

Division of Environmental Remediation

Record of Decision
Central Hudson Newburgh Site

Newburgh, Orange County, New York
Site Number 3-36-042

December 2005

DECLARATION STATEMENT - RECORD OF DECISION

Central Hudson Newburgh MGP Inactive Hazardous Waste Disposal Site Newburgh, Orange County, New York Site No. 3-36-042

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedy for the Central Hudson Newburgh 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 Central Hudson Newburgh MGP inactive hazardous waste disposal 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 releases of hazardous waste constituents from this site, if not addressed by implementing the response action selected in this ROD, present a significant threat to public health and/or the environment.

Description of Selected Remedy

Based on the results of the Remedial Investigation and Feasibility Study (RI/FS) for the Central Hudson Newburgh MGP site and the criteria identified for evaluation of alternatives, the NYSDEC has selected a combination of excavation, passive tar collection, in-situ oxidation, barrier wall, dredging and sediment capping. The components of the remedy are as follows:

In Area A (the former Gas Plant itself):

1. A remedial design program to provide the details necessary to implement the remedial program.
2. Excavation of the tar contamination in the southeast corner.
3. Relocation/management of the existing gas regulator station and excavation of any tar contamination in the former relief holder and surrounding area.

4. Installation of overburden/bedrock tar collection wells along Water Street, in the relief holder area, and in any other portions of the site where tar is identified but can not be excavated.
5. Development of a Site Management Plan (SMP). The SMP will include the institutional controls and engineering controls to: (a) address residual contaminated soils; (b) evaluate the potential for vapor intrusion for any buildings developed on the site; (c) provide for the operation and maintenance of the components of the remedy; (d) monitor the groundwater quality, and; (e) identify any use restrictions.
6. An institutional control in form of an environmental easement that will limit the use of the property to commercial or industrial uses and restrict use of groundwater.
7. The SMP will require the property owner to provide an Institutional Control/ Engineering Control (IC/EC) certification on a periodic basis.

In Area B (between the plant site and the Hudson River, including the City's Sewage Treatment Plant):

8. A remedial design program to provide the details necessary to implement the remedial program.
9. Installation of tar collection wells and removal of MGP tar from the River Street area of the STP.
10. In-situ chemical oxidation following the tar removal in the River Street area.
11. Installation of a containment wall with tar collection on the bank of the Hudson River.
12. Delineation and removal (if necessary) of contaminated soil along Renwick Street in an area identified by the City for expansion of the STP. Sufficient soil will be removed to provide a clean, safe environment for construction and operation of the expanded STP facility in this area.
13. Development of a Site Management Plan. The SMP will include the institutional controls and engineering controls to: (a) address handling and disposal procedures for any residual contaminated soils that may be excavated from the site during future use or redevelopment; (b) evaluate the potential for vapor intrusion for any buildings developed on the site; (c) provide for the operation and maintenance of the components of the remedy; (d) monitor groundwater quality.
14. A requirement for Central Hudson to utilize best efforts to obtain an institutional control with the property owners in Area B that will restrict the use of groundwater and limit the use and development of the property to commercial, industrial, or restricted residential use.

15. The SMP will require Central Hudson to provide an IC/EC certification on a periodic basis and require the property owners to assist Central Hudson in the preparation of the certification.

In area C (The Hudson River):

16. A remedial design program that will provide the details necessary to implement the remedial program.
17. Removal (and restoration, if the City of Newburgh so desires) of the existing rip-rap in the impacted shoreline area.
18. Removal by dredging of all tar impacted sediments with backfill/capping of the dredged area.
19. Installation of a sediment cap in areas where PAH contamination remains above the local background level of 20 ppm. Construction of the cap will not be allowed to reduce average water depths below 6 feet (equivalent to four feet at low tide). In near-shore areas, this will require prior removal of sediment to create sufficient room for the cap. In areas of deeper water, the sediment cap may be built on the existing sediment surface, provided it can be constructed so that it will not significantly erode, the finished river bottom elevation provides at least 6 foot average water depth (equivalent to 4 feet at mean low tide), and does not interfere with near-shore boating access.
20. Development of a Site Management Plan. The SMP will include the institutional and engineering controls to: (a) inspect, monitor and maintain the sediment cap; (b) repair any damage or erosion of the cap; and (c) otherwise prohibit cap removal or activities in the area that will impact the integrity of the cap.
21. As an institutional control, notification of the existence of the cap will be provided to appropriate Federal and State agencies with jurisdiction over dredging activities to ensure that the cap is not removed without removing the underlying contaminated sediment as well.
22. The SMP will require Central Hudson to provide an IC/EC certification on a periodic basis and require the property owner to assist Central Hudson in the preparation of the certification.

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
Division of Environmental Remediation

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RECORD OF DECISION

Central Hudson Newburgh MGP Site
Newburgh, Orange County, New York
Site No. 3-36-042
October 2005

SECTION 1: SUMMARY AND PURPOSE

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 the Central Hudson Newburgh Manufactured Gas Plant (MGP) Site. The presence of hazardous waste has created significant threats to human health and/or the environment that are addressed by this remedy. As more fully described in Sections 3 and 5 of this document, gas manufacturing and purification processes have resulted in the disposal of hazardous wastes, including MGP tar that contains benzene and polycyclic aromatic hydrocarbons (PAHs). These wastes have migrated through the subsurface, and have resulted in:

- a significant threat to human health associated with potential exposure to liquid MGP tar, soil, groundwater and sediments contaminated by MGP tar, and soil vapor released by these materials.
- a significant threat to the environment associated with the contamination of groundwater beneath the site and beneath adjacent properties.
- a significant threat to the environment associated with the impacts of MGP contaminants to fish and wildlife resources of the Hudson River.

To eliminate or mitigate these threats, the NYSDEC proposes the following combination of remedies in three adjacent parts of the project area:

For area A, which constitutes the MGP site itself, the NYSDEC has selected the following remedy:

- A remedial design program will be developed to provide the details necessary to implement the remedial program.
- Excavation and proper off site disposal of the tar contamination in the southeast corner.
- Relocation/management of the existing gas regulator station, followed by excavation and proper off site disposal of any tar contamination in the former relief holder area.

- Installation of overburden/bedrock tar collection wells along Water Street, in the relief holder area, and in any other portions of the site where tar is identified but can not be excavated.
- Since the remedy results in contamination above unrestricted levels remaining at the site, a site management plan (SMP) will be developed and implemented. The SMP will include the institutional controls and engineering controls to: (a) address residual contaminated soils that may be excavated from the site during future activities by requiring soil characterization and, where applicable, disposal/reuse in accordance with NYSDEC regulations; (b) evaluate the potential for vapor intrusion for any buildings developed on the site, including provision for mitigation of any impacts identified; (c) provide for the operation and maintenance of the components of the remedy, including collection of tar from the wells; (d) monitor the groundwater, tar collection, etc. and (e) identify any use restrictions regarding on site development or groundwater use.
- Imposition of an institutional control in form of an environmental easement that will limit the use and development of the property to commercial or industrial uses only and restrict use of groundwater.
- The SMP will require the property owner to provide an Institutional Control/ Engineering Control (IC/EC) certification on a periodic basis.

For area B, which is the area between the MGP site and the Hudson River, the NYSDEC has selected the following remedy:

- A remedial design program that will provide the details necessary to implement the remedial program.
- Installation of tar collection wells and removal of MGP tar from the River Street area of the STP.
- In-situ chemical oxidation following the tar removal in the River Street area.
- Installation of a containment wall with tar collection on the bank of the Hudson River.
- Since the remedy will result in contamination above unrestricted levels remaining on CSX and City properties, a SMP will be developed and implemented, in cooperation with the property owners. The SMP will include the institutional controls and engineering controls to: (a) address residual contaminated soils that may be excavated from the site during future use or redevelopment. The plan will describe the tar, soil and groundwater contamination present at depth beneath Area B, and detail proper procedures for handling and disposal of tar, contaminated soils and groundwater encountered during excavation; (b) include provisions that tar collection and oxidant addition continue until the remedial objectives have been achieved, or until the NYSDEC determines that continued operation would be technically impracticable or not feasible; (c) evaluate the potential for vapor intrusion for any buildings developed on the site, including provision for mitigation of

any impacts identified; (d) provide for the operation and maintenance of the components of the remedy; (e) monitor groundwater and tar collection.

- Removal and proper off site disposal of soils at the east end of Renwick Street, in an area identified by the City of Newburgh for future expansion of the sewage treatment plant. Soils will be removed to the extent necessary to provide a clean and safe environment for workers engaged in construction and operation of the expanded facility.
- Utilize best efforts to obtain an institutional control in a manner and form acceptable to the NYSDEC with the property owners in Area B that will restrict the use of groundwater and limit the use and development of the property to commercial, industrial or, subject to NYSDEC and NYSDOH approval, restricted residential use.
- The SMP will require Central Hudson to provide an IC/EC certification on a periodic basis and require the property owners to assist Central Hudson in the preparation of the certification.

For Area C, the Hudson River sediments, the NYSDEC has selected the following remedy:

- A remedial design program that will provide the details necessary to implement the remedial program.
- Removal and restoration of the existing rip-rap in the impacted shoreline area.
- Removal by dredging of all tar impacted sediments with backfill/capping of the dredged area.
- Installation of a sediment cap, approximately 2.5 feet thick, in areas where contaminants remain above the local background level of 20 ppm. Construction of the cap will not be allowed to reduce average water depths below 6 feet (equivalent to four feet at low tide). In near-shore areas, this will require prior removal of sediment to create sufficient room for the cap. In areas of deeper water, the sediment cap may be built on the existing sediment surface, provided it can be constructed so that it will not significantly erode, the finished river bottom elevation provides at least 6 foot average water depth, and does not interfere with near-shore recreational boating access.
- Since the remedy results in contamination above unrestricted levels remaining at the site, an SMP will be developed and implemented. The SMP will include the institutional and engineering controls to: (a) inspect, monitor and maintain the sediment cap; (b) repair any damage or erosion of the cap; and (c) otherwise prohibit cap removal or activities in the area that will impact the integrity of the cap.
- As an institutional control, notification of the existence of the cap will be provided to appropriate Federal and State agencies with jurisdiction over dredging activities to ensure that the cap is not removed without removing the underlying contaminated sediment as well.

- The SMP will require Central Hudson to provide an IC/EC certification on a periodic basis and require the property owner to assist Central Hudson in the preparation of the certification.

The selected remedy, discussed in detail in Section 8, 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 former MGP site occupies 1.8 acres along Water Street in the southern end of the City of Newburgh, Orange County. The property is roughly rectangular, bordered on the north by South William Street, on the east by South Water Street, on the south by Renwick Street, and on the west by South Colden Street. The location of the site is shown on Figure 1.

The site is currently owned by Central Hudson Gas and Electric Corporation and occupied by a natural gas regulator station that controls distribution of gas throughout the City of Newburgh and surrounding areas. In addition, the site contains six underground propane storage tanks that are used to provide extra gas to the local area during periods of peak demand. The entire MGP site is securely fenced.

The area contaminated by the MGP site is larger than the MGP site itself. Wastes from the MGP site, in the form of a dense, oily liquid known as MGP tar, have spread beneath the ground surface for several hundred feet to the east, beyond the property line. As this liquid moves, it passes beneath Water Street, two sets of railroad tracks, the City of Newburgh's Sewage treatment Plant (STP), and into the sediments beneath the Hudson River.

Surrounding land uses are commercial and industrial. The nearest residence is located roughly 600 feet to the southwest. In recent years, the City of Newburgh has made progress in redeveloping waterfront areas to the north and east of the MGP site. This redevelopment activity has not yet reached the area surrounding the MGP site; however, a rowing club was recently constructed immediately to the south of the STP, leading to an increase in boat traffic immediately off shore. Some proposals for residential redevelopment immediately to the west of the MGP site have also recently been advanced.

Throughout this document, "the site" refers to the MGP site itself. The larger area that has been impacted by migration of MGP contamination (including the MGP site itself) is referred to as the "project area." The boundaries of the site and the project area are shown on Figure 2.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

The manufactured gas plant began operations in 1876 under the name Consumers Gas Company. Through a series of consolidations and mergers in the early 20th century, the MGP came under the control of Central Hudson Gas and Electric Corporation. The plant was expanded several times during its lifetime, and eventually reached its maximum size and production capacity in approximately 1910. By 1929, gas pipelines had been constructed to link Newburgh to other MGPs under Central Hudson's control, allowing production to be shifted between different MGPs. The Newburgh plant was placed in standby status in 1929, and gas production at the plant decreased sharply. The MGP plant was demolished in 1951.

The plant used the Lowe carburetted water gas process to convert coal and petroleum to a combustible gas, which was piped to businesses and homes throughout Newburgh for heating, lighting and cooking purposes. The carburetted water gas process involved the passage of steam through hot coal or coke. This formed a gaseous mixture (water gas or blue gas) that was then passed through a super heater. Oil was sprayed into the super heater to generate additional gas, enhancing the heating and lighting capacity of the gas mixture.

The gas was cooled and purified prior to distribution. During cooling, an oily liquid commonly known as coal tar would condense from the hot gas and settle in the bottom of gas holders, pipes, and other structures. In the water gas process used at this site, the tar was derived both from petroleum products and from coal. Consequently, the material is referred to as "MGP tar" throughout this document.

Much of the tar condensation took place in a storage vessel known as a relief holder, where freshly produced gas was held prior to purification and distribution. The location of the relief holder is shown on Figure 3. Studies at other MGP sites throughout New York State have shown that relief holders are often sources of tar contamination, which migrates away from the holders through the subsurface. At this site, the foundation of the relief holder likely extended roughly 20 feet below the ground surface and had a dirt floor. Tar that accumulated in the bottom of this holder would have been under pressure, free to infiltrate downward through the shallow soils on the MGP site into the fractured bedrock beneath. The relief holder foundation still exists on the MGP site; the contents of this foundation and the surrounding soils and bedrock appear to be significant reservoirs of tar contamination.

Other tar handling facilities on the MGP site also appear to have leaked significant volumes of tar into the subsurface. In particular, several subsurface structures located at the southeast corner of the MGP, near the intersection of Renwick and Water streets, have been identified as important sources.

Some of the tar produced at the Newburgh MGP was discharged directly to the Hudson River. A series of three roughly parallel sewer lines led from the area of the MGP plant to the river near the eastern end of Renwick Street. Tar was discharged via at least one of these sewers, and possibly via all three. Because the tar is more dense than water, and largely insoluble, the tar discharged from the sewers tended to sink and accumulate in Hudson River bottom sediments in

the area surrounding the former sewer outfalls. The locations of the contaminant source areas are shown on Figure 3.

3.2: Remedial History

Excavation work at the City STP in 1994 led to the discovery of tar contamination. The excavation was being performed to allow construction of an additional secondary clarifier at the STP. The clarifier was designed as a deep subsurface concrete tank, extending roughly 22 feet below the ground. Once construction work began on the project, it was found that excavations which penetrated to depths where tar was present (typically from 8-22 feet below grade) would often encounter tar-contaminated soil and groundwater, and in some cases would encounter liquid tar seeping out of the walls of the excavation.

The volumes of tar entering the excavations were typically small but significant. Tar would often spread out on the floor of the excavation, creating an odor nuisance and potential benzene vapor exposures and potential dermal exposures for workers in the excavations. Without the ability to properly control the tar infiltration and the resulting worker exposures, construction of the clarifier was suspended for several years.

Subsequent investigations revealed widespread tar contamination beneath the central portion of the STP site. The proximity of the STP to the former MGP site made it appear likely that the MGP was the source of this contamination. However, the mechanism by which the tar was entering the STP site was not immediately obvious, and the possibility that some of the contamination originated elsewhere could not be ruled out at the time. The City of Newburgh successfully sued Central Hudson in Federal Court, resulting in a settlement agreement covering damages to the City's property caused by MGP wastes.

In 1995, Central Hudson entered into an Order on Consent with the NYSDEC. The order requires Central Hudson to investigate and remediate MGP related contamination at the MGP site itself and throughout the project area. The City of Newburgh is a party to this order, and has remained active in the investigation 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 responsible party for the Newburgh MGP site is Central Hudson Gas and Electric Corporation.

The NYSDEC and the Central Hudson Gas and Electric Corporation entered into a Consent Order on October 24, 1995. The Order obligates the responsible party to implement a full remedial program. Upon issuance of the ROD the Order on Consent obligates Central Hudson to implement the selected remedy.

SECTION 5: SITE CONTAMINATION

A Remedial Investigation/Feasibility Study (RI/FS) was 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 December 1995 and June, 1999. The field activities and findings of the investigation are described in the RI report.

The following activities were conducted during the RI:

- Research of historical information;
- Installation of 76 soil borings and 23 monitoring wells for analysis of soils and groundwater as well as physical properties of soil and hydrogeologic conditions;
- Sampling of 23 new and 15 existing monitoring wells;
- Collection of eight surface water samples in the Hudson River;
- Collection and analysis of about 81 aquatic sediment samples and visual inspection of 133 sediment probe and core samples;
- Tar recovery testing in 10 wells and piezometers; and
- Collection and analysis of eight ambient air samples.

The locations of the soil borings, monitoring wells, water and sediment samples are shown on Figure 4.

To determine whether the soil, groundwater, and sediments contain 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".
- Sediment SCGs are based on the result of a background study undertaken along the Newburgh waterfront. Background sediment samples were taken from approximately 37 locations to help distinguish MGP-related contamination from contamination which originated elsewhere in the industrialized Newburgh water front. These sampling

locations were upriver of the site, and are assumed to be unaffected by historic or current MGP site operations. The samples were analyzed for PAHs. The results of the analysis were compared to data from the RI (Table 1) to determine where the influence of the MGP plant ends. Based upon this study, a sediment background level of 20 ppm was determined, which will define the limits of remediation.

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 require remediation. These are summarized below. More complete information can be found in the RI report.

5.1.1: Site Geology and Hydrogeology

The geologic features of the MGP site and the rest of the project area largely determine where the tar has moved and where it is found today. Tar was released into the subsurface in at least three different areas (two on the MGP site itself and one along the banks of the Hudson River). Tar has migrated away from these areas through joints and cracks in the bedrock, and through coarser-grained layers in the overlying soil and sediment. Subsurface migration similar to this has been observed at numerous other MGP sites investigated under NYSDEC oversight.

The MGP site itself sits on a relatively steep hillside, with a thin layer of fill materials and glacial till overlying shale bedrock. The total thickness of these overburden materials varies from a few feet at the western edge of the MGP to over 20 feet along the eastern edge. It is important to note that the relief holder was built with a foundation that largely penetrated the fill and till deposits at the MGP site. The area around the relief holder has not been thoroughly investigated due to difficulties with subsurface utilities; however, it appears that the bottom of the relief holder foundation was at or within a few feet of the bedrock surface. Any tar that leaked from the bottom of the relief holder would have had ready access to the bedrock unit beneath the fill and till.

Based on examination of bedrock core samples and nearby outcrops, the shale is highly folded and deformed throughout the study area. Fractures are found in the bedrock at various locations which are difficult to predict based on borehole observations. Groundwater and liquid tar can move through these fractures.

Progressing further to the east toward the Hudson River, the soil deposits become thicker and more complex beneath the STP property. Much of the STP property was operated as a shipyard during the 1800s and early 1900s. The area was later filled and now stands roughly 8-10 feet above sea level. Beneath the fill lies a sequence of bedded sand, silt, and clay deposits. The total depth to bedrock increases to over 60 feet along the river's edge. Tar has moved through the coarser-grained sand layers, and can now be found in these units at varying depths below most of the central portion of the STP property.

Throughout the entire study area, the water table is relatively close to the ground surface. Depth to groundwater varies from zero (along the river bank) to roughly 10-15 feet at the MGP site itself.

The overall distribution of tar in soils and bedrock throughout the project area is shown on Figure 5. In viewing the map, it is important to keep in mind that much of the contamination is found at depth beneath the ground surface. Contaminated locations are color-coded to indicate how far below the ground surface the contamination is found. It should also be noted that not all soils within the contaminated area are contaminated. In many cases, the tar is present only along thin seams, with soils above and below these tar seams largely unimpacted.

5.1.2: Nature of Contamination

As described in the RI report, many soil, groundwater and sediment samples were collected to characterize the nature and extent of contamination. As summarized in Table 1, the main categories of contaminants that exceed their SCGs are volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs).

Specific volatile organic compounds of concern are benzene, toluene, ethylbenzene and xylenes. These are referred to collectively as “BTEX compounds” in this document.

The specific semivolatile organic compounds of concern in soil and groundwater are the following 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 plan 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.

It should be noted that the contaminants found at this site are quite common in the urban environment. The highest levels of contamination found in the project area are related to MGP operations; however, some level of contamination in surrounding areas is likely to result from other, unrelated activities in this highly urbanized area. The BTEX compounds are widely used as antiknock additives in gasoline, and are also found in paint thinners and other solvents. The PAH compounds can be found in some petroleum products such as diesel fuel and asphalt and are thus commonly found in runoff water from streets.

The principal human health and environmental exposures relate to the widespread distribution of MGP tar throughout the project area. Understanding the physical and chemical behavior of this tar is essential to proper characterization and clean up.

It is important to note that the tar at this site does not have the sticky, viscous consistency of other materials commonly labeled as “tar.” Instead, the tar found at this site has the consistency of motor oil, and is consequently able to move about as a liquid through the subsurface.

MGP tar belongs to a group of organic contaminants known as dense non-aqueous phase liquids, commonly abbreviated as DNAPLs. DNAPLs do not readily dissolve in water and tend to sink to the bottom of water bodies and aquifers. When released into the subsurface, these liquids can spread out in complex directions that may or may not be the same direction as groundwater flow. MGP tar is an unusual DNAPL, in that its density is only slightly greater than water. Although MGP tar does tend to sink, the relatively slight difference in density between tar and water makes this sinking effect somewhat unpredictable. For example, pools of liquid tar can often be found lying on the bottom of surface water bodies. However, despite the tar's greater density, it will also create oily slicks and sheens on the water surface when it is disturbed.

When tar enters a wet excavation, some of it will float on the surface of the water at the bottom of the excavation. At this point, vapor and odor control become important issues. When tar spreads out on the water surface, it significantly increases the escape of volatile chemicals (such as BTEX compounds) from the tar into the air. This creates the possibility of chemical vapor exposures for workers in the excavation. The tar also has a strong, objectionable odor, and frequently gives rise to nuisance complaints. Floating tar also tends to coat any clothing or parts of the body that become immersed, creating the potential for dermal exposures.

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 water, and parts per million (ppm) for waste, soil, and sediment. For comparison purposes, where applicable, SCGs are provided for each medium. Table 1 summarizes the degree of contamination for the contaminants of concern in all of these media and compares the data with the SCGs for the site. The following are the media that were investigated and a summary of the findings of the investigation.

Waste Materials

MGP tar releases have been identified in three principal areas:

- 1) The relief holder, in the central portion of the MGP site;
- 2) Tar handling structures in the southeast corner of the MGP site, and;
- 3) A direct discharge to the Hudson River from as many as three sewers at the east end of Renwick Street, along the shore line in what is now the central portion of the City of Newburgh's sewage treatment plant.

The locations of these three principal releases are shown on Figure 3.

Tar released at all three of these locations has spread through the subsurface, following zones of relatively high permeability where resistance to flow is minimized. In the overburden soils and river sediments, these zones of tar transport are typically horizontal layers of sand, silt, or

organic matter, which range in thickness from less than an inch to a few feet. In bedrock, the tar moves along numerous, discrete fractures in the folded and deformed shale.

Although the former MGP site appears to be the source of most of the tar found throughout the study area, the precise distribution of tar within the MGP site itself has been difficult to establish. This is because of difficulties in conducting intrusive subsurface investigation activities, such as drilling and test pitting, in close proximity to the gas storage and handling facilities that currently occupy the site. For example, the foundation of the former relief gas holder has not been directly sampled due to safety concerns related to the active gas regulator station that currently occupies this portion of the site.

Based on results from nearby borings, combined with experience at other MGP sites, the NYSDEC considers it likely that the fill materials in the relief holder foundation, the soils surrounding the foundation, and/or the bedrock nearby are heavily contaminated with MGP tar. Central Hudson has now indicated to the NYSDEC that excavation in this area is technically feasible, and has proposed treating this as a likely source area.

Drilling and test pitting in the southeast corner of the MGP site confirmed the presence of tar in soils. Most of the actual gas manufacturing operations were conducted on this portion of the site, and leakage into the subsurface had been known to exist in this area for some time.

In general, it appears that tar released from the two source areas at the former MGP has followed similar paths. In both cases, tar has moved to the east, beneath Water Street, the two railroad lines, the city's sewage treatment plant, and beyond to the Hudson River. As it moves, the tar has spread out laterally and vertically to the point where the effects of the two MGP site source areas overlap.

Due to access difficulties, no subsurface investigation has been conducted along the rail lines between Water Street and River Street. However, the tar must pass through this area as it moves to the east. Thus, it is assumed that tar contamination is present beneath the railroad at elevations comparable to what was encountered in the adjacent portions of the STP site.

Most borings in the central portion of the City's STP property, between Renwick Street and the former incinerator building, encountered at least some visible tar contamination. However, the degree of contamination and the detailed, three-dimensional distribution of tar is quite complex. This complexity results from the complicated flow paths available in the subsurface soils, combined with construction activities at the STP which have in some cases removed contaminated soils and replaced them with impermeable structures and/or clean backfill.

The shallowest zone of tar contamination at the STP was found at the southwestern corner, extending north from Renwick Street. A north-south utility trench in this area in 1999 encountered a nearly continuous seam of tar measuring over 50 feet in length, roughly 8-10 feet below the ground surface. Tar slowly entered the trench excavation during the time it was open. Borings in this area have encountered tar at depths of approximately 8 feet. In some cases, the tar is closely associated with existing underground utility lines. The tar may be migrating through backfill materials used around the pipes, or in some cases may have escaped from

underground sewer lines. In other cases, the tar is found in coarser-grained sand layers in the subsurface soils.

Throughout most of the rest of the STP site, the tar is found at lower depths, often in the range of 20-30 feet below ground surface. It is important to note that three subsurface clarifier tanks at the STP extend to depths that put the tank bottoms in close proximity to the tar. The excavation for the third clarifier, installed in 1999, encountered significant zones of tar contamination at depths of 20-25 feet. The other two clarifiers were installed to similar depths when the STP was constructed in the late 1960s. Although no direct observations were recorded at the time of STP construction, there is reason to believe that tar remains in immediate proximity to these tanks. Small amounts of MGP tar have been observed entering through pressure relief valves on these older tanks when they are drained for maintenance.

One area of particularly heavy tar contamination at the STP was identified at the east end of Renwick Street, along the shore line of the Hudson River near a test boring numbered TB-25. The MGP discharged tar and tar/water emulsions directly to the Hudson River via one or more sewer lines which ended in an embayment in this area. Based on historic photos, it appears that this embayment was filled in during the construction of the STP in the 1960s. In addition to the historic discharges, it is possible that some of the fill material was tar-contaminated soil from the excavation of the original two clarifiers. Some tar contamination has been found in this area at depths less than 10 feet below the ground surface.

The amount of tar contained in soil varies widely throughout the project area. In many locations, it appears that tar has passed through the soils in the past, but most has now drained away, to the point where the remaining "residual" tar is no longer mobile. In these locations, tar is held in soil pores tightly enough that it will not enter monitoring wells. These soils can be excavated and handled without the need to contain liquid tar, and tar will not spontaneously seep through the walls of open excavations. However, in other areas, the tar remains mobile in the subsurface. Wells completed in these areas will often slowly accumulate tar, and liquid tar will enter open excavations in these areas.

The amounts of mobile tar are often small, but still significant in two possible ways. First, even small amounts of tar which enter an open excavation could spread out on the surface of any water that is present in the floor of the excavation. This increases the potential for dermal exposure, since any part of the body that goes beneath the water surface could be coated with tar when it is withdrawn. The surface area of exposed tar in the excavation also increases as it spreads out, increasing the amount of tar that can evaporate, which in turn increases the potential for inhalation exposure.

Small amounts of mobile tar are also important because it appears that this mobile tar is still migrating from beneath the STP into Hudson River sediments. Even small amounts of tar discharged to these sediments will create a sheen on the water surface when the sediments are disturbed. This sheen is a violation of New York State Ambient Water Quality Standards.

Surface Soil

Nine surface soil samples (0-12 inches) were collected throughout the project area, and an additional three background samples were collected to the south and west.

No volatile organic compounds were detected in the surface soil samples.

Five PAH compounds were detected at levels that exceeded NYSDEC TAGM levels in one or more samples. A summary of the compounds detected and the range of concentrations encountered appears in Table 1. However, it should be noted that the highest PAH concentrations were found in a background sample, SS-12, collected to the west of the MGP site along Colden Street. The location is uphill from the site and upwind, based on prevailing wind direction.

