AMERICAN FELT & FILTER COMPANY
NEW WINDSOR, NEW YORK
REMEDIAL DESIGN/REMEDIAL ACTION
WORKPLAN

Consent Order Index # W3-0784-04-06
Site # 3-36-036

Prepared for:
New York State Department of Environmental Conservation

Prepared by:

Fleming
Lee Shue

Environmental Management & Consulting

6 East 32nd Street
New York, NY 10016

Project No. 10000-001

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1.0 INTRODUCTION

The American Felt and Filter Company (AFFCO) property " the Site", located in New Windsor, Orange County, New York (Figure 1), manufactures a variety of felt and filter products. The GAF Corporation (the former owner), who manufactured the same products as AFFCO, operated the Site prior to 1978. During both GAF's and AFFCO's ownership, the facility used 1,1,1- trichloroethane (TCA) as a solvent and carrier for zinc resinate which was used to impregnate felt sheets in the Feutron Department. The TCA was stored on Site in 55-gallon drums in an enclosed area just outside the Feutron Building. About 35 to 40 drums of TCA were generally present on Site during regular operations. Site investigations performed in 1988 revealed that groundwater and soil in the area near the Feutron Department contained TCA. The source of the contamination is believed to be a historic leakage within the enclosed process area and spillage in the drum storage area.

The Site was placed on the New York State Department of Environmental Conservation's (NYSDEC) List of Inactive Hazardous Waste Sites in 1991 (Site Code 3-36-036), due to the potential threat to the adjacent Quassaick Creek. The facility stopped using TCA in 1992 when the production line in the Feutron Department that utilized TCA was shut down.

Soil and/or groundwater sampling conducted in September 1994, August 1998, and October 2001 revealed that residual amounts of TCA were still present in the soil and groundwater. The purpose of this work plan is to design a Dual Phase Extraction (DPE) system that will remediate soil and groundwater in the former drum storage area near the Feutron Building. Upon approval of this work plan, FLS will prepare an Operation, Maintenance, and Monitoring (OM&M) Work Plan for the proposed DPE system.

2.0 SITE INFORMATION

2.1 Site Description

The AFFCO Site is an active manufacturing facility located on the north side of Walsh Avenue, west of River Road in New Windsor, New York (Figure 2). The Site lies on the south side of Quassaick Creek, which flows into the Hudson River approximately 2 miles east of the Site. The surrounding area has a mixture of land uses, including residential. Potable water is supplied by the aqueducts of New York City's upstate Catskill/Delaware reservoirs. The total land area of the Site is approximately four acres, and includes several large buildings; as well as parking, open lawn and wooded areas (Figure 2).

2.2 Site History/ Previous Investigations

The Site has been used for felt production for over 100 years. Investigation of the Site was initially undertaken when traces of TCA were measured in water samples collected from an outfall, which discharged to Quassaick Creek. The source of the contamination is believed to be past leaks and spills from the enclosed process area and the drum storage

area. Site conditions were assessed during five sampling programs conducted in January and December 1988, September 1994, August 1998, and October 2001.

2.2.1 January 1988

This initial study involved groundwater and surface water sampling of the Site. Five supply wells used for process water at the plant already existed at the Site; and nine additional, shallow groundwater monitoring wells (S-1 through S-9, shown on Figure 2) were installed. The state's groundwater standard for TCA is 5 parts per billion (ppb). All of the groundwater monitoring wells sampled exhibited TCA levels above the standard. S-6, the monitoring well on the western portion of the Site, contained 91 ppb of TCA. The source of this contamination is not known. This portion of the Site has not been used by AFFCO, but was apparently used by GAF for the storage of equipment. Three surface water samples were collected from the Quassaick Creek and analyzed for TCA (Figure 2). The surface water analysis indicated that the upstream portion of the creek (C-1) did not contain any TCA, while the portion of the creek immediately downgradient of the drum storage area (C-2) contained 33 ppb of TCA. The creek sample collected from the downstream east edge of the Site (C-3) contained 22 ppb of TCA. The Quassaick Creek is classified as a Class C surface water body. There are no standards or guidance values for TCA in Class C surface water bodies. Surface water sampling locations are shown in Figure 2.

2.2.2 December 1988

Since high concentrations of TCA were detected in January 1988, a second round of groundwater sampling was conducted to assess whether the contaminant levels had changed over time. The TCA concentrations detected during December 1988 were mostly less than half of those detected in January 1988. Soil conditions in the vicinity of the Feutron Building were also evaluated to determine if there was any contamination from past surface spills. The soil sampling indicated that a localized area (approximately 50 feet by 50 feet) located north of the Feutron Building, had TCA contamination exceeding the NYSDEC Technical and Administrative Guidance Memorandum (TAGM 4046) Recommended Soil Cleanup Objectives (RSCO) of 800 ppb. The RSCO is based on potential for impact to groundwater used as a potable supply.

2.2.3 September 1994

A third round of groundwater sampling was conducted to assess the latest groundwater conditions and guide any future Site work. TCA concentrations of groundwater in the two wells near the drum storage area: S-8 (shallow) and E-1 (the former production well), which initially had 1,400 and 2,800 ppb of TCA, respectively, were found to be at 48 ppb and 10 ppb of TCA, respectively at that time.

2.2.4 August 1998

In August 1998, the Site was investigated again to assess any changes in conditions since the last sampling event in September 1994. This program examined soil, soil gas, and

groundwater throughout the Site. Soil gas samples were collected to test and were analyzed for the presence of organic vapors, an indication of contaminated soils. In areas where concentrations of organic vapors were found to be elevated in the soil, soil samples were collected and analyzed for volatile organic compounds (Figures 3 and 4). Groundwater from all monitoring wells was also sampled during this investigation. The soil gas survey demonstrated that the soil contamination at the Site was generally limited to the vicinity of the area where TCA was stored and used on the Site. Groundwater sampling indicated that exceedances of the groundwater standards (for use of the groundwater as a drinking water source without treatment) were found only in the wells immediately adjacent to the area where the TCA was stored and used (i.e., in monitoring wells S-6, S-8, and the former production well (E-1).

2.2.5 October 2001

The soil gas in the northwest corner (i.e., both inside and outside) of the Feutron Building was re-sampled. Select soil and groundwater samples were also taken from this area (and were guided by the soil-gas sampling results). In addition, all of the Site's ten (10) monitoring wells were re-sampled. Because there were no records on the construction details of the former production well (E-1), a new bedrock well was installed adjacent to E-1 (Figure 5). The new well was named E-1 New, while the old well remained E-1. Soils were sampled during the installation of this new well. However, none of soil samples collected from E-1 New exceeded the RSCO of 800 ppb. The soil-gas sampling results indicated that seven locations exhibited elevated levels of organic vapors, which prompted soil samples to be obtained from these areas and analyzed for volatile organic compounds (VOCs). Four of the soil samples contained elevated levels of TCA that exceeded the RSCO.

