



Department of Environmental Conservation

Division of Environmental Remediation

Record of Decision
Operable Unit 1
O&R 93B Maple Avenue
Former MGP Site, Haverstraw,
Rockland County, New York
Site Number 3-44-044

March 2005

New York State Department of Environmental Conservation
GEORGE E. PATAKI, *Governor* DENISE M. SHEEHAN, *Acting Commissioner*

DECLARATION STATEMENT - RECORD OF DECISION

Operable Unit 1 O&R 93B Maple Avenue Former MGP Site Haverstraw, Rockland County, New York Site No. 3-44-044

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedy for the O&R 93B Maple Avenue Former Manufactured Gas Plant (MGP) site. The selected remedial program was chosen in accordance with the New York State Environmental Conservation Law and is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300), as amended.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for the O&R 93B Maple Avenue Former MGP site, and the public's input to the Proposed Remedial Action Plan (PRAP) presented by the NYSDEC. A listing of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Assessment of the Site

Actual or threatened release of hazardous waste constituents from this site have been addressed by implementing the interim remedial measure identified in this ROD. The removal of contaminated soil and waste from the site has eliminated the threat to public health and the environment.

Therefore, no additional measures are necessary for the former plant site which is designated as Operable Unit 01. Additional areas of concern beyond Operable Unit 01 will be the subject of a future PRAP and ROD, for Operable Unit 02.

Description of Selected Remedy

Based on the results of the Remedial Investigation (RI) for the O&R 93B Maple Avenue Former MGP site, the remedial measures taken to date, and the criteria identified for evaluation of alternatives, the NYSDEC has selected No Further Action with unrestricted residential use. The components of the interim remedial measure are as follows:

- Excavation and off-site disposal of MGP structures, piping and contaminated soil above the 25 ppm total PAH background level. Based upon the achievement of the 25 ppm background goal, no site use restrictions are required.

New York State Department of Health Acceptance

The New York State Department of Health (NYSDOH) concurs that the remedy selected for this site is protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

Date

Dale A. Desnoyers, Director
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TABLE OF CONTENTS

SECTION	PAGE
1: SUMMARY OF THE RECORD OF DECISION	1
2: SITE LOCATION AND DESCRIPTION	2
3: SITE HISTORY	2
3.1: Operational/Disposal History	2
3.2: Remedial History	2
4: ENFORCEMENT STATUS	3
5: SITE CONTAMINATION	3
5.1: Summary of the Remedial Investigation	3
5.2: Interim Remedial Measures	9
5.3: Summary of Human Exposure Pathways:	10
5.4: Summary of Environmental Impacts:	11
6: SUMMARY OF THE REMEDIATION GOALS AND SELECTED REMEDY	11
7: HIGHLIGHTS OF COMMUNITY PARTICIPATION	12
Tables	
Table 1A: On Site Surface Soil Concentrations	14
Table 1B: Nature and Extent of Subsurface Soil Contamination	14
Table 1C: Post IRM Subsurface Soil Contamination	15
Table 1D: Nature and Extent of Shallow Groundwater Contamination	15
Table 1E: Background Soil Concentrations	16
Figures	
Figure 1: Site Location and Regional Background Sample Locations	18
Figure 2: Sample Locations	19
Figure 3: IRM Extent and Confirmation Sample Locations	20
Appendices	
Appendix A: Responsiveness Summary	A-1
Appendix B: Administrative Record	B-1

RECORD OF DECISION

**O&R 93B Maple Avenue Former MGP Site
Haverstraw, Rockland County, New York
Site No. 3-44-044
March, 2005**

SECTION 1: SUMMARY OF THE RECORD OF DECISION

The New York State Department of Environmental Conservation (NYSDEC), in consultation with the New York State Department of Health (NYSDOH), has selected a remedy for Operable Unit 1 of the former Manufactured Gas Plant (MGP) Site located at 93B Maple Avenue in Haverstraw, NY. Operable Unit #1 (OU 1) of the site, consists of the parcel on which the former plant site was located. As more fully described in Sections 3 and 5 of this document, the production of manufactured gas and the generation of related byproducts have resulted in the disposal of hazardous wastes, including benzene, ethylbenzene, toluene, and xylene (BTEX), various polycyclic aromatic hydrocarbons (PAHs) and cyanide (CN). These wastes contaminated the soils and groundwater at the site, and resulted in:

- a significant threat to human health associated with potential exposure to contaminated subsurface soils, former MGP structures and groundwater.
- a significant environmental threat associated with the impacts from contaminated former MGP structures and contaminants to subsurface soils, surface water and groundwater.

During the course of the investigation certain actions, known as interim remedial measures (IRMs), were undertaken at the 93B Maple Avenue site in response to the threats identified above. An IRM is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the remedial investigation/feasibility study (RI/FS). The IRM undertaken at this site included removal of all of the former structures and contaminated overburden soils from Operable Unit 1.

Based on the implementation of the above IRM, the findings of the investigation of this site indicate that the site no longer poses a significant threat to human health or the environment, therefore No Further Action with unrestricted use was selected as the remedy for this site.

The selected remedy, discussed in detail in Section 6, is intended to attain the remediation goals identified for this site in Section 6. The remedy must conform with officially promulgated standards and criteria that are directly applicable, or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, criteria and guidance are hereafter called SCGs.

SECTION 2: SITE LOCATION AND DESCRIPTION

The 93B Maple Avenue site is located in the Village of Haverstraw, Rockland County, New York. The site is a rectangular, flat 0.21 acre parcel. The property is bounded by residential lots on Maple Avenue to the southwest, residential lots on Tor Avenue to the northwest, an alley to the northeast and residential lots to the southeast. The area is zoned for light industrial usage, it is predominately residential with some light industrial use nearby. Haverstraw Bay of the Hudson River is located approximately 800 feet to the east of the site. Please refer to Figures 1 and 2 for the above features.

Operable Unit (OU) No. 1, which is the subject of this document, consists of the tax parcel on which the former manufactured gas plant (MGP) existed (lot 78) and the adjacent lots where remedial excavation activities were completed. Please refer to Figure 3, which shows the extent of the completed remedial excavation which constitutes operable unit 1. An operable unit represents a portion of the site remedy that for technical or administrative reasons can be addressed separately to eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination.