On the MGP site, the highest PAH levels were found in the southeast corner. Both locations are inside the security fence and are not accessible to the public. The remedy for this site (presented in Section 8 of this document) calls for excavation of this area.

PAH compounds were also detected in soils within the City's STP. However, the PAH levels are relatively low and do not appear to be related to MGP contamination. Shallow soils at the STP site largely consist of fill materials not related to MGP operations.

Subsurface Soil

Most of the tar released from the MGP site was released from subsurface structures such as the relief holder foundation and subsurface piping. Most of the movement of tar takes place below the water table, which in most cases is 5-15 feet below ground surface.

Subsurface soils throughout the study area have been contaminated by the movement of MGP tar. The distribution of this contamination is discussed under the heading of "waste materials" above. Table 1 contains summaries of subsurface soil contamination throughout the project area.

Sediments

An area of the Hudson River offshore from the STP property, roughly three acres in size, has been contaminated with PAH compounds from the MGP. The approximate boundary of this contaminated area is shown on Figure 6. Other MGP-related contaminants were also detected in sediments; however, the PAH compounds are more widely distributed and more persistent in the environment. Thus, the discussion of sediment contamination centers on PAH contamination.

The screening level for protection of benthic aquatic life in sediments is 4 ppm total PAHs, and is based on empirical data from studies of biological effects. However, PAHs are introduced into the environment from a wide variety of human activities, and not all of the PAH contamination along the Newburgh waterfront can be attributed to the MGP. Central Hudson conducted a survey of PAH contamination along the Newburgh waterfront, upriver from the MGP, to assist in determining the boundaries of the area impacted by the MGP. Seventy four percent of the upstream sediment samples collected during the urban background study exceeded the 4 ppm

level. Based on the results of this study, the NYSDEC has set a level of 20 ppm total PAH to define the boundaries of contamination attributable to the MGP site.

MGP tar appears to have entered the river from two separate processes. First, during the period when the MGP operated, direct discharge of tar from the sewer outfalls near the east end of Renwick Street resulted in tar accumulation at the bottom of the Hudson River in areas near the sewer outfalls. Although much of the area surrounding the outfalls has since been filled, the river bed beyond the limits of the fill remains heavily contaminated with tar.

In addition to the historic discharge of tar via sewers, tar is also reaching the river bottom by slow migration through soils beneath the STP. This tar originates at the MGP site, migrates slowly through sand layers and other high-permeability zones beneath the STP, and then moves out into higher permeability sand, silt and organic zones in the sediments.

At the center of the contaminated area, the most grossly contaminated sediments contain visible drops and seams of tar. These have been found both at the sediment surface and in more permeable sand, silt and organic layers within the sediments. Most of the tar contamination is found at relatively shallow depths beneath the sediment surface; however, some visible contamination has been noted as far as 10 to 15 feet down into the sedimentary deposits.

Beyond the limits of the visible tar contamination, a broader fringe zone contains lower levels of PAH contamination bound to sediment particles. These sediments appear to have been contaminated by transport and redeposition of the more highly contaminated sediments closer to the source areas. Throughout this fringe zone, PAH concentrations exceed SCGs by a wide margin; however, these levels decline to the north, south, and east until they reach levels similar to other areas along the Newburgh waterfront. It should be noted, however, that some uncertainty still remains as to the eastern limits of the MGP contaminated zone. Although some of the easternmost sediment samples still contain MGP related contamination at levels above 20 ppm, it appears that the 20 ppm boundary is located nearby. Further investigation will be necessary to fully delineate this area of contamination.

Groundwater

Groundwater that comes into contact with MGP tar dissolves some of the more soluble contaminants. The most notable of these contaminants are the BTEX compounds described in Section 5.1.2. Once dissolved, the contaminants are carried along with the natural groundwater flow, which is directed toward the Hudson River.

Because the source of the groundwater contamination (the MGP tar) has spread throughout the project area, groundwater contamination is similarly distributed. Groundwater in both the bedrock and overburden aquifers is contaminated. Total BTEX levels in monitoring wells range from non-detect to 4.3 ppm. It should be noted that some of these wells produce a mixture of tar and water when sampled; under these conditions, it is often difficult to determine how much of the contamination is dissolved in the water and how much comes from the tar. Regardless of the distribution of contaminants, the groundwater is highly contaminated in these areas.

Once dissolved, BTEX compounds are subject to degradation by ordinary soil bacteria. Consequently, dissolved BTEX contamination often does not travel far and is found primarily in close proximity to the tar source materials.

Although the distribution of BTEX contamination within the study area is quite complex, it is important to note that contaminant levels drop off sharply to the north and south of the area of known tar contamination. This is largely due to the predominantly west-to-east flow of both tar and groundwater through the project area. There is no evidence of groundwater contamination beyond the northern boundary of the MGP site or the northern boundary of the STP site. Within the STP, contaminant levels drop off sharply south of Renwick Street.

Surface Water

Eight water samples were collected in the Hudson River during the course of the RI. No volatile compounds were detected in any of the water samples. Several PAH compounds were detected in two water samples (SW-08 and SW-09) which were collected in shallow water in the vicinity of known sediment contamination. However, due to the very low concentrations involved (between 2 and 15 ppb), these are estimated concentrations.

Despite the results of the limited surface water sampling program, there is strong visual evidence that MGP wastes are impacting water quality in the Hudson River. Slicks and sheens of MGP tar have been observed on the surface of the Hudson River at low tide, in the vicinity of the most grossly contaminated sediments. At the shore line, these sheens are relatively small in size, often no more than a few square inches. However, off shore slicks measuring tens of feet across have been observed on several occasions. These appear to originate in the heavily tar-impacted sediments off shore from the STP site. During periods of low tide, some portion of the tar held in the sediments is released, presumably due to the decreased water pressure. The tar density is only slightly greater than water, so some portion of the tar disturbed by the low tide event floats to the water surface, where it spreads out in the form of a slick.

The presence of slicks and sheens on the water surface is a violation of the New York State Ambient Water Quality Standards (6NYCRR Part 703.2).

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.

Following the discovery of tar contamination on the STP site, the original plans for construction of the third clarifier tank were amended to include provisions for working in contaminated soils. Excavation of the soils necessary to complete the clarifier was completed as an IRM in 1999.

Although the construction of the clarifier resulted in the removal of contaminated soils, the volume removed was limited, compared to the volume of contaminated soil remaining.

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 the “Baseline Human Health Risk Assessment” dated June 2001.

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.

Under the current land use at the site, construction workers could be exposed to site contamination in soil and groundwater. During excavation work, construction workers could come in direct contact with contaminated soil and groundwater, potentially resulting in dermal exposures or exposure through the inhalation of soil particles or vapors released from groundwater.

Depending on future land use conditions at the site, future residents and construction workers could be exposed to contamination present in soil and groundwater. Future residents and construction workers could come in direct contact with contaminated soil and groundwater if excavation work is conducted on the site. Inhalation of soil particles or vapors released from groundwater may also occur as a result of excavation.

Recreational users of the Hudson River may be exposed to contaminated sediments through dermal contact with sediments or incidental sediment ingestion. Potential exposure may also occur through dermal contact with the sheens created on the river’s surface when MGP tar is released into the sediments. The recent establishment of a rowing club in the vicinity of the impacted area can only increase this potential.

5.4: Summary of Environmental Impacts

This section summarizes the existing and potential future environmental impacts presented by the site. 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 “Newburgh Project Ecological Assessment” completed in June 2001 presents a discussion of the existing and potential impacts from the site to fish and wildlife receptors. The following environmental exposure pathways and ecological risks have been identified:

- Sediments in the Hudson River adjacent to the City’s STP are heavily contaminated with MGP tar and chemicals derived from the tar. In general, an area of roughly 1 acre in the center of the contaminated zone contains visible MGP tar. A fringe area surrounding the tar contains PAH contamination at levels which exceed SCGs, and which are also elevated above surrounding areas. This sediment contamination is potentially toxic, both to fish and to sediment-dwelling (benthic) organisms that function as food sources for fish and other aquatic wildlife.
- During periods of extreme low tides, tar moves up from the contaminated sediments and creates slicks and sheens on the surface of the Hudson River. This constitutes a violation of New York State Ambient Water Quality Standards. In addition, birds and wildlife foraging in the area of exposed contaminated sediments may come into contact with MGP tar and/or potentially toxic levels of PAHs bound in sediments.
- Because of the development and paving of the project area, and the fact that the MGP tar is moving below the ground surface, no impacts to terrestrial wildlife were identified.

Site contamination has also impacted the groundwater resource in both the bedrock and overburden aquifers. Neither aquifer is used for drinking water supply. The availability of a public water supply throughout the project area, combined with the presence of a sewage treatment plant, makes it unlikely that either aquifer will be used as a source of drinking water in the future.

The subsurface soils in the area of groundwater discharge to the Hudson River are contaminated with MGP tar at depth. Contaminated groundwater and liquid tar are believed to discharge to into the River sediments at depth. However, the shallow groundwater discharge in the area adjacent to the River, at and near the water table, does not appear to be impacted under current conditions.

Very low levels of PAH contamination were detected in two water samples from the Hudson River. However, it appears that this contamination resulted from the presence of MGP tar in the underlying sediments and did not result from the discharge of contaminated groundwater into the river. It appears unlikely, based on data from this site and NYSDEC’s experience at other MGP sites, that dissolved MGP contaminants are a significant source of contamination in the river.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

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 at the site through the proper application of scientific and engineering principles.

The remediation goals for this site are to eliminate or reduce to the extent practicable:

- exposures of persons at or around the site to MGP tar in Hudson River sediments. Some tar contamination in these sediments is exposed during low tide periods, and persons walking along the shore line may encounter this tar under current conditions;
- exposures of persons at or around the site to sheens and floating slicks of MGP tar on the surface of the Hudson River. Off shore slicks and sheens have been noted on the water surface off shore during low tide periods. The existence of these sheens violates New York State Water Quality standards and presents a risk of exposure to boaters and fishermen;
- exposures of persons engaged in subsurface utility work or other excavation work to MGP tar and tar-contaminated soils; and
- environmental exposures of fish and wildlife to MGP tar and PAH compounds derived from the tar in the Hudson River sediments.

Further, the remediation goals for the site include attaining to the extent practicable:

- ambient groundwater quality standards.
- the narrative surface water quality standards for sheens

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the Newburgh MGP Site were identified, screened and evaluated in the FS report, which is available at the document repositories identified in Section 1.

MGP tar has moved beyond the limits of the original MGP site, and has spread out both vertically and horizontally over several adjoining properties that Central Hudson does not control. This widespread distribution of tar, and the physical layout of the properties under which it has spread, limit the degree to which the contamination can be removed. Several potential remedial alternatives were examined but “screened out” (eliminated from further consideration) in the Feasibility Study.

Bedrock Contamination: The presence of tar and the associated groundwater contamination in the bedrock aquifer presents a technical challenge. The NYSDEC is not aware of any remedial technology which will totally remove tar and the associated groundwater contamination from the bedrock aquifer. Even a small amount of tar remaining in the bedrock aquifer would continue to contaminate groundwater at concentrations that would likely exceed water quality standards. Consequently, full remediation of groundwater in the bedrock aquifer to drinking water

standards is considered technically impracticable. Bedrock groundwater is currently undrinkable, due to MGP contamination, and is likely to remain so for the foreseeable future.

Under current conditions, there is no human exposure to the contaminated groundwater in the bedrock aquifer. Future exposure also appears unlikely, given the widespread availability of a public water supply in Newburgh. Nonetheless, future groundwater exposures cannot be ruled out.

Contamination in Deep Soils: Beyond tar contamination in the bedrock, the Feasibility Study also considered the presence of MGP tar at depth in the soils beneath the project area. Unlike the bedrock, the soils in the study area could be excavated and replaced with clean backfill materials. This would result in returning the soils to pre-release conditions, although the tar and groundwater contamination in the underlying bedrock would remain.

However, the presence of the sewage treatment plant, city streets, and a mainline railroad track makes excavation of deep soil contamination extraordinarily difficult. For example, excavation would require relocation of the sewage treatment plant. The plant's replacement value has been estimated at \$50 million. Assuming that a suitable site could be found for the relocated STP, the cost of the land for a new STP would have to be added to this figure, and then added to the actual costs of an excavation remedy. The Feasibility Study provided an estimate of total costs for total excavation at roughly \$100-150 million.

A summary of the remedial alternatives that were considered for this site are discussed below. The "present worth" quoted for each alternative represents the amount of money invested in the current year that would be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth costs for alternatives with an indefinite duration. This is only for comparison purposes and does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals are not achieved.

7.1: Description of Remedial Alternatives

The following potential remedies were considered to address the contaminated soils, sediments, and groundwater at the site.

The remedial alternatives have been broken into geographic areas labeled A (the MGP site itself), B (the city and railroad properties between the MGP and the Hudson River), and C (the sediments in the Hudson River).

These alternatives are discussed separately below. However, it should be noted that remediation of each area relates to the others. For example, the movement of tar through the subsurface toward the Hudson River must be stopped before off shore sediments are cleaned up. Otherwise, continuing movement of tar could possibly recontaminate the off shore sediments.

Area A Alternatives

Under current conditions, Area A (the former MGP site) serves as a source area for tar contamination, which is held in the soils and bedrock beneath the site (and probably in some remaining MGP structures such as the foundation of the former relief holder). This tar appears to be slowly migrating away from the MGP site, beneath adjacent properties to the east, both through the bedrock and through the overburden. In light of these facts, NYSDEC considers the elimination of tar migration from the MGP site to be the most important objective.

Although the MGP site is the original source of most or all of the tar contamination in the study area, most of the potential for human and ecological exposures to this contamination lies to the east. The former MGP site is securely fenced, with access limited to Central Hudson employees. Employee exposure to MGP tar and tar contaminated soil could occur during subsurface excavation work; however, the presence of buildings and a gravel surface over the entire site limits exposures during routine work activities.

The following four alternatives were identified for remediation of Area A. Figure 7 presents the approximate locations where these alternatives would be implemented.

Alternative A1: No Action

<i>Present Worth:</i>	\$0
<i>Capital Cost:</i>	\$0
<i>Annual OM&M:</i>	\$0

The No Further Action alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

Under this alternative, no remedial activities would be conducted. Monitoring activities would not continue, and no activities to reduce on-site or off-site exposures would take place.

Alternative A2: Institutional Controls

<i>Present Worth:</i>	\$200,000
<i>Capital Cost:</i>	\$67,500
<i>Annual OM&M:</i>	\$10,000

This alternative would also involve no actual remediation of wastes at the MGP site, but would include administrative measures (referred to as institutional controls) to limit human exposures to the MGP wastes remaining on the site. The slow migration of tar into off site areas would continue unabated.

These institutional controls would apply only to area A and would include:

(a) A soil management plan (SMP) to specify how contaminated soils would be handled and disposed during future excavation, to evaluate the potential for vapor intrusion if new buildings were constructed in the future, and to identify any development or groundwater use restrictions.

(b) An environmental easement on Central Hudson’s property that would require compliance with the approved SMP, limit the property to commercial or industrial uses only; restrict the use of groundwater as a source of potable or process water, and require the property owner to complete and submit an IC/EC certification.

(c) IC/EC certification that would certify that the controls continue to protect public health and the environment in accordance with the SMP.

Alternative A3: Institutional Controls and Overburden/Bedrock Tar Removal

<i>Present Worth:</i>	\$1,300,000
<i>Capital Cost:</i>	\$459,675
<i>Annual OM&M:</i>	
<i>(Years 1-5):</i>	\$130,000
<i>(Years 5-30):</i>	\$40,000

This alternative would build on Alternative A2 by using wells to remove mobile tar from the subsurface in both the overburden and the bedrock. The objective would be to stop the flow of tar from the MGP site to the rest of the study area by removing as much tar as possible. Any tar collected would be shipped to a regulated off-site facility for proper treatment and disposal.

In general, the wells would be placed in known and suspected source areas (such as the former relief holder) and along the eastern boundary of the site, along South Water Street. If tar accumulates in any of these wells, then additional wells would be drilled in the intervening spaces, cutting the well spacing to approximately 12.5 feet. If tar production continues, additional wells may be required. Additional bedrock wells in the central portion of the site would be added if, following excavation of the relief holder foundation, it appears that significant quantities of tar have escaped into the bedrock in this area. Since tar is present in both the overburden and the underlying bedrock, tar collection wells would need to be constructed to collect tar from both of these geologic units.

The wells would be constructed with sumps (sections of closed well casing) at the bottom of each well to capture any tar that enters the well and hold it for manual removal at appropriate periodic intervals. Tar would be allowed to enter each well passively (without active pumping of groundwater); however, tar pumping (producing as little excess water as feasible) could be initiated at a later time, if results indicate that this would increase the rate of tar removal. For cost estimation purposes, it has been assumed that pumping would not be required.

It is anticipated that each well would only capture tar from a relatively small area. Furthermore, given the history of tar production at existing wells, it is anticipated that tar recovery may be quite uneven. Many wells would collect little or no tar, while nearby wells may produce large volumes. Some wells would not produce tar regularly, but would produce sporadically. Predicting in advance which wells would produce would not be possible. In light of these considerations, the wells would need to be closely spaced and monitored over relatively long time frames to ensure that tar mobility has been effectively and permanently addressed.

The number and placement of these wells would be determined during the remedial design phase of the project. For cost estimation purposes, it has been estimated that a total of 62 wells would

be required. Of these, 24 would be in the area in and around the relief holder and the remaining 38 would be located on the eastern edge of the MGP site, along South Water Street (30 initially with 8 assumed to fill in areas of tar production). The number of wells could increase if additional source areas are identified.

Monitoring the effectiveness of the tar capture system would be difficult. The closely spaced wells along the eastern boundary of the MGP site would be intended to serve a dual role in this regard. First, they would be intended to capture as much of the tar in this area as possible. Beyond this, they would provide an indirect measure of the effectiveness of site-wide tar capture. If any of these boundary wells continue to accumulate tar over the long term, this would be taken as evidence that tar collection efforts should be expanded, either by drilling additional collection wells or by taking measures such as tar pumping to capture tar more effectively throughout the MGP site.

The institutional controls from Alternative A2 would be expanded to include requirements to continue operation, monitoring, and maintenance of the tar capture system.

Alternative A4: Institutional Controls, Excavation of Southeast Corner and Former Relief Holder, and Overburden/Bedrock Tar Removal

<i>Present Worth:</i>	\$4,100,000
<i>Capital Cost:</i>	\$3,485,565
<i>Annual OM&M:</i>	
<i>(Years 1-5):</i>	\$90,000
<i>(Years 5-30):</i>	\$30,000

This alternative would build upon Alternative A3, by adding excavation of the two likely source areas: the former relief holder and the area near the southeast corner of the MGP site. Prior to conducting these excavations, additional investigations will be conducted to delineate the excavation boundaries of the southeast corner of the MGP site, and to evaluate the presence and extent of tar contamination within and surrounding the former relief holder. Tar collection wells would still be installed; however, the number of wells would be reduced due to the removal of much of the source material.

Excavation would be conducted using standard construction machinery and techniques. Some measures for odor suppression would be required as excavation proceeded. The extent of the odor control measures required would be determined during the remedial design. Contaminated soils and debris would be shipped off site for proper treatment and disposal.

Both excavations would proceed below the water table, requiring the collection of groundwater in order to maintain safe working conditions in the excavation. Extracted groundwater would be treated and properly disposed. Shoring of the excavation in the southeast corner of the site would be required in order to avoid damage to adjacent portions of South Water Street and Renwick Street. Following excavation of the contaminated areas, the excavated areas would be restored to pre-existing grades with acceptable backfill materials that meet TAGM 4046 guidelines.

For the purposes of cost estimation, it has been assumed that the relief holder foundation extends

to the top of bedrock roughly 15 to 20 feet below ground surface, and that excavation would stop at that point. However, it has been NYSDEC's experience that soils and rock immediately surrounding gas holders can often be as contaminated as the material remaining inside the holder. Pipes and other structures leading away from gas holders are also frequently found to contain tar. If grossly contaminated soils or structures are identified surrounding the holder foundation, these soils would be removed to the extent practicable. Likewise, if grossly contaminated bedrock is found beneath the holder, and if this rock is suitable for excavation with conventional excavation equipment, it would be removed to the extent practicable. However, it is anticipated that the presence of adjacent gas storage infrastructure would impose significant limits on the practicability of additional excavation.

The excavations would remove much of the shallow tar contamination in the southeast corner of the site and the area surrounding the relief holder. With this waste removed, many of the overburden tar collection wells called for under Alternative A3 would not be required. For cost estimation purposes, it has been assumed that the 62 wells called for in Alternative A3 would be reduced to 38. This would include 33 along the eastern property line (27 initially with 6 additional assumed to fill in areas of tar production) and 5 located near the relief holder. As noted in the description of Alternative A3, however, this number could increase. If any of these boundary wells continue to accumulate tar over the long term, this would be taken as evidence that tar collection efforts should be expanded, either by drilling additional collection wells or by taking measures such as tar pumping (producing as little excess water as feasible) to capture tar more effectively throughout the MGP site.

The institutional controls from Alternative A2 would be expanded to include requirements to continue operation, monitoring and maintenance of the tar capture system.

Area B Alternatives

Area B, between the eastern boundary of the MGP site and the Hudson River, is occupied by two city streets, two railroad lines, and the City's sewage treatment plant. MGP tar contamination is present in the bedrock and subsurface soils. No MGP contamination is exposed at the ground surface in Area B; however, some of it is located at shallow depths (8-10 feet) and has been exposed during past construction and maintenance activities.

Two main issues need to be considered in Area B:

- 1) Movement of tar through the subsurface beneath area B toward the Hudson River, and;
- 2) The possibility of human exposures to tar and tar contaminated soils during excavation and other subsurface construction activities.

The following seven alternatives have been identified for remediation of Area B. The locations where these alternatives would be implemented, individually or in combination, are shown on Figure 8.

Alternative B1: No Action

<i>Present Worth:</i>	0
<i>Capital Cost:</i>	0
<i>Annual OM&M:</i>	0

The No Further Action alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

Under this alternative, no remedial activities would be conducted. No monitoring would take place, and no activities to reduce on site or off site exposures would take place.

Alternative B2: Institutional Controls

<i>Present Worth:</i>	200,000
<i>Capital Cost:</i>	68,000
<i>Annual OM&M:</i>	
<i>(Years 1-5):</i>	\$10,000
<i>(Years 5-30):</i>	\$10,000

This alternative would also involve no actual remediation of wastes, but would include administrative measures (referred to as institutional controls) to limit human exposures to the MGP wastes remaining beneath Area B.

Two property owners would be involved in area B: CSX Transportation, which owns the two railroad lines, and the City of Newburgh, which owns the two city streets and the STP. Since the City properties are committed to ongoing public purposes, changes in future land use are considered unlikely. Future redevelopment, however, could occur and would not be precluded by any of the alternatives evaluated.

These institutional controls would only apply to the contaminated portions of Area B and would include:

- (a) A soil management plan (SMP) to specify how contaminated soils would be handled and disposed during future excavation, to evaluate the potential for vapor intrusion if new buildings were constructed in the future, and to identify any development or groundwater use restrictions.
- (b) Use of Central Hudson’s best efforts to obtain institutional controls in a manner and form acceptable to the NYSDEC that would require compliance with the approved SMP, limit the property to commercial, industrial, or restricted residential (subject to NYSDEC and NYSDOH approval) uses only; restrict the use of groundwater as a source of potable or process water, and require Central Hudson (with assistance from the property owners) to complete and submit an IC/EC certification.
- (c) Periodic notification to current and future landowners or operators of facilities in Area B to remind those owners/operators of the contamination present and the need to comply with the terms of the SMP.

(d) IC/EC certification that would certify that the controls continue to protect public health and the environment in accordance with the SMP.

Alternative B3: Institutional Controls and Removal of Tar from Central Portion of the STP

<i>Present Worth:</i>	\$500,000
<i>Capital Cost:</i>	\$194,000
<i>Annual OM&M:</i>	
<i>(Years 1-5):</i>	\$40,000
<i>(Years 5-30):</i>	\$18,000

This alternative would build on Alternative B2 with the addition of passive tar recovery wells in the central portion of the STP property.

Construction and operation of these wells would be similar to those described for Area A under Alternative A3, with the exception that no wells would be completed in the bedrock. For cost estimation purposes, it has been assumed that 17 collection wells would be installed (12 initially with 5 additional wells to be added later, based on tar production results from the original 12). The wells would be installed primarily along River Street and near the primary settling tanks. These are the areas where future underground utility work appears to be the most likely. However, if additional mobile tar contamination were identified in areas associated with STP expansion, the number of wells could increase. The wells would be installed in phases, with the first phase consisting of wells spaced 50 feet apart to identify areas of greatest potential for mobile tar. Additional wells would be installed on either side of any wells that produce tar, cutting the spacing to 25 feet. Depending on results of the second round wells, additional wells could be installed to cut the spacing again.

It is assumed that tar would be collected periodically by hand, using a weighted bailer. If this proves inadequate due to rapid entry of tar into one or more of the wells, then a tar pumping system could be installed. In either case, the tar removal schedule would be adjusted so that the collection sumps do not become overfilled with tar, causing the well to lose its effectiveness.

The objective would be to reduce the mobility of tar in the central portion of the STP site. This is the area where tar has been encountered during underground excavation work in the past, and where further excavation work would be most likely to encounter flowing tar in the future. It also appears that most of the tar moving from the MGP toward the Hudson River passes through this area. Thus, reducing the mobility of tar in this area would have benefits in two ways: reducing the amount of tar migrating toward the Hudson River, and reducing or eliminating the entry of liquid tar into future excavations. This Alternative would not seek to capture any tar that has already passed by the central portion of the STP site.

Removal of mobile, drainable tar would not by itself eliminate the exposure hazards that underground utility workers would encounter in this area. Future excavations may still encounter contaminated soils, and appropriate measures would still be required to provide for worker safety and proper disposal of excavated soils. However, worker exposures would be less likely and less severe in cases where liquid tar was no longer present.

The institutional controls from Alternative B2 would be expanded to include requirements to continue operation, monitoring and maintenance of the tar capture system.

Alternative B4: Institutional Controls, Removal of Tar from Central Portion of the STP, and In-Situ Chemical Oxidation

<i>Present Worth:</i>	\$1,200,000
<i>Capital Cost:</i>	\$295,000
<i>Annual OM&M:</i>	
<i>(Years 1-5):</i>	\$85,000
<i>(Years 5-30):</i>	\$63,000

This alternative would build on Alternative B3, with the addition of in-situ chemical oxidation to facilitate the removal of MGP contamination. The objective would be to provide a higher degree of treatment than would be possible using passive collection alone.

In situ oxidation involves the introduction of chemical oxidants into the subsurface. Results at other sites indicate that in situ oxidation can be effective in cases where the oxidant (which is dissolved in water) can be brought into direct contact with the contaminant. However, effectiveness is much lower in the presence of pooled liquid tar, because the oxidant solution cannot penetrate the tar effectively. Consequently, any pooled tar would need to be removed before in situ oxidation could begin. It is assumed that the tar collection wells would also be used as injection points for the chemical oxidant. Oxidant addition would only proceed once tar stopped entering each well.

The oxidants would be distributed through the subsurface by moving with the natural flow of groundwater, and would react with the MGP contaminants they come into contact with. The byproducts of this destruction process are carbon dioxide and water. A treatability study would be conducted to select which oxidant should be used; particularly evaluating compatibility and impact on the STP structures and piping. At other sites, the oxidizers considered have included potassium permanganate, persulfate, ozone, and peroxide compounds.

The institutional controls from Alternative B2 would be expanded to include requirements to continue operation, monitoring and maintenance of both the tar capture system and the oxidant injection system.

Alternative B5: Institutional Controls, Hudson River Edge Overburden Tar Removal, and Soil Excavation/Disposal (TB-25 Area)

<i>Present Worth:</i>	\$4,100,000
<i>Capital Cost:</i>	\$3,783,000
<i>Annual OM&M:</i>	
<i>(Years 1-5):</i>	\$40,000
<i>(Years 5-30):</i>	\$18,000

This alternative would apply the passive tar collection approach described in Alternative B3, but would also call for constructing collection wells along the shore of the Hudson River. The objective would be to reduce or eliminate mobility of tar in the immediate vicinity of the river bank, and thus to reduce discharge of tar into the river. In addition, grossly contaminated soils

along the shore line at the east end of Renwick Street (referred to as the TB-25 area) would be excavated and shipped off site for treatment and disposal.

The number and placement of tar collection wells would be determined during the remedial design investigation. Initially, 15 wells would be drilled, spaced roughly 25 feet apart, between the locations of borings TB-29 and TB-62. It is anticipated that many of these wells would not spontaneously collect tar, but some would. Additional wells would be completed surrounding any of the original wells that do produce tar, cutting the well spacing in productive areas to 12.5 feet. For cost estimation purposes, it has been assumed that only two additional wells would be required, bringing the total number of wells up to 17. This number could increase if tar accumulates in several wells.