2.3 Problems Identified at the Site

Groundwater, surface water and soil contamination have been discovered at the Site. The most recent investigation, conducted in 2001, revealed that TCA was still present in, and adjacent to, the former drum storage area near the Feutron Building. However, TCA concentrations in the groundwater were significantly lower when compared with previous sampling results.

3.0 CONCLUSIONS

Soil and soil gas sampling performed in 1998 demonstrated that TCA and its breakdown product (such as 1,1-dichloroethene) were still present at significant levels in and adjacent to the former drum storage area near the Feutron Building. Inside the Feutron Building, TCA was only detected in two subsurface soil gas samples. Figure 5 shows the area of contaminated soil. The pattern of contamination indicates that the source of TCA was located outside this building (i.e., the drum storage area), based on these two locations. If the spill had occurred inside the building, TCA would most likely be detected in the shallow soil depths (0-2 feet) as opposed to only at the deeper depth interval (6- 8 feet).

Shallow groundwater contamination was detected in 1998 both in the drum storage area and at much deeper levels downgradient of the drum storage area (between the storage area and the creek). However, the TCA contamination is primarily found in shallow groundwater, as much lower contaminant levels were associated with deeper groundwater in the aquifer. The water would not be potable without treatment due to (naturally) high levels of hydrogen sulfide.

Sampling performed in 2001 confirmed the continued presence of TCA contamination in soil and groundwater, however, this contamination is now limited to a small area of the Site where this chemical was stored and used only.

In 2001, soil sampling at the location of the new bedrock well and the six soil gas sampling locations revealed exceedances of TAGM 4046 RSCO at one location inside the Feutron Building and two locations in the former s storage area outside the building (Figure 5).

4.0 REMEDIAL ACTION

Based on the nature of the contamination remaining in the Site soils and groundwater, remediation of the soils in the impacted area by Dual Phase Extraction (DPE) was selected in a feasibility study performed for the Site and incorporated into a Record of Decision (ROD) for this Site. A DPE system combines Soil Vapor Extraction and a Groundwater Pump and Treat System, removing in-situ contamination in both the soils and groundwater simultaneously (Figure 6).

The Soil Vapor Extraction (SVE) portion of this proposed remedial method consists of drawing air through the soils, allowing organic vapors to be released from the soil and be extracted to the surface. The vapors are then treated with activated carbon before exhausting the air to the atmosphere. The Site geology favors this technology in that the top 7- to 8-feet of soils are uniform fine to medium sands underlain by a dense till layer (gravel, silt, and clay) separating the shallow unsaturated soils from the deeper saturated soils on the Site. A pilot test (refer to section 5.0) will be performed to evaluate the optimal configuration of the SVE system.

The Groundwater Pump and Treat portion of this proposed remedial method consists of pumping groundwater from the impacted area in order to drop the groundwater table to a level slightly above the pump, without reaching the dry condition. The drop in the groundwater table will expose contaminated soils in the saturated zone to the SVE system for treatment. Additionally, TCA will be removed from the liquid medium (groundwater) by pumping the water through activated carbon canisters prior to its discharge to the Quassick Creek. The Groundwater Pump and Treat system is feasible only if Site conditions allow the water level to be dropped to the desired depth with a reasonable pump volume, therefore a Pumping Test (refer to Section 6.0) will be performed to assess the feasibility of this portion of the DPE system.

If Site conditions do not allow for a drop in the groundwater table with a reasonable pump volume, the SVE system will be operated without the Groundwater Pump and Treat System.

5.0 PILOT TEST

The design of a SVE system requires the area of influence to be assessed by installing one or more vapor extraction/pumping wells in the area of contamination, then applying a vacuum to the wells and measuring the drop in pressure in surrounding vapor probes/piezometers. The extraction/pumping well and the vapor probes/piezometers will also be used to collect water level measurements during the pumping test. The pilot test allows optimization of the following process parameters:

- Air extraction rate (cfm)
- Extraction vacuum (inches of water)
- Radius of influence (feet)

Of these parameters, the area of influence is the most important as it determines the number of wells necessary to cover the area shown to be contaminated by the presence of TCA at the AFFCO Site. Figure 6 shows the area of contamination based on the soil gas surveys conducted at the Site and the soil samples obtained based on the soil gas survey.

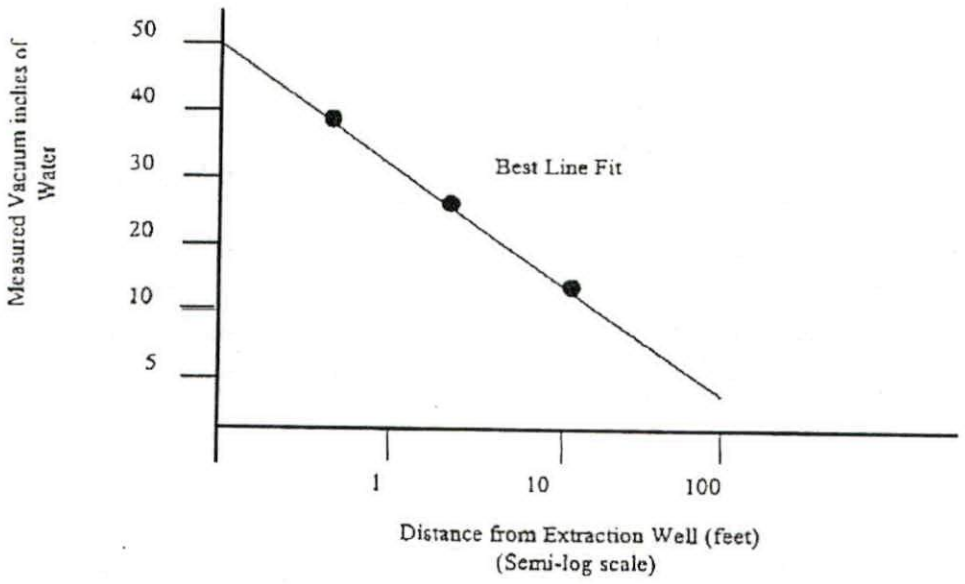
The Site has a physical limitation in that the building has a concrete floor that is 3- to 5-feet thick in the northwest corner. This thick layer of concrete was placed historically when flooding undermined the building. The repair consisted of adding pilasters (columns tied to the existing walls) to the outside of the building and pumping concrete into the void left from the flooding. When testing the building for soil gas, the small diameter (3/4-inch) hole took a very long time to reach soils below the concrete. This physical limitation will need to be taken into account in the design of the DPE on this Site.