The remaining operable unit for this site is identified as OU2 which consists of the contamination underlying the concrete building at 93B (lot 77), and the contaminated stream tract that extends through the properties with street addresses of 95, 99, and 103 Maple Avenue. Interim Remedial Measure Activities are ongoing for this operable unit, which will be the subject of a future PRAP.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

A former manufactured gas plant (MGP) is a facility where gas for lighting and heating homes and businesses was produced. The plant at 93B Maple was constructed and began initial operation circa 1859. Manufactured gas was produced at this site using the coal gas process. Coal gas was produced by heating coal in retorts or beehive ovens, carbonizing the coal in the absence of air. The gas produced was then condensed and purified prior to distribution.

A New Historical Atlas of Rockland County (1876) and an 1884 lithograph shows the presence of a gas plant and a single gas holder. The plant was located on the northeastern side of the site along a railroad line and the holder was located along a small stream at the southwestern side of the site. According to the Haverstraw Department of Public Works (DPW), the stream was culverted and relocated by 1940.

The site was acquired by Haverstraw Light and Fuel Company in 1894. The plant was believed to have shut down in 1893 or 1894, when operations shifted to the Clove and Maple Avenue site.

3.2: Remedial History

In 1997, Orange and Rockland Utilities (O&R) completed site assessments for both of the former manufactured gas plant sites in Haverstraw, New York. The results of this screening are presented in the "Preliminary Site Assessment Report for Two Former Manufactured Gas Plant Sites, Haverstraw, New York", which identified the need for additional investigation and remediation of the site.

SECTION 4: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The NYSDEC and Orange and Rockland Utilities Inc. entered into a Consent Order on Jan. 2, 1996. The order obligates O&R to investigate the former MGP sites in their service area. This order was superceded by a second order (#D3-0001-99-01) dated March 11, 1999, which clarified the obligation to investigate, and as necessary, remediate the Haverstraw manufactured gas plant site.

SECTION 5: SITE CONTAMINATION

A remedial investigation study (RI) has been conducted to evaluate the alternatives for addressing the significant threats to human health and the environment.

5.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The RI was conducted between September 1998 and February 1999. The field activities and findings of the investigation are described in the draft RI report.

The following activities were conducted during the RI:

- Research of historical information;
- Excavation of 4 test pits (bringing the site total to 5) to directly observe subsurface conditions, subsurface structures and collect soil samples ;
- Excavation of 3 shallow geotechnical test pits to evaluate subsurface conditions associated with the foundation of the 93B building;
- Physical testing of soils from two geotechnical borings;
- Installation of approximately 39 soil borings to observe subsurface geologic conditions and collect subsurface soil samples. Including the borings for the PSA and monitoring wells, approximately 47 borings have been completed at the site;
- Collection and analysis of approximately 114 subsurface soil samples, and 36 confirmation subsurface soil samples during the IRM, for a total of approximately 150 subsurface soil samples;
- Installation and analytical sampling of 3 additional monitoring wells (bringing the site total to 4) to evaluate groundwater flow and collect groundwater samples;
- Completion of multiple rounds of groundwater elevation readings from the monitoring wells and one additional peizometer, to evaluate groundwater flow and the accumulation of non aqueous phase liquid;
- Analysis of approximately ten groundwater samples from monitoring wells (bringing the site total to eleven) to evaluate groundwater conditions at the site;

- Completion of slug testing on 2 monitoring wells, to evaluate groundwater flow and soil transmissivity;
- A survey of public and private water supply wells in the area around the site;
- Collection and analysis of approximately 4 surface water samples from the adjacent storm sewer and storm sewer outfall;
- Collection and analysis of 1 sediment sample from the storm sewer adjacent to the site; and
- Collection of 1 soil vapor sample from within the former gas holder for chemical analysis, based on the field screening of 7 other on-site locations.

To determine whether the soil and groundwater contains contamination at levels of concern, data from the investigation were compared to the following SCGs:

- Groundwater, drinking water, and surface water SCGs are based on NYSDEC "Ambient Water Quality Standards and Guidance Values" and Part 5 of the New York State Sanitary Code.
- Soil SCGs are based on the NYSDEC "Technical and Administrative Guidance Memorandum (TAGM) 4046; Determination of Soil Cleanup Objectives and Cleanup Levels".
- 19 Background surface soil samples were taken from 18 locations, as shown on Figures 1 and 2. The results of the analyses were compared to data from the RI (see Table 1) and a site remedial goal of 25 ppm total polycyclic aromatic hydrocarbons (PAHs) was determined to achieve unrestricted use.

Based on the RI results, in comparison to the SCGs and potential public health and environmental exposure routes, certain media and areas of the site required remediation. These are summarized below. More complete information can be found in the RI report and the Phase I IRM Construction Certification Report.

5.1.1: Site Geology and Hydrogeology

The site geology includes a fill layer at the current ground surface, underlain by layers of alluvium deposits and then a dense glacial till. The layer of fill material consists of gravel, loamy soil with cobbles, brick fragments, ash, cinders, coal, clinker, pottery and glass shards. The fill thickness ranges from approximately 8 to 14 feet.

The first sub-unit, descending below the fill layer, is a course-grained sand and gravel with some fine-grained material and cobbles. It ranges in thickness from 0 to 5 feet.

The second sub-unit is a clay unit. Its upper horizon is a massive gray and brown clay, which ranges in thickness from 0 to 16 feet. This layer grades at times to a clayey/silt, which ranges in thickness from 5 to 16 feet. This layer forms an effective confining unit beneath the site and was found to be continuous across the site.

The clay unit is underlain by a fine sand and silt unit. This fine sand and silt unit extends to approximately 36 feet below the ground surface, where it rests upon a red sand and clay till.

The groundwater at the site consists of a shallow, unconfined to semi-confined system due to the clay unit. Groundwater was encountered at the site within the upper alluvium and fill layers at a depth of 6 to 10 feet below ground surface. This shallow groundwater unit has approximately 11 to 15 feet of depth.

Deeper monitoring wells installed to the south of the site, as part of the concurrent investigation of the Clove and Maple MGP Site, were installed with their screen intervals beneath the clay subunit. These wells exhibit artesian hydraulic heads, thereby demonstrating that the clay unit is behaving as a semi confining layer.

The shallow groundwater table is very flat, and appears to generally flow to the southeast towards the Hudson River, consistent with the regional groundwater. The tides in the river do not have any significant influence on the groundwater levels on the site. However, it should be noted that during high tides the river elevation does cause the storm drain to the east of the site to backflow.

5.1.2: Nature of Contamination

As described in the RI report, several groundwater, air, and soil samples were collected to characterize the nature and extent of contamination. As summarized in Table 1, the main categories of contaminants which exceed their SCGs are volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs). These contaminants have contaminated the overburden soils and groundwater on the site.