Alternative B5 would also call for excavation and off-site disposal of soils in an area near the east end of Renwick Street. The existence of mobile NAPL here has been confirmed during the RI, ranging in depth from approximately 10 to 30 feet below the ground surface. The City of Newburgh has expressed particular concern with soil contamination in this area, which is one of the few remaining locations on the STP property which is still available for plant expansion. Construction of additional aeration tanks to increase the STP's capacity, has been proposed in this area. Although the aeration tanks would probably be relatively shallow structures, their actual design has not yet been completed, and it is possible that construction work could proceed deep enough below ground surface to encounter some of the shallower tar contamination in this area.

Under Alternative B5, excavation to remove this NAPL-bearing soil would proceed to the full depth of approximately 30 feet, using standard construction equipment. Due to the proximity to the river and the presence of groundwater at shallow depths, shoring and dewatering of the excavation would be necessary. Any water pumped from the excavation would be sufficiently treated to meet discharge limits, and then discharged either to the sewage treatment plant or directly to the Hudson River.

Soils would be excavated and disposed off-site. If necessary, stabilizing agents such as lime or fly ash could be added to reduce the liquid content of soils prior to shipment off site for treatment and disposal. Soil may also be temporarily stockpiled and dewatered at the excavation site.

Any water generated during dewatering activities would be treated prior to discharge to either the STP or the Hudson River.

The institutional controls from Alternative B2 would be expanded to include requirements to continue operation, monitoring and maintenance of the tar capture system.

Alternative B6: Institutional Controls and Tar and Groundwater Containment Wall (With Long-Term Groundwater Treatment)

<i>Present Worth:</i>	\$9,900,000
<i>Capital Cost:</i>	\$5,055,000
<i>Annual OM&M:</i>	
<i>(Years 1-5):</i>	\$410,000
<i>(Years 5-30):</i>	\$378,000

This alternative would cut off further migration of MGP tar into the Hudson River by constructing a subsurface wall along the river bank at the eastern edge of the STP property. The wall, conceptually consisting of steel sheet piles with tight joints to prevent leakage, would be driven downward to penetrate the low-permeability clay unit that was identified at a depth of roughly 30 to 40 feet. The wall would be constructed in a manner consistent with 6 NYCRR Part 608 and would not result in any loss of, or permanent impact to, the resources of the River. It has been assumed for cost estimating purposes that the wall would extend from the location of boring TB-29 to TB-57, a distance of approximately 400 feet. Wing walls would extend inland from these points at an angle, to limit flow around the ends of the wall.

The wall would block the flow of both groundwater and tar toward the Hudson. Currently, an estimated 80,000 gallons per day of water pass through this area into the Hudson, along with a far smaller amount of tar. To prevent excessive buildup of groundwater on the west side of the wall, a groundwater collection system would be installed to remove groundwater, using either conventional vertical wells or horizontal wells installed in trenches. The collected groundwater would contain dissolved MGP contaminants and would probably include some tar. The tar would be collected for off site disposal; following this step, the remaining water would be treated to meet NYSDEC discharge standards and then discharged to either the STP or directly to the Hudson River. The sizing and location of the tar/water collection system would be determined during the remedial design.

Due to the presence of the STP outfall and storm sewer outfalls in the area, welded boots or impermeable collars could be used to seal the points where these pipes penetrate the containment wall.

The institutional controls from Alternative B2 would be expanded to include requirements to continue operation, monitoring and maintenance of the barrier wall, and the groundwater/tar collection and treatment system.

Alternative B7: Institutional Controls and Tar Containment Wall (Without Long-Term Groundwater Treatment)

<i>Present Worth:</i>	\$5,500,000
<i>Capital Cost:</i>	\$4,918,000
<i>Annual OM&M:</i>	
<i>(Years 1-5):</i>	\$65,000
<i>(Years 5-30):</i>	\$35,000

This alternative would be similar to Alternative B6, but with a significant modification to the concept of the barrier wall along the Hudson River. The barrier wall would still be driven into

the impermeable clay unit, but it would be located further to the east, at a lower elevation and closer to the Hudson River shore line. The top of the wall would be several feet lower, below the position of the water table, leaving enough room to allow shallow groundwater to pass over the top of the wall. The RI demonstrated that shallow groundwater in this area is uncontaminated, and thus does not require treatment.

The MGP tar, which moves through this area at depth, would still be stopped by the wall. To prevent this tar from building up to excessive levels behind the wall, a series of wells or a collection trench and sump system would be built along the west side of the wall. If a trench were employed, tar that enters the trench would flow along the trench bottom to sumps which would be periodically pumped out. Likewise, any tar collection wells would be equipped with sumps to collect tar, and these sumps would require periodic pump-out.

Any tar-impacted soil found at shallow depths near the top or the ends of the wall would need to be removed, so that groundwater flowing over the top of the wall or around the ends would flow through clean soils. Along the central portion of the wall, this removal would extend down to a level two feet below the top of the wall. Near the southern end of the wall at the foot of Renwick Street, tar-contaminated soil may be found at this depth farther inland. Removal of contaminated soil in this area would serve two purposes: removing soil which could contaminate groundwater flowing over or around the wall, and removing contamination that could cause direct exposures to construction workers during future STP expansion in this area. The need for any additional soil removal will be evaluated during remedial design.

Area C Alternatives

The following six alternatives were identified to address contamination of sediments in Area C, which consists of the Hudson River and sediments directly off shore (east) of the Sewage Treatment Plant. The principal risks posed by this contamination are the generation of slicks and sheens on the river surface and potential toxicity to aquatic life, including bottom-dwelling (benthic) organisms that ordinarily inhabit the river bottom. Benthic organisms are an important part of the food chain on which aquatic life in the river depends.

Area C sediments are soft, fine-grained materials (predominantly silts and clays, with some fine sand). The central portion of this area contains sediments that are heavily contaminated, and contain visible MGP tar in some intervals. In the following discussions, this is referred to as the “tar-impacted” zone. Surrounding this central area is a less-contaminated fringe where no tar is visible, but where PAH contamination derived from MGP wastes has been identified. For discussion purposes, this is referred to as the “PAH-Impacted” zone. As noted earlier, the eastern edge of the PAH-Impacted zone has not been fully defined.

A background study conducted as part of the Ecological Risk Assessment showed that PAH concentrations fall rapidly to approximately 20 ppm around the edge of the contaminated zone; below this level, it becomes difficult to separate the influence of the MGP wastes from the other sources of PAH contamination on the Newburgh waterfront. Consequently, the 20 ppm PAH contour has been used to define the boundaries of the area of sediment contamination which is attributable to the MGP Site and requires remediation.

The contaminated sediments identified during the RI lie at depths ranging from 0-10 feet below the water surface. Water depths increase with distance from the shore line, so it is possible that water depths greater than 15 feet would be encountered as the eastern fringe of Area C is more fully defined. Water levels rise and fall daily due to tides, with an average tidal range of 4.6 feet. Therefore, these water depths should be considered as averages of the high and low tide depths.

Potential technologies for remediation of sediment contamination include dredging, and capping. Dredging refers to the excavation of sediments from the river bottom. Dredged materials would be dewatered and shipped off site for proper treatment and disposal. Capping would involve the placement of additional, uncontaminated sediment on the river bottom to cover the contaminated material. The cap would isolate the contaminated material and provide a new, uncontaminated sediment surface that would be colonized by the benthic organisms that are native to the area. The cap could be constructed either above grade (by placing the capping materials directly on the existing sediment surface) or below-grade (by first removing a layer of sediment as thick as the cap's designed thickness, so that the finished cap surface is at the same elevation as the existing river bed).

Both dredging and capping would disturb the river bottom and could result in the release of tar or PAH-contaminated sediments into the water column. Both would require measures to control release of suspended sediments into downstream areas. Placement of capping materials would require, at a minimum, the use of silt curtains around the perimeter of the work area to limit the escape of suspended sediment. Dredging would likely create more suspended sediment than capping, and thus any dredging work would be conducted behind sheet piling unless an acceptable alternative is identified during the remedial design phase. Installation of sheet piling becomes progressively more difficult and expensive farther from shore, due to the increase in water depths and stronger river currents.

The use of floating oil-skimming booms may also be required to contain any slicks and sheens that may be liberated during activities which disturb the sediments.

Institutional controls would be required to protect the integrity of the cap. If sufficient water depth is provided over the top of the cap, it is considered unlikely that ordinary boating activities would cause a sufficient disturbance of the cap to threaten its integrity. In the future, some forms of construction or dredging could threaten the integrity of the cap; however, such activities are already regulated under both state and federal law. These regulations are considered sufficient institutional controls for this purpose.

Any capping or dredging would meet the substantive requirements of the New York State SCG for protection of navigable waters, contained in 6 NYCRR Part 608. In particular, any above-grade capping would have to be stringently designed and constructed to comply with this regulation because filling in water bodies is rarely permitted, and on a practical level there are concerns that such a cap could be eroded by river currents.

Alternative C1: No Action

<i>Present Worth:</i>	\$0
<i>Capital Cost:</i>	\$0
<i>Annual OM&M:</i>	\$0

The No Action alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

Under this alternative, no remedial activities would be conducted. No monitoring would take place, and no activities to reduce human or ecological exposures would take place.

Alternative C2: Institutional Controls and Above-Grade Sediment Capping Over The Entire Area

<i>Present Worth:</i>	\$3,500,000
<i>Capital Cost:</i>	\$2,834,000
<i>Annual OM&M:</i>	
<i>(Years 1-5):</i>	\$50,000
<i>(Years 5-30):</i>	\$50,000

This alternative would involve the installation of an above-grade engineered cap over the entire area where tar has been identified in sediment cores, or where PAH concentrations exceed 20 ppm. The areas is shown on Figure 9, and encompasses an area of roughly 2.9 acres.

The objective of the cap would be to cut off contact between aquatic organisms in the Hudson River and the contaminated sediments, and to establish a comparable clean sediment surface that benthic organisms could recolonize. All of the PAH contamination would remain in place—none would be removed or treated.

The cap would need to remain in place in order to be effective, so it would be designed and constructed to resist erosion by water currents, wave action, boat disturbances and winter-season ice jams. The details of this cap design would be established during the remedial design; however, at this point it is assumed that the cap would consist of multiple layers, in the order specified below.

In areas where visible tar has been identified, the lowest layer would consist of 6 inches of organoclay, followed by 6 inches of sand, then a 6-inch layer of armoring stone, and 12 inches of soft sediment to provide an environment for colonization by benthic organisms. The purpose of the organoclay layer would be to adsorb and immobilize tar migrating upward from the underlying contaminated sediments. The stone armoring layer is intended to protect the underlying layers from erosion.

In the surrounding PAH-impacted area, where tar is not present, the organoclay layer would be omitted. The proposed cap would consist of 6 inches of sand, 6 inches of armoring stone, and 18 inch layer of soft sediment.

The composition and arrangement of these layers may be modified during the design process to

maximize the long term effectiveness of the cap, and to maximize the habitat value of the top surface of the cap.

The conceptual 2.5-foot thickness of the above-grade cap would reduce water depths throughout the capped area, and would effectively make some of the capped area into dry land. A permit would be required from the U.S. Army Corps of Engineers. In addition, the STP outfall pipe, which extends roughly 350 feet offshore, might need to be reconstructed. The outfall is located off shore in order to maximize mixing of the treated effluent with river water. Making the river shallower could adversely affect this mixing. Effectiveness of the STP outfall would need to be evaluated during the remedial design.

The eastern edge of the MGP-contaminated sediment zone can not be precisely defined with the existing data. This adds a degree of uncertainty to estimating the extent of the cap. Some additional investigation work would be required during the remedial design phase to more precisely determine the position of the 20 ppm PAH boundary.

The institutional controls would include:

- (a) A SMP consisting of controls to inspect, monitor and maintain the sediment cap, and repair any damage or erosion of the cap
- (b) Notification of the existence of the cap would be provided to appropriate Federal and State agencies with jurisdiction over dredging activities to ensure that the cap is not removed without removing the underlying contaminated sediment as well.
- (c) Institutional controls in a manner and form acceptable to the NYSDEC that would require compliance with the approved SMP, and require Central Hudson with assistance from the property owner to complete and submit an IC/EC certification.
- (d) IC/EC certification that would certify that the controls continue to protect public health and the environment in accordance with the SMP.

Alternative C3: Institutional Controls, Dredging to 2.5 Feet, and Below-grade Sediment Capping Over The Entire Area

<i>Present Worth:</i>	\$13,300,000
<i>Capital Cost:</i>	\$12,661,000
<i>Annual OM&M:</i>	
<i>(Years 1-5):</i>	\$50,000
<i>(Years 5-30):</i>	\$50,000

This alternative would be similar to Alternative C2, but would include a provision to dredge approximately 2.5 feet of sediments from the river bottom prior to installing the cap. The objective would be to create a final capped surface that closely resembles the current elevation of the river bed. Approximate boundaries are shown on Figure 10.

The area to be dredged would first be surrounded by a sheet pile enclosure (or other comparable shoring) to prevent contaminated sediments that become suspended in the water during dredging

from escaping into the Hudson River. Within this enclosure, a layer of sediment equal in thickness to the cap (assumed to be approximately 2.5 feet) would be removed using conventional dredging equipment. The volume of material to be removed is estimated to be 11,600 cubic yards.

Excavation would be performed “in the wet” without dewatering the excavated area. Sediments would be sent off site for proper treatment and disposal. Sediment dewatering would be required prior to trucking the sediment off site. This would require construction of a temporary dewatering facility near the dredging site. Water generated during the dewatering process would be treated and then discharged either to the STP or to the Hudson River.

Following the completion of dredging, the area would be capped in the same manner as described under Alternative C2.

The principal advantage of this Alternative would be that it would not raise the final elevation of the river bed. This would prevent making any of the capped area into dry land and should make the cap less subject to erosion by river currents and ice jams. In addition, a substantial volume of contaminated sediments and tar would be permanently removed from the River. Diffusion of effluent from the STP outfall would remain unaffected. Potential remobilization of tar due to the weight of the cap would be lessened, since the weight of the cap would be offset by the prior removal of sediment in the capped area.

The cap design specified above is used for cost estimation purposes. Modifications to the cap design may be made if site conditions warrant. For example, if excavation leaves a clean sediment surface exposed on the river bottom, the stone armoring would serve no purpose and could be omitted. Similarly, a cap design which omitted the sand layer (substituting soft, fine grained material comparable to the existing river bottom) may prove to have greater value for burrowing worms and other benthic organisms.

The institutional controls would include:

- (a) A SMP detailing the steps necessary to inspect, monitor and maintain the sediment cap, repair any damage or erosion of the cap, and prohibit removal of the cap, unless the underlying contaminated sediment is also removed.
- (b) Institutional controls in a manner and form acceptable to the NYSDEC that would require compliance with the approved SMP, and require Central Hudson with assistance from the property owner to complete and submit an IC/EC certification.
- (c) IC/EC certification that would certify that the controls continue to protect public health and the environment in accordance with the SMP

**Alternative C4: Institutional Controls, Removal of Tar-Impacted Sediments,
Backfill/Capping of the Dredged Area, and Natural Attenuation of PAH-Impacted
Sediments**

<i>Present Worth:</i>	\$9,700,000
<i>Capital Cost:</i>	\$9,114,000
<i>Annual OM&M:</i>	
<i>(Years 1-5):</i>	\$50,000
<i>(Years 5-30):</i>	\$50,000

Alternative C4 would provide a greater degree of contaminant removal than C3 by removing all tar-impacted material. No action would be conducted in the surrounding PAH-impacted area.

The area of tar-impacted sediments measures roughly 500 by 100 feet. Within this area, the average depth of removal would be approximately 4 feet; however, the maximum depths will range from roughly 10-15 feet. The boundaries of this alternative are shown on Figure 11.

Dredged sediment would be handled in the same manner described under Alternative C3, then shipped off site for proper treatment and disposal. The total volume of sediment to be excavated is estimated at roughly 7500 cubic yards

The dredged area would be capped once the dredging is complete. For cost estimation purposes, it has been assumed that the cap would be constructed in the same manner as described in Alternative C3. However, if the bottom of the excavation following dredging was found to be uncontaminated, the need for an armor-protected cap would be eliminated and simple, soft sediment backfill could be substituted. A 24-inch surface layer of fine grained material similar to existing surface sediments would be installed to provide a comparable habitat for benthic organisms.

Outside the tar-impacted area, no remedial actions would be performed. Natural attenuation processes such as burial and microbial degradation would be assumed to reduce PAH concentrations over time. With no sediment cap on the river bed, the need for institutional controls to monitor and protect the cap would be eliminated.

**Alternative C5: Institutional Controls, Removal of Tar-Impacted Sediments,
Backfill/Capping of the Dredged Area, Dredging to 2.5 Feet Below Grade in Remaining
Near-Shore Areas, and Above-Grade Sediment Capping Over the Remaining Area**

<i>Present Worth:</i>	\$12,100,000
<i>Capital Cost:</i>	\$11,450,000
<i>Annual OM&M:</i>	
<i>(Years 1-5):</i>	\$50,000
<i>(Years 5-30):</i>	\$50,000

Alternative C5 is a hybrid of Alternatives C2, C3, and C4, combining the removal of all tar-impacted sediments with capping of the surrounding PAH-impacted sediments to provide a higher level of protection. The cap would be a combination of above-grade and below-grade construction, with the above-grade cap used only in deeper water. The approximate layout of

this alternative is shown on Figure 12.

All tar-impacted materials would be removed as described under Alternative C4. The PAH-impacted sediments surrounding the tar-impacted zone would be capped. Much of the cap would be constructed below-grade, as described under Alternative C3, in order to minimize changes in the elevation and habitat value of the river bed. However, in deeper water farther off shore, the cap would be constructed above grade, as described under Alternative C2. Below-grade construction could also be required in deeper water depending on the results of the Remedial Design Investigation.

The boundary between the two types of cap would be determined during the Remedial Design, taking into account cap stability, habitat protection, boating access, and the increasing technical complexity of dredging and capping as water depths increase farther from shore:

1) Cap Stability: Any capping materials placed on the river bottom would be subject to erosion from a variety of natural and man made forces. However, some of these erosional forces would be more of a concern in shallow water than in deeper water. These include wave action, physical scouring from ice jams during the winter months, and possible disturbance from boat anchors and boat propeller wash during docking maneuvers. All of these factors are expected to diminish in importance as water depths increase.

2) Habitat Protection: The soft river bottom in the shallow areas of the River near the shoreline is an important ecological resource, and the intent of the remedy is to restore this habitat. Although the stone armoring layer is expected to be highly effective in preventing erosion of the cap and thus isolating the contaminated sediments from benthic organisms, the stone would not by itself constitute a comparable bottom habitat. It is important for the fine grained, soft sediment above the armoring layer to remain in place to provide a suitable habitat and not be subject to erosion. Examination of the sediment cores in the contaminated area indicates that sediment is being deposited, not eroded, under current site conditions. The Remedial Design Investigation would include studies to confirm the RI observations and measure rates of sediment erosion and deposition. In addition, in order to limit the amount of filling in the river and minimize the loss of water column habitat, sediments in the areas proposed for both below-grade and above-grade capping would be tested prior to cap placement to determine the actual level of toxicity of the PAHs and confirm the need for capping.

3) Boating Access: Currently, the rip rap river bank limits how close to the shore recreational boats can approach, particularly at low tide. However, the City of Newburgh (which owns the riverbed in this area) has expressed interest in constructing a sewage pump out station for recreational boats, taking advantage of its proximity to the sewage treatment plant. A preliminary analysis has concluded that a 4 foot minimum depth of water is needed for recreational boating access. Any capping that takes place would be designed to avoid interfering with this proposal, and therefore would not be allowed to reduce low tide water depths below 4 feet. This is equivalent to an *average* water depth (ignoring tidal fluctuations) of 6 feet. This should be considered as a minimum figure, subject to revision upward if boating access or other considerations require deeper water. It should also be noted that the pump out facility would be subject to permitting review and approval on its own merits. Nothing in this plan should be taken as prior approval for construction of this facility.

4) Technical Complexity: It is anticipated that construction of a below-grade cap would become significantly more complex in deeper water farther from shore. In large part, this is due to the necessity of controlling the spread of contaminated sediments by conducting the necessary dredging inside a sheet-pile enclosure. As the area of the below-grade cap increases, three things happen which complicate the design and construction of sheet pile enclosure. First, the length of wall becomes larger (because it is encircling a larger area) and this increases both the amount of sheeting required and the amount of internal bracing required to keep the wall upright, rigid, and leakproof. Second, the increasing depth of water requires a taller sheet pile wall—the wall must not only reach through deeper water, it must also be driven farther into the bottom in order to be adequately anchored. This may require not only bigger sheet pile panels, but thicker panels as well. Third, the wall would need to withstand higher forces due to stronger river currents farther from shore. Again, this may have the effect of requiring thicker, more robust sheeting.

Combined, these three factors are expected to produce a sharp increase in complexity as the area of below-grade capping increases. The point at which this sharp increase takes place would be another factor used, in conjunction with cap stability, during the Remedial Design in determining the location for the boundary between above-grade and below-grade caps.

Modifications to the cap design would be made if site conditions warrant. For example, it may be possible to omit the stone armoring layer in areas where clean bottom conditions have been achieved through excavation. Thus, for example, if excavation of the tar-bearing zone leaves a clean sediment surface exposed at the bottom of the excavation, the stone armoring would serve no purpose and could be omitted. Similarly, a cap design which omits the sand layer (substituting additional soft, fine grained material comparable to the existing river bottom) may prove to have greater value for burrowing worms and other benthic organisms. The cap design specified above is used for cost estimation purposes.

As in Alternative C4, this Alternative would involve dredging approximately 7500 cubic yards of sediment from the tar impacted zone, which measures roughly 100 feet (east to west) by 500 feet (north to south). In addition, approximately 1500 cubic yards may be dredged from PAH-impacted near-shore areas located immediately to the north and south of the tar-impacted zone, and potentially to the east as well. This would lower the river bottom elevation, up to 2.5 feet, to allow for construction of a below-grade cap in these areas.

Handling, disposal, and dewatering of the dredged sediments would be as described under Alternative C4. Construction of the cap would be as described under Alternatives C2 and C3.

The institutional controls would include:

(a) A SMP detailing the steps necessary to inspect, monitor and maintain the sediment cap, and repair any damage or erosion of the cap

(b) Notification of the existence of the cap will be provided to appropriate Federal and State agencies with jurisdiction over dredging activities to ensure that the cap is not removed without removing the underlying contaminated sediment as well.

(c) Institutional controls in a manner and form acceptable to the NYSDEC that would require

compliance with the approved SMP, and require Central Hudson with assistance from the property owner to complete and submit an IC/EC certification.

(d) IC/EC certification that would certify that the controls continue to protect public health and the environment in accordance with the SMP.

**Alternative C6: Institutional Controls, Removal of Tar-Impacted Sediments,
Backfill/Capping of the Dredged Area, Dredging to 2.5 Feet and Below-Grade Sediment
Capping Over the Remaining Area**

Present Worth:	\$17,200,000
Capital Cost:	\$16,553,000
Annual OM&M:	
(Years 1-5):	\$50,000
(Years 5-30):	\$50,000

This alternative would be designed to achieve all of the goals in removing and isolating tar and PAH contamination, while restoring river bottom contours to match existing contours.

Alternative C6 would involve the removal of tar-impacted sediments with backfill/capping of the dredged area as in Alternatives C4 and C5, combined with dredging and below-grade capping of the remaining area of sediments containing over 20 ppm PAH. The layout of this alternative is shown on Figure 13.

Dredging, treatment and disposal of the contaminated sediments would be conducted in the same manner as described under Alternative C4. Construction of the below-grade cap would proceed as described in Alternative C3. Although the intent of this alternative is to mimic the current river bottom contours as closely as possible, some modifications could be made to accommodate construction of a pump-out station if the City of Newburgh obtains a permit for construction.

The volume of tar-impacted material to be dredged would remain at 7,500 cubic yards, as in Alternatives C4 and C5. An estimated additional volume of 7,000 cubic yards would be dredged in the surrounding PAH-impacted area to allow for construction of the 2.5 foot thick, below grade cap.

The institutional controls would include:

(a) A SMP detailing the steps necessary to inspect, monitor and maintain the sediment cap, and repair any damage or erosion of the cap.

(b) Notification of the existence of the cap will be provided to appropriate Federal and State agencies with jurisdiction over dredging activities to ensure that the cap is not removed without removing the underlying contaminated sediment as well.

(c) Institutional controls in a manner and form acceptable to the NYSDEC that would require compliance with the approved SMP, and require Central Hudson with assistance from the property owner to complete and submit an IC/EC certification.

(d) IC/EC certification that would certify that the controls continue to protect public health and the environment in accordance with the SMP.

7.2 Evaluation of Remedial Alternatives

The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375, which governs the remediation of inactive hazardous waste disposal sites in New York State. A detailed discussion of the evaluation criteria and comparative analysis is included in the FS report.

The first two evaluation criteria are termed “threshold criteria” and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative’s ability to protect public health and the environment.
2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the NYSDEC has determined to be applicable on a case-specific basis.

The next five “primary balancing criteria” are used to compare the positive and negative aspects of each of the remedial strategies.

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.
4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.
5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.
6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.
7. Cost-Effectiveness. Capital costs and operation, maintenance, and monitoring costs are

estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision. The costs for each alternative are presented in Table 2.

This final criterion is considered a “modifying criterion” and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

8. Community Acceptance - Concerns of the community regarding the RI/FS reports and the PRAP are evaluated. A responsiveness summary will be prepared that describes public comments received and the manner in which the NYSDEC will address the concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public are issued describing the differences and reasons for the changes.

SECTION 8: SUMMARY OF THE PROPOSED REMEDIES

For Area A, the MGP site, NYSDEC has selected Alternative A4, Institutional Controls, Excavation of Southeast Corner and Former Relief Holder, and Overburden/Bedrock Tar Removal as the remedy.

For Area B, the area between the MGP site and the Hudson River, NYSDEC has selected Alternatives B4 and B7, which between them call for Institutional Controls, Removal of Tar from Central Portion of the STP, In-Situ Chemical Oxidation, and Tar Containment Wall (Without Long-Term Groundwater Treatment). In addition, in the area of proposed STP expansion at the east end of Renwick Street, sufficient soil will be removed to allow excavation and construction to proceed in a clean work environment.

For Area C, the Hudson River sediments, NYSDEC has selected Alternative C5: Institutional Controls, Removal of Tar-Impacted Sediments, Backfill/Capping of the Dredged Area,

Dredging to 2.5 Feet Below Grade in Remaining Near-Shore Areas, and Above-Grade Sediment Capping Over the Remaining Area.

The elements of the remedies for all three areas are described at the end of this section.

The selected remedies are based on the results of the RI and the evaluation of alternatives presented in the FS.

These alternatives have been selected because, as described below, they satisfy the threshold criteria and provide the best balance of the primary balancing criteria described in Section 7.2. They will achieve the remediation goals for the site by removing the MGP tar from known source areas and other areas where tar has accumulated, reducing the mobility of tars between these source areas and the Hudson River, and constructing a barrier to further discharge of tar into the river. In the river itself, the selected remedy will remove the most grossly contaminated sediments and cut off human and ecological exposures to the contaminants that remain.

The evaluation of the alternatives for areas A, B, and C are discussed below. For the sake of clarity, they are discussed separately. However, it should be kept in mind that the selected remedies will be inter-related parts of an integrated approach to protection of human health and the environment in a highly complex area. The approach can be summarized as follows:

Contaminants that can be readily identified and removed will be removed by excavation. Those which are impracticable to reach by excavation will either be partially removed by other means (e.g. collection of liquid tar), treated in place (e.g. in-situ oxidation), or contained to prevent further movement and exposure (e.g. the barrier wall and capping of contaminated sediments).

In area A, a source of MGP tar has been identified in the southeast corner of the MGP site and a likely source has been identified in the area of the former relief holder. Contaminated soils in these areas appear to be the source of most or all of the tar that moves through the study area and into the Hudson River. The most effective and reliable method to remove these sources is through excavation, as proposed in Alternative A4. At depth in area A, there is mobile tar in the bedrock where excavation is not practicable. Although it is not practicable to locate and remove all of this tar, some portion of it can be removed through extraction wells. This may be a small fraction of the total amount of tar present in the subsurface, but it represents the most mobile fraction, and thus the fraction most likely to migrate into off-site areas. Removing this tar will reduce or eliminate the hydraulic forces that currently cause the tar to move off site.

Area A is fenced and secured, and the ground surface has been covered with crushed stone and fill materials, so no direct exposures are likely during ordinary work activities. Central Hudson will establish an institutional control (in the form of a deed restriction or environmental easement) to help ensure that future exposures during subsurface excavations are minimized.