The pilot test will consist of installing a single 4-inch extraction/pumping well close to the point of contamination in the former drums storage area adjacent to the north wall of the Feutron Building. A Geoprobe unit will be used to install three one-inch diameter vapor probes/piezometers to measure the vacuum at various distances (5, 10, and 20 feet) from the extraction/pumping well toward the creek to estimate an area of influence of the well outside the building. Three additional vapor probes/piezometers will be installed inside the Feutron Department at various distances (5, 10, and 20 feet) from the extraction/pumping well toward the south wall of the Feutron Building. The purpose of installing the additional vapor probes/piezometers is to evaluate whether subsurface obstacles, such as foundations, are not separating the soil outside the building from the soil beneath the building. If these obstacles exist, a second 4-inch extraction /pumping well will be installed inside the building. The three additional vapor probes/piezometers will be adjusted and reinstalled inside the building at distances of 5, 10, and 20 from the second extraction/pumping well toward the south wall of the building, as shown in Figure 7.

The extraction/pumping wells will be drilled using a hollow-stem auger and will be constructed of 4-inch diameter Schedule 40 PVC casing in a 6¼-inch augured hole. The well will be installed with a 12-foot long PVC screen (0.020 inch slot) and a 2-foot long sump set in the till layer to provide a reservoir for possible TCA contamination. The screen will extend from two feet below ground surface to the top of the 2-foot sump. A filter pack of No. 2 Morie sand, or equivalent will be placed in the annular space around the screens. A grout, consisting of a cement and bentonite mixture or an anti-shrink mixture, will extend from the pack to one foot below ground surface.

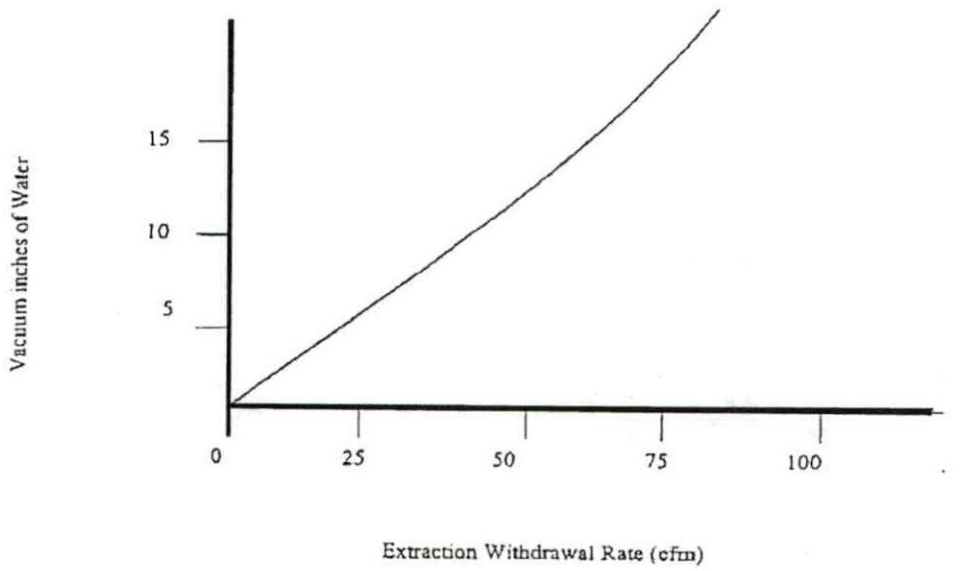
The six vapor probes/piezometers inside and outside the Feutron Building will be installed to the depth of 16 feet below grade with a 1-inch diameter PVC screen (0.020 inch slot) using a geoprobe unit. The vapor probes/piezometers will be constructed as in the same fashion as the extraction/pumping wells.

Measurements of vacuum levels at the three distances will be made to establish the location where a vacuum of 0.1 inches of water, and 10% of the applied vacuum occurs. These data will be plotted on semi-log paper as follows:



The 10% cut-off value is an empirical value based upon prior designs in similar geological settings. Once the radius of influence is established, overlapping circles will be placed on Figure 5 to establish the number of wells required to efficiently remediate the contaminated soils.

An air permeability test will also be performed by running the vacuum pump at differing speeds and measuring the air flow rate for each level of vacuum. The data will be plotted as follows to size an appropriate blower for the air permeability tested on the Site.



Air treatment during the test will be provided by a single 55-gallon of activated carbon. The low concentrations of VOC's in the Site soils should allow the test to be performed without excessive discharge of 1,1,1 trichloroethane to the atmosphere. During the test, measurements of organic vapors before and after the carbon treatment system will be taken along with the air flow rate to estimate the mass rate of extraction. This will allow the size of the air treatment system to be established. These measurements will be taken over time to establish a mass extraction rate. A vapor barrier will be used during the pilot test to cover the impacted area to prevent air infiltration from the surface to the subsurface soils.

5.1 System Design

At the completion of the test, a report will be prepared documenting the testing results and presenting the design methodology to be applied to the Site. It is anticipated that at least 2 extraction wells will be required to cover the affected area.

6.0 PUMPING TEST

The purpose of pumping the well is to lower the groundwater so that the high density TCA located just above the till layer can be reached and remediated. The pumping will allow removal of TCA from the fluid medium. FLS has designed a pumping test to find the pumping rate that can both lower the water without drying out the water table while keeping the water level at a specific height allowing the soil vapor extraction system to reduce the contaminants adsorbed to soils. The pumping test that will be used in this study will be a step-drawdown test.

6.1 Step-Drawdown Test

The step drawdown test provides a range of specific capacities for the pumping well and is therefore, the most reliable method for determining the pump size and setting. The

pumping test will consist of applying different pumping rates to a pumping well and measuring the drawdown in the observation wells located at varying distances from the pumping well. Measurements of drawdown versus pumping rate (step-drawdown test) and drawdown versus distance (distance-drawdown test) can be used to calculate the hydraulic characteristics of the aquifer, such as the aquifer coefficient (B), head loss due to laminar flow in aquifer and well coefficient (C), and head loss due to turbulent flow in the well screen and pump inlet. Once these hydraulic characteristics are known, the drawdown inside the well for any realistic pumping rate at certain times can be predicted and an appropriate pumping rate can be selected to lower water inside the well to a level just above the pump, without reaching the dry condition.