Specific volatile organic compounds of concern are benzene, toluene, ethylbenzene, and xylenes. These are referred to collectively as BTEX in this document. Benzene is a known carcinogen.

The specific semivolatile organic compounds of concern in soil and groundwater are the following polycyclic aromatic hydrocarbons (PAHs):

acenaphthene	acenaphthylene
anthracene	<i>benzo(a)anthracene</i>
<i>benzo(a)pyrene</i>	<i>benzo(b)fluoranthene</i>
benzo(g,h,i)perylene	<i>benzo(k)fluoranthene</i>
<i>dibenzo(a,h)anthracene</i>	<i>chrysene</i>
fluoranthene	fluorene
<i>indeno(1,2,3-cd) pyrene</i>	2-methylnaphthalene
naphthalene	phenanthrene
pyrene	

PAH concentrations referred to in this document are the summation of the individual PAHs listed above (i.e. total PAHs or TPAHs). The italicized PAHs are probable human carcinogens. The summation of the italicized PAHs is referred to in this document as cPAHs.

Tar is the major type of waste present at this site, and is typically found at former MGP sites. This tar is the predominant source of the BTEX, PAHs, and cyanide identified in various media at the site and discussed further in section 5.1.3. MGP tars contain high levels of PAH compounds, often greater than 100,000 parts per million (ppm). These tars also may exceed SCGs for BTEX by several orders of magnitude.

These tars are reddish brown to black, oily liquids which do not readily dissolve in water. Material such as this are commonly referred to as a non-aqueous phase liquid, or NAPL. Although most tars are slightly more dense than water (DNAPL), the difference in density is slight. Consequently, they typically sink when in contact with water.

Typically site groundwater that comes into contact with the NAPL or impacted media, such as soil, results in the contamination of the groundwater and aqueous phase migration of the contaminants.

Certain metals were also found in excess of SCGs. Generally, these metal values were consistent with typical background concentrations or coincided with areas of identified site impacts (BTEX/PAHs).

In certain tar or heavily contaminated soil samples, enough benzene or other constituents may be present to require that the material be managed as a hazardous waste. During the design of the IRM, samples were collected to make this determination for disposal purposes. The analyses performed included the Toxicity Characteristic Leaching Procedure (TCLP) and reactivity. The analytical results did not exceed hazardous threshold criteria.

5.1.3: Extent of Contamination

This section describes the findings of the investigation for all environmental media that were investigated.

Chemical concentrations are reported in parts per billion (ppb) for groundwater and parts per million (ppm) for waste and soil. For comparison purposes, where applicable, SCGs are provided for each medium.

Table 1 summarizes the degree of contamination for the contaminants of concern in surface soil, pre IRM subsurface soil, post IRM subsurface soil, background soils, and groundwater; and compares that data with the SCGs for the site. The following are the media which were investigated and a summary of the findings of the investigation.

Waste Materials

NAPL was observed in several borings, excavations and one monitoring well on the site. Figure 3 illustrates the extent of the NAPL observations. The NAPL observed was limited in volume, and appeared to have a consistency of used motor oil. Generally, the NAPL was observed as a DNAPL that was present in the former holder structure and pervious soil units in contact with the holder.

The NAPL appears to have originated in the former holder structure and migrated downward into the underlying sand bed beneath the holder. This unit overlies the clay unit at the site, which appears to effectively limit the NAPLs vertical extent. Laterally, the NAPL has migrated as fingers through the porous fill and sand lenses at the site. This migration is limited and appears to follow geologic features, such as the irregular surface of the clay layer.

A second area of waste was identified between the concrete block building (93B) and 93A Maple. This area appears to be associated with a former stream channel that contains DNAPL and debris. The stream itself was relocated into the culvert to the immediate east of the site, sometime after the plant ceased operation. The DNAPL present in the historic trace of this stream is likely the result of historic plant discharges into the former stream. Contamination associated with this stream trace beyond the 93 Maple property, is being addressed by an IRM and will be the subject of a future PRAP.

Surface Soil

Numerous samples were collected from 0 to 2 inches to help define surface soil conditions on site, off site and in the general area (background). These samples found the site and local area soils to contain PAHs as further detailed below and under the heading of, "background samples".

Two surface soil samples were collected from the site in 1997, and analyzed for BTEX, PAHs Target Analyte List (TAL) metals and cyanide. The result of these on-site samples are summarized in Table 1A. Six surface soil samples were also collected in 1997 from the Haverstraw area, BSS-1 through BSS-7 as shown on Figure 1. These samples were analyzed for TAL metals.

Six surface soil samples were then collected from the adjacent parcels in November 2001, samples BSS-01-1 through BSS-01-6 as shown on Figure 1. These samples were analyzed for VOCs, SVOCs and cyanide. Seven additional surface soil samples were also collected from the surrounding neighborhood in December 2001, these HASS samples are shown on Figure 2. These samples were analyzed for VOCs, SVOCs and cyanide. The results of these two sample sets are summarized in Table 1E. These samples found xylene in one off-site sample. All of the samples contained PAHs, with levels that ranged from 3.7 to 117 ppm. The highest levels were detected on an adjacent lot and are an order of magnitude below those found in waste materials on site.

These findings are the result of historic fill prevalent at the site and in the surrounding neighborhood, as well as more recent anthropogenic (resulting from the influence of human beings) activities. Based on the topography and soil stratigraphy observed during the site investigation and IRM excavation, it appears that the site and adjacent lots are covered by several feet of fill which was placed after the plant ceased to operate. In summation, the surface soils that were present during the MGP plants operation history are no longer present on the surface of the site.

Subsurface Soil

BTEX and PAHs were identified as contaminants of concern in the subsurface soils at the site. Analytically, the subsurface soils on site contained PAHs that ranged from Non Detect (ND) to 2,931 ppm in boring GP-26. Table 1B presents a summary of the analytical results for these compounds.

Generally, the distribution of these compounds in the subsurface soils coincides with the presence of DNAPL or fill materials. The fill materials on and around the site were observed to contain ash, coal, clinker and other anthropogenic materials which contain PAHs. However, the levels of PAHs found in this fill is an order of magnitude below those observed in NAPL contaminated soils.

The distribution of NAPL in the subsurface is discussed under the previous heading of Waste Material. As noted in that discussion, the clay layer underlying the site is effectively containing the contamination.

For illustration, analytically, the subsurface soils in on-site boring GP-09 contained PAHs that ranged from Non Detect (ND) to 2,593 ppm. This impacted sample was collected at 8 feet below grade from a sand layer located directly above the clay layer beneath the site. A sample collected immediately beneath this sample from the clay substrate, only contained 1.9 ppm of PAHs. Coincidentally, the sample collected from the 0-4 foot interval in this boring only contained 36 ppm of PAHs.

