

## Nyack Gas Plant Site

### Excavation—In Situ Stabilization/Solidification—Flowable Tar Recovery—In Situ Chemical Oxidation

**Site Name:** Nyack Gas Plant Site (Operable Unit 1)

**Site Location:** Nyack, New York

**Technology Used:**

- Excavation
- Pumping of Flowable Tar
- In Situ Chemical Oxidation (ISCO) (Modified Fenton's Reagent)
- In Situ Stabilization/Solidification (ISS/S)

**Regulatory Program:** New York State Department of Environmental Conservation (DEC)

**Remediation Scale:** Full

**Project Duration:** 2004 to present

**Site Information:** A manufactured gas plant (MGP) operated at this site from 1852 until 1965. It is believed that gas was made from the coal carbonization process from 1852 until 1887. From 1887 until 1889, the plant used oil instead of coal, and from 1890 until 1938, the plant used both coal and oil as feedstock for the carbureted water gas process. From 1938 until 1965, the site was used as an oil gas facility during times of peak demand.

**Contaminants:** The primary contaminants of concern in the groundwater and soil (Table 1) are polycyclic aromatic hydrocarbons (PAHs), carcinogenic PAHs, cyanide, and BTEX (benzene, toluene, ethylbenzene, and xylenes). In some areas of the site, flowable tar (Figure 1) has migrated into the bedrock to over 40 ft below ground surface (bgs).

Table 1. Maximum Concentration Detected for Contaminants of Concern		
Contaminant	Ground-water	Soil
PAHs	11,450	19,388
cPAHs	717	1,936
BTEX	199,500	2,860
Cyanide	495,000	14
Units: Groundwater $\mu\text{g/L}$ , Soil $\text{mg/kg}$		

**Hydrogeology:** The topography of the site is characterized by an upper terrace with a bank leading down to a lower terrace that ends at the Hudson River (Figure 2). Both areas are covered with varying thicknesses of fill. The jetty area, which protrudes into the Hudson River, has the thickest layer of fill (13 ft). The second significant area of fill forms the slope between the upper and lower terraces, which was placed there after plant operations ended. A layer of native silty sand generally underlies the fill material. A layer of glacial till was noted in one boring on the upper terrace. Sandstone bedrock underlies the silty sand.

The bedrock is fractured and is a productive aquifer. The overburden in the upper terrace is entirely above groundwater. In the lower terrace, groundwater is found in the overburden, and fluctuates with the tide, indicating some hydraulic communication between the river and the groundwater.