The step drawdown test is similar to the constant-rate discharge test in many respects. The major difference being that the step drawdown test consists of several short duration, constant rate discharge tests, each running at a progressively higher pumping rate. The minimum suggested step drawdown test consists of at least four different pumping rates, each conducted for a minimum duration of 60 minutes. It is important, however, to run the initial step long enough to establish that the effects of well storage have dissipated. The remaining steps should each be run for the same duration as the initial step.

6.2 Test Procedures

The step-drawdown test will be conducted using one pumping well and six vapor probes/piezometers. In order to determine if groundwater inside and outside the Feutron Building are hydraulically connected, as the well is being pumped, the water levels in the six will also be monitored. As a result for the well pumping, if the drawdowns in the three piezometers outside are not equal to the three piezometers inside the Feutron Department, a second extraction/pumping well will be installed inside the building. If the drawdowns are equal, no additional wells inside the building will be installed.

To establish the baseline characteristics of the water table, some initial data will be collected prior to commencing the step-drawdown and distance-drawdown tests. A few days prior to performing the pumping test, the static water levels within the vapor extraction/pumping well and vapor probes/piezometers wells will be measured.

During the pumping test, water levels in the extraction/pumping well and vapor probes/piezometers will be measured by pressure transducers (In-situ Mini Troll Pressure Transducers) that have the capability of recording changes in water levels every second for a few hours. Additionally, water levels in the pumping and observation wells will be manually measured using a water level meter to verify the pressure transducer measurements.

The pumping well will be pumped at successive pumping rates 3, 6, 9, and 12 gallons per minute (gpm) for two hour increments. Initially, the pumping well will be pumped at 3 gpm until drawdown is stabilized, and then the well will be pumped at increasing rates to 12 gpm. Drawdown and time will be recorded and downloaded from the In-situ Mini Troll, reviewed, and graphed. We will prepare a report summarizing our findings and recommend the flow rate needed to lower the groundwater in the pumping well to a level slightly above the pump without reaching the dry condition.

During the pumping test, the system discharge will be directed to a 5,000-gallon holding tank. Water inside the holding tank will be treated through activated carbon canisters prior to its discharge to the Quassick Creek.

7.0 SCHEDULE

The tentative schedule for implementation and completion of the scope of work for the Remedial Design/Remedial Action Investigation Work Plan has been estimated at a total of approximately two to three-months following work plan approval.

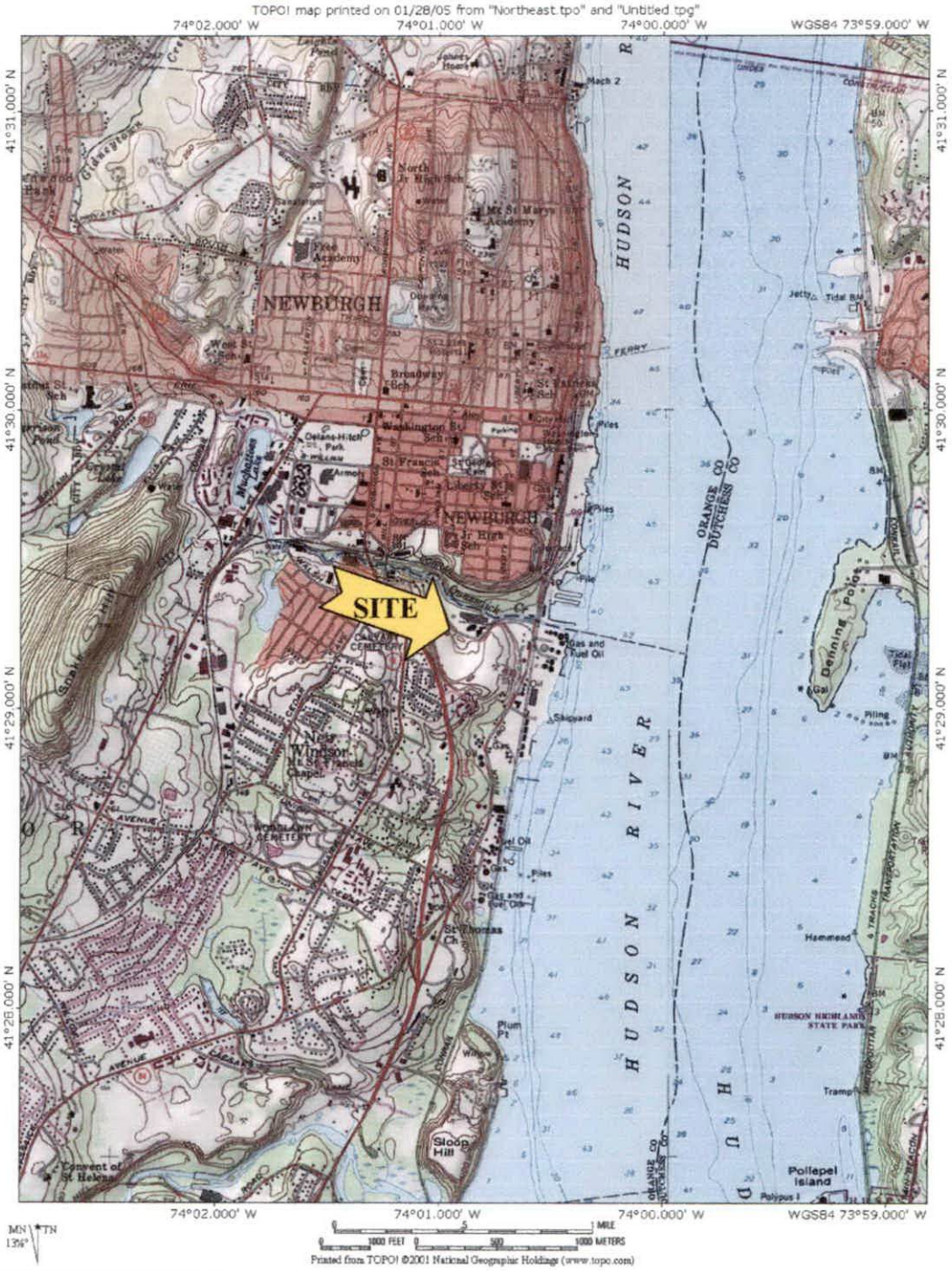
FLS has scheduled three weeks for well and vapor probes/piezometers installations and development, followed by a one week settling period where no work will be completed on-Site. The one-week break will allow the most recently installed wells a one-week period to settle.

After the one-week settling period is completed the SVE pilot test will be performed. FLS has scheduled one week for completion of the SVE pilot test. After the completion of the pilot test, the pumping test will be performed. FLS has scheduled one week for completion of the pumping test.