Alternative A2 was rejected because it would not meet the threshold criterion of protecting human health and the environment. Although institutional controls and existing site security measures would be protective on the MGP site itself, the continued migration of MGP tar away from Area A would continue, leading to continuation of potential human and ecological exposures farther to the east.

Alternative A3 was not selected because removal of tar from wells may not, by itself, be effective in preventing migration of tar. The combination of source area excavation and tar removal from all areas where mobile tar can be identified (Alternative A4) offers a higher level of protection.

Alternative A4 will meet the threshold criteria by eliminating, to the maximum extent practicable, the off site migration of tar from the former MGP site, and by limiting human and ecological exposures to the contamination that remains in the subsurface. The combination of source removal through excavation and collection of liquid tar offers the best chance for preventing further contamination of off-site areas.

Area B is largely an area where tar is in transit through the subsurface on its way to the Hudson River. As with Area A, no wastes are exposed at the surface in Area B. However, underground utility workers have been exposed to tar in the past, and similar future exposures are possible.

Future exposures are most likely along River Street, and in the TB-25 area near the end of Renwick Street. These are areas where tar contaminated soil has been found within 10 feet of the ground surface and where future STP expansion is most likely to require subsurface work.

In the unlikely event that the STP property is redeveloped for some other use in the future, additional exposures to tar and contaminated subsurface soils could occur; however, these will be managed through modifications to the SMP to reflect the new use. Unlike Area A, Central Hudson does not control Area B. Land is held by CSX Transportation and the City of Newburgh. Use of Central Hudson's best efforts to obtain institutional controls in Area B in a manner and form acceptable to the NYSDEC will be required.

Remediation of subsurface tar contamination in Area B is generally more complicated and more difficult than in Area A. The tar is widely distributed throughout the area. Much of it can not be readily excavated due to the presence of STP structures and piping. Some of the subsurface tar can be recovered with wells; however, finding this tar is challenging and it is possible that some mobile tar may go undetected and continue to move toward the Hudson River.

Alternatives B4 and B7, taken together, offer the best approach to minimizing exposure to the tar currently located in Area B and to preventing the migration of tar into area C.

Alternatives B1 and B2 were rejected because neither meets the threshold criterion of protecting public health and the environment. With either of these alternatives, tar would continue to move through Area B toward the Hudson River. Alternative B1 would also not protect subsurface utility workers at the STP, who would potentially be exposed to tar in excavations.

Alternative B3 was not selected because it would only partially meet the criterion of effectiveness. Removal of tar from wells in area B would leave substantial amounts of residual tar contamination behind, adhering to soil particles. Future excavation workers would still potentially be exposed to tar in excavations. In contrast, the selected remedy will provide a higher level of protection by treating the residual contamination with in-situ oxidation. NYSDEC also believes that the addition of in-situ oxidation will likely reach at least some of the mobile tar which could escape detection and capture by collection wells.

Alternative B5 was not selected because, by itself, it would be applied only at the east end of Renwick Street. B5 would address future construction in this area, but mobile tar and highly contaminated soils would be left in place in the rest of the STP site. Future subsurface utility worker exposures along River Street in the western edge of the STP site, where much of the plant's influent piping is located and where previous worker exposures have taken place, would not be addressed.

The selected remedy includes an important component of Alternative B5: the removal of sufficient mobile tar contaminated soil to allow construction at the east end of Renwick Street. Proposed future expansion of the STP aeration tanks in this area could require excavation into tar contaminated soil, and dewatering activities could produce contaminated groundwater. Both activities could raise worker exposure and environmental protection issues. The remedy does not include excavation to the full depth of contamination in this area (approximately 28 feet), but will proceed to a depth sufficient to allow construction in a clean working environment.

Because the design and timing of the Renwick Street STP expansion has not yet been determined, the depth and schedule of this additional soil removal cannot be specified at this time. During construction of the barrier wall, the remedy will require the removal of the shallow tar contamination, to at least two feet below the top of the barrier, to assure the quality of the groundwater passing over the wall remains acceptable for discharge to the River. If the design of the STP expansion project has not made sufficient progress by the time the barrier wall is built, implementation of this additional excavation work may, with NYSDEC approval, be coordinated with the construction schedule of the STP expansion project so as to only sheet, dewater and excavate the area once. If this option is chosen, Central Hudson will retain responsibility for any extra handling and disposal of contaminated soil and groundwater produced during the work.

Alternative B6 would be partially protective in that it would prevent migration of tar into the Hudson River. As such, it could be a component of an effective remedy for Area B. However, it would be significantly more costly on a long term basis than Alternative B7. The barrier design in the selected remedy, B7, allows allow uncontaminated shallow groundwater to pass over the top of the barrier wall, and thus will not require the costly collection and treatment of groundwater. Operation and maintenance of such a collection and treatment system would be very costly over the long term.

In light of these considerations, NYSDEC has selected a combination of Alternatives B4 and B7 as the remedy for Area B. Combined with removal of shallow soil contamination in the STP aeration tank construction area, these alternatives present the greatest likelihood of limiting movement of tar through area B and discharge to the Hudson River and directly removing tar from areas where human exposure is most likely.

Remediation of area C must be performed in conjunction with remedies for areas A and B in order to be effective. None of the remedies proposed for area C will be effective if the tar continues to migrate into area C from areas A and B.

Alternative C1 was rejected because it would not provide any level of protection to human health and the environment. Current conditions, in which human and ecological receptors are exposed to MGP tar and tar-related contaminants, would continue indefinitely.

Alternative C2 was rejected because an above-grade cap in shallow, near-shore areas would not meet the threshold criterion of compliance with New York State Standard, Criteria, and Guidance. An above-grade cap in shallow water would have the effect of filling a portion of the river and moving the shoreline eastward into the river. This would amount to destroying the river bottom habitat that the remediation work seeks to restore. It also constitutes filling of a navigable waterway.

In deeper water, an above-grade cap will still eliminate a small amount of habitat by making the water column shallower, but it also restores clean river bottom habitat that is currently contaminated. The loss of habitat in the water column may be necessary because of the difficulties associated with remediation in deeper water off shore. Thus, the alternatives that call for above-grade capping in deeper water have been retained for further consideration.

Alternative C4 would remove tar-impacted sediment, but its effectiveness in the PAH-impacted sediment would depend on natural attenuation. Although PAHs may be subject to physical, chemical, and biological natural attenuation processes, it is uncertain if these processes would result in the elimination of potential toxicity. There is currently little documentation of the effectiveness of natural attenuation on PAH contamination in sediments. Laboratory and field studies have shown that PAH compounds are difficult for bacteria to digest. Thus, Alternative C4 was rejected because it would not meet the threshold criterion of protectiveness, in that it may not fully address the potential sediment toxicity.

The remaining three alternatives for Area C would meet the thresholds for protectiveness and compliance with SCGs. Balancing criteria are used to refine the remedy selection.

The short-term effectiveness of all three remaining alternatives would be roughly equal. All three remedies require extensive disruption of the area to be remediated, but the disruption would be of a limited duration. Impacts on the operations of the City's adjacent sewage treatment plant would be roughly the same for all three alternatives. Continued operation of the sewage outfall pipe would be required in all cases, and it could become necessary to replace or extend this pipe.

Alternative C3 would allow some tar-impacted sediments to remain at depth beneath the cap. This tar could retain its ability to move through coarser-grained sediment layers, and could migrate to the edges of the cap and once again reach the sediment surface. Thus, the long-term effectiveness and permanence of such a cap would be less certain than with Alternatives C5 and C6. Reduction of mobility, toxicity, and volume would also be less for Alternative C4 than for C5 and C6, since the latter two alternatives would call for removal of more of the most grossly contaminated sediment.

Alternatives C5 and C6 would both remove all of the tar-impacted sediment and cap the surrounding PAH-impacted sediments. The two alternatives differ only in the approach to the design and construction of the cap. The long-term effectiveness of the below-grade cap (C6) is believed to be somewhat better, in that there would be less of a tendency for river currents and ice jams to scour and erode the cap, especially in areas of relatively shallow water. This difference will be largely offset, however, by careful design and placement of the above grade cap in alternative C5. The stone armoring layer in the cap will minimize the risk of erosion, particularly in deep water, which will greatly reduce or eliminate this difference. However, it is the intent of the cap design to avoid having this armoring layer exposed by erosion. If the stone were to be exposed, the cap would no longer provide the soft, fine-grained sedimentary environment comparable to existing bottom conditions. Extensive exposures of stone would be subject to colonization by zebra mussels.

The below-grade cap (C6) would likely be more implementable from an administrative standpoint, in that it would not amount to placement of fill in the Hudson River. Any fill activities would be subject to review and approval by the US Army Corps of Engineers. Likewise, the area to be filled is owned by the City of Newburgh, which has expressed interest in constructing a dock with sewage pump-out facilities for recreational boats in this area. In addition to the federal requirements, remediation activities would need to meet the substantive requirements of New York State regulations contained in 6NYCRR Part 608, "Use and

Protection of Waters.”

However, Alternative C5 is more implementable in another sense. The eastern boundary of the area to be capped has not yet been precisely determined, so it is possible that the cap will need to be extended further to the east, farther out into the river. If expanding the area of the cap becomes necessary, it will be easier to expand an above grade cap (C5), than it will be with a below-grade cap (C6), since no sheet piling and dredging will be required prior to cap placement.

Construction of a below-grade cap will result in the permanent removal of more contaminated material from the environment, due to the necessity of dredging PAH contaminated sediments to make room for the cap. Alternative C6 would thus be slightly preferable to C5 with respect to reduction of mobility, toxicity, and volume. However, the additional amount of contaminant removal achieved under Alternative C6 would be very small. With a properly functioning cap, the practical impact of this contaminant removal will be likely to be insignificant in terms of environmental exposures.

However, the marginally increased level of mass reduction, implementability and permanence of Alternative C6 relative to C5 comes with a 42 percent increase in cost, from \$12.1 Million to \$17.2 Million.

In light of these considerations, the NYSDEC has selected Alternative C5. Alternative C5 offers the best balance of effectiveness, implementability and cost effectiveness for area C.

The estimated present worth cost to implement the remedy is \$22.9 Million, broken down as follows:

Alternative A4	\$ 4.1 Million
Alternative B4	\$ 1.2 Million
Alternative B7	\$ 5.5 Million
<u>Alternative C5</u>	<u>\$12.1 Million</u>
TOTAL	\$22.9 Million

The total cost to construct the remedies is estimated to be \$20,150,000. The estimated annual operation, maintenance, and monitoring costs for 30 years range from \$177,500 to \$290, 000.

The elements of the selected remedies are as follows:

Area A

1. A remedial design program will be implemented to provide the details necessary for the construction, operation, maintenance and monitoring of the remedial program. This will include additional pre-design investigation to further delineate the excavation areas identified below. At the relief holder, this will include subsurface investigation (test trenches or borings) in and around the holder foundation to determine the vertical and

lateral extent of contamination and whether or not the holder foundation rests directly on bedrock. At the southeast corner, this will also involve delineation of the limits of the shoring system for the excavation. This excavation could extend beyond the fenced boundary of the MGP site, beneath the sidewalk for example, if subsurface contamination warrants. However, both Renwick Street and Water Street contain underground utility lines and these existing utilities represent the limit of the investigation and the limit of the footprint to which any excavation will be expanded.

2. Steel sheeting, or another appropriate shoring system, will be installed around the perimeter of the excavation, defined by the pre-design investigation, in the southeast corner of the MGP site to stabilize the walls of the excavation and limit the flow of groundwater into the excavation. The boundaries of this excavation may extend beyond the site boundary somewhat, based on the results of the pre-design investigation. Excavated soils may require dewatering prior to off site disposal. A groundwater treatment or pretreatment system will be designed and constructed to remove tar and dissolved contaminants prior to discharge to either the storm sewer or the sanitary sewer.
3. The active natural gas regulator station will be relocated or otherwise managed during excavation of the relief holder area. This relocation may be either permanent or temporary, at Central Hudson's discretion, to allow excavation of the holder contents and contamination outside the holder down to the estimated 20 foot depth of the foundation. Since the footings for the gas regulator station appear to be tied into the holder foundation wall, if the wall rests directly on the bedrock it could remain intact. However, if contamination exists under the foundation wall, the design will provide for excavation from beneath the wall, partial removal of the wall or alternative methods of addressing any contamination. Contaminated soils, piping, and ancillary structures surrounding the holder foundation will be excavated to the extent practicable, as will contaminated bedrock if it proves amenable to excavation with conventional excavation machinery. Excavated soils will be dewatered, as necessary, prior to shipment off site for treatment and/or disposal. The excavation sites will be restored by grading, placement of clean soil and seeding, gravel or pavement, as appropriate.
4. A row of wells, spaced at roughly 25-foot intervals, will be drilled along the eastern boundary of the site, designed with sumps to collect tar from the overburden and bedrock. If tar accumulates in any of these wells, then additional wells will be drilled in the intervening spaces, cutting the well spacing to approximately 12.5 feet. If tar production continues, additional wells may be required. Additional bedrock wells in the central portion of the site will be added if, following excavation of the relief holder foundation, it appears that significant quantities of tar have escaped into the bedrock in this area. For planning purposes, it is assumed that a total of 38 wells will be required: 33 along the eastern property line (27 initially with 6 additional based upon tar production) and 5 in the area around the relief holder. Tar will be collected periodically from the sumps, using either bailers or a pumping system. Collection schedules will be determined after the wells are installed, and will be adjusted to ensure that the sumps do not overflow. Any pumping system will be designed to maximize tar recovery while

producing as little excess water as feasible. Any tar and water collected from the wells will be containerized for proper off site treatment and/or disposal. The operation of the tar recovery system will continue until the remedial objectives have been achieved, or until the NYSDEC determines that continued operation is technically impracticable or not feasible.

5. Since the remedy results in contamination above unrestricted levels remaining at the site, a SMP will be developed and implemented. The SMP will include the institutional controls and engineering controls to: (a) address residual contaminated soils that may be excavated from the site during future activities by requiring soil characterization and, where applicable, disposal/reuse in accordance with NYSDEC regulations; (b) evaluate the potential for vapor intrusion for any buildings developed on the site, including provision for mitigation of any impacts identified; (c) provide for the operation and maintenance of the components of the remedy, including collection of tar from the wells; (d) monitor the groundwater, tar collection, etc.; and (e) identify any use restrictions regarding on site development or groundwater use.
6. Imposition of an institutional control in form of an environmental easement that will: (a) require compliance with the approved SMP; (b) limit the use and development of the property to commercial or industrial uses only; (c) restrict use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the Orange County Department of Health; and, (d) require the property owner to complete and submit to the NYSDEC an IC/EC certification.
7. The SMP will require Central Hudson to provide an IC/EC certification, prepared and submitted by a professional engineer or environmental professional acceptable to the NYSDEC annually or for a period to be approved by the NYSDEC. The IC/EC certification will certify that the institutional controls and engineering controls put in place are unchanged from the previous certification and that nothing has occurred that will impair the ability of the control to protect public health or the environment or that constitutes a violation or failure to comply with the SMP.

Area B

1. A remedial design program will be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program. This will include additional investigation (borings or test trenches) to delineate contamination and geotechnical conditions along the alignment of the river front barrier wall, and to determine the proper elevation for the top of the barrier wall. The remedial design will also include a determination of proper technique for oxidant injection and appropriate oxidants for the application conditions including the subsurface structures and piping beneath the STP.
2. Two rows of overburden tar collection wells will be installed, one row along River Street and the other along the northern edge of the primary settling tanks in the sewage

treatment plant. Initially, approximately 12 wells will be installed at approximately 50 foot spacings; the results from these wells will be used to guide the placement of subsequent wells, bringing the estimated total to 17. If tar production is high or persistent at any of these wells, additional wells may be installed at closer spacings. Tar will be collected periodically from the wells, using manual methods or a pumping system, as needed to collect tar while producing as little excess water as feasible. Collection schedules will be determined after the wells were installed, and will be adjusted to ensure that the well sumps do not overflow. Any tar collected from the wells will be containerized for proper off site treatment and/or disposal. Any water collected from the wells will be containerized for proper off site treatment or, at the City's discretion, treatment at the STP.

3. Once tar production from each well falls to levels where recovery will no longer be reasonable, the well will be converted to use for oxidant injection. Oxidant will be introduced on a periodic schedule sufficient to establish oxidizing conditions in the surrounding portions of the aquifer. A monitoring program will be instituted to assess the effectiveness of the system.
4. An impermeable barrier wall will be constructed in the subsurface along the riverfront, extending from location TB-57 to TB-29. The wall will be constructed of tight-jointed steel sheeting, cement/bentonite slurry, or other suitable material identified during the design. The bottom of the wall will be deep enough to form a seal with the silt/clay layer at approximately 20 to 30 feet depth. In keeping with the results of the remedial design, the top of the wall will be truncated far enough below the ground surface to allow groundwater to pass above and enter the Hudson River. Wing walls will extend inland from the north and south ends of the wall to limit flow around the ends of the wall.

Tar-contaminated soils encountered down to a depth two feet below the top of the wall will be removed all along the length of the wall. Any tar-contaminated soil that may be found at this depth farther inland in the TB-25 area will also be removed to the extent necessary to assure the groundwater quality flowing through the area and over the wall prior to discharge to the river will not exceed groundwater standards. A tar collection system will be installed along the western side of the barrier wall, consisting of either a series of sump-equipped wells or a drain pipe, sloped to allow flow to a series of collection sumps. Tar will be collected from the wells/sumps on a periodic schedule sufficient to keep the sumps from overflowing. This schedule will be adjusted as tar production changes with time.

5. A boring and test pit investigation will be conducted in the area identified by the City for expansion of the STP aeration tanks along Renwick Street. If tar contaminated soil is found at locations and depths that would result in worker exposures during future excavation, this soil will be removed to the extent necessary to provide clean working conditions during construction and operation of the STP. Implementation of this component of the remedy can be concurrent with the rest of the remedial construction or, with NYSDEC approval, can be coordinated with the construction schedule of the STP

expansion project so as to only sheet, dewater and excavate the area once. If this excavation is coordinated with the STP expansion, any contaminated soil or groundwater encountered during construction or during excavation dewatering will be handled by Central Hudson.

6. Since the remedy will result in contamination above unrestricted levels remaining at the site, a SMP will be developed and implemented. The SMP will include the institutional controls and engineering controls to: (a) address residual contaminated soils that may be excavated from Area B during future use or redevelopment, describing the tar, soil and groundwater contamination present at depth and detailing proper procedures for their identification, handling and disposal if encountered; (b) require that tar collection and oxidant addition continue until NYSDEC determines that the remedial objectives have been achieved, or until the NYSDEC determines that continued operation will be technically impracticable or not feasible; (c) evaluate the potential for vapor intrusion for any buildings developed in Area B, including provision for mitigation of any impacts identified; (d) provide for the operation and maintenance of the components of the remedy; (e) monitor the groundwater, tar collection, etc., (f) identify any use restrictions for Area B site development or groundwater use, and (g) include provision for future construction in the Renwick Street aeration tank area, if applicable.
7. Central Hudson will use its best efforts to obtain an institutional control, in a manner and form acceptable to NYSDEC, with the property owners in Area B, that will: (a) require compliance with the approved SMP and allow access for Central Hudson to implement any necessary operation, maintenance, and monitoring of the components of the remedy, (b) limit the use and development of the property to commercial, industrial or restricted residential uses; (c) restrict use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the Orange County Department of Health; and, (d) require the property owners to cooperate in the preparation of the NYSDEC IC/EC certification.
8. The SMP will require Central Hudson to provide an IC/EC certification, prepared and submitted by a professional engineer or environmental professional acceptable to the NYSDEC, annually or at an interval to be approved by the NYSDEC. This IC/EC certification will certify that the institutional controls and engineering controls put in place in Area B are unchanged from the previous certification and that nothing has occurred that will impair the ability of the control to protect public health or the environment or that constitutes a violation or failure to comply with any operation an maintenance or soil management plan.

Area C

1. A remedial design program will be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program. This will include additional investigation (offshore borings) to more precisely delineate the eastern edge of sediment contamination and more precise measurement of bottom elevations to

determine the proper boundary between below-grade and above-grade portions of the cap. A detailed assessment of erosional forces on the river bottom (including but not limited to measurement of river currents) will be made to allow determination of cap design parameters and the depth of water necessary to protect the interests of boaters, aquatic habitat, and the integrity of the cap. An evaluation of the engineering complexity, reliability, and cost of the sheet piling systems required for below-grade cap construction will be performed, in which with the erosion modeling identified above will be used to determine the depth at which above-grade capping may become appropriate for this site. Below-grade construction could also be required in deeper water depending on the results of the Remedial Design Investigation. No above-grade capping will be allowed in areas where it will result in low-tide water depths of 4 feet or less. A sediment toxicity testing program will be undertaken to ensure that only sediments presenting toxicity will be capped.

2. The current layer of rip rap (boulders) along the shore line at the sewage treatment plant will be removed for the duration of the remedial project. Uncontaminated boulders may be staged on site and reused when remediation is completed. Other debris in the remediation area (construction debris, timbers, and the remains of a partially sunken barge) will be identified and removed. Following completion of the dredging and capping activities, the rip rap erosion protection along the shoreline will be re-installed and the shoreline restored in a manner that will allow for the development of the City's proposed waterfront public walkway.
3. The area to be dredged will be surrounded with sheet piling (or other comparable shoring) driven into the river bottom and river bank, in order to isolate the dredging area and prevent escape of contaminants and suspended sediments into the main body of the Hudson River. Contaminated sediment may be removed without dewatering the enclosed area, using conventional dredging equipment. All sediment containing visible tar will be removed; in surrounding areas, enough sediment will be removed to provide clearance for construction of the cap.
4. Following dredging, the dredged area will be restored to its original elevation in areas where original low-tide water depth is 4 feet or less. If MGP-contaminated material is no longer present, the original grade can be restored using fine-grained soil materials similar to native sediments. If MGP-related contamination is still present on the river bed following dredging, then an engineered cap will be installed. Beyond the limits of the dredged area, the engineered cap will be installed to cover the existing sediment surface in areas where surficial PAH levels exceed 20 ppm, unless the extent of the below grade and above grade cap were modified to higher concentrations by the toxicity testing performed during the design. Above-grade capping will be allowed where the design criteria detailed in paragraph 1. above can be met. Silt curtains will be installed prior to placement of the cap to control resuspension of sediment during placement.
5. Since the remedy results in contamination above unrestricted levels remaining in Area C, a SMP will be developed and implemented. The SMP will include the institutional

controls and engineering controls to: (a) inspect, monitor and maintain the sediment cap, including annual inspection of the cap using either a diver or underwater photography techniques and visual inspection of the uppermost fine sediment layer of the cap; (b) repair any damage or erosion of the cap; and (c) otherwise prohibit removal or activities in the area which will compromise the integrity of the cap.

6. Notification of the existence of the cap to appropriate Federal and State agencies with jurisdiction over dredging activities, to ensure that the cap is not removed without removing the underlying contaminated sediment as well.
7. The SMP will require Central Hudson to provide an IC/EC certification with the assistance of the property owner, prepared and submitted by a professional engineer or environmental professional acceptable to the NYSDEC annually or for a period to be approved by the NYSDEC. The IC/EC certification will certify that the institutional controls and engineering controls put in place in Area C are unchanged from the previous certification and that nothing has occurred that will impair the ability of the control to protect public health or the environment or that constitutes a violation or failure to comply with any operation an maintenance plan or soil management plan.

SECTION 9: 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.

A public meeting was held on March 17, 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.

TABLE 1
Nature and Extent of Contamination

WASTE (NAPL)	Contaminants of Concern	Concentration Range Detected (ppm)^a	SCG^b (ppm)^a	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	ND-880	none	n/a
	Toluene	ND-1500	none	n/a
	Ethylbenzene	ND-4600	none	n/a
	Xylenes (total)	ND-3900	none	n/a
Semivolatile Organic Compounds (SVOCs)	Total PAH	ND-231,250	none	n/a

SURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)^a	SCG^b (ppm)^a	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	BTEX Compounds	low estimated concentrations detected	various	none
Semivolatile Compounds	Benzo(a)anthracene	0.085-4.7	0.224	11 of 13
	Benzo(a)pyrene	0.1-4.6	0.061	13 of 13
	Benzo(b)fluoranthene	0.12-3.5	1.1	4 of 13
	Benzo(k)fluoranthene	0.1-4.6	1.1	4 of 13
	Chrysene	0.11-5.1	0.400	6 of 13

SUBSURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)^a	SCG^b (ppm)^a	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	ND-20		
	Toluene	ND-34		
	Ethylbenzene	ND-320		
	Xylenes (total)	ND-380		
Semivolatile Organic Compounds (SVOCs)	PAH (total)	ND-3300	none	n/a

SEDIMENTS	Contaminants of Concern	Concentration Range Detected (ppm)^a	SCG^b (ug/g oc)^a	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	ND-2500	28	4 of 32
	Toluene	ND-240	49	4 of 32
	Ethylbenzene	ND-420	24	14 of 32
	Xylenes (total)	ND-15000	92	10 of 32
Semivolatile Organic Compounds (SVOCs)	Total PAH	0.275-9811 ppm	4 ppm or background (20 ppm)	86 of 90 (above 4 ppm) 68 of 90 (above 20 ppm)

GROUNDWATER	Contaminants of Concern	Concentration Range Detected (ppb)^a	SCG^b (ppb)^a	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	ND-4100	1.0	22 of 53
	Toluene	ND-610	5	5 of 53
	Ethylbenzene	ND-460	5	14 of 53
	Xylenes (total)	ND-660	5	20 of 53
Semivolatile Organic Compounds (SVOCs)	Total PAH	ND-18,816	various	n/a

SURFACE WATER	Contaminants of Concern	Concentration Range Detected (ppb)^a	SCG^b (ppb)^a	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	all ND	1.0	0 of 8
	Toluene	all ND	5	0 of 8
	Ethylbenzene	all ND	5	0 of 8
	Xylenes (total)	all ND	5	0 of 8
Semivolatile Organic Compounds (SVOCs)	Total PAH	ND-15	various	n/a

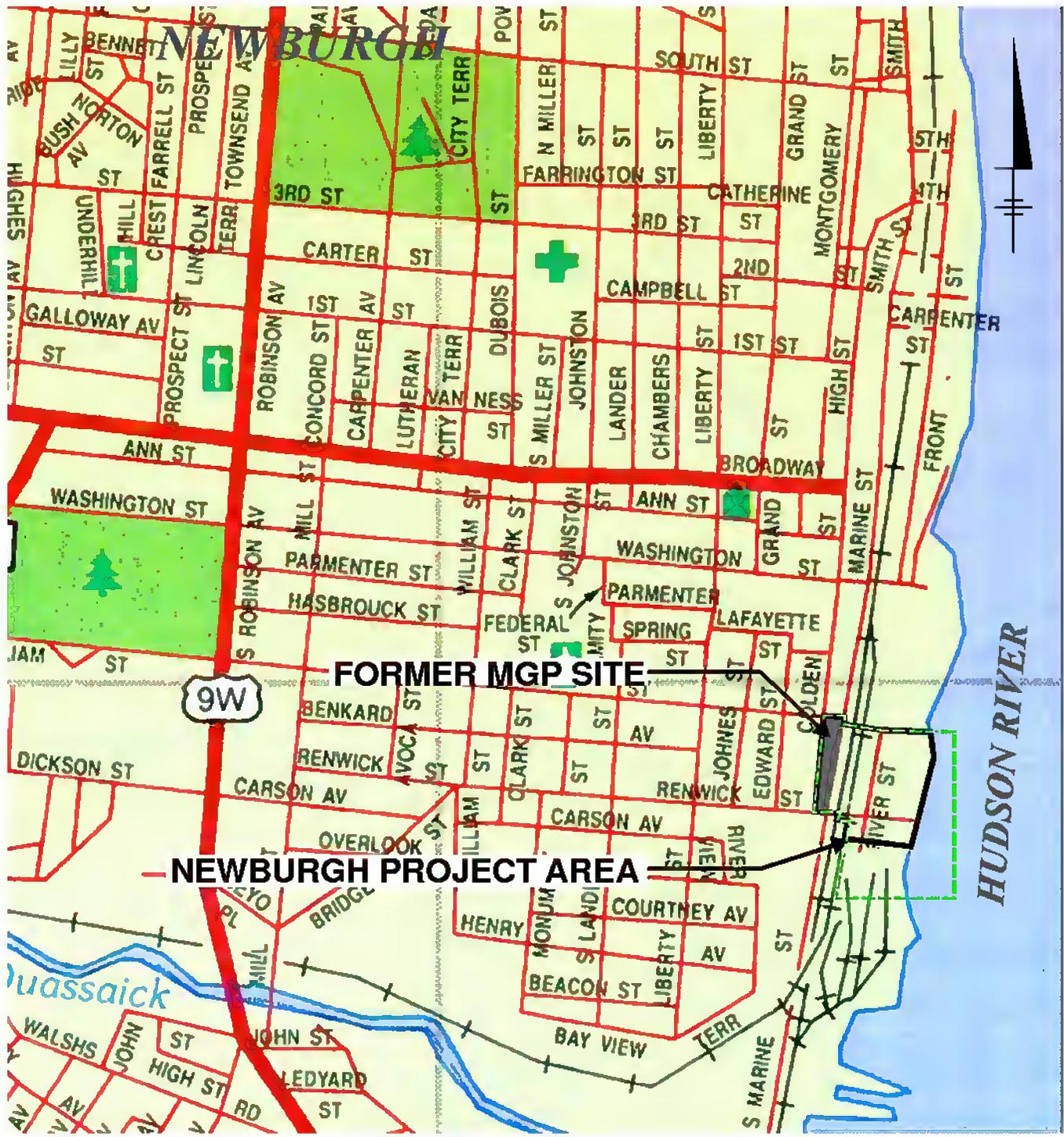
^a ppb = parts per billion, which is equivalent to micrograms per liter, ug/L, in water;
ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
ug/m³ = micrograms per cubic meter
ug/g oc = micrograms per gram of organic carbon (for sediments only)

