the maximum detected concentration. EPA also utilized the health-based screening criteria provided in its Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils. This guidance provides calculations of concentrations in groundwater associated with indoor air concentrations at acceptable levels of cancer risk and noncancer health hazards. This review compared the data from the groundwater monitoring wells for the Site with EPA's Soil Vapor Intrusion values associated with a cancer risk

of 10^{-6} or a noncancer hazardous quotient of 1. Review of groundwater monitoring well sampling data indicates that the Soil Vapor Intrusion screening values described previously are exceeded for several chemicals including vinyl chloride (comparison value 0.25 ppb and concentration in ground water of 118 ppb at Well EB-33 and a concentration of 117 ppb at Well S-2). Other contaminants of concern include: cis-1,2-DCE (Well S-2 has a concentration of 229 ppb, Well S-11 has a concentration of 232 ppb, and Well S-1 has a concentration of 5.06 ppb compared to comparison value of 2.1 ppb); TCE (concentration of 25.6 ppb in Well S-7 and the comparison value is the MCL of 5 ppb); and 1,1-DCE (concentration of 89 ppb in Well S-7 and comparison value is 22 ppb). This screening level analysis does not indicate that a vapor intrusion problem exists. Rather, EPA's analysis indicates that further evaluation of the vapor intrusion pathway would be appropriate. Such evaluation would include site-specific considerations such as the type of building, the location of the building with respect to the maximum detected concentrations, and the subsurface characteristics of that location.

Question C: has any other information come to light that could call into question the protectiveness of the remedy?

No ecological targets were identified in the RODs and none were identified during the five-year review, and therefore monitoring of ecological targets is not necessary. There is no other information that calls into question the protectiveness of the remedies.

Technical Assessment Summary

According to the data reviewed and the Site inspections, the remedies are functioning as intended by the RODs. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedies. The cleanup levels cited in the RODs have not yet been met for OU 1 or for OU 2, Area 4. The RAOs are still valid and are currently being met for OU 1, and were met for OU 2, Area 2. The groundwater contamination plume is being contained and treated prior to discharge to the Susquehanna River to prevent degradation of water quality. The groundwater monitoring wells are functional, and the annual groundwater sampling data from these wells and the OU 1 plant influent indicate that treatment for inorganics at Well 1-1 is not necessary. The Area 4 SVE system is currently operating and removing VOCs from subsurface soils to protect the groundwater from the leaching of VOC contaminants from the soil.

VIII. Recommendations and Follow-Up Actions

The remedial actions for OU 1 and OU 2, Area 4 need to be continued. In addition, an assessment of the vapor intrusion pathway needs to be implemented. These are all part of the ongoing remedial actions at this Site. There are no recommendations or follow-up actions associated with this review.

IX. Protectiveness Statement

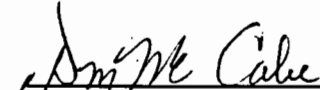
Currently there is no human or environmental exposure to, or ingestion of, contaminated groundwater and soil, and no exposures expected during the next five years. Site remedies are ongoing and are expected to fully protect human health and the environment when they are completed.

Next Review

The next five-year review for the Vestal Water Supply Well 1-1 is required by September 2008, five years from the date of this review.

Approved by:

Date:



George Pavlou, Director
Emergency and Remedial Response Division
U.S. Environmental Protection Agency

9-30-03

XI. Attachment 1 - Bibliography for Vestal Water Supply Well 1-1 Superfund Site

Water Supply Well 1-1 Superfund Site Remedial Investigation, Operable Unit 1 (OU 1), Ecology and Environment, Inc., May 1986

Water Supply Well 1-1 Superfund Site Contamination Risk Assessment, OU 1, Ecology and Environment, Inc., May 1986

Vestal Water Supply Well 1-1 Superfund Site Record of Decision, OU 1, June 27, 1986

Water Supply Well 1-1 Superfund Site Design Report VOC Removal Facility, OU 1, CDM Federal Programs Corp., August 1987

Vestal Water Supply Well 1-1 Superfund Site Final Supplemental Remedial Investigation, Operable Unit 2 (OU 2), Ebasco Services Inc., May 1990