After the completion of the well installation, SVE pilot test, and pumping test, FLS will allow two weeks for data preparation and interpretation. Once the data have been reviewed, FLS will prepare a Remedial Action Report for the Site. This report will take approximately two weeks to complete.

Figures

FIGURE 1: SITE LOCATION MAP



SUBJECT PROPERTY

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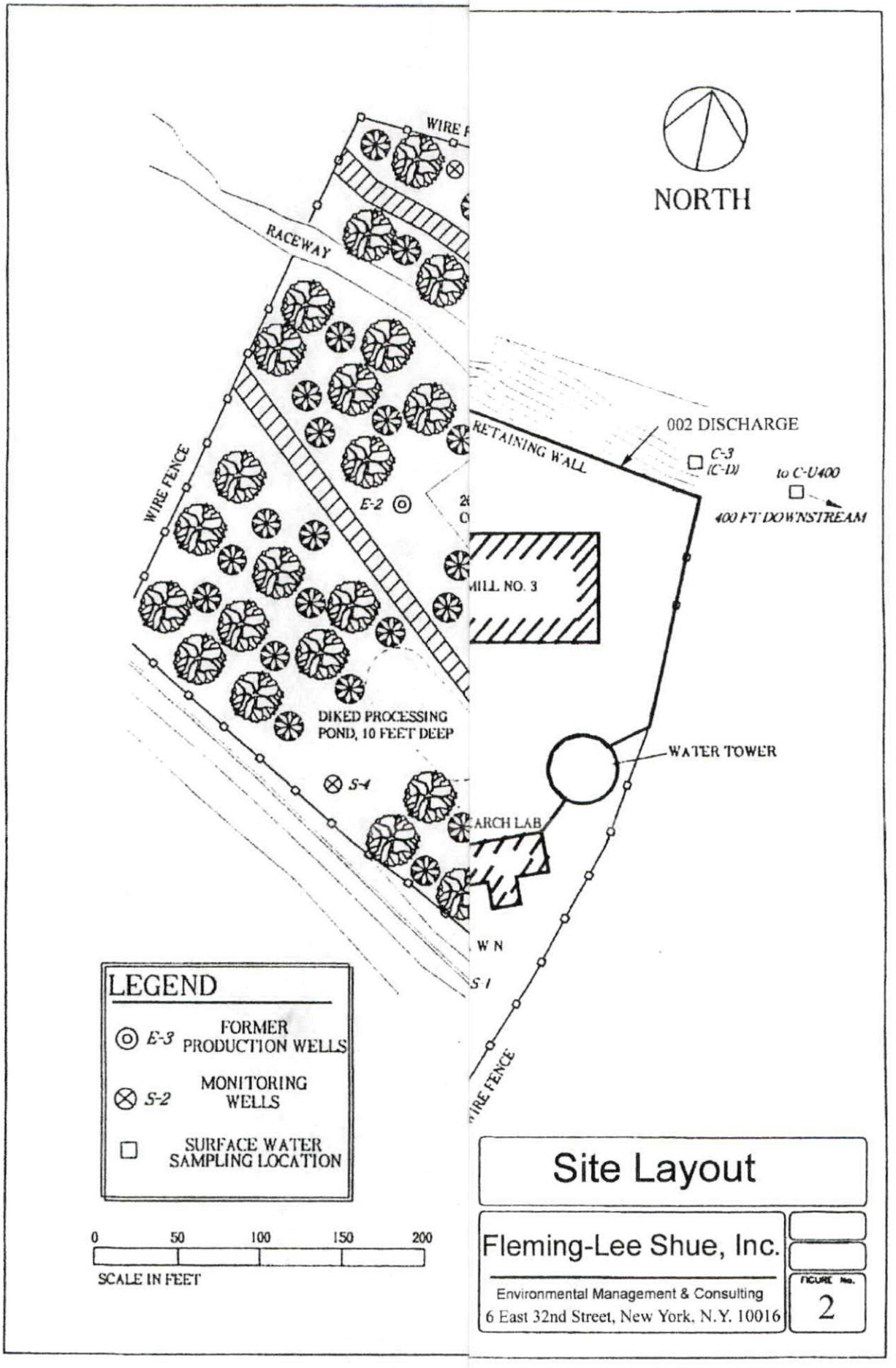
361 Walsh Road
New Windsor, New York