Cyanide has also been identified as a contaminant in the subsurface soils at the site. Generally, the values are low (ND - 13.5) and are co-located with PAH contaminants. However, it is worth noting this typical MGP contaminant in evaluating the PAH contaminants associated with the site.

Metals were also identified in the sub surface analytical samples, but generally are consistent with background values or are located with PAH contaminants.

Groundwater

BTEX, PAHs and cyanide have been identified as contaminants in the groundwater on the site. The groundwater impacts are limited to MW-1, which was installed in an area where the heaviest NAPL impacts have been observed. The results for all of the site wells are summarized in Table 1D. Please refer to Figure 2 for the well locations.

Maximum contaminant levels observed in the site wells were 880 ppb of BTEX and 68.7 ppb of PAHs in MW-1, which was removed when the soil and groundwater around it were removed and properly disposed of as part of the site IRM. MW-1 was located immediately downgradient of the holder structure. These levels dissipate to ND for BTEX and 4 ppb of PAHs in well MW-3, located approximately 25 feet down gradient from MW-1.

All of the exceedances for groundwater standards for site related compounds are from monitoring well MW-1. The other site wells, (MW-2, MW-3, and MW-27) did not have any exceedances of drinking water criteria for BTEX, PAHs, and cyanide compounds. The only site well that remains after the IRM excavation is well MW-03, which is located in the alleyway outside of the excavation footprint.

Storm Sewer System

Four storm sewer water samples were collected in January 2002 from the storm drainage system that is present in the alley immediately to the east of the site. The sample collected from the upgradient location was the most impacted for PAHs and cyanide, with levels of 2 ppb and 29 ppb respectively.

One sediment sample was collected from a catch basin downstream of the site. This sample was impacted by VOCs and PAHs. 72 ppm of PAHs and 80 ppb of BTEX were detected. However, the impacts do not appear to be site related or significant. As with the surface water sample, it should be noted that the stormwater system is receiving runoff from streets and other properties.

Hence surface water runoff is not considered a contaminant migration pathway for the site.

Background Samples

During the investigation of the site, it was determined that background samples would be necessary to assess the local historic fill conditions and the impact of anthropogenic sources of PAHs at the site.

The initial assessment included the collection of six samples from the Haverstraw area in 1997, BSS-1 through BSS-6, and as shown on Figure 1. The results of these samples were limited to analysis for metals.

A second and third round of samples was completed in November and December 2001, and the results are summarized in Table 1E. The November samples were collected from the parcels immediately adjoining the site, as shown on Figure 2. These 7 samples found the values for total PAHs to range from 3.7 to 117

ppm. No detections were found for cyanide (CN), and one detection of .001 ppm of xylene was found. The third round of 6 additional samples was completed in December from the surrounding neighborhood, as shown on Figure 1. Analysis of these samples was limited to VOCs and SVOCs. These samples found the values for Total PAHs in the surrounding neighborhood to range from 10.9 to 31.6 ppm. No detections were found for BTEX and CN.

Based on the overall investigation, this area of Haverstraw was found to have significant areas of historic fill. Based upon the review of the background sampling data, a site remedial goal of 25 ppm of total PAHs was established.

5.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS.

Based on the results of the RI data, it was determined that the removal of the contaminated former gas holder that remained on the site would be a highly effective IRM and would provide invaluable information regarding the site contaminant distribution.

As detailed in the IRM work plan and the Phase I IRM Construction Certification Report, a temporary structure was erected at the site and the holder remnants and associated contaminated subsurface soil were excavated for disposal at an off site permitted facility. As shown in Figure 3, this excavation removed all of the MGP contaminated soils from the following parcel lots: 80 and 85 (87 Maple Ave.), 79 (91 Maple Ave.), 76 (93A Maple Ave.), 86.1 (6 Tor Ave.) and 78 to a level of 25 ppm of total PAHs. This excavation resulted in approximately 6,100 tons of soil being removed and sent for off site treatment and disposal.

The temporary enclosure was utilized to control weather conditions and potential odors from the heavy contamination within the former gas holder remnants. The atmosphere in the enclosure was consistently maintained at a negative pressure, and the air was treated with granulated activated carbon prior to discharge. A full time air monitoring system was also employed at the site, to verify that site activities did not exceed applicable air criteria.

The excavation proceeded from the ground surface to the underlying clay layer. The sidewalls of the excavation were shored and the excavation dewatered. All water removed from the excavation was treated in an on site system and then discharged to the regional sewer, or a permitted off site facility. Confirmatory samples were taken from the bottom of the excavation, (see Figure 3), and visual inspections were performed to verify the excavation effectively removed all of the NAPL and stained soils from the site.

All of the confirmatory samples results were below the 25 ppm total PAH site remedial action objective for unrestricted residential use.

Similarly, 32 of the 36 samples met SCGs for individual BTEX constituents. As residual levels of BTEX would be expected to naturally bioremediate in the near term, these samples also indicate a successful removal of contamination associated with the subsurface soils and former plant structures at the site.

To facilitate the excavation of the site soils and structures, the site was dewatered during the IRM. Over the months of site work, multiple pore volumes of water were removed from the site and surrounding soils and properly disposed of. This discharge totaled over 2,680,000 gallons. As the groundwater quality will

increase with time due to the biodegradable nature of BTEX, the removal of source materials and flushing effect of dewatering are considered to have effectively addressed the groundwater contamination at the site.

As part of the IRM process, these observations and the data collected were evaluated for consistency with the site model of limited NAPL migration from the contaminated holder. The data supported this model, with the following modifications. Additional NAPL contamination was observed underneath a portion of the concrete block building at the site (93B), and within the former stream trace.

As a result of these observations, in situ chemical oxidization IRM was implemented to remediate the residual NAPL that could not be extracted from underneath the building by the excavation's dewatering system. An additional IRM excavation is also underway to physically remove the contamination in the former stream trace. Please refer to Figure 3.

5.3: Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the human exposure pathways can be found in Section 7 of the RI report.

An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site. An exposure pathway has five elements: [1] a contaminant source, [2] contaminant release and transport mechanisms, [3] a point of exposure, [4] a route of exposure, and [5] a receptor population.

The source of contamination is the location where contaminants were released to the environment (any waste disposal area or point of discharge). Contaminant release and transport mechanisms carry contaminants from the source to a point where people may be exposed. The exposure point is a location where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (e.g., ingestion, inhalation, or direct contact). The receptor population is the people who are, or may be, exposed to contaminants at a point of exposure.