Water Supply Well 1-1 Superfund Site Final Supplemental Feasibility Study Report, OU 2, Ebasco Services Inc., May 1990

Vestal Water Supply Well 1-1 Superfund Site Record of Decision, OU 2, June 27, 1990

Vestal Water Supply Well 1-1 Superfund Site Groundwater Monitoring Plan, OU 1, Morlando Construction Enterprises, Inc., July 12, 1990

Vestal Water Supply Well 1-1 Superfund Site Remedial Action Report, OU 1, U.S. Environmental Protection Agency, March 30, 1995

Vestal Water Supply Well 1-1 Superfund Site Revised Draft Operations & Maintenance Manual, OU 1, Foster Wheeler Environmental Corp., February 1996

Vestal Water Supply Well 1-1 Superfund Site Monthly Progress Reports, OU 1, November 1996 through May 2003

Vestal Water Supply Well 1-1 Superfund Site In-Situ Soil Vapor Extraction System Operation and Maintenance Manual, OU 2, Area 2, Envirogen, Inc., January 1997

Vestal Water Supply Well 1-1 Superfund Site In-Situ Soil Vapor Extraction System Installation and Start-up Report, OU 2, Area 2, MWR, Inc., April 1997

Water Supply Well 1-1 Superfund Site Final Report Geoprobe Soil Sampling, OU 2, Area 2, MWR, Inc., July 1997

Vestal Water Supply Well 1-1 Superfund Site Annual Effectiveness Monitoring Reports, OU 1, Foster Wheeler Environmental Corp., 1997, 1998, 1999, 2000, 2001 and 2003

Vestal Water Supply Well 1-1 Superfund Site Five-Year Review Report, U.S. Environmental Protection Agency, September 30, 1998

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Vestal Water Supply Well 1-1 Superfund Site Final Remedial Action Report, Remediation of Contaminated Soils Via In-Situ Vacuum Extraction, OU 2, Area 2, U.S. Environmental Protection Agency, May 15, 2001

Comprehensive Five-Year Review Guidance, U.S. Environmental Protection Agency, EPA 540-R-01-007, June 2001

Water Supply Well 1-1 Superfund Site Final Pre-Remediation Geoprobe Sampling Summary Report, OU 2, Area 4, Envirogen, Inc., March 21, 2002

Interim Progress Report No. 1, In-Situ Soil Vapor Extraction System, Vestal Water Supply Well 1-1 Superfund Site, Operable Unit 2, Area 4, Envirogen/Shaw E&I, Inc., August 4, 2003

Interim Progress Report No. 2, In-Situ Soil Vapor Extraction System, Vestal Water Supply Well 1-1 Superfund Site, Operable Unit 2, Area 4, Envirogen/Shaw E&I, Inc., August 20, 2003

Table 1
Chronology of Site Events

Event	Date
Volatile organic contamination detected at Well 1-1 and well taken off- line	1980
NPL listing	9/8/83
Remedial Investigation/Feasibility Study (RI/FS) completed - OU-1	5/86
ROD selecting OU-1 remedy signed	6/27/86
Remedial design approved for air stripper - OU-1	9/29/87
Superfund State Contract signed	11/2/88
Start of construction of air stripper - OU-1	5/31/89
RI/FS completed - OU-2	5/90
Completion of construction of air stripper - OU-1	6/10/90
ROD selecting OU-2 remedy signed	9/27/90
Unilateral Administrative Order issued - OU-2, Area 4	3/29/91
Remedial design completed for Well 1-1A - OU-1	5/92
Start of construction of Well 1-1A - OU-1	9/10/92
Completion of construction of Well 1-1A - OU-1	12/31/93
Remedial design completed - OU-2, Areas 2 & 4	9/30/94
Remedial Action Report for groundwater remedy approved - OU-1	3/30/95
Start of construction of soil vapor extraction system (SVE) - OU-2, Area 2	10/11/96
Start of LTRA for OU-1	10/15/96
Completion of construction of SVE - OU-2, Area 2	1/18/97
First Five-Year Report signed	9/30/98
Cost Recovery Consent Decree entered - OU-2, Area 4	5/26/99
Completion of SVE remediation - OU-2, Area 2	11/20/00
Remedial Action Report for SVE approved - OU-2, Area 2	5/15/01
Start of construction of SVE - OU-2, Area 4	4/1/03
Completion of construction of SVE - OU-2, Area 4 signifying completion of all Site construction activities	6/27/03
Preliminary Close Out Report signed	9/11/03