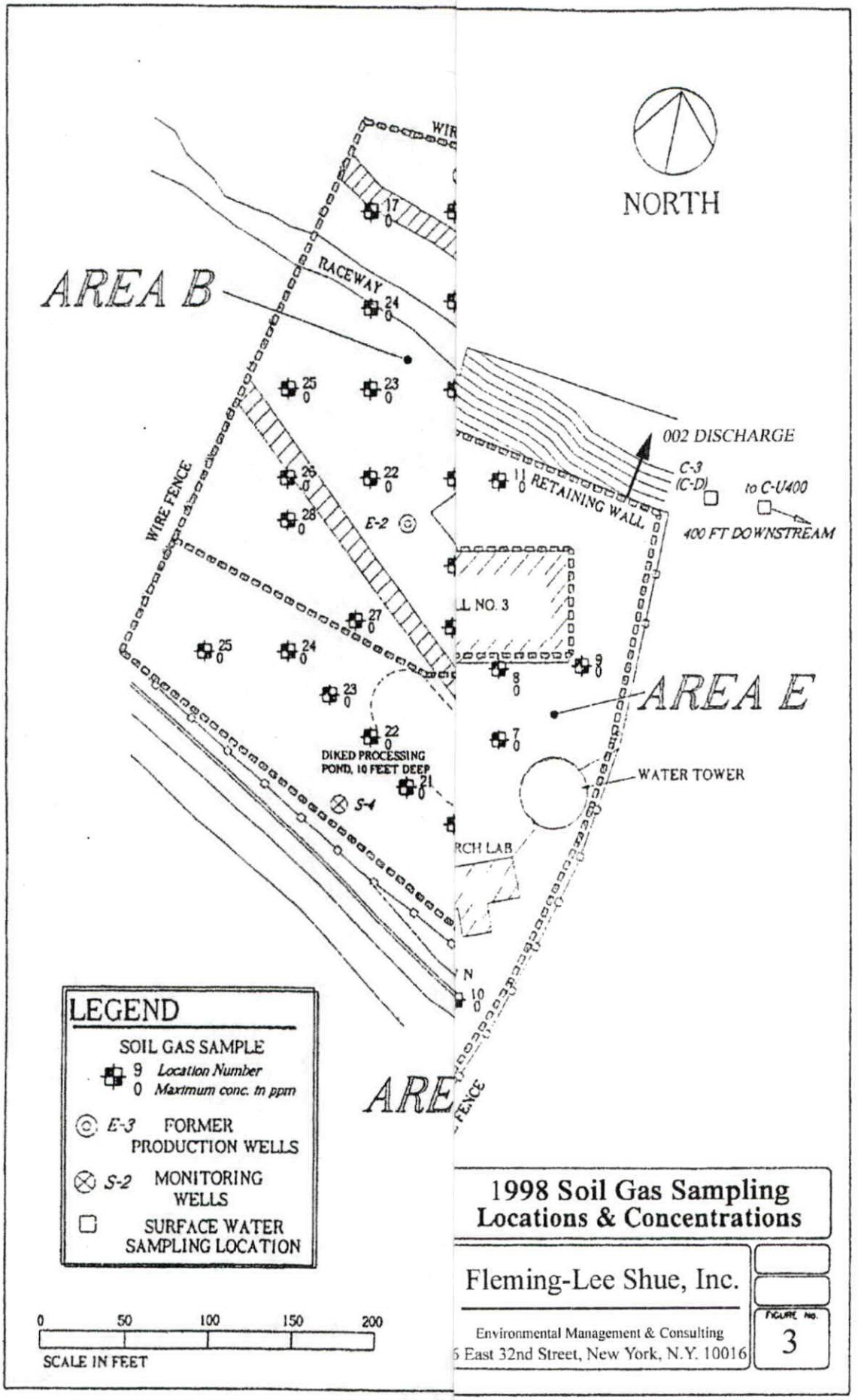
Site Layout

Fleming-Lee Shue, Inc.