An exposure pathway is complete when all five elements of an exposure pathway exist. An exposure pathway is considered a potential pathway when one or more of the elements currently does not exist, but could in the future.

Prior to implementation of the previously discussed IRM for OU 1 of this site, the potential existed for exposure to site related contaminants in surface and sub-surface soil. However, given the successful completion of said IRM, the potential for exposure to site related soil contaminants in concentrations that may represent a health concern has been eliminated.

5.4: Summary of Environmental Impacts

This section summarizes the existing and potential future environmental impacts presented by the site prior to the IRM. Environmental impacts include existing and potential future exposure pathways to fish and wildlife receptors, as well as damage to natural resources such as aquifers and wetlands.

The Fish and Wildlife Impact Analysis, which is included in the March 2002 Fish and Wildlife Impact Analysis Report, presents a detailed discussion of the existing and potential impacts from the site to fish and wildlife receptors.

The following potential environmental exposure pathways and ecological risks have been identified:

- Contamination of the on-site groundwater resource, and the potential for migration of contaminants by groundwater and/or NAPL to surface water.

Due to the urban nature and small size of the site, it provides no wildlife habitat. The closest habitat of significance is Haverstraw Bay, in the Hudson River. The river is located approximately 1000 feet east and south east of the site, as shown on Figure 1. No pathways or negative impacts were identified from Operable Unit 1 to Haverstraw Bay. The potential for significant impacts are considered unlikely, due to the limited site size and available data from groundwater and the storm sewer system.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS AND SELECTED REMEDY

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed of at the site through the proper application of scientific and engineering principles.

Prior to the completion of the IRM described in Section 5.2, the remediation goals for this site were to eliminate or reduce to the extent practicable:

- exposures of persons at or around the site to BTEX, PAHs and cyanide in subsurface soils, and former plant structures;
- the potential release of contaminants from subsurface soil and former plant structures into groundwater that may continue the limited exceedances of groundwater quality standards;
- potential environmental exposures of flora or fauna to BTEX and PAHs in subsurface soils, groundwater and former plant structures by migration of site contaminants in groundwater; and
- the potential release of contaminants from subsurface soils and former plant structures into off-site soils through NAPL migration and leaching of contaminants from subsurface soil.

The NYSDEC believes that the IRM has accomplished these remediation goals by the complete excavation and off-site treatment and disposal of contaminants from this operable unit of the site.

The main SCGs applicable to this project are as follows:

- Ambient groundwater quality standards are being met as the sources of groundwater contamination have been removed from the site, the primary groundwater contaminants of BTEX are readily biodegradable, and several volumes of contaminated groundwater were removed from the site area as part of the IRM.

- No future wells would be installed at the site without the review and approval of the Rockland County Health Department. This county institutional control would assure appropriate review of future groundwater use at the site.
- Soil quality has been restored to conditions that would provide for unrestricted residential use as all of the contaminated site soils and former plant structures have been removed and replaced with backfill that meets NYSDEC generic soil cleanup objectives.

The following elements of the IRM already completed have achieved the remediation goals and satisfy SCGs for the site:

1. Excavation and off-site disposal of MGP structures, piping and contaminated soil above the 25 ppm total PAH background level. Based upon the achievement of the 25 ppm background goal, no site use restrictions are required.

Based on the results of the investigations at the site, the IRM that has been performed, and the evaluation presented here, the NYSDEC has selected No Further Action as the preferred alternative for Operable Unit 1 of the site. Since the site remedial cleanup concentrations established by background level were achieved, there would be no need for continued monitoring of the site, a site management plan, or institutional controls. The site will have no use restrictions.

The basis for this selection is the NYSDEC's conclusion that No Further Action will be protective of human health and the environment and will satisfy all SCGs, as described above. Overall protectiveness is achieved through meeting the remediation goals listed above.

Therefore, the NYSDEC concludes that No Further Action is needed and no institutional/engineering controls would be necessary.

SECTION 7: HIGHLIGHTS OF COMMUNITY PARTICIPATION

As part of the remedial investigation process, a number of Citizen Participation activities were undertaken to inform and educate the public about conditions at the site and the potential remedial alternatives. The following public participation activities were conducted for the site:

- Repositories for documents pertaining to the site were established.
- A public contact list, which included nearby property owners, elected officials, local media and other interested parties, was established.
- Fact sheets were mailed to the contact list, in english and spanish, to keep the community informed of site activities and public meetings.
- Door to door outreach was undertaken to supplement the mailings and local media.
- Public information meetings were held in December 2004 and October 2002 to keep the public abreast of upcoming site work and investigation results.
- A public meeting was held on March 15, 2005 to present and receive comment on the PRAP.

- A responsiveness summary (Appendix A) was prepared to address the comments received during the public comment period for the PRAP.

No public comments were received.

TABLE 1 A
On Site Surface Soil Concentrations
93B Maple Avenue Former MGP Site
 May 1997

SURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)^a	SCG^b (ppm)^a	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	ND	0.06	0/2
	Toluene	ND	1.5	0/2
	Ethylbenzene	ND	5.5	0/2
	Xylene	ND	1.2	0/2
	BTEX	ND	10	0/2
Semivolatile Organic Compounds	Total cPAHs	8 - 45	10	1/2
	Total PAHs	15 - 75	500	0/2
Inorganic	Cyanide	.39 - .75	NA	0/2

TABLE 1 B
Nature and Extent of Subsurface Soil Contamination
93B Maple Avenue Former MGP Site
 May 1997 - November 2001

SUBSURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)^a	SCG^b (ppm)^a	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	ND - 860	0.06	16/113
	Toluene	ND - 2,800	1.5	2/113
	Ethylbenzene	ND - 340	5.5	5/113
	Xylene	ND - 2,800	1.2	10/113
	BTEX	ND - 6,800	10	5/113
Semivolatile Organic Compounds	Total cPAHs	ND - 448	10	46/113
	Total PAHs	ND - 2,931	500	12/113
Inorganic	Cyanide	ND - 13.5	NA	0/113

TABLE 1 C
Post IRM Subsurface Soil Contamination
93B Maple Avenue Former MGP Site
 April 2003 - November 2003

EXCAVATION BOTTOM SAMPLE	Contaminants of Concern	Concentration Range Detected (ppm)^a	SCG^b (ppm)^a	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	ND - 2.5	0.06	4/36
	Toluene	ND - 2.6	1.5	1/36
	Ethylbenzene	ND - 1.5	5.5	0/36
	Xylene	ND - 4.3	1.2	2/36
	BTEX	ND - 10.9	10	1/36
Semivolatile Organic Compounds	Total cPAHs	ND - 1.4	10	0/36
	Total PAHs	ND - 13.8	25^d	0/36
Inorganic	Cyanide	ND	NA	0/3