^b SCG = standards, criteria, and guidance values

ND = none detected

**Table 2
Remedial Alternative Costs**

Remedial Alternative	Capital Cost	Annual OM&M	Total Present Worth
A1 No Action	\$0	\$0	\$0
A2 Institutional Controls (IC)	\$67,500	\$10,000	\$200,000
A3 IC and Overburden/Bedrock Tar Removal	\$459,675	\$130,000 (1-5) \$40,000 (5-30)	\$1,300,000
A4 IC, Excavation of SE Corner/Holder Overburden/Bedrock Tar Removal	\$3,485,565	\$90,000 (1-5) \$30,000 (5-30)	\$4,100,000
B1 No Action	\$0	\$0	\$0
B2 Institutional Controls (IC)	\$77,500	\$10,000	\$200,000
B3 IC and Tar Removal	\$193,725	\$40,000 (1-5) \$17,500 (5-30)	\$500,000
B4 IC, Tar Removal, and In-Situ Chemical Oxidation	\$294,975	\$85,000 (1-5) \$62,500 (5-30)	\$1,200,000
B5 IC, Hudson River Edge Tar Removal, and Soil Excavation TB-25 Area	\$3,782,700	\$40,000 (1-5) \$17,500 (5-30)	\$4,100,000
B6 IC and Tar Containment Wall, With Long-Term Groundwater Treatment	\$5,055,345	\$410,000 (1-5) \$377,500 (5-30)	\$9,900,000
B7 IC and Tar Containment Wall Without Groundwater Treatment	\$4,917,645	\$65,000 (1-5) \$ 35,000 (5-30)	\$5,500,000
C1 No Action	\$0	\$0	\$0
C2 Above-Grade Sediment Capping over Entire Area	\$2,833,853	\$50,000	\$3,500,000
C3 Dredging to 2.5 Feet Below-Grade Capping Over the Entire Area	\$12,660,503	\$50,000	\$13,300,000
C4 Removal of Tar-Impacted Sediments, Backfill/Capping of the Dredged Area, and Natural Attenuation of Sediments	\$9,113,850	\$50,000	\$9,700,000
C5 IC, Removal of Tar Sediments, At Grade & Above-Grade Sediment Capping	\$11,449,553	\$50,000	\$12,100,000
C6 IC, Removal of Tar-Impacted Sediments, Backfill/Capping of Dredged Area, Dredging to 2.5 Feet	\$16,552,553	\$50,000	\$17,200,000

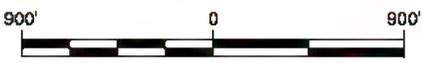


9W

FORMER MGP SITE

NEWBURGH PROJECT AREA

HUDSON RIVER



Approximate Scale: 1" = 900'



AREA LOCATION

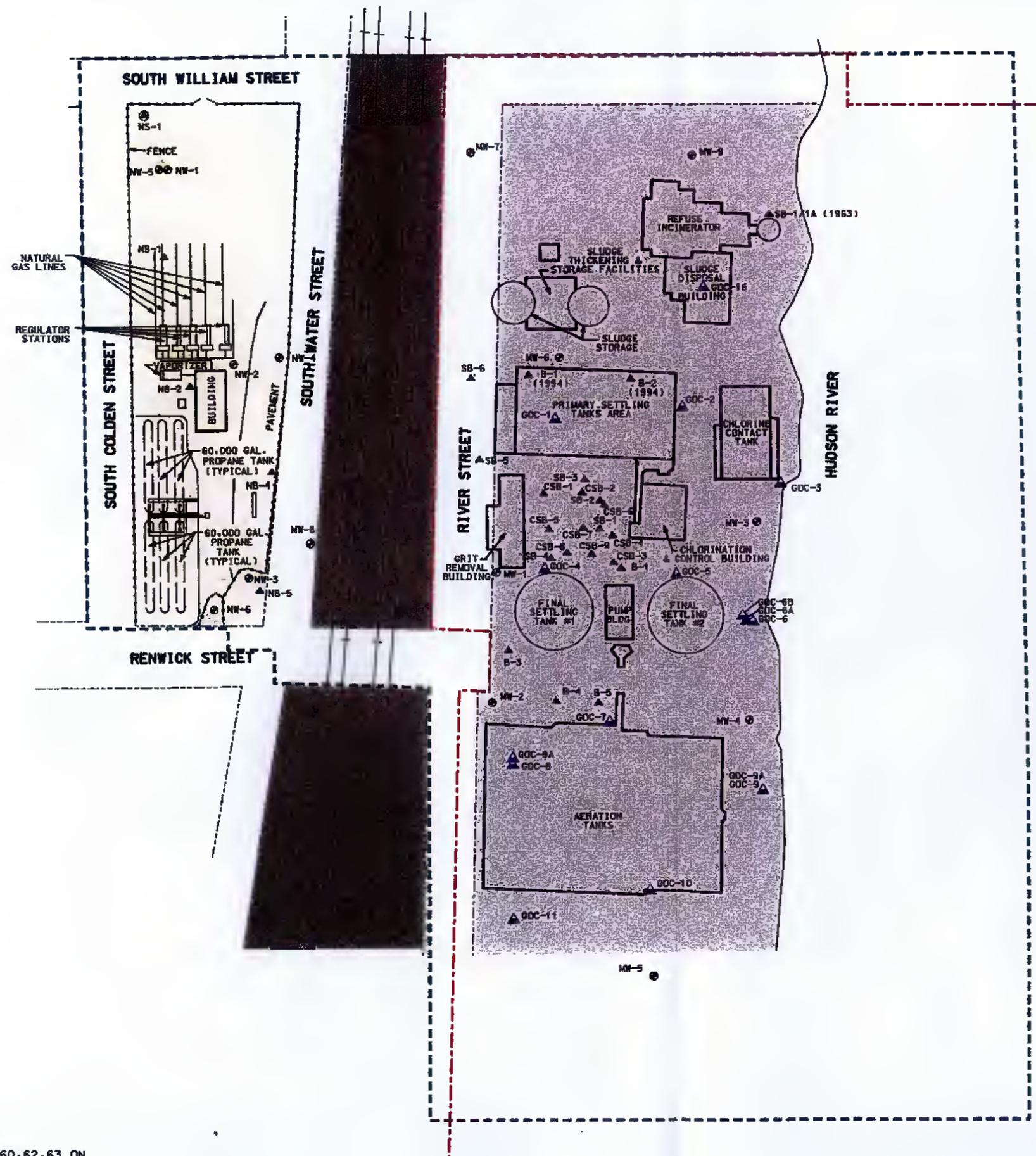
NEWBURGH PROJECT
REMEDIAL INVESTIGATION

PROJECT LOCATION MAP

BBL

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
1



LEGEND

- PRE RI GROUND-WATER MONITORING WELL
- ▲ PRE RI SOIL BORING
- PRE RI SURFACE SOIL SAMPLE
- ▲ GEOTECHNICAL BORING (GOODKIND & O'DEA-CHAZEN)
- APPROXIMATE FORMER MGP SITE PROPERTY AREA
- APPROXIMATE CONSOLIDATED RAIL PROPERTY AREA
- ▨ APPROXIMATE CITY OF NEWBURGH SEWAGE TREATMENT PLANT PROPERTY AREA
- ⊂ APPROXIMATE PROJECT AREA
- - - APPROXIMATE CITY PROPERTY BOUNDARY

NOTE: BASE MAP PROVIDED BY CITY OF NEWBURGH ENGINEERING DEPARTMENT.
ALL LOCATIONS ARE APPROXIMATE.



NEWBURGH PROJECT
REMEDIAL INVESTIGATION

**FORMER MGP SITE AND OTHER
AREAS OF INVESTIGATION**

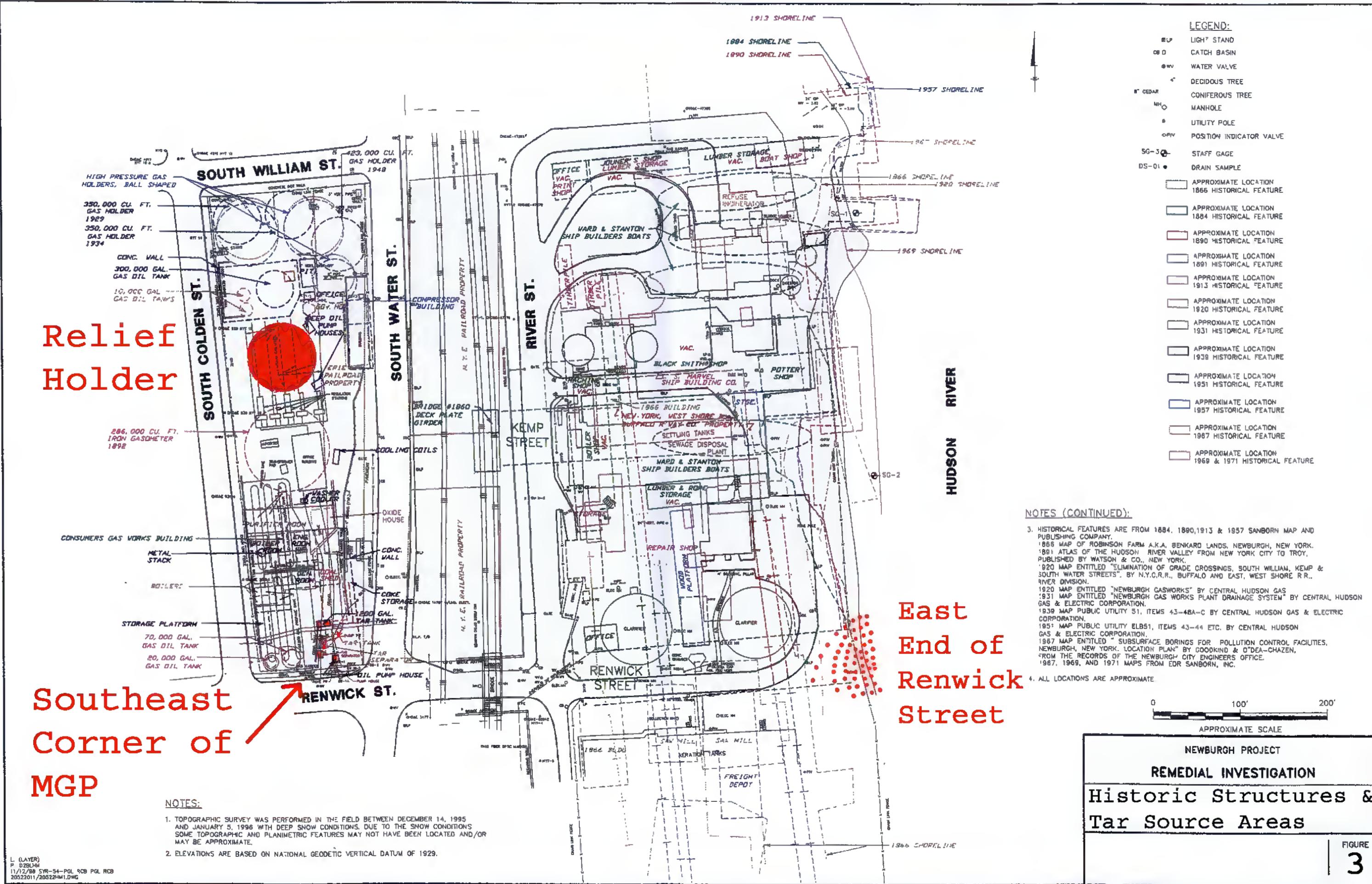
BBL BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
2

Relief
Holder

Southeast
Corner of
MGP

East
End of
Renwick
Street



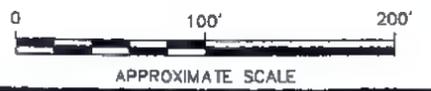
LEGEND:

⊕	LIGHT STAND
CB D	CATCH BASIN
⊙	WATER VALVE
◊	DECIDUOUS TREE
◊	CONIFEROUS TREE
MH	MANHOLE
⊙	UTILITY POLE
⊙	POSITION INDICATOR VALVE
SG-3	STAFF GAGE
DS-01	DRAIN SAMPLE
[Red outline]	APPROXIMATE LOCATION 1866 HISTORICAL FEATURE
[Blue outline]	APPROXIMATE LOCATION 1884 HISTORICAL FEATURE
[Green outline]	APPROXIMATE LOCATION 1890 HISTORICAL FEATURE
[Purple outline]	APPROXIMATE LOCATION 1891 HISTORICAL FEATURE
[Orange outline]	APPROXIMATE LOCATION 1913 HISTORICAL FEATURE
[Yellow outline]	APPROXIMATE LOCATION 1920 HISTORICAL FEATURE
[Pink outline]	APPROXIMATE LOCATION 1931 HISTORICAL FEATURE
[Light blue outline]	APPROXIMATE LOCATION 1938 HISTORICAL FEATURE
[Light green outline]	APPROXIMATE LOCATION 1951 HISTORICAL FEATURE
[Light purple outline]	APPROXIMATE LOCATION 1957 HISTORICAL FEATURE
[Light orange outline]	APPROXIMATE LOCATION 1967 HISTORICAL FEATURE
[Light pink outline]	APPROXIMATE LOCATION 1969 & 1971 HISTORICAL FEATURE

NOTES (CONTINUED):

3. HISTORICAL FEATURES ARE FROM 1884, 1890, 1913 & 1957 SANBORN MAP AND PUBLISHING COMPANY.
1866 MAP OF ROBINSON FARM A.K.A. BENKARD LANDS, NEWBURGH, NEW YORK.
1891 ATLAS OF THE HUDSON RIVER VALLEY FROM NEW YORK CITY TO TROY, PUBLISHED BY WATSON & CO., NEW YORK.
1920 MAP ENTITLED "ELIMINATION OF GRADE CROSSINGS, SOUTH WILLIAM, KEMP & SOUTH WATER STREETS", BY N.Y.C.R.R., BUFFALO AND EAST, WEST SHORE R.R., RIVER DIVISION.
1920 MAP ENTITLED "NEWBURGH GASWORKS" BY CENTRAL HUDSON GAS & ELECTRIC CORPORATION.
1931 MAP ENTITLED "NEWBURGH GAS WORKS PLANT DRAINAGE SYSTEM" BY CENTRAL HUDSON GAS & ELECTRIC CORPORATION.
1938 MAP PUBLIC UTILITY 51, ITEMS 43-48A-C BY CENTRAL HUDSON GAS & ELECTRIC CORPORATION.
1951 MAP PUBLIC UTILITY ELB51, ITEMS 43-44 ETC. BY CENTRAL HUDSON GAS & ELECTRIC CORPORATION.
1967 MAP ENTITLED "SUBSURFACE BORINGS FOR POLLUTION CONTROL FACILITIES, NEWBURGH, NEW YORK, LOCATION PLAN" BY GOODKIND & O'DEA-CHAZEN, FROM THE RECORDS OF THE NEWBURGH CITY ENGINEERS OFFICE.
1967, 1969, AND 1971 MAPS FROM EDR SANBORN, INC.

4. ALL LOCATIONS ARE APPROXIMATE

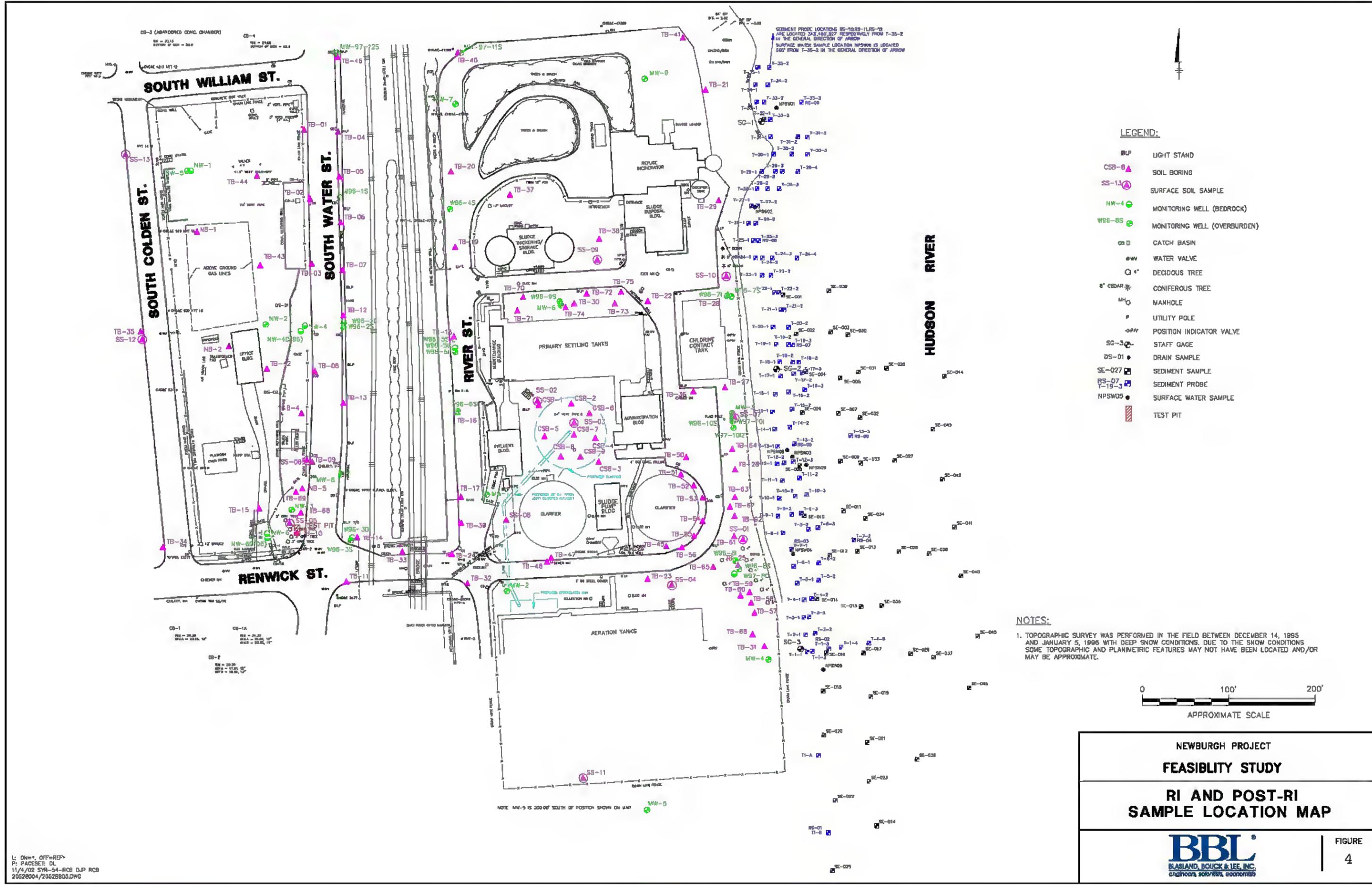


NEWBURGH PROJECT
REMEDIAL INVESTIGATION
Historic Structures &
Tar Source Areas

FIGURE
3

NOTES:

1. TOPOGRAPHIC SURVEY WAS PERFORMED IN THE FIELD BETWEEN DECEMBER 14, 1995 AND JANUARY 5, 1996 WITH DEEP SNOW CONDITIONS. DUE TO THE SNOW CONDITIONS SOME TOPOGRAPHIC AND PLANIMETRIC FEATURES MAY NOT HAVE BEEN LOCATED AND/OR MAY BE APPROXIMATE.
2. ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.

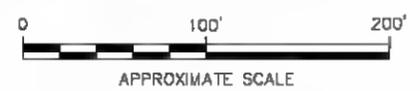


L: ON=1, OFF=REF
P: FACESEE, DL
11/4/02 SYR-54-RCB D.P. RCB
20528004/20528005.DWG



- LEGEND:**
- BLP LIGHT STAND
 - CSB-8 ▲ SOIL BORING
 - SS-13 ▲ SURFACE SOIL SAMPLE
 - NW-4 ● MONITORING WELL (BEDROCK)
 - WS6-BS ● MONITORING WELL (OVERBURDEN)
 - CB 0 CATCH BASIN
 - WV WATER VALVE
 - D* DECIDUOUS TREE
 - C* CONIFEROUS TREE
 - MH ○ MANHOLE
 - U UTILITY POLE
 - PVI POSITION INDICATOR VALVE
 - SG-3 ○ STAFF GAGE
 - DS-01 ● DRAIN SAMPLE
 - SE-027 □ SEDIMENT SAMPLE
 - RS-07 T-19-3 □ SEDIMENT PROBE
 - NPSWOS ● SURFACE WATER SAMPLE
 - ▨ TEST PIT
 - NAPLs NOT ENCOUNTERED
 - NAPLs ENCOUNTERED AT OR ABOVE 10 FEET DEPTH
 - NAPLs ENCOUNTERED GREATER THAN 10 FEET DEPTH
 - NAPLs ENCOUNTERED GREATER THAN 15 FEET DEPTH
 - NAPLs ENCOUNTERED GREATER THAN 20 FEET DEPTH
 - NAPLs ENCOUNTERED GREATER THAN 30 FEET DEPTH
 - NAPLs ENCOUNTERED GREATER THAN 40 FEET DEPTH
 - ▨ BLACK STAINING ENCOUNTERED AT OR ABOVE 10 FEET DEPTH
 - ▲ NAPLs OBSERVED IN BEDROCK

- NOTES:**
1. TOPOGRAPHIC SURVEY WAS PERFORMED IN THE FIELD BETWEEN DECEMBER 14, 1995 AND JANUARY 5, 1996 WITH DEEP SNOW CONDITIONS. DUE TO THE SNOW CONDITIONS SOME TOPOGRAPHIC AND PLANIMETRIC FEATURES MAY NOT HAVE BEEN LOCATED AND/OR MAY BE APPROXIMATE.
 2. ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.

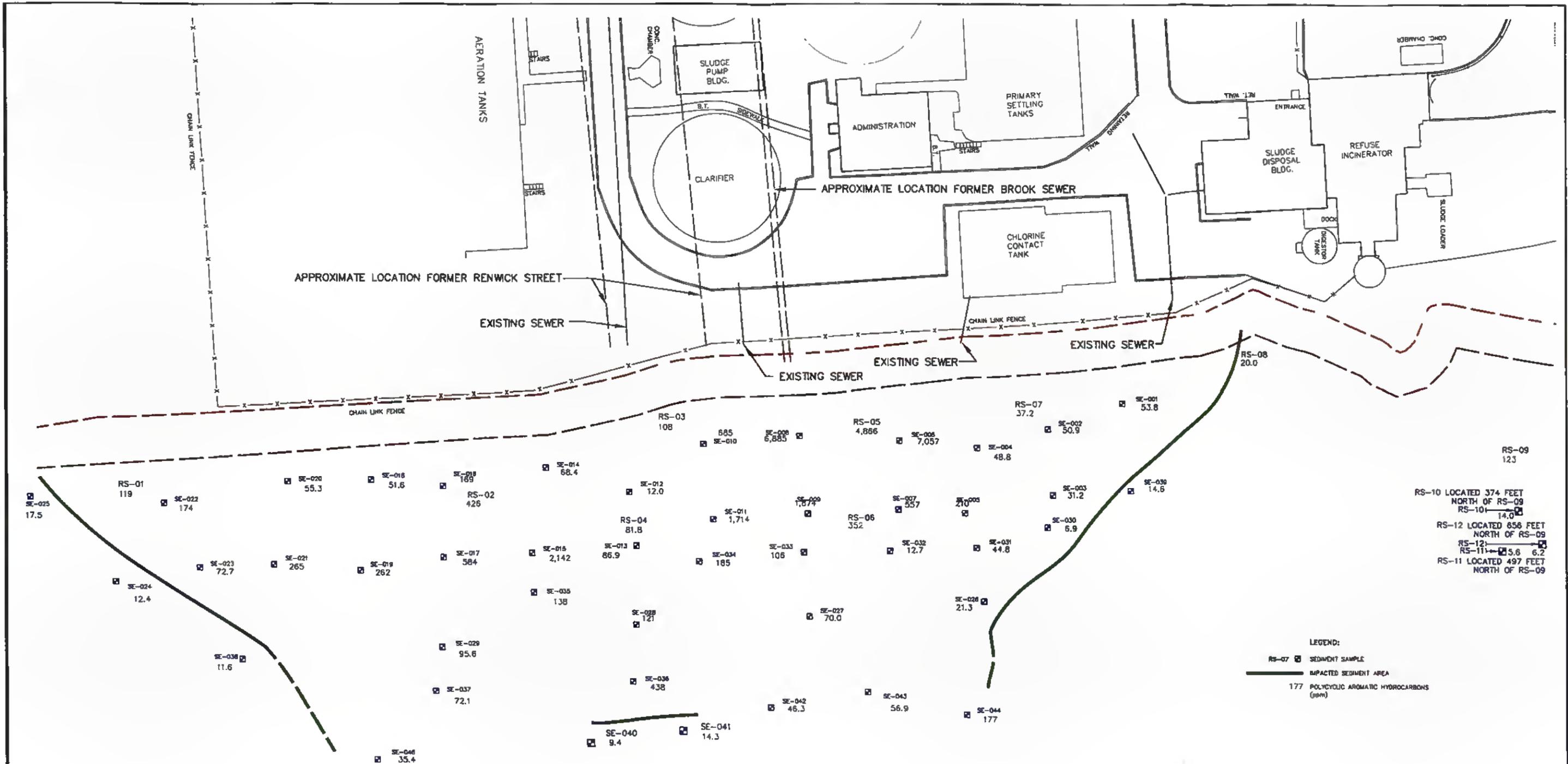


**NEWBURGH PROJECT
FEASIBILITY STUDY**

NAPL DISTRIBUTION MAP

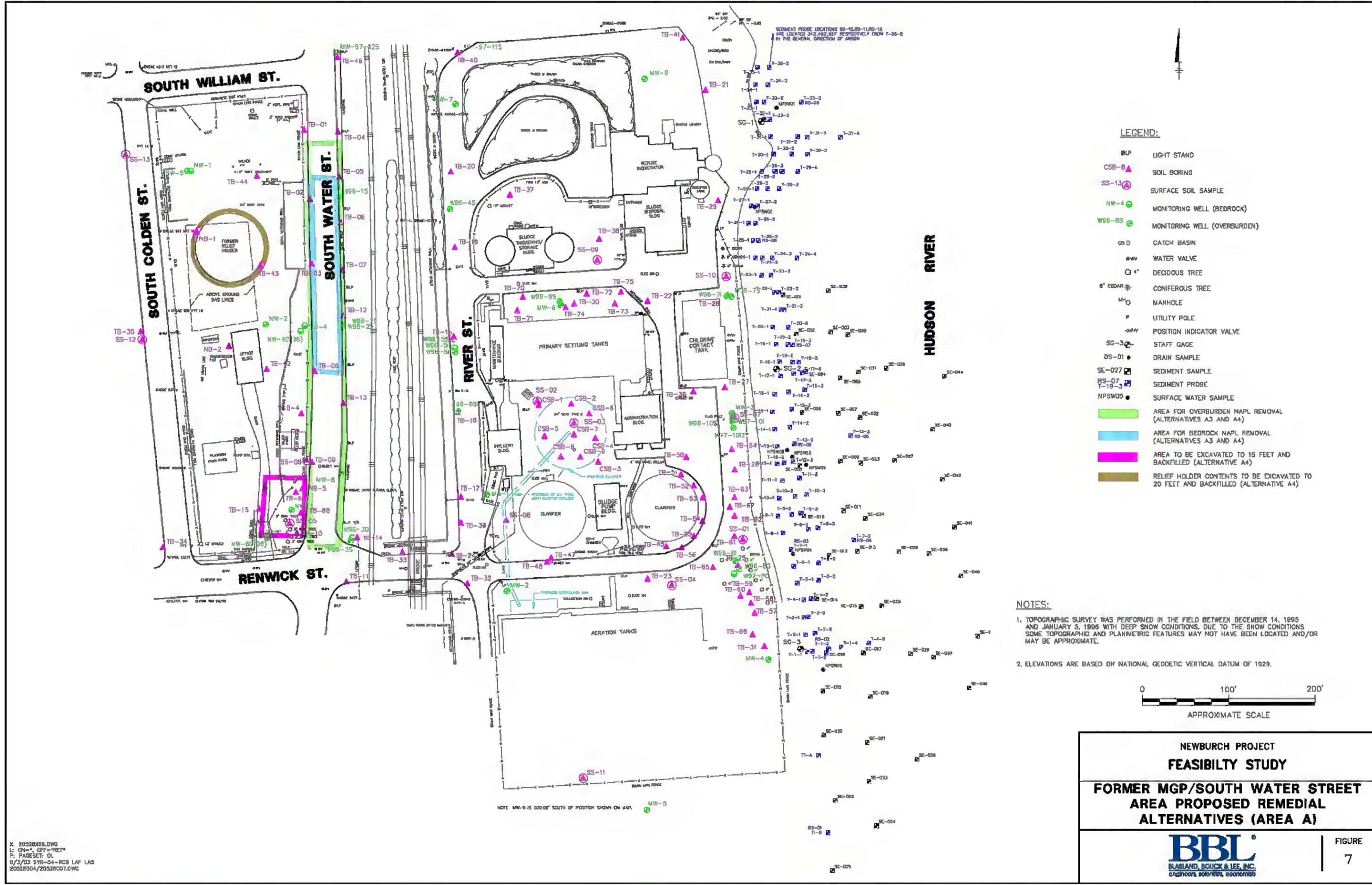


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11/1/92 STA-04-RCB LAF RCB
20528004/20528008.DWG



**NEWBURGH PROJECT
FEASIBILITY STUDY
PAH CONCENTRATIONS IN SURFACE
SEDIMENTS**

X: 20528004.DWG
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P: PAGESET / DL DL29
8/7/02 5:18:54-RCB PCL RCB
20528004/20528006.DWG

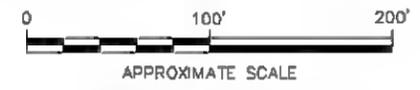


LEGEND:

- BLP LIGHT STAND
- CSB-8 SOIL BORING
- SS-13 SURFACE SOIL SAMPLE
- NW-4 MONITORING WELL (BEDROCK)
- WSB-85 MONITORING WELL (OVERBURDEN)
- CB D CATCH BASIN
- WV WATER VALVE
- Q DECIDUOUS TREE
- 8" CEDAR CONIFEROUS TREE
- MH MANHOLE
- UTILITY POLE
- POSITION INDICATOR VALVE
- SC-3 STAFF GAGE
- DS-01 DRAIN SAMPLE
- SE-027 SEDIMENT SAMPLE
- RS-07 SEDIMENT PROBE
- Y-19-3 SURFACE WATER SAMPLE
- NPSWOS SURFACE WATER SAMPLE
- AREA FOR OVERBURDEN NAPL REMOVAL (ALTERNATIVES A3 AND A4)
- AREA FOR BEDROCK NAPL REMOVAL (ALTERNATIVES A3 AND A4)
- AREA TO BE EXCAVATED TO 15 FEET AND BACKFILLED (ALTERNATIVE A4)
- RELIEF HOLDER CONTENTS TO BE EXCAVATED TO 20 FEET AND BACKFILLED (ALTERNATIVE A4)

NOTES:

1. TOPOGRAPHIC SURVEY WAS PERFORMED IN THE FIELD BETWEEN DECEMBER 14, 1995 AND JANUARY 3, 1996 WITH DEEP SNOW CONDITIONS. DUE TO THE SNOW CONDITIONS SOME TOPOGRAPHIC AND PLANIMETRIC FEATURES MAY NOT HAVE BEEN LOCATED AND/OR MAY BE APPROXIMATE.
2. ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.