Environmental Management & Consulting

6 East 32nd Street, New York, N.Y. 10016

FIGURE No. 2

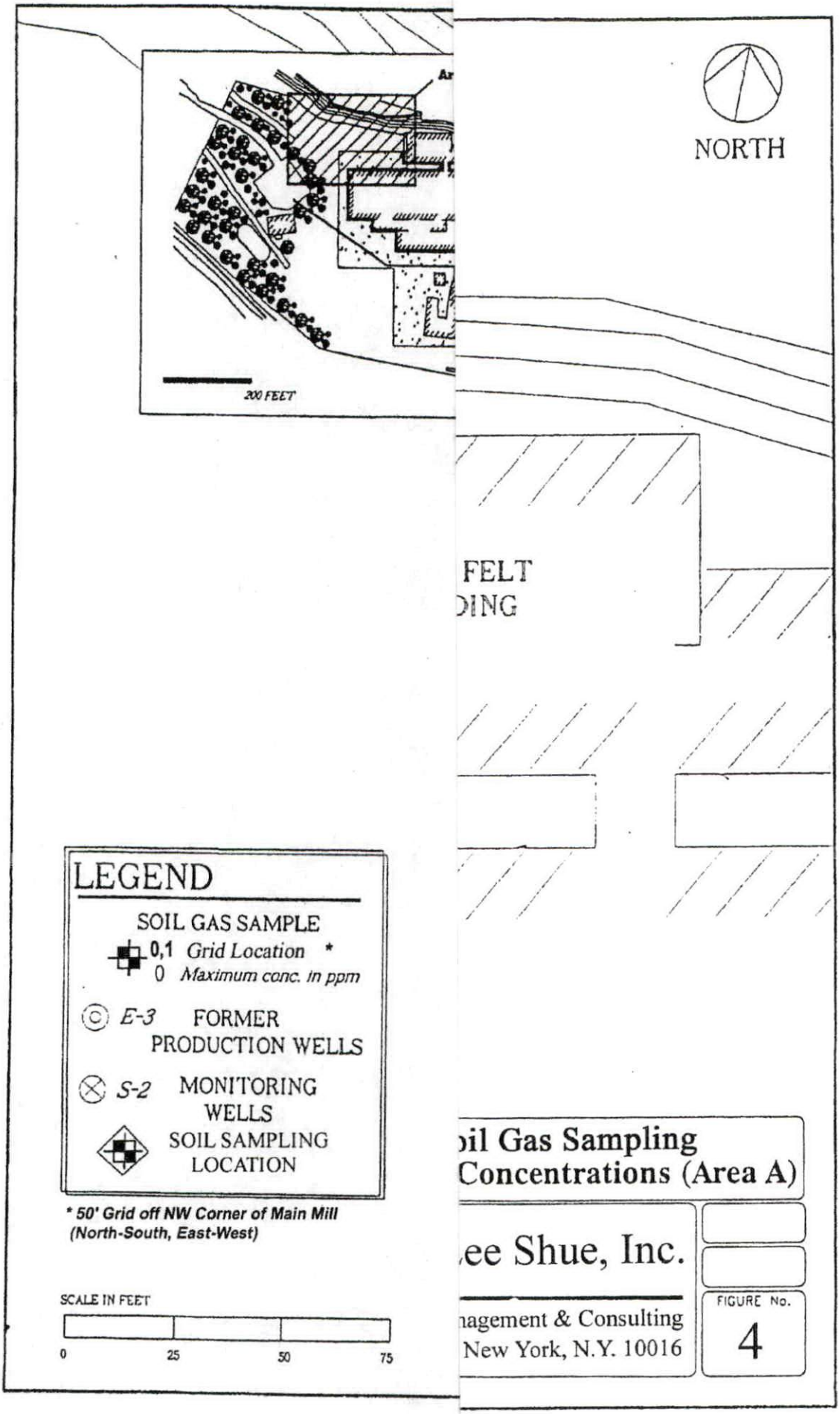


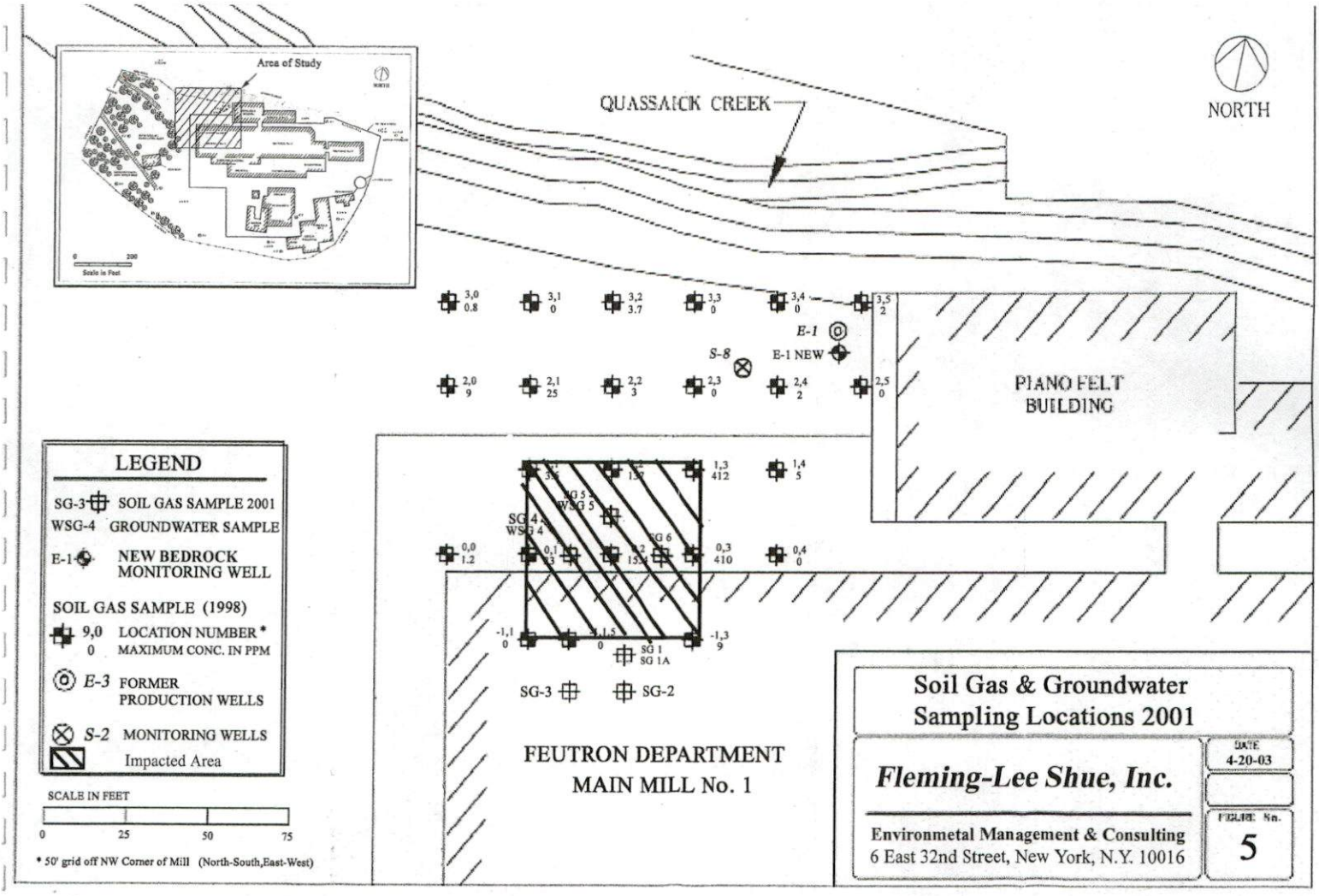
1998 Soil Gas Sampling Locations & Concentrations

Fleming-Lee Shue, Inc.

Environmental Management & Consulting
6 East 32nd Street, New York, N.Y. 10016

FIGURE No. 3


NORTH
200 FEET
FELT
DING
LEGEND
SOIL GAS SAMPLE
0,1 Grid Location *
0 Maximum conc. in ppm
E-3 FORMER PRODUCTION WELLS
S-2 MONITORING WELLS
SOIL SAMPLING LOCATION
* 50' Grid off NW Corner of Main Mill (North-South, East-West)
SCALE IN FEET
0
25
50
75
oil Gas Sampling
Concentrations (Area A)
ee Shue, Inc.
nagement & Consulting
New York, N.Y. 10016
FIGURE No.
4


Area of Study
QUASSAICK CREEK
NORTH
E-1
E-1 NEW
S-8
PIANO FELT BUILDING
SG 4
WSG 4
SG 5
WSG 5
SG 6
SG 1
SG 1A
SG-3
SG-2
FEUTRON DEPARTMENT
MAIN MILL No. 1
LEGEND
SG-3 SOIL GAS SAMPLE 2001
WSG-4 GROUNDWATER SAMPLE
E-1 NEW BEDROCK MONITORING WELL
SOIL GAS SAMPLE (1998)
9,0 LOCATION NUMBER *
0 MAXIMUM CONC. IN PPM
E-3 FORMER PRODUCTION WELLS
S-2 MONITORING WELLS
Impacted Area
SCALE IN FEET
0 25 50 75
* 50' grid off NW Corner of Mill (North-South,East-West)
Soil Gas & Groundwater Sampling Locations 2001
Fleming-Lee Shue, Inc.
Environmetal Management & Consulting
6 East 32nd Street, New York, N.Y. 10016
DATE 4-20-03
FIGURE No. 5