TABLE 1 D
Nature and Extent of Shallow Groundwater Contamination
93B Maple Avenue Former MGP Site
 June 1997 - December 2001

GROUNDWATER	Contaminants of Concern	Concentration Range Detected (ppb)^a	SCG^b (ppb)^a	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	ND - 880	1	4/10
	Toluene	ND - 2	5	0/10
	Ethylbenzene	ND - 4	5	0/10
	Xylene	ND - 13	5	1/10
	BTEX	ND - 880	NA	0/10
Semivolatile Organic Compounds	Total cPAHs	ND - 16	NA	0/10
	Total PAHs	ND - 68.7	NA	0/10
Inorganic	Cyanide	ND - 439	200	4/10

TABLE 1 E
Background Soil Concentrations
93B Maple Avenue Former MGP Site
 June 1997 - December 2001

SURFACE SOILS	Contaminants of Concern	Concentration Range Detected (ppm)^a	SCG^b (ppb)^a	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	ND	0.06	0/13
	Toluene	ND	1.5	0/13
	Ethylbenzene	ND	5.5	0/13
	Xylene	ND - .001	1.2	0/13
	BTEX	ND - .001	10	0/13
Semivolatile Organic Compounds	Total cPAHs	5 - 45	10	9/13
	Total PAHs	3.7 - 117	500	0/13
Inorganic	Cyanide	ND	NA	0/13

For Table 1A-D

^a ppb = parts per billion, which is equivalent to micrograms per liter, $\mu\text{g/l}$, in water;
ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg , in soil;
 $\mu\text{g/m}^3$ = micrograms per cubic meter
ppbv = parts per billion by volume

^b SCG = standards, criteria, and guidance values;

^c LEL = Lowest Effects Level and SEL = Severe Effects Level. A sediment is considered to be contaminated if either of these criteria is exceeded. If both criteria are exceeded, the sediment is severely impacted. If only the LEL is exceeded, the impact is considered to be moderate.