Figure 1. Tar Draining from a Sampler

Courtesy New York State DEC

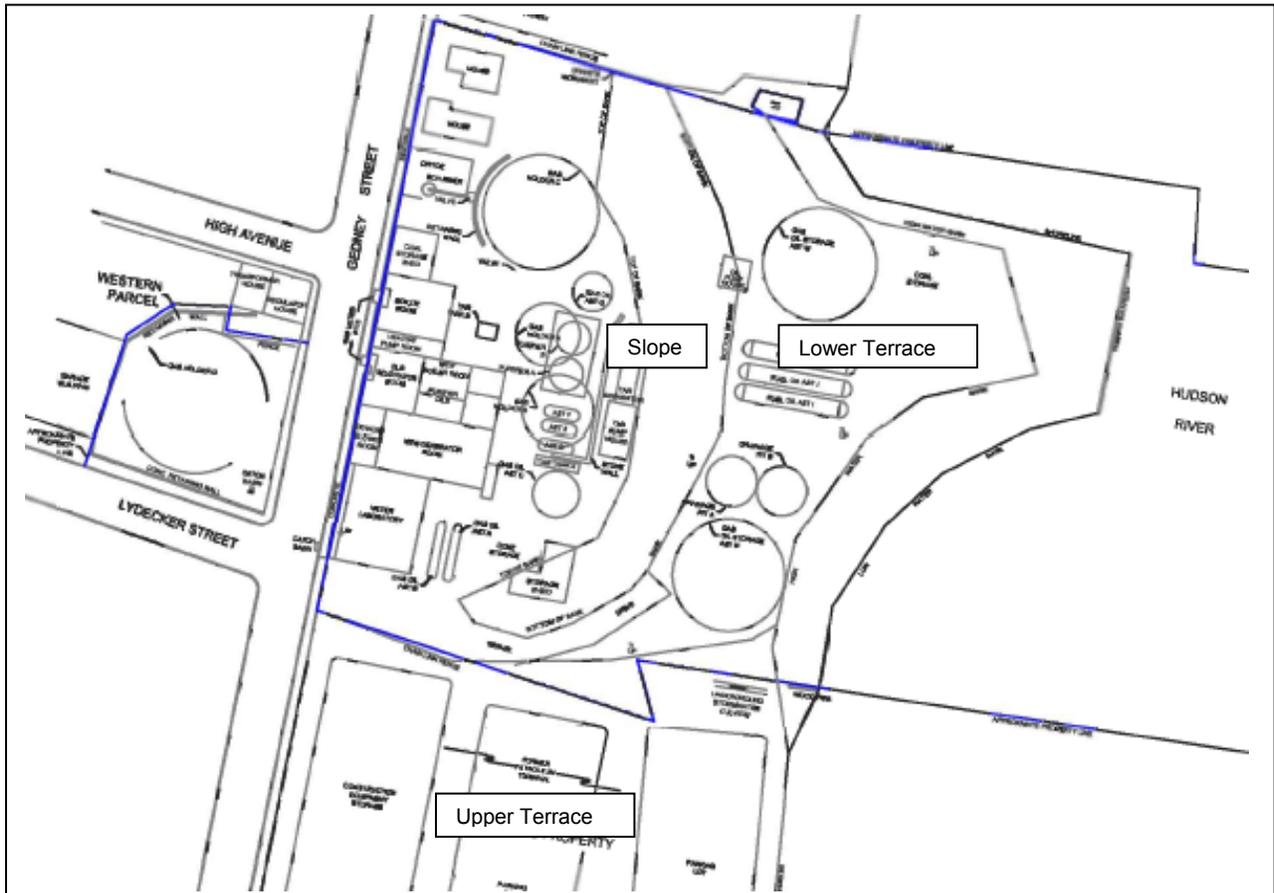


Figure 2. Cleanup Areas at Nyack Gas Plant

Courtesy New York State DEC

**Project Goals:** The primary objectives of this action were to remediate the source of contamination, prevent exposure to humans, and reduce and minimize the downward migration of contaminants to the aquifer. To the extent practicable, ambient groundwater quality standards were used as the cleanup goals for the aquifer. The cleanup levels recommended in the state Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels (TAGM 4046) were the cleanup goals for the soil.

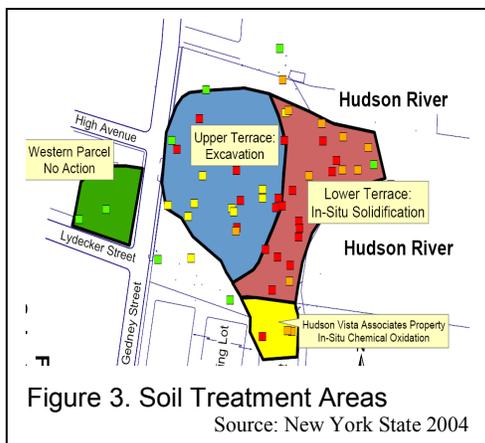
**Cleanup Approach:** About 2,107 tons of MGP structural and piping debris were removed, and approximately 25,377 tons of soil containing 500 parts per million (ppm) or more total PAHs

were excavated from the upper terrace and disposed of offsite. The contaminated soil in the slope area was also removed as part of the excavation activities on the upper terrace. Wells were placed in the upper terrace area bedrock to remove pumpable tar.

Following the removal of pumpable tar, the bedrock was treated with 87,190 gallons of a 17% solution of modified Fenton's Reagent. This solution was pressure applied using 19 injection wells and six extraction wells. A total of 34,826 gallons of groundwater was recovered and treated.

The pilot study at the Hudson Vista Associates property (See Figure 3 for location) showed that

solidification would work better on the contaminant matrix than ISCO. Thus, approximately 2,520 yd<sup>3</sup> of soil was solidified using Portland cement.



Following removal of structures, debris, and obviously contaminated soil in the lower terrace, Portland cement was auger mixed with approximately 11,402 yd<sup>3</sup> of contaminated soil to solidify it and prevent further migration of contaminants. An approximately 311 yd<sup>3</sup> area that could not be augered was jet grouted.

To prevent contact with the solidified soil and provide a cover for the bedrock, a 2-ft layer of clean soil was placed over the site.

A long-term groundwater monitoring program was established to track changes in groundwater quality. The wells will be tested annually for the presence of BTEX and PAHs.

Future remedial actions are not anticipated at this time.

**Project Results:** The excavation action removed heavily contaminated soil from the property and achieved the goal of preventing future contact and further contamination of the groundwater. The solidification of the contaminated soil on the lower terrace and at the Hudson Vista prop-

erty has cut contaminant leaching to an acceptable level. Covering the entire property with soil will prevent future contact provided the institutional controls are maintained. The owner of the property is required to certify on an annual basis that the remedy is functioning as designed and the institutional controls are being maintained.

Approximately 60 liters of free tar were recovered from the extraction wells. Since an unknown amount of residual tar was present in the bedrock, it is not possible to measure how successful the ISCO treatment was; however, data from monitoring wells indicate a drop in dissolved contaminant concentrations following the application. Groundwater monitoring of the bedrock is currently not occurring.

#### Sources:

ISOTEC. Undated. Nyack Manufactured Gas Plant (MGP) Site, New York Case Study. In Situ Oxidative Technologies, Inc., 2 pp.

New York State. 2004. Record of Decision Nyack Gas Plant Site Operable Unit No.1 Former Plant Site Nyack (V), Rockland County, New York Site Number 3-44-046. Department of Environmental Conservation.

[http://www.dec.ny.gov/docs/remediation\\_hudson\\_pdf/rod34404601.pdf](http://www.dec.ny.gov/docs/remediation_hudson_pdf/rod34404601.pdf)

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