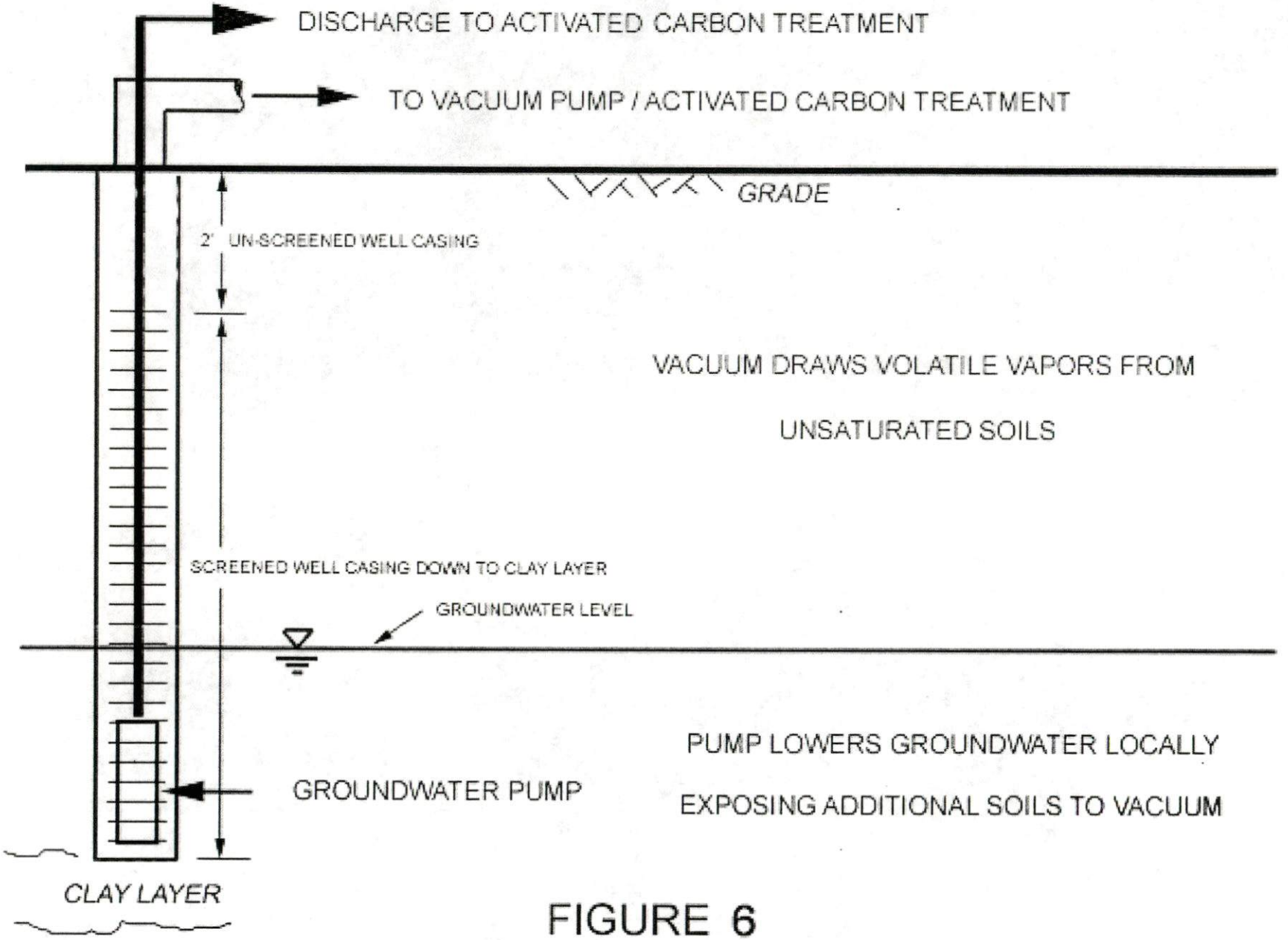
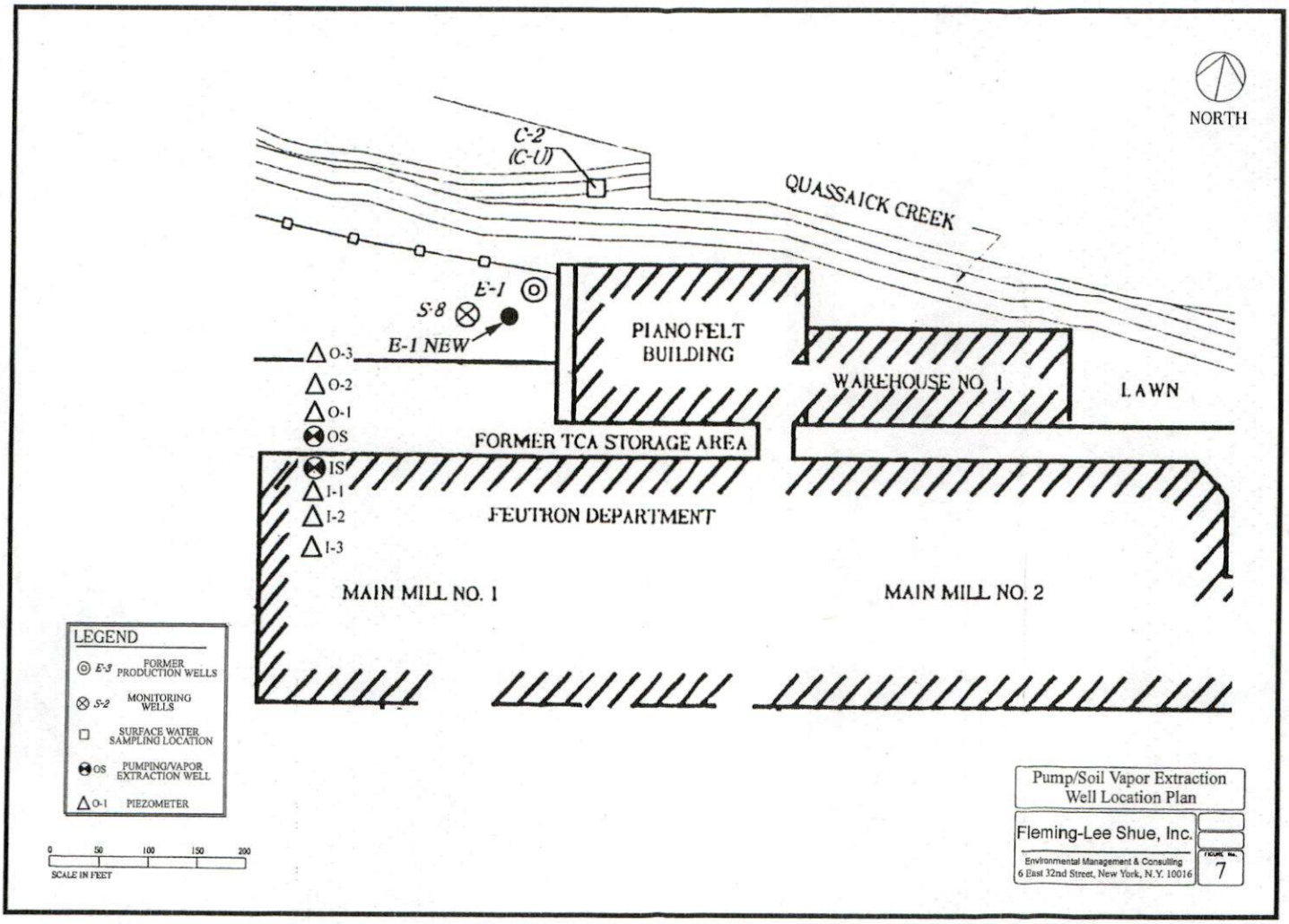


FIGURE 6
DUAL PHASE EXTRACTION SYSTEM


NORTH
C-2
(C-U)
QUASSAICK CREEK
E-1
S-8
E-1 NEW
O-3
O-2
O-1
OS
IS
I-1
I-2
I-3
PIANO FELT
BUILDING
WAREHOUSE NO. 1
LAWN
FORMER TCA STORAGE AREA
FEUTRON DEPARTMENT
MAIN MILL NO. 1
MAIN MILL NO. 2
LEGEND
E-3 FORMER PRODUCTION WELLS
S-2 MONITORING WELLS
SURFACE WATER SAMPLING LOCATION
OS PUMPING/VAPOR EXTRACTION WELL
O-1 PIEZOMETER
0 50 100 150 200
SCALE IN FEET
Pump/Soil Vapor Extraction
Well Location Plan
Fleming-Lee Shue, Inc.
Environmental Management & Consulting
6 East 32nd Street, New York, N.Y. 10016
FIGURE No.
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