^d A local background value was used to establish unrestricted residential use

NT - Not tested for this parameter

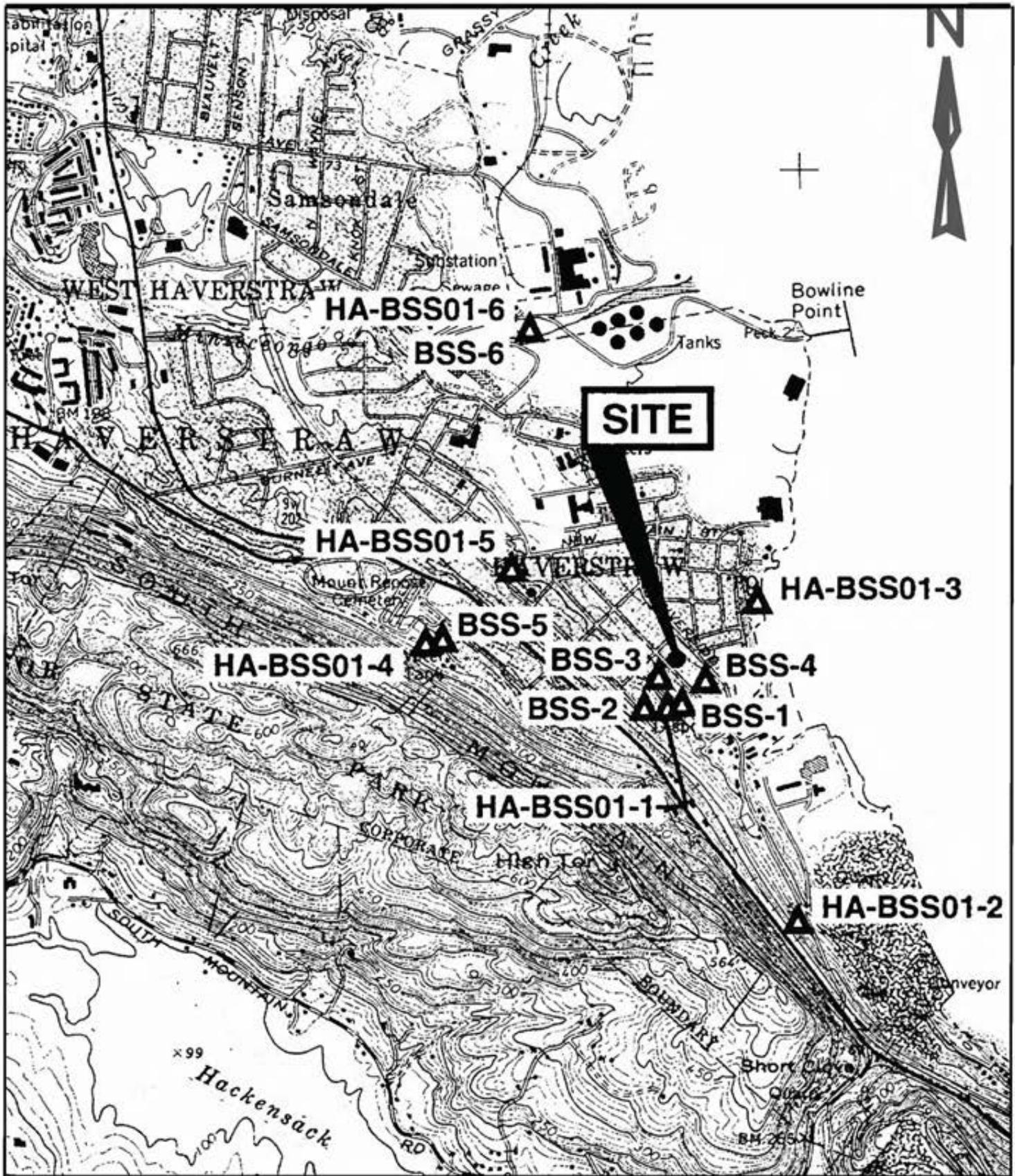
ND - Not Detected

NA - None Available

BTEX indicates the summation of benzene, toluene, Ethylbenzene and xylene

Total PAH indicates the total of all PAH compounds identified

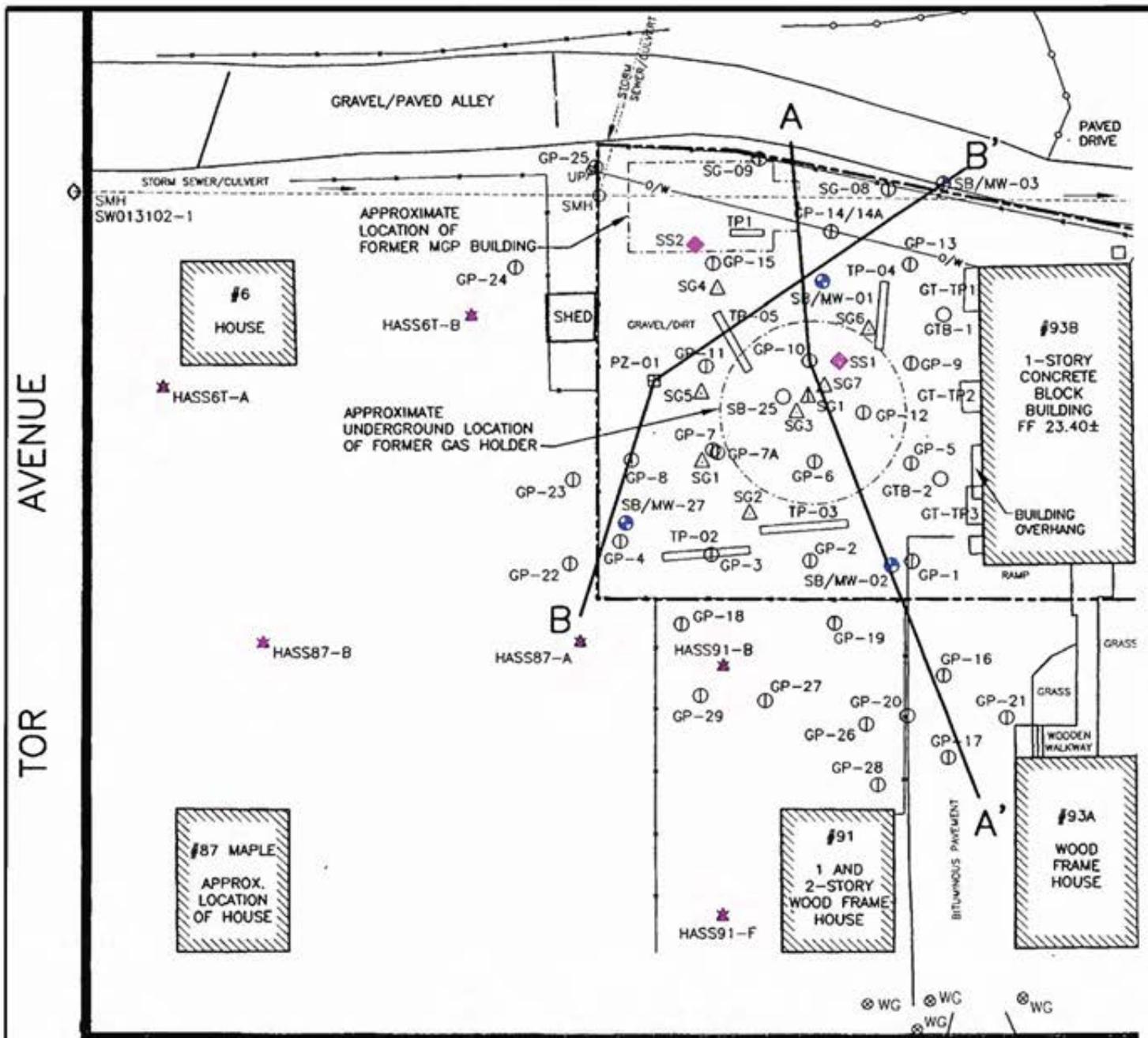
Total cPAH indicates the total of the seven PAH compounds that are considered carcinogenic



O&R 93B MAPLE AVENUE, HAVERSTAW MGP SITE, 3-44-044
 HAVERSTRAW (V), ROCKLAND COUNTY, NEW YORK

SITE LOCATION AND REGIONAL BACKGROUND SAMPLE LOCATIONS

FIGURE 1



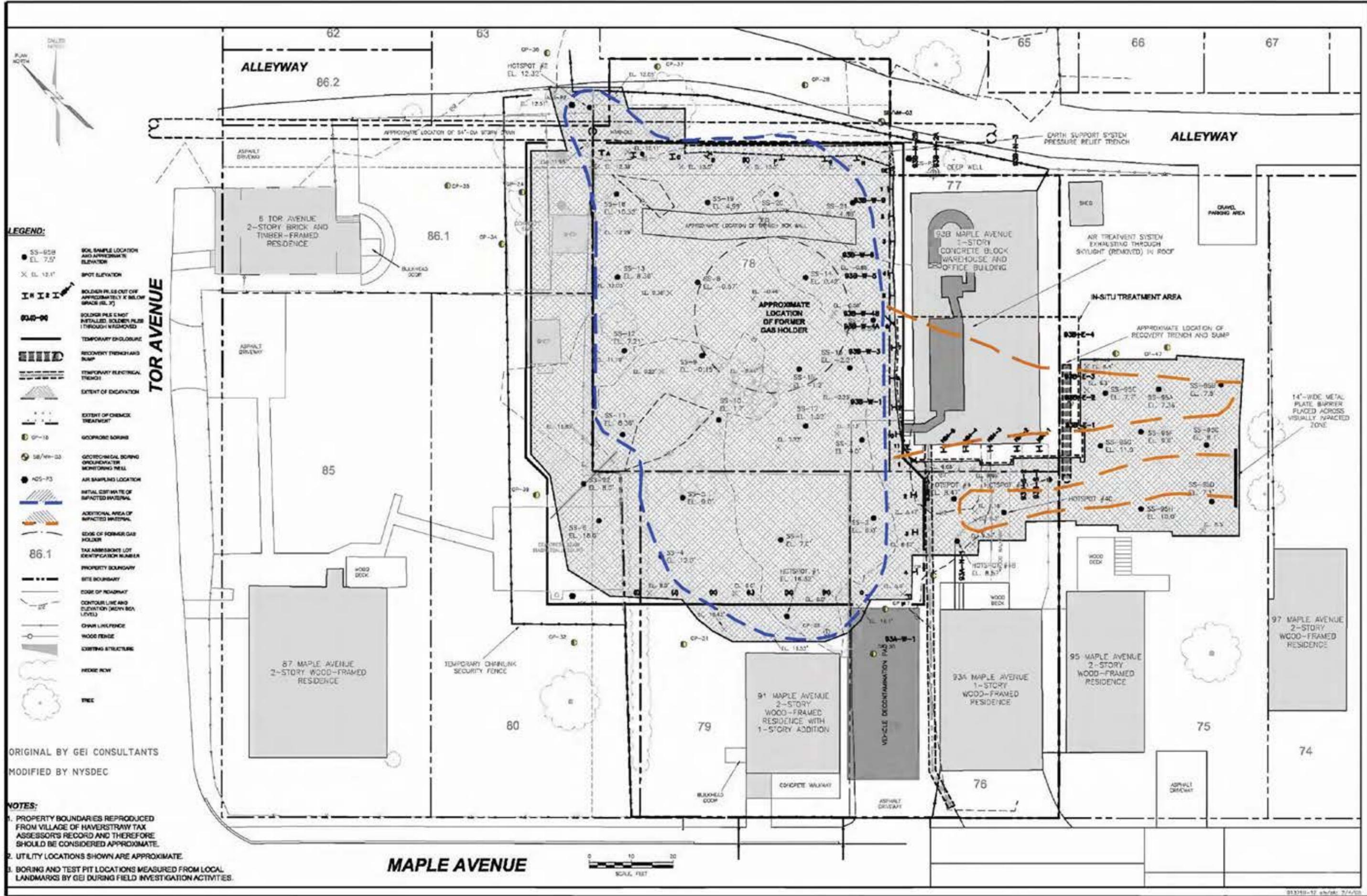
- NOTES: XX-SSXX-X SURFACE SOIL SAMPLE
 GP-XX/SG-X GEOPROBE SUBSURFACE SOIL SAMPLE
 SB/MW-XX SOIL BORING/MONITORING WELL LOCATION
 SWXXXXXX-X SURFACE WATER SAMPLE LOCATION
 GTB-X GEOTECHNICAL BORING LOCATION