**NEWBURCH PROJECT
FEASIBILITY STUDY**

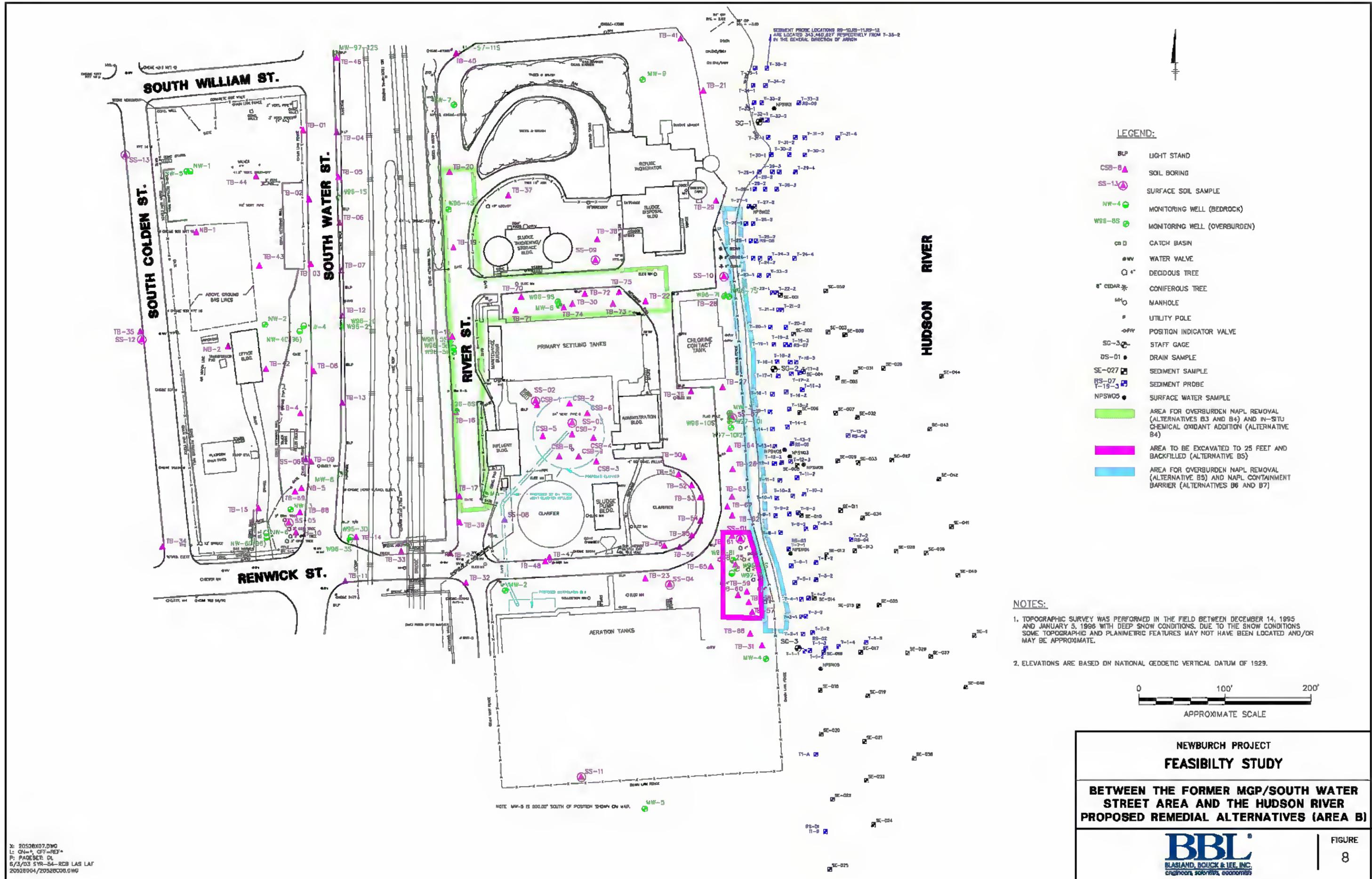
**FORMER MGP/SOUTH WATER STREET
AREA PROPOSED REMEDIAL
ALTERNATIVES (AREA A)**



FIGURE
7

X: 20528006.DWG
L: CIVIL, GEF-1100
P: PAGESET: DL
8/3/03 5:44-RCB LAF LAS
20528004/20528007.DWG

NOTE: MW-9 IS 300 FEET SOUTH OF POSITION SHOWN ON MAP.

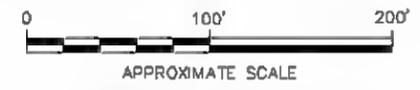


LEGEND:

- BLP LIGHT STAND
- CSB-8 SOIL BORING
- SS-13 SURFACE SOIL SAMPLE
- NW-4 MONITORING WELL (BEDROCK)
- W96-85 MONITORING WELL (OVERBURDEN)
- CB D CATCH BASIN
- WV WATER VALVE
- Q DECIDUOUS TREE
- 8" CEDAR CONIFEROUS TREE
- MH MANHOLE
- UTILITY POLE
- POSITION INDICATOR VALVE
- SC-3 STAFF GAGE
- DS-01 DRAIN SAMPLE
- SE-027 SEDIMENT SAMPLE
- RS-07 Y-19-3 SEDIMENT PROBE
- NPSW05 SURFACE WATER SAMPLE
- AREA FOR OVERBURDEN NAPL REMOVAL (ALTERNATIVES B3 AND B4) AND IN-SITU CHEMICAL OXIDANT ADDITION (ALTERNATIVE B4)
- AREA TO BE EXCAVATED TO 25 FEET AND BACKFILLED (ALTERNATIVE B5)
- AREA FOR OVERBURDEN NAPL REMOVAL (ALTERNATIVE B9) AND NAPL CONTAINMENT BARRIER (ALTERNATIVES B6 AND B7)

NOTES:

1. TOPOGRAPHIC SURVEY WAS PERFORMED IN THE FIELD BETWEEN DECEMBER 14, 1995 AND JANUARY 3, 1996 WITH DEEP SNOW CONDITIONS. DUE TO THE SNOW CONDITIONS SOME TOPOGRAPHIC AND PLANIMETRIC FEATURES MAY NOT HAVE BEEN LOCATED AND/OR MAY BE APPROXIMATE.
2. ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.



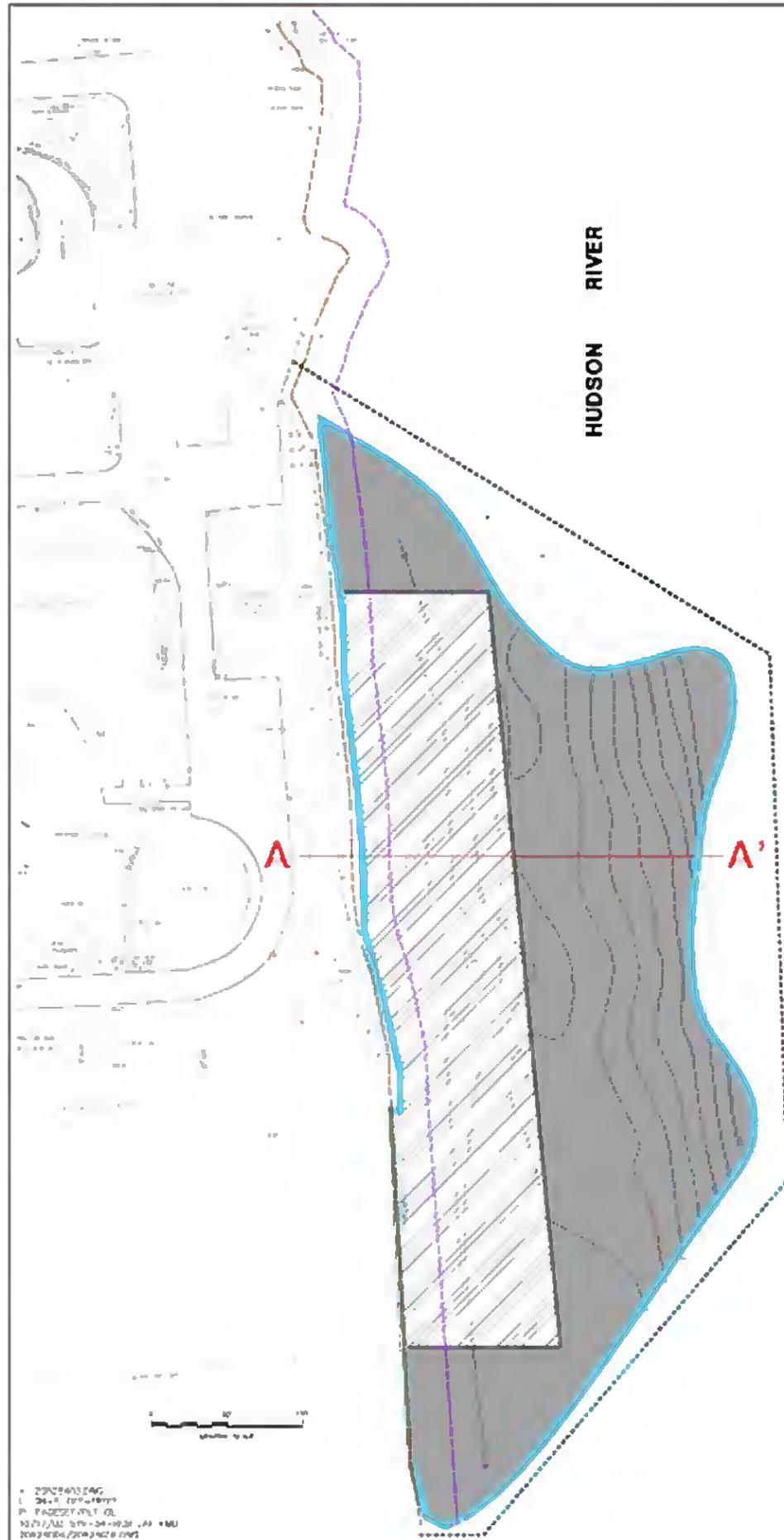
**NEWBURCH PROJECT
FEASIBILITY STUDY**

**BETWEEN THE FORMER MGP/SOUTH WATER
STREET AREA AND THE HUDSON RIVER
PROPOSED REMEDIAL ALTERNATIVES (AREA B)**

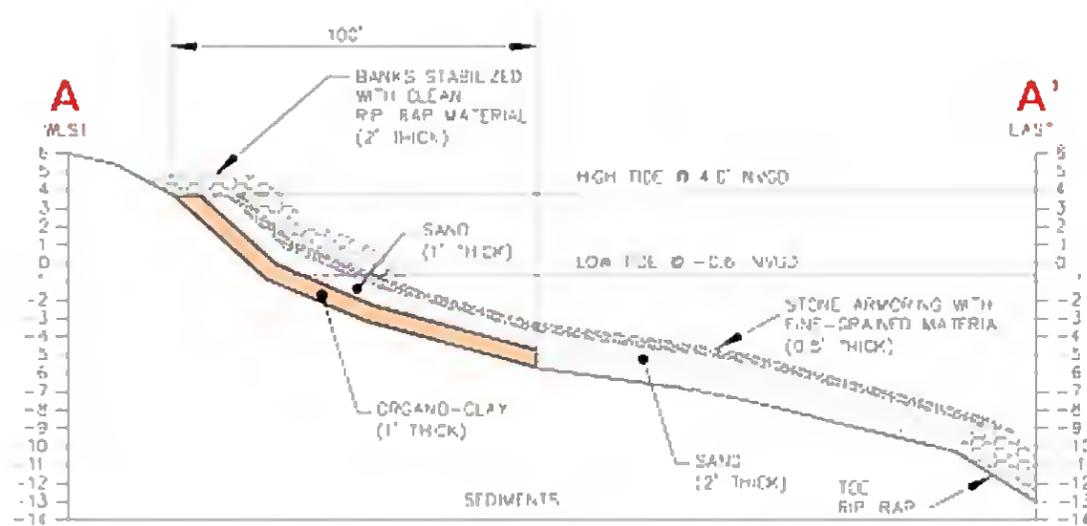
BBL
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

FIGURE
8

X: 20528X07.DWG
L: ON=*, OFF=REF*
P: P:\PROJECTS\DL
6/2/03 5:18:54-RCB LAS LAF
20528004/20528006.0.WG



HUDSON RIVER



CROSS-SECTION A-A'



LEGEND

⊙	1.5H" STAND
⊙	WATER VALVE
⊙	DECIDUOUS TREE
⊙	CONIFEROUS TREE
⊙	UTILITY POLE
---	POSITION INDICATOR VALVE
█	AREA TO BE UNAPPED ABOVE GRADE
---	ELEVATION @ HIGH TIDE
---	ELEVATION @ LOW TIDE
---	SLT DRAINAGE
█	SEDIMENTS CONTAINING 20 PPM TOTAL PARS AT THE SURFACE (0' - 100')
█	SEDIMENT CONTAINING PAR'S OR SURFACE PAR'S > 200 PPM

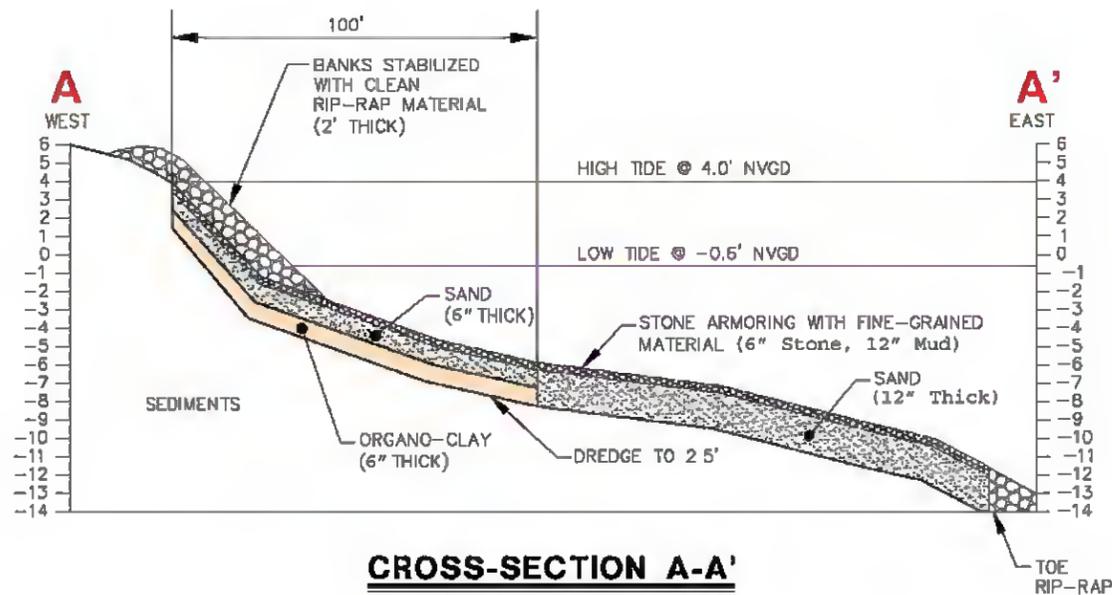
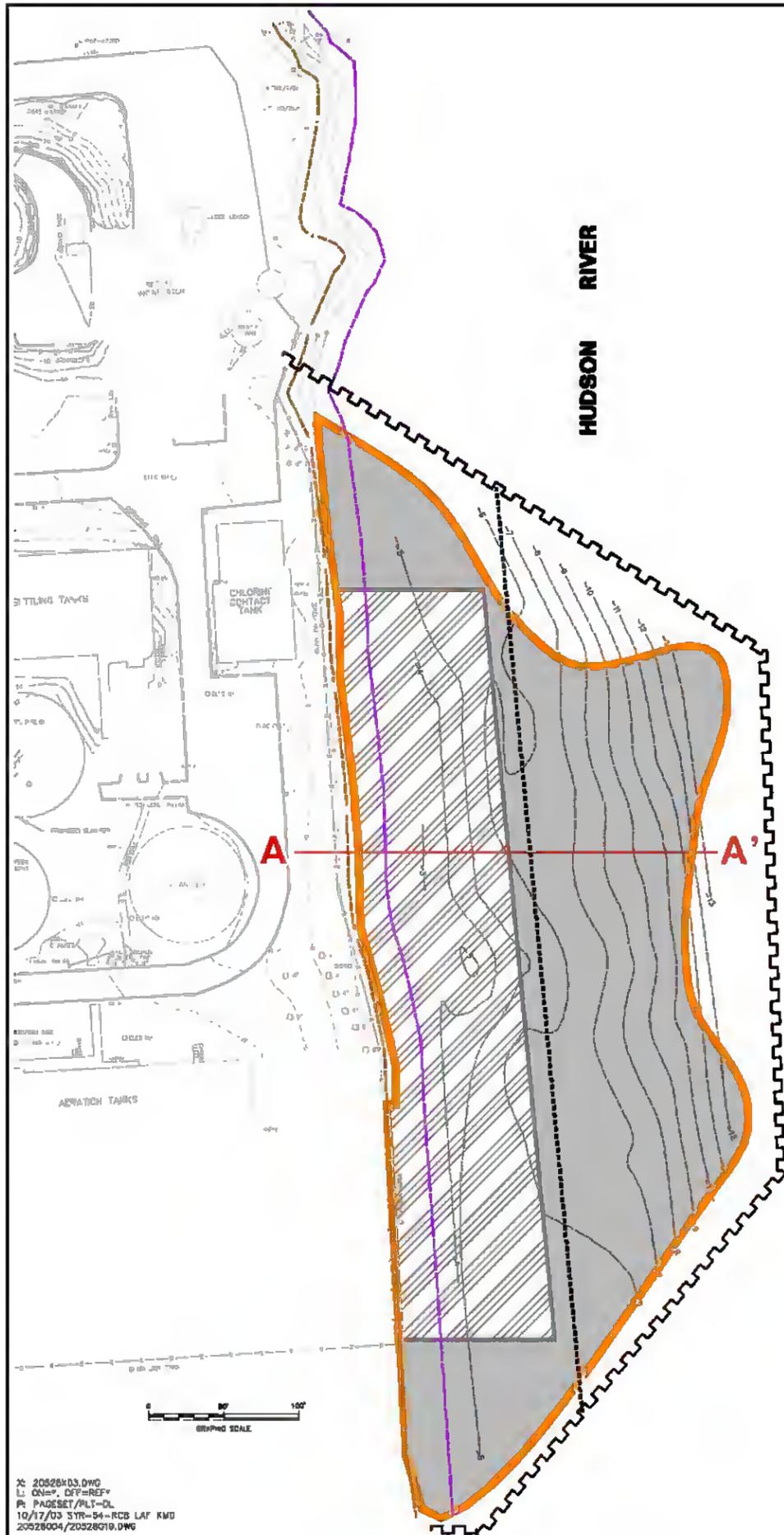
- NOTES:**
1. TOPOGRAPHIC SURVEY WAS CONDUCTED IN THE FIELD UNDER CONDITIONS IN 1995 AND 1996 WITH DEEP UNDER CONDITIONS DUE TO THE SLOPE DRAINING SIDE TOPOGRAPHIC AND PLUMBING FEATURES MAY NOT HAVE BEEN LOCATED AND/OR MAY BE APPROXIMATE
 2. ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929
 3. BATHYMETRIC INFORMATION WAS DERIVED FROM THE TOP ELEVATIONS OF THE SOUTHEAST BENTONITE SERIES COLLECTED BY USGS IN 1997 AND 2000
 4. THE ELEVATIONS ARE BASED ON WATER ELEVATION DATA COLLECTED AT STATION 56-2 BETWEEN AUGUST 30 AND SEPTEMBER 6, 1999. STATION 56-2 IS LOCATED IN THE RIVER JUST EAST OF THE DRAINAGE CONTACT TANK
 5. ALTERNATIVE C2 PROVIDES FOR AN ASBESTE GRADE CAP OVER THE AREA SHOWN STABILIZED ADJACENT RIVERBANKS BY REPLACING EXISTING RIP-RAP WITH CLEAN RIP-RAP MATERIAL AND PROVIDING FOR LONG-TERM MONITORING AND MAINTENANCE CONTROLS. CAP THICKNESS ASSUMED AT 2.5 FEET
 6. EXISTING RIP-RAP WILL BE REMOVED AND SHOULD BE STABILIZED WITH CLEAN RIP-RAP MATERIALS PLACED AT THE CAP MATERIAL
 7. CAP CONSTRUCTION SHOWN WITHOUT CONSIDERING POTENTIAL SLOPE AND SETTLEMENT UNDER THE WEIGHT OF THE CAP
 8. SPECIFIC BANK STABILIZATION MEASURES WILL BE DEVELOPED DURING REVEAL DESIGN

NEWBURCH PROJECT
 FEASIBILITY STUDY
 PROPOSED HUDSON RIVER
 REMEDIAL ALTERNATIVE C2

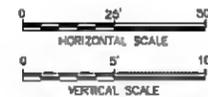
BBL
 BASLAND, BOKER & LEE, INC.
 engineers scientists architects

FIGURE

2004/05/04
 L. 2640 10/04/04
 P. 10/04/04
 10/04/04 10/04/04 10/04/04 10/04/04



CROSS-SECTION A-A'



LEGEND:

- ⊙ LIGHT STAND
- ⊙ W WATER VALVE
- ⊙ 4\"/>
- ⊙ 6\"/>
- ⊙ UTILITY POLE
- ⊙ PVI POSITION INDICATOR VALVE
- ORANGE SHADE AREA TO BE EXCAVATED TO 2.5 FEET THEN CAPPED TO GRADE
- SHORELINE @ HIGH TIDE
- SHORELINE @ LOW TIDE
- TEMPORARY SHEETPILE
- SILT CURTAIN
- SEDIMENTS CONTAINING 20 PPM TOTAL PAHs AT THE SURFACE (0-1 FOOT)
- SEDIMENT CONTAINING NAPL OR SURFACE PAHs > 200 PPM

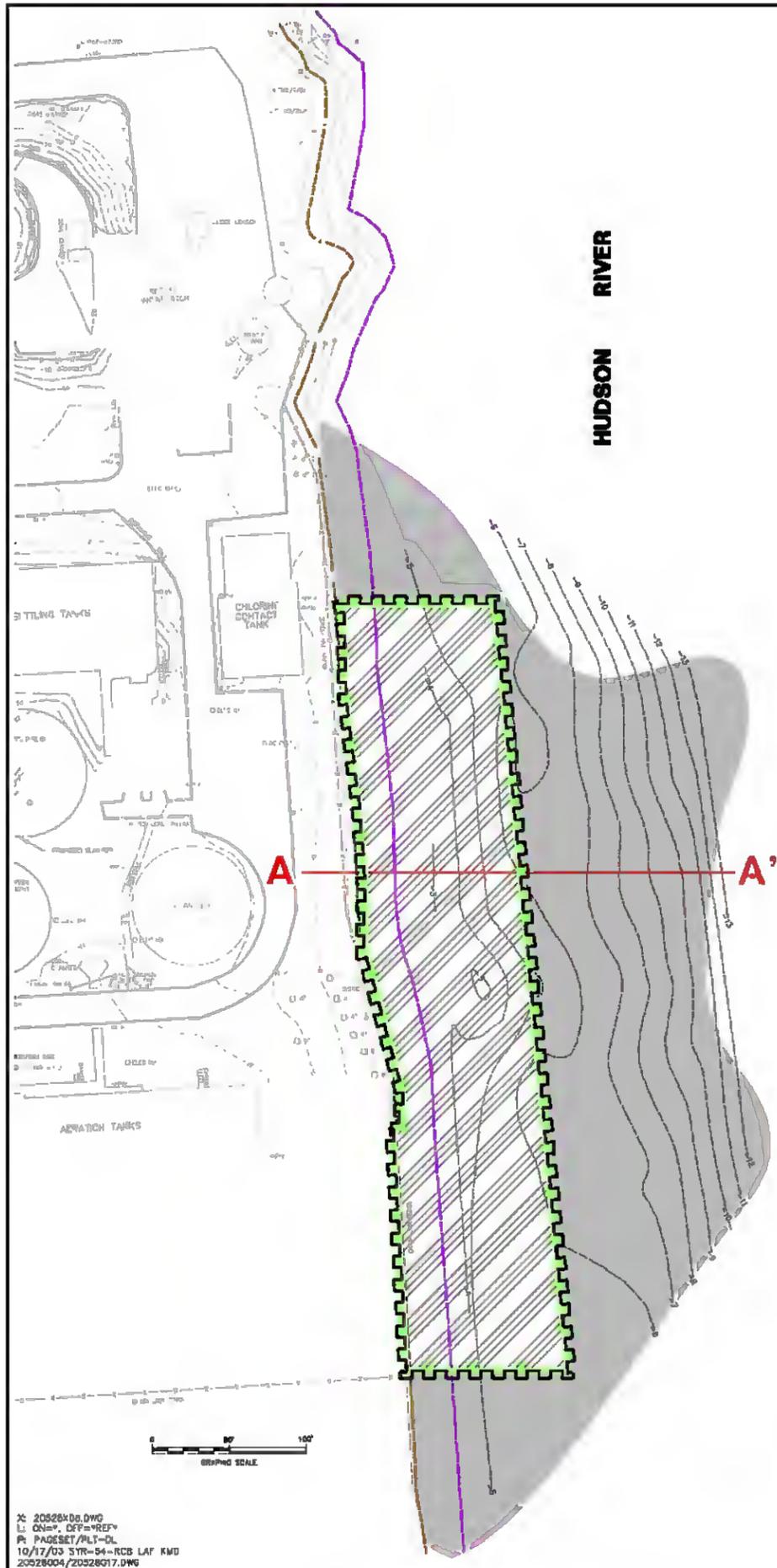
NOTES:

1. TOPOGRAPHIC SURVEY WAS PERFORMED IN THE FIELD BETWEEN DECEMBER 14, 1995 AND JANUARY 5, 1996 WITH DEEP SNOW CONDITIONS. DUE TO THE SNOW CONDITIONS SOME TOPOGRAPHIC AND PLANIMETRIC FEATURES MAY NOT HAVE BEEN LOCATED AND/OR MAY BE APPROXIMATE.
2. ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.
3. BATHYMETRIC INFORMATION WAS COMPILED FROM THE TOP ELEVATIONS OF THE SOUTHEAST SEDIMENT BORING SERIES COLLECTED BY BBL IN 1997 AND 2000.
4. TIDE LEVELS ARE BASED ON WATER ELEVATION DATA COLLECTED AT STATION 50-2 BETWEEN AUGUST 30 AND SEPTEMBER 9, 1996. 50-2 IS LOCATED IN THE RIVER JUST EAST OF THE CHLORINE CONTACT TANK.
5. EXISTING RIP-RAP WILL BE REMOVED AND SHORELINES STABILIZED WITH CLEAN RIP-RAP MATERIALS.
6. ENTIRE AREA TARGETED FOR CAPPING WILL BE DREDGED TO 2.5' BELOW SEDIMENT SURFACE. DREDGED AREA WILL BE CAPPED TO GRADE. CAP THICKNESS ASSUMED AT 2.5 FEET.
7. SPECIFIC BANK STABILIZATION MEASURES WILL BE DEVELOPED DURING REMEDIAL DESIGN.