Table 2

Annual System Operations/O&M Costs for OU-1

Dates		Total Cost rounded to nearest \$1,000
From	To	
1/1997	12/1997	\$227,000
1/1998	12/1998	\$295,000
1/1999	12/1999	\$261,000
1/2000	12/2000	\$231,000
1/2001	12/2001	\$188,000
1/2002	12/2002	\$307,000

Table 3

Annual System Operations/O&M Costs for OU-2, Area 2

Dates		Total Cost rounded to nearest \$1,000
From	To	
1/1997	12/1997	\$274,000
1/1998	12/1998	\$85,000
1/1999	12/1999	\$352,000
1/2000	12/2000	\$237,000

Table 4

Total VOC Concentration in Monitoring Wells

Monitoring Well Identification	November 1996 (initial)	November 1997 (first)	June 1999 (second)	June 2000 (third)	June 2001 (fourth)	October 2002 (fifth)
Well S-1	NS	NS	NS	NS	NS	22.26
Well S-2	1572.5	504.9*	994	1472	807	533.68
Well S-6	NS	NS	NS	NS	NS	55.35*
Well S-7	380	561.22	NS	NS	NS	1445.3
Well S-8	ND	NS	NS	NS	NS	35.5
Well S-11	5131	441.7	383	4154	417	467.9
Well EB-31	128.5	106	67	79	81	97.62
Well EB-33	2384.4	1285.23	1321	833	552	355.35
Well EB-41	ND	4.6	6	6	8	31.2
Well EB-42	2	1	ND	1	ND	ND
Well 1-22	NS	NS	NS	NS	NS	ND
Well 1-23	NS	1	ND	ND	ND	NS
Well 1-24	3.6	8.33	4	9	5	ND
Well 1-29	963	249.3	217*	58.5*	NS	175.7
Well 1-29A	30	97.4	69	NS	51	43.86
Well 1-30	ND	1	ND	ND	ND	NS
Well 1-28	NS	NS	NS	NS	ND	NS
Well 1-28A	NS	NS	NS	NS	ND	NS
Well 1-32R	NS	NS	NS	NS	NS	ND
Well 1-32A-R	NS	NS	NS	NS	NS	ND

Qualifiers:

(initial) – indicates annual effectiveness report

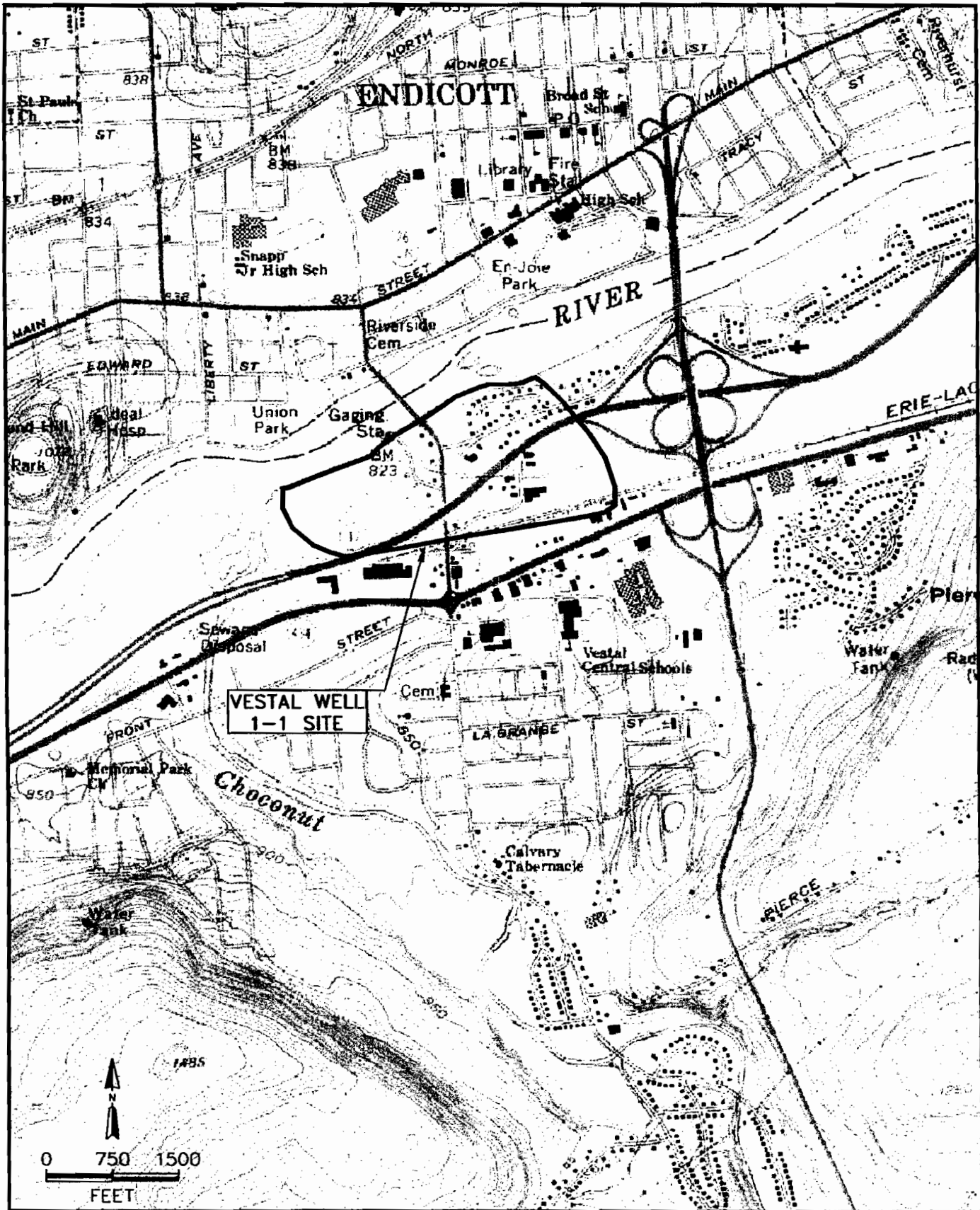
NS – Not Sampled

* -Average of duplicate data

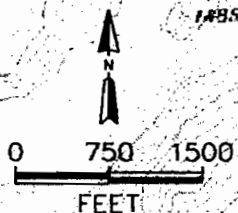
ND – Not Detected

Notes:

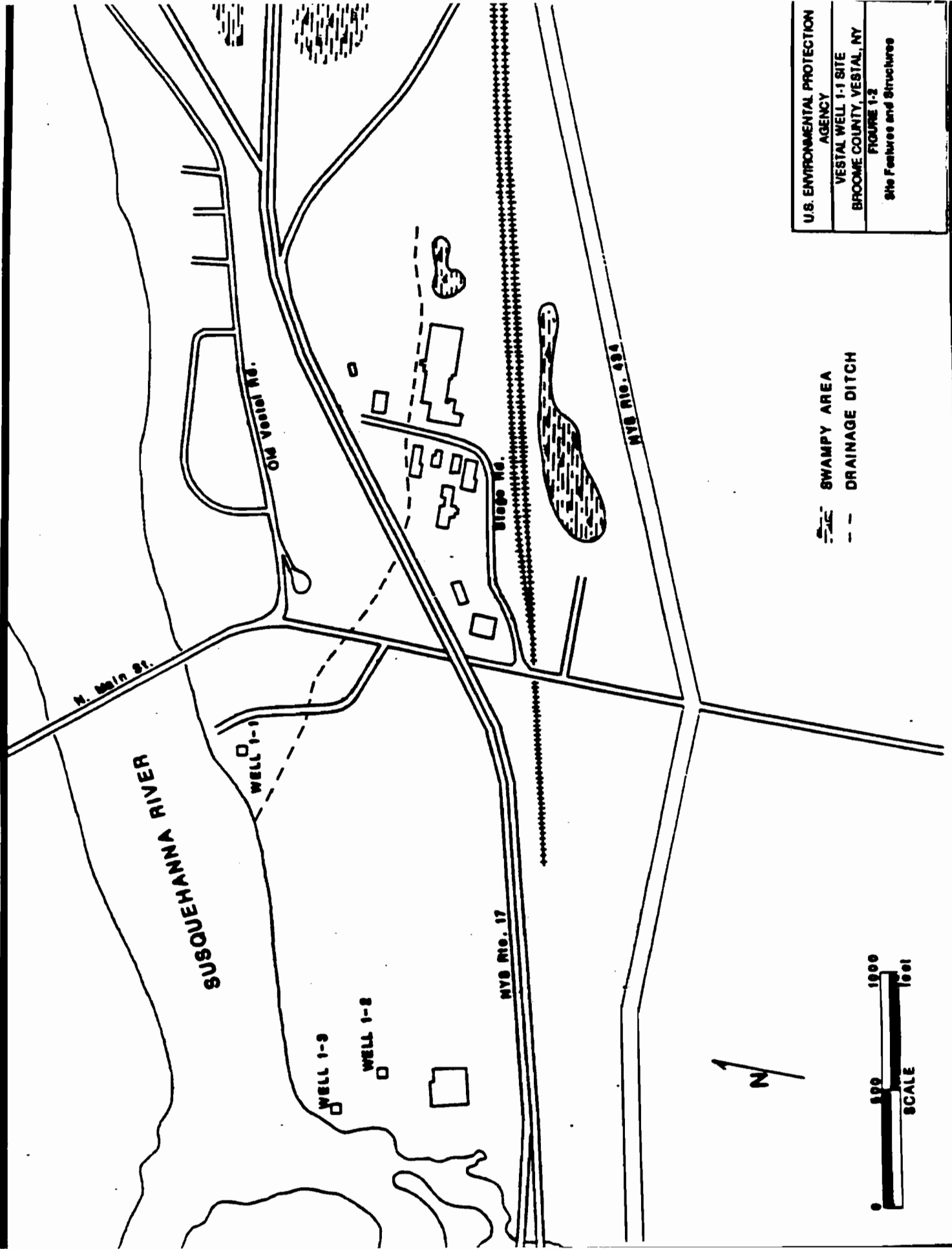
1. Monitoring Wells 1-23, 1-30, 1-28, and 1-28A were not sampled in October 2002 because they are not required to be sampled by the Monitoring Plan.



**VESTAL WELL
1-1 SITE**

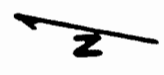


 <small>FOSTER WHEELER ENVIRONMENTAL CORPORATION</small>	TITLE:	DWN:	DES.:	PROJECT NO.:
	Site Map	CTS		
	Vestal Well 1-1 Site	CHKD:	APPD:	FIGURE NO.:
Vestal, New York	CEM	GJ	1-1	
	DATE:	REV.:		
	01/08/03	0		



U.S. ENVIRONMENTAL PROTECTION
 AGENCY
 VESTAL WELL 1-1 SITE
 BROOME COUNTY, VESTAL, NY
 FIGURE 1-3
 Site Features and Structures