- GT-X GEOTECHNICAL TEST PIT LOCATION
 TP-XX TEST PIT LOCATION
 SG-1 SOIL GAS SAMPLE LOCATION
 PZ-XX PIEZOMETER LOCATION

O&R 93B MAPLE AVENUE, HAVERSTAW MGP SITE, 3-44-044
 HAVERSTRAW (V), ROCKLAND COUNTY, NEW YORK

SAMPLE LOCATIONS

FIGURE 2

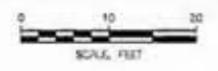


LEGEND:

- SS-05B EL. 7.5' SOIL SAMPLE LOCATION AND APPROXIMATE ELEVATION
- × EL. 12.1' SPOT ELEVATION
- BOLDER PILE OUT OF APPROXIMATELY 1' BELOW GRADE (EL. 7)
- BOLDER PILE (NOT INSTALLED, BOLDER PILE THROUGH W/DOOR)
- TEMPORARY ENCLOSURE
- RECOVERY TRENCH AND PUMP
- TEMPORARY ELECTRICAL TRENCH
- EXTENT OF EXCAVATION
- EXTENT OF CHEMICAL TREATMENT
- GP-18 GEOPHYSICAL BORING
- SB/W-03 GEOTECHNICAL BORING OR GROUNDWATER MONITORING WELL
- ACS-03 AIR SAMPLING LOCATION
- INITIAL ESTIMATE OF IMPACTED MATERIAL
- ADDITIONAL AREA OF IMPACTED MATERIAL
- EDGE OF FORMER GAS HOLDER
- 86.1 TAX ASSessor'S LOT IDENTIFICATION NUMBER
- PROPERTY BOUNDARY
- SITE BOUNDARY
- CODE OF ROADWAY
- CONTOUR LINE AND ELEVATION (SHOW SEA LEVEL)
- CHAIN LINK FENCE
- WOOD FENCE
- EXISTING STRUCTURE
- HEDGE ROW
- TREE

ORIGINAL BY GEI CONSULTANTS
MODIFIED BY NYSDEC

- NOTES:**
1. PROPERTY BOUNDARIES REPRODUCED FROM VILLAGE OF HAVERSTRAW TAX ASSESSOR'S RECORD AND THEREFORE SHOULD BE CONSIDERED APPROXIMATE.
 2. UTILITY LOCATIONS SHOWN ARE APPROXIMATE.
 3. BORING AND TEST PIT LOCATIONS MEASURED FROM LOCAL LANDMARKS BY GEI DURING FIELD INVESTIGATION ACTIVITIES.



APPENDIX A

Responsiveness Summary

RESPONSIVENESS SUMMARY

O&R 93B Maple Avenue Former MGP Site Haverstraw, Rockland County, New York Site No. 3-44-044

The Proposed Remedial Action Plan (PRAP) for the O&R 93B Maple Avenue Former Manufactured Gas Plant (MGP) site, was prepared by the New York State Department of Environmental Conservation (NYSDEC) in consultation with the New York State Department of Health (NYSDOH) and was issued to the document repositories on February 25, 2005. The PRAP outlined the remedial measures proposed for the contaminated soils, groundwater and structures at the O&R 93B Maple Avenue Former MGP site. The release of the PRAP was announced by sending a notice to the public contact list, informing the public of the opportunity to comment on the proposed remedy.

A public meeting was held on **March 15, 2005**, which included a presentation of the Remedial Investigation (RI), as well as a discussion of the proposed remedy. The meeting provided an opportunity for citizens to discuss their concerns, ask questions and comment on the proposed remedy. The public comment period for the PRAP ended on March 28, 2005.

No public comments were received at the public meeting or during the comment period.

APPENDIX B

Administrative Record

Administrative Record

O&R 93B Maple Avenue Former MGP Site Site No. 3-44-044

1. Order on Consent, Index No. D3-0001-99-01, between NYSDEC and Orange and Rockland Utilities (O&R), executed on March 3, 1999.
2. "Preliminary Site Assessment Report for Two Manufactured Gas Plant Sites, Haverstraw, New York", August 1997, Remedial Technologies Inc.
3. "Draft Remedial Investigation Report, 93B Maple Avenue, Former Manufactured Gas Plant Site, Haverstraw, New York", March 29 2002, GEI Consultants Inc.
4. "Interim Remedial Measure Work Plan, 93B Maple Avenue Former Manufactured Gas Plant Site, Haverstraw, New York", August 2002, GEI Consultants Inc.
5. "Proposed Remedial Action Plan for the O&R 93B Maple Avenue Former MGP Site, Haverstraw, Rockland County, New York, Site Number 3-44-044", February 2005, New York State Department of Environmental Conservation.
6. "Interim Remedial Measures Certification Report, 93B Maple Avenue, Former Manufactured Gas Plant Site, Haverstraw, New York", March 2005, GEI Consultants, Inc.