**NEWBURGH PROJECT
FEASIBILITY STUDY**

**PROPOSED HUDSON RIVER
REMEDIAL ALTERNATIVE C3**





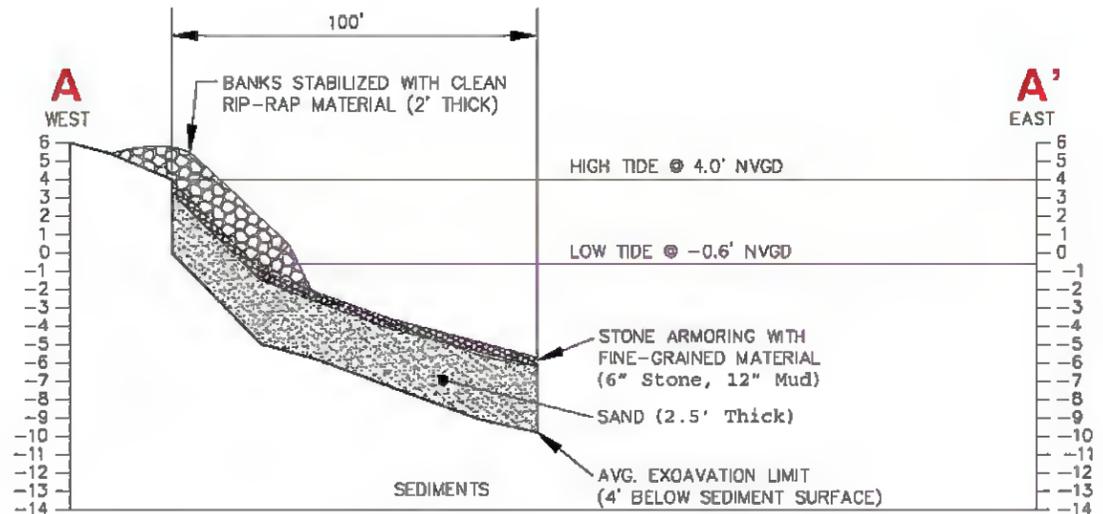
HUDSON RIVER

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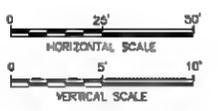
- RIP LIGHT STAND
- WV WATER VALVE
- DT DECIDUOUS TREE
- CT CONIFEROUS TREE
- UP UTILITY POLE
- PIV POSITION INDICATOR VALVE
- NAPL-CONTAINING SEDIMENTS TO BE EXCAVATED (AVERAGE 4 FEET) THEN BACKFILLED TO GRADE
- SHORELINE @ HIGH TIDE
- SHORELINE @ LOW TIDE
- TEMPORARY SHEETPILE
- SEDIMENTS CONTAINING 20 PPM TOTAL PAHs AT THE SURFACE (0-1 FOOT)
- SEDIMENT CONTAINING NAPL OR SURFACE PAHs > 200 PPM

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3. BATHYMETRIC INFORMATION WAS COMPILED FROM THE TOP ELEVATIONS OF THE SOUTHEAST SEDIMENT BORING SERIES COLLECTED BY BBL IN 1997 AND 2000.
4. TIDE LEVELS ARE BASED ON WATER ELEVATION DATA COLLECTED AT STATION 50-2 BETWEEN AUGUST 30 AND SEPTEMBER 9, 1996. 50-2 IS LOCATED IN THE RIVER JUST EAST OF THE CHLORINE CONTACT TANK.
5. EXISTING RIP-RAP WILL BE REMOVED AND SHORELINES STABILIZED WITH CLEAN RIP-RAP MATERIALS.
6. ENTIRE AREA TARGETED FOR DREDGING WILL BE DREDGED TO AN AVERAGE OF 4' BELOW SEDIMENT SURFACE. DREDGED AREA WILL BE BACKFILLED TO GRADE. BACKFILL THICKNESS ASSUMED TO BE 4 FEET.
7. SPECIFIC BANK STABILIZATION MEASURES WILL BE DEVELOPED DURING REMEDIAL DESIGN.



CROSS-SECTION A-A'



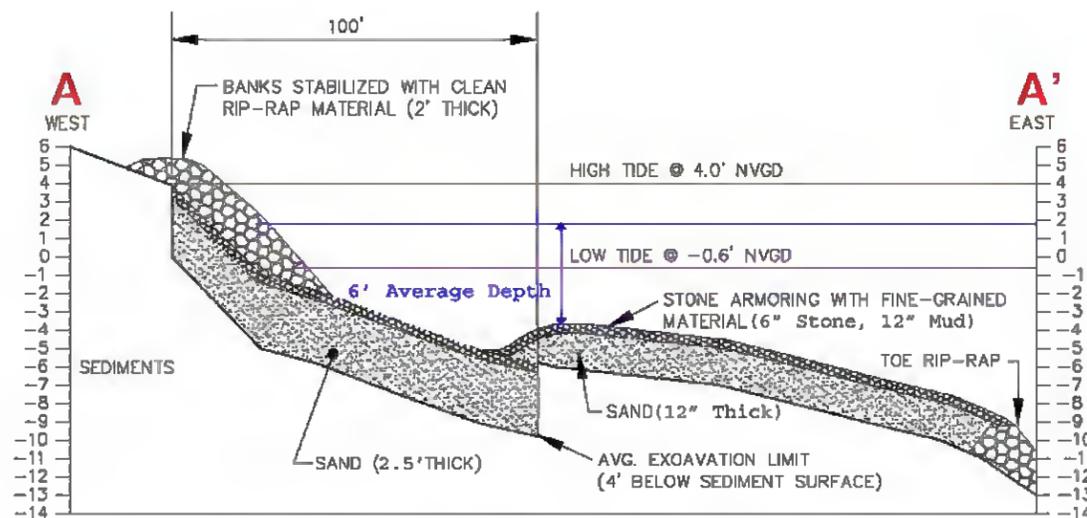
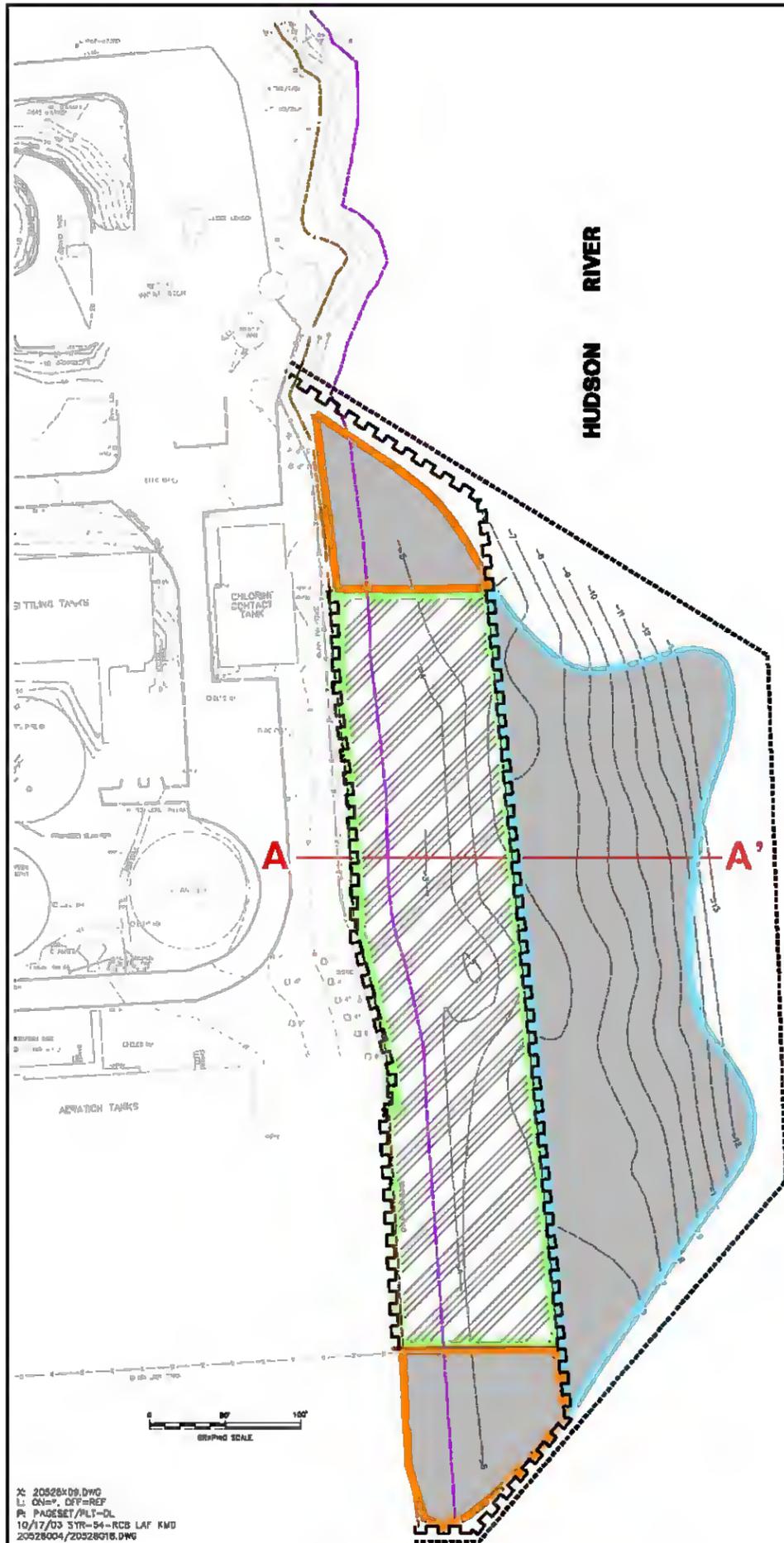
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NEWBURGH PROJECT
FEASIBILITY STUDY

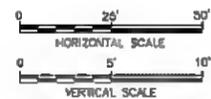
**PROPOSED HUDSON RIVER
 REMEDIAL ALTERNATIVE C4**

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 engineers, scientists, economists

FIGURE
11



CROSS-SECTION A-A'



LEGEND:

- BLP LIGHT STAND
- WV WATER VALVE
- DT DECIDUOUS TREE
- CT CONIFEROUS TREE
- UP UTILITY POLE
- PIV POSITION INDICATOR VALVE
- AREA TO BE CAPPED ABOVE GRADE
- NAPL-CONTAINING SEDIMENTS TO BE EXCAVATED (AVERAGE 4 FEET) THEN BACKFILLED TO GRADE
- AREA TO BE EXCAVATED TO 2.5 FEET THEN CAPPED TO GRADE
- SHORELINE @ HIGH TIDE
- SHORELINE @ LOW TIDE
- TEMPORARY SHEETPILE
- SILT CURTAIN
- SEDIMENTS CONTAINING 20 PPM TOTAL PAHs AT THE SURFACE (0-1 FOOT)
- SEDIMENT CONTAINING NAPL OR SURFACE PAHs > 200 PPM

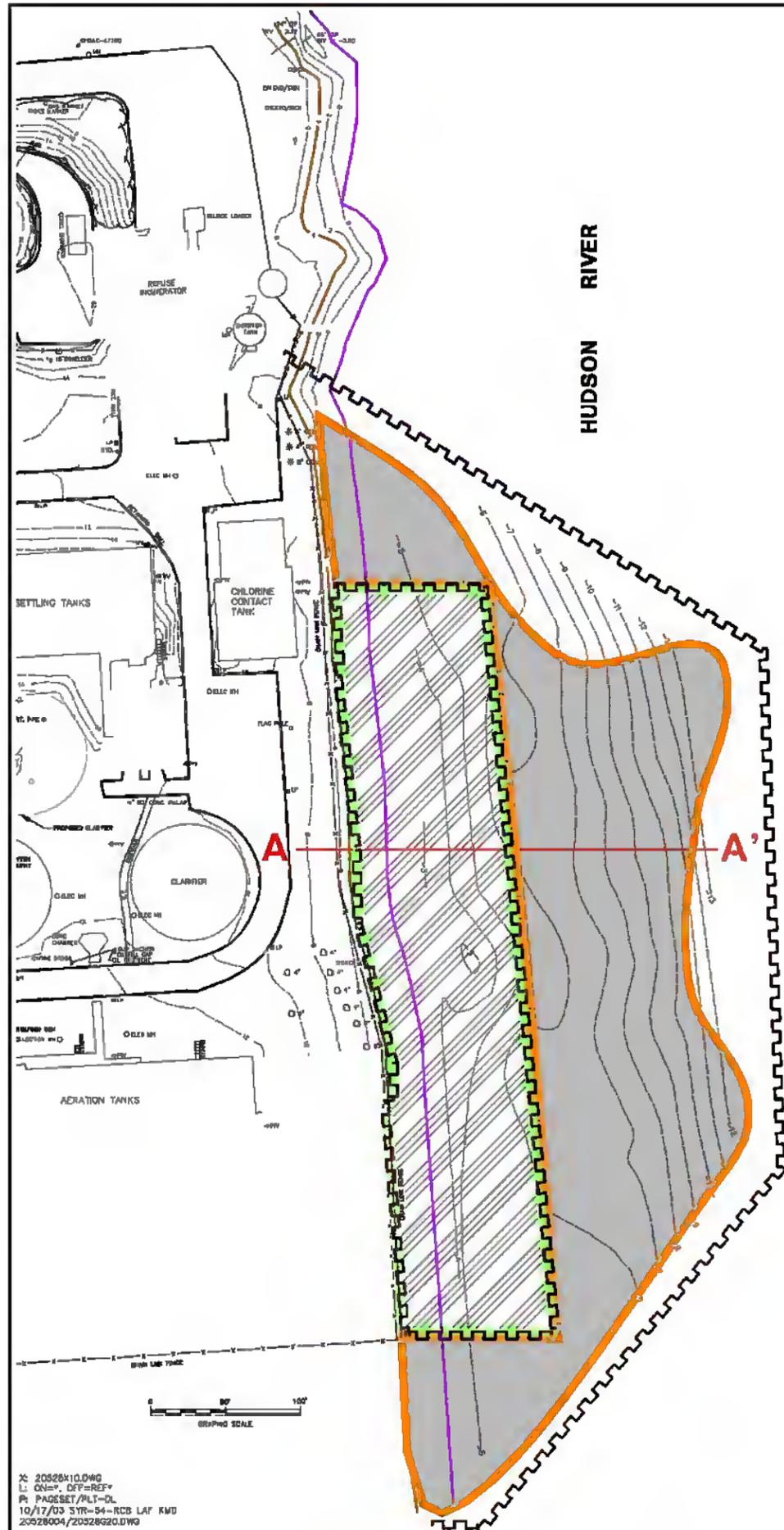
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4. TIDE LEVELS ARE BASED ON WATER ELEVATION DATA COLLECTED AT STATION SG-2 BETWEEN AUGUST 30 AND SEPTEMBER 9, 1996. SG-2 IS LOCATED IN THE RIVER JUST EAST OF THE CHLORINE CONTACT TANK.
5. TARGETED AREA DEFINED AS EXTENDING 100 FEET TO THE EAST FROM THE SHORELINE.
6. NAPL CONTAINING SEDIMENTS WILL BE DREDGED TO 4' AND BACKFILLED/ARMORED TO GRADE. A BELOW-GRADE CAP WILL BE PLACED IN THE REMAINING NEAR-SHORE AREAS AND AN ABOVE-GRADE CAP WILL BE PLACED IN THE REMAINING AREAS. CAP THICKNESS ASSUMED AT 2.5 FEET IN THE REMAINING AREAS.
7. EXISTING RIP-RAP WILL BE REMOVED AND SHORELINES STABILIZED WITH CLEAN RIP-RAP MATERIALS.
8. CAP CONFIGURATION SHOWN WITHOUT CONSIDERING POTENTIAL SEDIMENT BED SETTLEMENT UNDER THE WEIGHT OF THE CAP.
9. SPECIFIC BANK STABILIZATION MEASURES WILL BE DEVELOPED DURING REMEDIAL DESIGN.

**NEWBURGH PROJECT
FEASIBILITY STUDY**

**PROPOSED HUDSON RIVER
REMEDIAL ALTERNATIVE C5**





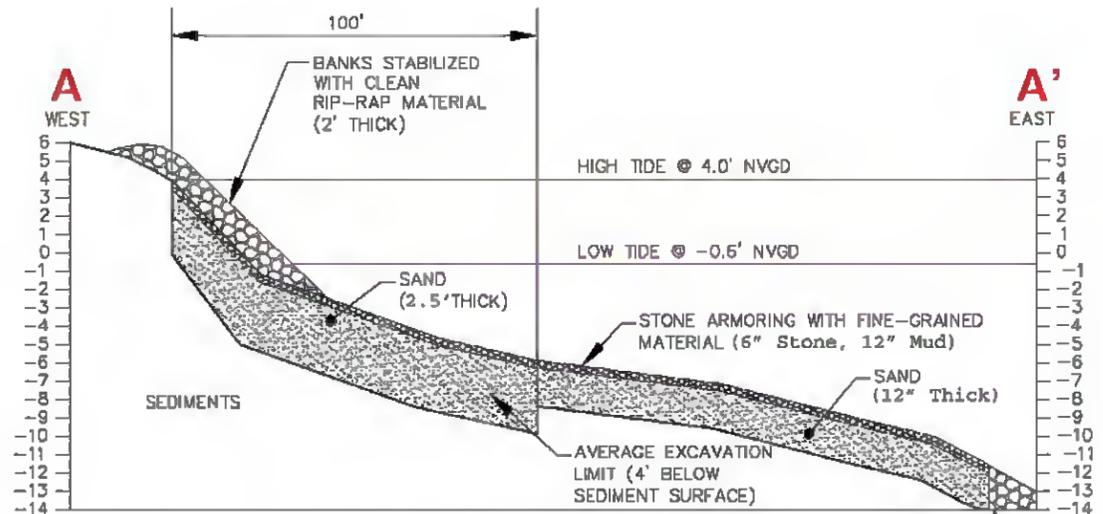
HUDSON RIVER

LEGEND:

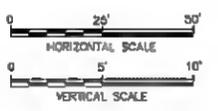
- RIP LIGHT STAND
- WV WATER VALVE
- DT DECIDUOUS TREE
- CT CONIFEROUS TREE
- UP UTILITY POLE
- PIV POSITION INDICATOR VALVE
- AREA TO BE EXCAVATED TO 2.5 FEET THEN CAPPED TO GRADE
- NAPL-CONTAINING SEDIMENTS TO BE EXCAVATED (AVERAGE 4 FEET) THEN BACKFILLED TO GRADE
- SHORELINE @ HIGH TIDE
- SHORELINE @ LOW TIDE
- TEMPORARY SHEETPILE
- SEDIMENTS CONTAINING 20 PPM TOTAL PAHs AT THE SURFACE (0-1 FOOT)
- SEDIMENT CONTAINING NAPL OR SURFACE PAHs > 200 PPM

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6. ENTIRE AREA TARGETED FOR DREDGING WILL BE DREDGED TO AN AVERAGE OF 4' BELOW SEDIMENT SURFACE AND BACKFILLED TO GRADE. AREA TARGETED FOR CAPPING WILL BE DREDGED TO 2.5' BELOW SEDIMENT SURFACE AND CAPPED TO GRADE. CAP THICKNESS ASSUMED AT 2.5 FEET.
7. SPECIFIC BANK STABILIZATION MEASURES WILL BE DEVELOPED DURING REMEDIAL DESIGN.



CROSS-SECTION A-A'



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NEWBURGH PROJECT
FEASIBILITY STUDY

**PROPOSED HUDSON RIVER
 REMEDIAL ALTERNATIVE C6**

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 engineers, scientists, economists

FIGURE
13

APPENDIX A

Responsiveness Summary

RESPONSIVENESS SUMMARY

Newburgh MGP Site City of Newburgh, Orange County, New York Site No. 3-36-031

The Proposed Remedial Action Plan (PRAP) for the Newburgh 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 24, 2005. The PRAP outlined the remedial measure proposed for the contaminated soil, sediment and groundwater at the Newburgh 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 17, 2005, which included a presentation of the Remedial Investigation (RI) and the Feasibility Study (FS) 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. These comments have become part of the Administrative Record for this site. The public comment period was to have ended on March 28, however it was extended by thirty days to April 28, at the request of the public.

This responsiveness summary responds to all questions and comments raised during the public comment period. The following are the comments received at the PRAP public meeting, with the NYSDEC's responses:

Comment 1: What is the problem with this contaminant? What is it toxic to? Is it toxic to humans? Why are we concerned about something that isn't toxic to humans?

Response: Two main categories of contaminants are found in the tar or NAPL at MGP sites. Both categories can be toxic to humans and wildlife, but they need to be considered separately because of differences in their chemical behavior in the environment. It is also important to consider where, and in what form, exposure to these compounds could occur.

BTEX Compounds: The tar contains high levels of benzene, toluene, ethylbenzene, and xylenes, which are known collectively as BTEX compounds. These are volatile organic compounds, which are also found in cleaning solvents and in gasoline. They are slightly soluble in water, although the dissolution of BTEX from the tar into water is very slow. Once dissolved in water, all of the BTEX compounds are subject to attack by bacteria, which use them as a food source. This bacterial digestion process is the principal limit on how far BTEX contamination can spread in the environment.

The greatest human health concern is with benzene, which is identified by the USEPA as a probable human carcinogen; however, the other three compounds pose toxicity concerns as well. The most likely pathway for BTEX contamination to reach humans at this site would be through ingestion of contaminated groundwater.

BTEX compounds are also toxic to wildlife. The point of wildlife exposure at this site are the sediments

of the Hudson River. BTEX that is released from the sediments into the water column is rapidly metabolized by bacteria, and consequently has not been found in the river water. In the sediments, the toxicity due to BTEX is somewhat masked by the much higher concentrations of PAH compounds, which are discussed below.

PAH Compounds: The tar also contains high levels of polycyclic aromatic hydrocarbons, commonly referred to as PAH compounds. This is a broad class of compounds, with hundreds of individual PAH molecules known to exist. USEPA has identified 17 of these as hazardous materials, and they are the PAHs used to define contamination at this site. Some of those 17 compounds are known or suspected human carcinogens. PAH compounds are far less soluble in water than the BTEX compounds, and are less readily broken down by bacteria. Thus, they tend to persist in the environment.

Comment 2: With the wall in place, isn't the coal tar just going to build up behind the wall and then eventually go over the wall and into the river again?

Response: A tar collection system, consisting of wells or a horizontal drain, will be constructed on the land side of the barrier wall to collect any tar which builds up behind the barrier wall. Tar will be removed from the collection system periodically.

Comment 3: Doesn't this type of coal tar occur naturally? I know for a fact it does out in California, in Santa Barbara. I just don't understand why we're spending 22 million dollars to clean up something that we're not being exposed to right now, is twenty feet below the surface, and is hurting only a trillionth of the eco-system (Sturgeon). I think it would be more cost effective to just leave the stuff where it is.

Response: Coal tar does not occur naturally—it is produced as a byproduct of gas and/or coke manufacturing. Some of the toxic constituents of tar (BTEX compounds and PAH compounds) do occur naturally in crude oil, at concentrations generally lower than what is found in coal tar. Please note, however, that naturally occurring materials can still be significantly toxic, particularly when released in quantity.

Comment 4: Isn't there a better way to remediate this site, such as a technology like pressurizing? Can't you get the contaminant in motion and then suck it up? The reason I ask is I have seen such technology in Alaska.

Response: Although the tar will move through the subsurface and in some cases can be drawn into wells, it is generally not possible to remove all of the tar. Some will remain trapped in small void spaces between soil particles. This limitation applies even when water is injected into the ground under pressure.

Comment 5: During the remediation process, how much of an eyesore is the project going to be?

Response: Remediation will be conducted in phases, with each phase involving the use of heavy construction equipment. As such, the actual areas undergoing remediation will resemble a building construction site.

Comment 6: What would happen if we did nothing? Couldn't we prevent future contamination by just buying the contaminated land?

Response: The PRAP briefly discusses the “No Action” alternative for each of the three areas A, B, and C. In each case, the result of doing nothing is unacceptable. Tar would continue to move into the Hudson River, where it would continue to cause slicks and sheens on the water surface and continue to cause sediment contamination. Purchasing the contaminated land would do nothing to change this situation.

Comment 7: If we go and make Central Hudson spend twenty two million dollars on this, they are going to get the money back from us anyway by charging more for gas, correct?

Response: Central Hudson’s rates are regulated by the Public Service Commission, and the costs of site remediation are considered in setting those rates.

Comment 8: I just think it isn’t worth 22 million dollars to have clean soil to dig up later on, and we should just deal with this problem when we have to dig the soil to these depths.

Response: The cleanup is not only intended to limit human contact with contaminated soils. At present, tar is continuing to move into the Hudson River, where both human and ecological contact can take place. The creation of sheens and slicks on the surface of the Hudson River is a violation of New York State Ambient Water Quality Standards, with potential impacts reaching beyond the immediate area of the site. The section of the river where these slicks originate is used by recreational boaters, including rowers who sit very close to the water line and would be likely to get tar on their skin if they were to row through a slick.

Comment 9: How long will the barrier wall be in place before it wears out, and we have to replace it again?

Response: With proper design and construction, the barrier wall should remain effective indefinitely.

Comment 10: Once you start this project and start stirring up the water, how long will it be until the turbidity goes away and there is normal usage of the river again? Are you certain the river will settle down again?

Response: Experience at other dredging projects indicate that excess turbidity will settle out and dissipate rapidly once disturbance of the river bed is complete. During the period when disturbances of the river bed are taking place, engineering controls will limit the spread of turbid water beyond the work area. At a minimum, this will include the use of silt curtains. The activity most likely to create turbidity (dredging) will be conducted inside a sheet pile enclosure. Within this enclosure, turbidity will unavoidably increase during dredging and backfilling/capping, but this turbid water will be isolated from contact with the river. Excess turbidity within the sheeted enclosure will be allowed to settle before the sheeting is removed and normal river flow resumes.

Comment 11: When the coal tar was found in 1994, it halted the expansion of the Sewage Treatment Plant. Has this expansion been finished yet?

Response: Yes, the secondary clarifier project that was postponed in 1994 was completed in 1999. An additional expansion of the *primary* clarifiers began in early June, 2005.

Comment 12: I'm concerned about how this project will affect the future expansion of the sewage treatment plant and consequently the expansion of the town. The sewage treatment plant is currently maxed out, and expansion will be needed for future development of the town.

Response: The portion of the STP which overlies the tar contamination is now almost fully utilized, so there is relatively little room available for expansion. Some expansion, however, is anticipated and has been taken into account in determining the remedy.