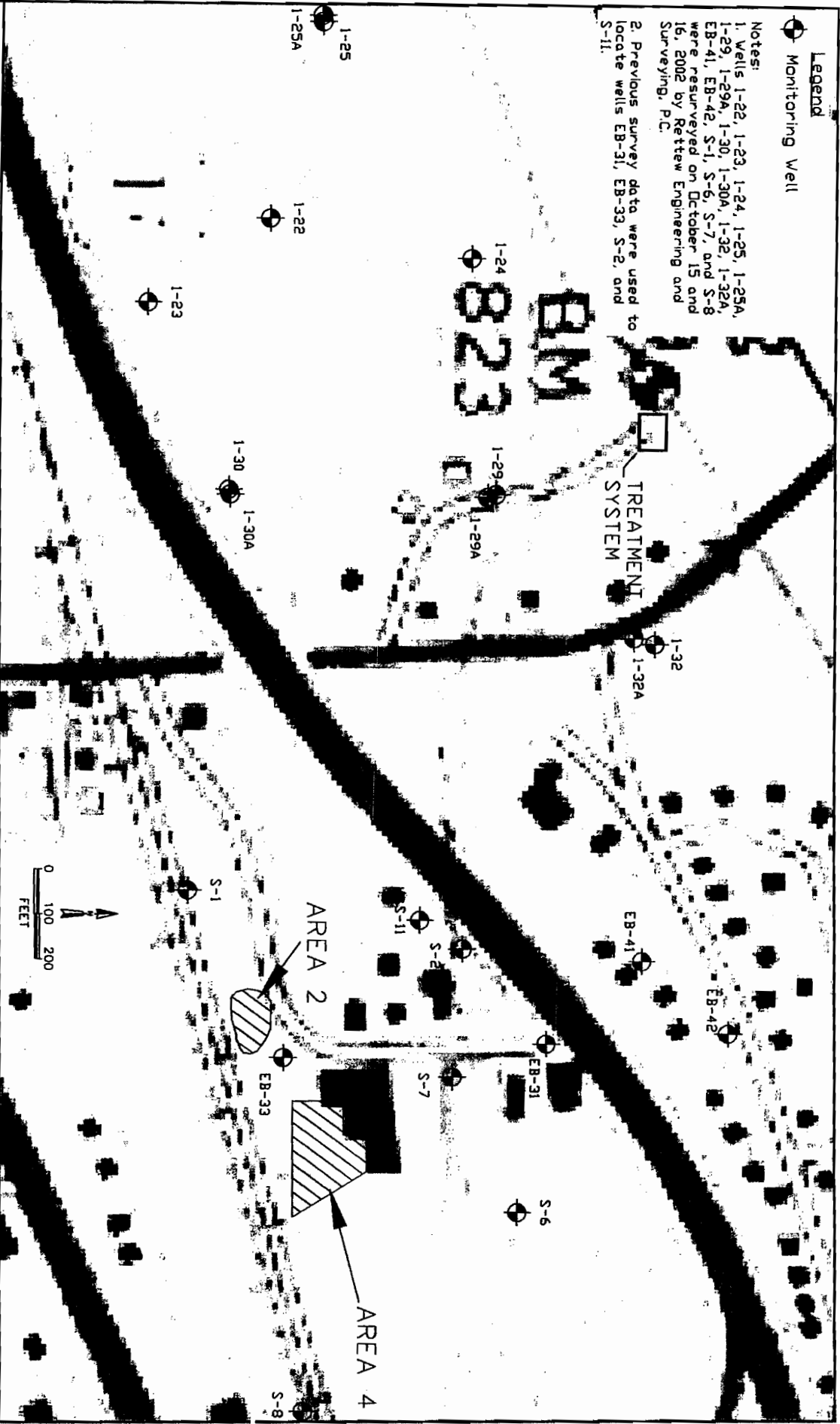
SWAMPY AREA
 DRAINAGE DITCH



Legend
 Monitoring Well

Notes:
 1. Wells 1-22, 1-23, 1-24, 1-25, 1-25A, 1-29, 1-29A, 1-30, 1-30A, 1-32, 1-32A, EB-41, EB-42, S-1, S-6, S-7, and S-8 were resurveyed on October 15 and 16, 2002 by Rettew Engineering and Surveying, P.C.

2. Previous survey data were used to locate wells EB-31, EB-33, S-2, and S-11.



FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE:
 Monitoring Well Locations
 Vestal Well 1-1 Site
 Vestal, New York

DATE:	02/05/03	PROJECT NO.:	1945.1009.0700
REV.:	0	FIGURE NO.:	2-1
DATE:	02/05/03		
REV.:	0		
DATE:			
REV.:			