The project to install additional settling tanks ("primary clarifiers") was examined carefully when it was first proposed several years ago. A preliminary examination of the plans indicated that these structures are not deep enough to reach into the MGP contamination, which is found at depths of greater than 20 feet in this area. The NYSDEC had some concerns that ground vibration related to this construction could accelerate the movement of tar through this area. In response to NYSDEC requests, Central Hudson installed five additional piezometers in this area to verify the location of the tar contamination and to determine the extent to which it remains mobile. These piezometers continued to accumulate tar over a period of roughly two years, confirming that there is mobile tar in the area at depth and that it can be at least partially recovered with wells. In response, the NYSDEC requested that additional, large-diameter collection wells be installed along the northern and eastern perimeter of the work area. These wells were installed during April, 2005 and have been monitored periodically since then. This has resulted in a high density of data points, confirming the earlier conclusion that the tar was too deep to present an exposure concern for construction workers, STP staff, or the general public in this area. Construction of the primary clarifiers began in June of 2005.

Regarding the second proposed expansion project, nothing in the selected remedy forecloses the expansion of the aeration tanks. The existing aeration tanks are located along the south side of Renwick Street, and one possible location for expansion would be to build between the existing tanks and the river bank. This is adjacent to (but apparently not in contact with) the mass of tar-contaminated soil known to exist at the east end of Renwick Street. The tanks appear to be shallow enough to avoid contact with tar contaminated soil at depth. There is, however, some uncertainty as to the exact limits of MGP contamination in this area, and the remedy contains a provision to ensure that this contamination does not impede STP expansion if and when it takes place.

As noted in the PRAP, some degree of soil excavation will be required during installation of the riverfront barrier wall, which will terminate in an angled "wing wall" near the area of the proposed expansion. If additional tar-contaminated soil is identified during this excavation work and it appears that the contamination extends into the proposed aeration tank expansion area, the contamination will be documented for future reference. At Central Hudson's discretion, the contaminated soil may be removed at that time, or the removal may be postponed until construction is ready to proceed. In either event, Central Hudson will retain responsibility for the removal and disposal of the contaminated soil, and for the collection, treatment, and discharge of any contaminated groundwater which must be managed during construction. The ROD has been revised to clarify this action.

Beyond these two expansions, the portion of the STP property which contains MGP contaminants is largely developed. Additional expansion in portions of the STP property to the north and south would be outside the MGP-impacted area and would require no special precautions.

Comment 13: Why can't we move the contaminant with a surfactant or detergent? How about if you made a trail for the contaminant to follow and kept it well under control?

Response: Surfactant flushing of non-aqueous liquids is an emerging technology that shows some promise; however, full scale implementation at this site poses a number of problems which led to its not being considered. To date, this technology has not been successfully demonstrated on MGP tars.

As with any in-situ technology, the most difficult problem is making sure that the surfactant comes into close contact with the tar. In addition, once the tar has been mobilized by the surfactant, the resulting mixture must be captured to avoid spreading contamination beyond its current limits. Under the conditions at this site, where the tar has spread widely in thin seams, successfully delivering the surfactant and controlling the flow of the remobilized tar would be quite difficult.

Comment 14: What is the capping material? Isn't this material going to erode over time?

Response: The principal consideration in designing the cap will be ensuring its stability over time. The conceptual design in the PRAP appears likely to succeed in this area; however there will be a significant amount of field work, modeling and analysis during the Remedial Design to confirm that the assumptions used for this conceptual design were correct.

The cap will be made up of layers, with one of those layers consisting of four-inch crushed stone as an "armoring" erosion control measure. The NYSDEC is confident that stone of this size will not be eroded in this quiet water area. However, the stone layer in and of itself would not provide a comparable river bottom habitat, so the top layer is to consist of fine sediment (clay and silt) comparable to the material being deposited on the river bottom today. The critical question to be addressed during the remedial design, is to determine whether this fine grained material will remain in place on top of the stone armoring layer.

Comment 15: What type of bedrock is present in this area?

Response: The bedrock is a mixture of dark gray shales and sandstones. Based on examination of nearby outcrops and regional geologic trends, it appears that these rocks are intensely folded and may be highly fractured in some areas.

Comment 16: What is the toxicity of PAHs in aquatic life? What are we going to do ten years from now when we want to expand the Sewage Treatment Plant even farther, and we find coal tar outside of the remediated area. Is Central Hudson still liable. What past experience proof do we have that the cap will work, and won't wash away?

I have some experience with putting caps over contaminated waste sites and making parking lots, and from this experience I can say that something always goes wrong. The caps I've dealt with in the past are on dry land. So I'm having a very hard time believing that a cap is going to work, not on dry land, but in a river? Can you give me some examples of some places where an underwater cap has worked?

Response: Underwater caps have been successfully implemented at several locations, both in the US and worldwide. The USEPA has prepared a very informative document on the subject entitled “Guidance for In-Situ Subaqueous Capping of Contaminated Sediments”, which is available on the internet at: <http://www.epa.gov/glupo/sediment/iscmain/>.

Please bear in mind that a number of factors that limit cap effectiveness on land are less important or absent altogether below the water line. Parking lot caps are subjected to freeze-thaw cycles which crack the pavement, and are also exposed to vehicle traffic which accelerates cracking. This does not take place under water. This cap is not being designed to be water tight or to support a load. It is simply employed to prevent benthic organisms from coming into contact with the low-level PAH contamination beneath the cap.

Comment 17: Our primary concerns are the extent of contaminant left in place and the use of capping as a remedy. We would prefer remedy C6 to the recommended C5. We also have strong reservations about the use of a cap below water, and we strongly urge you to reconsider such a questionable remedy. In your presentation, you mentioned that the target clean up goal for PAHs is 20 ppm. This seems to be very high for a background level, and we would recommend a clean up goal of 4 ppm, which is a more typical widely accepted standard. We don't believe the proposed clean up goal of 20 ppm will adequately protect the resource (Hudson River), and would favor a much lower clean up goal, and effectively a long term, permanent type remedy to the PAH contamination problem at this location.

Response: Application of the 4 ppm screening level as a cleanup goal is inappropriate in this case. Nearly three quarters of the background samples along the Newburgh waterfront exceeded this level, and it is not reasonable to attribute this background contamination to Central Hudson's MGP site. Therefore, a 20 ppm remedial goal has been established for this site as a site-specific determination of the limit of the MGP's influence. Central Hudson's responsibility extends to PAH contamination which can be attributed, in whole or in part, to their MGP operation.

Although the MGP site may be the largest and most concentrated source of PAH compounds along the waterfront, it is by no means the only source. PAH compounds are introduced into the environment from a variety of sources. In particular, street runoff in urban areas is a known source, with PAH contributions from particulate automotive exhaust, motor oil leakage, and other combustion and petroleum-related sources. The background study demonstrated that there are numerous other sources of low-to-moderate level PAH sediment contamination along the Newburgh waterfront. Some of these sources (most notably, the City of Newburgh's storm sewers and combined sewage overflows) represent ongoing sources of PAH contamination that are likely to continue for some time into the future. Sediment remediation performed near these discharge points would be rapidly reversed by these ongoing discharges.

Within the area to be remediated, the cap will be constructed of clean material such that the 4 ppm criterion will be met. However, in areas proposed to be capped without prior removal, a comprehensive sediment toxicity study will be undertaken to determine the actual toxicity of the PAHs in the sediments. Areas shown to be toxic will be capped; in areas shown to be non-toxic, no capping will be required unless the planned sediment erosion studies indicate these sediments are likely to be eroded.

Comment 18: We need a more definitive look at the cap design. We feel that the conceptual design of the cap is not a strong enough basis by which we can pass judgement on the remedy. Just looking at the presentation and schematic of the conceptual cap design, the bathymetry produced looks unnatural to us. We would suggest that the actual design of the cap be open for public comment, not just the conceptual design. We urge you to keep the public advised of the actual design of the cap so we can provide input.

Response: The NYSDEC appreciates that the cap design is conceptual, and the PRAP makes it clear that a Remedial Design investigation will be required to confirm that the cap can be constructed in accordance with the conceptual design. Opportunity for public review of the design concept, including a public meeting or availability session will be held prior to finalization of the design to present these details.

Comment 19: What adverse environmental problems will the remediation project cause in terms of affecting the lives of the people of Newburgh on a daily basis? Specifically, will there be toxic fumes released as a result of the remediation, and will contaminants be falling out of trucks as they drive through town? Can you be sure the public will be safeguarded 100% of the time, not just 95% or 99%?

Response: Potentially adverse effects of the remediation work were considered during remedy selection, and can be addressed using engineering controls. MGP site remediation typically requires active measures to control release of vapors and nuisance odors from tar contaminated soils and sediments. A community air monitoring plan (CAMP) will be instituted for all intrusive work to monitor air quality in and around the site to alert the NYSDEC of any potential airborne release of contaminants of corrective measures may be employed.

Trucks will be inspected prior to departure. They will be covered and no leakage of soils or liquids (whether they are contaminated or not) will be allowed. Truck routes will also be established and access to and from the site will be controlled.

Comment 20: Can you explain to us how the tar removal wells work, and what the term sump means?

Response: The tar removal wells will be six-inch diameter wells, with slotted well screens installed in the depth interval where tar contamination is identified. Below the screen, a sump consisting of an additional length of blank pipe with a cap on the bottom will be installed.

The wells are intended to function passively, with little or no pumping during routine operation. Liquids (both groundwater and tar) can freely enter and exit the well through the screen. Once inside, the liquids separate: tar can settle to the bottom of the well where it will be trapped in the sump for periodic removal. Groundwater is free to continue migrating, out through the well screen and back into the formation. Although there are no plans

to pump these wells on a routine basis, some low-flow pumping may be attempted in cases where it appears that this would increase the flow of tar into the wells.

Comment 21: Are the sturgeon in trouble right now?

Response: Shortnose sturgeon are listed as an endangered species in the Hudson River; however, this listing is

not the result of this MGP contamination. It is unknown what role sediment contamination in the River in general has played in causing the decline in this species. However, the area of contaminated sediment at this site is quite small (compared to the fish's feeding range) so it would be very difficult to demonstrate a direct impact on sturgeon and other bottom feeding fish.

Comment 22: In terms of project scheduling, have you broken the project into phases, and can you give us a time frame of when these phases will take place.

Response: It is expected that the project will be broken into phases. The barrier wall, for example, must be in place before the sediment remediation takes place. Otherwise, tar migration could recontaminate the river bed. In addition, remediation of Area A will require a significant amount of utility relocation and rerouting before it can proceed. Beyond this, the sequencing of each component of the remedy will be worked out in the Remedial Design.

Comment 23: We are happy that this environmental problem is being addressed on behalf of the fisherman, boaters, swimmers, and sturgeon. However, because of the complexity of the remedy proposed we are also requesting in writing a 60 day extension to the public comment period.

Response: In response to this and similar requests, the public comment period was extended by 30 days, to April 28, 2005.

Comment 24: We have completed our review for Area C. We do not think that alternative C5 is acceptable. We feel this remedy does not remove PAHs in the fringe zone of the river and the long term effectiveness of an above grade cap is not good. The above grade cap will provide problems with the Army Corp of Engineers and may cause Ice Jams. We think that instead of a cap near the shore line, excavation should take place in the fringe zone to at least two and a half feet, but ideally up to six feet. In addition, we would like to see remediation at this site done right the first time. Therefore, we would like an excavation of contamination to the state standard and guidance of 4 ppm, which we believe would be the "cream of the crop". We will submit our recommendations for remedies A and B in writing, provided we have more time to review.

Response: See discussion of Comment 17 above.

Comment 25: In Newburgh, and across the United States, we have used rivers as sewers. Can we learn something from this project? Can we take examples for this project from rivers in Europe? How do similar projects in Europe compare to our project? Are we sure we aren't reinventing the wheel?

Response: New York State is a leader in the US in pursuing cleanup of MGP sites. Similar MGP problems have been noted in European countries, and NYSDEC staff monitor the general trends in the cleanup of these sites. Unfortunately, the options available for cleaning up historic sites such as this are fairly limited.

Comment 26: Do coal tar slicks move down the river? Is the drinking water supply safe in the town of Newburgh?

Response: The coal tar slicks observed in the Hudson River have a limited downstream movement when river currents are favorable. There has been no impact on Newburgh's water supply, which is not derived from the Hudson River.

Comment 27: What are the potentials for transporting contaminated material off site by barge? How about rail? They put an actual railroad spur in for another project, right?

Response: Transportation of contaminated material off site will be determined during the Remedial Design. Although rail and barge transport may be considered during the design process, they often prove unworkable for a number of reasons. Loading facilities would have to be arranged at or near the remediation site. In the case of barge transportation, this would be problematic because of the shallow water depths involved. There does appear to be space available for rail loading a few hundred yards north of the site; however, permission to use this area would need to be arranged with the owner. A more important limitation is at the other end of the transportation route. Very few treatment and disposal facilities are accessible by either rail or barge.

Comment 28: I'm still concerned about the contamination getting into the drinking water, because a lot of our drinking water pipes are 100 years old. Can you say with 100 % certainty that our water pipes in Newburgh will be safe from contamination by coal tar?

Response: The only water lines which pass through tar-contaminated areas are those that supply water to the treatment plant itself. Furthermore, water pipes are pressurized, so leakage from these pipes tends to result in water moving outward from the pipes, not inward.

Comment 29: There is a Brownfield site close to the Newburgh MGP. What if these two sites are undergoing clean up activities at the same time? Will the clean up at the Brownfield site affect or delay our project?

Response: This comment refers to the Consolidated Iron site, which adjoins the STP property to the north. Consolidated Iron is being handled by the USEPA under the federal Superfund program. MGP contamination does not reach as far north as the property line with Consolidated Iron, so there is no overlap of contamination. We do not anticipate any interference from the USEPA cleanup.

Comment 30: What time of year will the remediation project take place, because if it takes place in the summer, it is likely to have a large negative impact on surrounding businesses.

Response: The timing of the remedial work has not been determined yet. Much of this scheduling will be performed during the Remedial Design. MGP soil excavations are often scheduled for the winter months, to help control nuisance odors. However, at least some of the work at this site (for example, excavation and cap emplacement in the river) must be conducted when there is no floating ice in the river.

Comment 31: Was a lot of the information that is being presented and gone over tonight included in the Environmental Impact Study?

Response: The information presented here tonight is presented in the Remedial Investigation Report and in the Feasibility Study Report, both of which can be found in the document repository. These are considerably more detailed than what would be presented in an Environmental Impact Study. The fact sheet for the site briefly summarizes the information.

Comment 32: What is the next step after tonight's meeting?

Response: Once the public comment period closes, the NYSDEC will prepare a summary of the comments received, and our responses to each. The PRAP will be revised, as appropriate, and the combined document will then be released as the final Record of Decision for the site.

Comment 33: From experience traveling up and down the Hudson, I have noticed that most of the sediment on the shoreline is fill and often gravel. So it doesn't make sense to me that a mud cap is going to stay in place, when everywhere else on the river the sediment is gravel along the shoreline.

Response: The Hudson River shoreline in the vicinity of the site is primarily a man-made river bank consisting of fill, gravel, and boulders which were placed to make dry land in formerly shallow-water areas and to prevent shoreline erosion. As you move away from the shore, however, the natural river bottom is made up of much finer-grained materials such as silts and clays. The remedy calls for cap placement only in deeper water areas (6 feet average water depth and above). Sediments observed in this area during the Remedial Investigation were clays and silts, with minor amounts of fine sand.

Comment 34: Will trucks be hauling sediment out wet? How far are the trucks going to be going? Do they burn the dirt at the facility where the contaminated soil goes? How many total truck trips will be required to complete this project?

Response: The sediment will be dewatered prior to shipment off site. Contaminated sediment and soil will be sent to an off-site treatment/disposal facility and some will be thermally treated. This is not "burning" in the strict sense of soil incineration. Rather, the soil is placed into a rotating kiln where it is heated sufficiently to vaporize the organic contaminants. The vaporized contaminants are then destroyed by oxidation. There are a number of such treatment facilities available, both regionally and nationwide. Selection of a treatment facility has not yet been made.

The estimated volume of sediment to be removed is 9000 cubic yards. This is equivalent to roughly 450 tandem dump truck loads.

Comment 35: How will the final remedy be presented?

Response: The release of the Record of Decision will be announced in a fact sheet, which will be mailed to everyone on our mailing list and will also be placed in the document repositories. The ROD will also be available at the repositories, and will also be available on the NYSDEC's web site.

Comment 36: How can we access the ROD on the web? What are additional avenues for public involvement?

Response: The fact sheet announcing release of the ROD will contain the web address to access the ROD. Additional public participation will be scheduled during the development of the Remedial Design.

Comment 37: How much does the public input tonight factor into your final remedial decision?

Response: Public acceptance of the proposed remedy is an important part of the remedy selection process. Proposed remedies can be (and have been) altered as a result of public comment.

Comment 38: What is the planned monitoring duration for the site, and the underwater cap specifically?

Response: Since substantial quantities of waste will remain in the subsurface, monitoring will be continued indefinitely. For cost estimation purposes, it is assumed that monitoring will continue for 30 years. This does not imply that monitoring will be discontinued at that time.

Comment 39: Is the ROD Final? Are any changes possible after the ROD comes out?

Response: The ROD describes the selected remedy for the site. However, if new information regarding site conditions becomes available, or if the selected remedy proves unworkable for any reason, there is a process available for amending the ROD.

Comment 40: Given the concept of the 30 day period for comments, why aren't we given the opportunity to comment in a meeting such as this until midway through the 30 day time frame? To the layperson, the PRAP may not always make sense.

Response: The public meeting is scheduled to provide enough time for participants to read the PRAP, while still leaving enough time to prepare written comments following the meeting. Thus, the meetings tend to be scheduled toward the middle of the 30 day comment period. With the subsequent extension of the comment period to 60 days, adequate time for preparing written comments was provided.

Comment 41: Has this situation effected the functioning of the STP?

Response: Most of the tar beneath the STP is moving at depths too great to impact STP operations. To our knowledge, there have been no effects on the routine, day-to-day operations of the STP. However, when the deep secondary clarifier tanks are emptied for periodic maintenance, contaminated groundwater and some tar sheens have been reported entering the tanks through pressure relief valves in the tank bottoms. This water can be successfully treated.

Comment 42: How would this proposed remedy impact future required expansions or modifications of the STP? If the city decides in the future to expand the Sewage Treatment Plant, and we find more coal tar and problems outside the proposed remedial actions areas, can we still hold Central Hudson liable for clean up? Can such an additional liability be worked into the present clean up agreement?

Response: See Responses 11 and 12. The remedy calls for a soil management plan (SMP) to control handling and disposal of any MGP-contaminated soils which may be encountered during future expansions,

modifications, or other excavation work. Central Hudson remains legally liable for the costs of preparing and executing the remedy (including the SMP). However, there may be side agreements which do not involve NYSDEC that shift those costs in whole or in part to other parties.

Comment 43: Will the barrier wall just be straight?

Response: No. There will be angled “wing walls” on the ends to assist in the capture of tar and prevent the tar from flowing around the wall. In addition, some bends in the alignment of the wall may prove necessary to avoid obstructions such as the chlorine contact tank and the outfall pipe.

Comment 44: How much scientific literature have you reviewed concerning the effect of either NAPL or PAHs on benthic organisms?

Response: PAH contamination of this sort is commonly found at MGP sites. Scientific literature relating to the effects of this contamination is reviewed as we evaluate site conditions.

Comment 45: How will the coal tar that collects along the barrier wall be pumped out?

Response: The details of the tar collection system will be established during the Remedial Design, but there are only two options to choose from: either vertical wells or a horizontal collection drain. Both would be installed on the west (land) side of the barrier wall to collect tar that accumulates behind the wall. Tar would be removed periodically, either by hand (using bailers) or pumped. The removal schedule would be adjusted to ensure that the tar collection sumps do not become overfilled.

Comment 46: Has the current river bed contamination affected the sturgeon or other groundfeeders?

Response: The area of **contaminated sediment** is quite small, compared to the fish’s feeding range, so it would be very difficult to demonstrate a direct impact on sturgeon and other bottom feeding fish.

Scenic Hudson, the Riverkeeper and the Sloop Clearwater submitted a joint letter dated April 28, 2005 which included the following comments:

Comment 47: In separate letters dated March 17, 2005, both Hudson River Sloop Clearwater and Scenic Hudson requested a 60-day extension to the public comment period due to the complexity of the site and the multifaceted aspects of the proposed remedy. The extension of only 30 days remains inadequate.

Response: The thirty day extension is in line with extensions granted at other sites, and is considered adequate for review of this site as well.

Comment 48: Although the Department has previously held the required public meeting to discuss this proposed plan, we strongly request a formal public hearing. Given the probability that this remedy will set a precedent for other regional MGP sites and the fact that this is a very complicated site with multiple remedies being proposed, each of significant technical complexity and intrinsically connected with each other, we believe this request should be honored.

Response: The NYSDEC has a strong citizen participation program at all of the sites in the remedial programs managed by the Division of Environmental Remediation. No written comments on this PRAP were received from individual members of the public, despite significant publicity in local media, the mailing of a fact sheet, and a doubling of the normal comment period. The NYSDEC does not believe a public hearing is justified in this case and further opportunities for input and notices of the progress of the design will be provided as this project proceeds.

Comment 49: In addition, the PRAP does not include a mechanism for ongoing public process throughout the remedial design, remediation and monitoring phases, and it should.

Response: There are already procedures in place providing for public input throughout the process. These future events are not detailed in the PRAP, but rather in the site CP plan. Additional meetings will be held as the Remedial Design approaches completion, to allow further comment on the details of the design and its implementation. Fact sheets will also be issued when project developments warrant.

Comment 50: The PRAP Does Not Specify Standards, Criteria, and Guidance. The goal of a remedial action is to restore that site to pre-disposal conditions, to the extent feasible and authorized by law. The regulations also require that consideration being given to guidance determined to be applicable on a case-specific basis. But, relevant guidance and how it was applied to this project was not offered for public comment. This information is necessary to understand and comment on the PRAP.

Response: Section 5.1 identifies the SCGs for this site. The PRAP notes that the site is currently causing a violation of New York State Ambient Water Quality Standards, in that sheens and slicks are sporadically generated on the surface of the Hudson River due to tar contamination in sediments. The remedy is designed to address this situation directly through removal of sediments that contain tar, and through capture of tar before it reaches the river.

As discussed in Section 7.1 of the PRAP, restoration of pre-disposal conditions in Areas A and B is not feasible due to the extensive migration of tar into deep soils and bedrock and the presence of critical infrastructure such as railroad tracks and the sewage treatment plant. With tar widely distributed in places where it cannot be totally removed, restoration of groundwater quality to drinking water standards will not be achieved by any available technology.

There are no existing standards for sediment quality. The Technical Guidance for Screening Contaminated Sediments was used in the evaluation of sediment contamination at the site. Although the screening criterion of 4 ppm has not been used as a cleanup value, the remedy for Area C will achieve a clean sediment surface in the areas that are capped. Some PAH contamination will remain in sediments at depth below the cap; however, these sediments will be isolated from contact with benthic organisms and other fish and wildlife receptors by the presence of the cap. Areas that may be shown to be non-toxic, through toxicity testing undertaken as part of the design, will not be capped.

Comment 51: The Remedy Selection Does Not Protect Public Health and the Environment. Based on our review of the contamination and remedial issues, the overall remedy selection is unsupported and

does not fully take into account factors such as protectiveness, effectiveness, adequate control, feasibility or community acceptance. This is true for Areas A and B, but even more troubling for Area C, Hudson River sediments.

The proposed remedy appears to be using visual observation as the basis for removal and excavation. Removing only “grossly contaminated material” may not meet the goal as stated above. Cleanup objective should follow the Department’s own guidance such as the “Ambient Water Quality Standards and Guidance Values” and the “Technical and Administrative Guidance Memorandum (TAGM) 4046; Determination of Soil Cleanup Objectives and Cleanup Levels.” These cleanup goals should be established to protect human health, ground water and ecological resources.

Response: The NYSDEC has developed a considerable amount of experience in MGP site cleanup over the past 5-10 years, and has found that visual and olfactory identification is highly effective for identification of MGP-impacted materials. Tar is dark colored, oily in appearance, and has a conspicuous odor. Even soils that do not contain visible tar can be identified by staining and odor. Visual and olfactory identification is a quicker, more cost effective, and in most cases more reliable means for identifying contaminated soil.

The critical issue at this site, as at many other MGPs, is the movement of undissolved tar (NAPL) through the subsurface. The source materials in which tar resides, and the pathways by which this migration occurs, are difficult to predict in advance, but are not difficult to recognize once they have been uncovered or sampled. In this context, grossly contaminated materials are those that contain visible drops or stringers of tar, or that contain such heavy oily sheens that we can reasonably conclude that there was tar present before the sample was disturbed during collection. These materials are the highest priority for remediation, since they serve either as reservoirs for NAPL contamination, or as conduits for moving the contamination through the subsurface.

As noted in the PRAP, most of the NAPL movement is taking place at depths where human and ecological contact is unlikely. The most likely points of exposure are in the Hudson River sediments and in deep underground utility excavations in Areas A and B. While it is tempting to maintain that all contamination in all three areas should simply be removed, the NYSDEC has not identified any technology that can achieve this goal, particularly in light of the existing use of the land for vital services such as transportation and sewage treatment.

New York State Ambient Water Quality Standards are cited in Section 5.1 of the PRAP, in the context of sheens being generated on the surface of the Hudson River by the presence of MGP contaminated sediment on the river bottom. This condition is a violation of the narrative portion of those standards and is a common observation at MGP sites with sediment contamination. Please bear in mind that the primary ecological exposures in the river are in the sediments, not the water column. Despite the presence of liquid tar on or near the sediment surface, very little dissolved contamination was found in the river water. The low level of dissolved contamination that was identified was in close proximity to heavily contaminated sediments that will be removed; consequently, the chemical-specific ambient water quality standards are expected to be achieved by the remedy. During construction of the remedy in Area C, surface water will be monitored, and appropriate controls will be in place to ensure that no water quality standards (narrative or chemical) are exceeded.

Comment 52: The DEC needs to set measurable and enforceable cleanup standards, based on its own guidance, for the removal of NAPL-impacted soils and sediments. Based on its own guidance, we urge the Department to set more specific cleanup goals for this site. Goals should include but not be limited to:

Contaminant	Rec. Soil Cleanup Objective (ppm)*
Benzene	0.06
Toluene	1.5
Ethylbenzene	5.5
Xylenes	1.2

***Source: Technical and Administrative Guidance Memorandum (TAGM) 4046; Determination of Soil Cleanup Objectives and Cleanup Levels**

Response: As noted in the response to comment 51, visual and olfactory observations are the most rapid and reliable means for identifying NAPL-impacted soils and sediments. The TAGM cleanup objectives cited are based on protecting humans and ecological receptors from direct contact and on protecting groundwater. The assumptions used to derive those numbers need to be considered when applying them. Routine human contact with MGP contaminated soils is quite unlikely at this site, since they are not exposed at or near the ground surface. Ecological contact with these soils is unlikely for the same reason. Incidental human contact with contaminated soils during excavation is a potential concern, and the remedy addresses this through the use of NAPL removal and in-situ oxidation in the area where underground utility work is the most likely exposure in the future and the site management plan, with requirements such as a worker health and safety plan and soil handling and disposal plans will protect these future workers. Also, the 1999 plant expansion involved excavations along both Renwick and River Streets, in areas with significant levels of tar contamination, which were successfully completed using similar engineering controls. Groundwater is not used for potable purposes anywhere at or near the site, and no technology exists to restore groundwater to drinking water standards in any case. The remedy calls for institutional controls to prevent this exposure pathway from developing in the future.

Comment 53: We are particularly concerned about the PRAP's reliance on institutional and engineering controls in lieu of a removal to standards that would otherwise apply. Indeed, there has been no evaluation by Central Hudson or the Department of the efficacy of relying on such controls.

The proposed “imposition of an institutional control in the form of deed restrictions or environmental easement that would limit the use and development of the property...” (p. 2) would restrict not only the use of Central Hudson’s property, but that of the City of Newburgh, CSX, neighboring properties, and of the Hudson River as well. Such restrictions are not merely unfair to the City, but are inconsistent with provisions in the City of Newburgh’s Local Waterfront Revitalization Program, the New York State Waterfront Revitalization Act, and the federal Coastal Zone Management Act.

Response: No prohibition of public access to City-owned properties is proposed. Access restrictions to these properties are not necessary because no MGP-impacted materials are present on or near the ground surface. Access to the MGP site itself is already restricted for security reasons, not because of MGP contamination.

Neither are the institutional controls intended to prohibit redevelopment of the STP site. Industrial, commercial or restricted residential redevelopment (apartments or condominiums) could be permitted, provided that appropriate precautions detailed in the site management plan are observed. Please note that the City already has controls in place that largely achieve this same objective. The land is already zoned for industrial use, and the City's Local Waterfront Revitalization Program strongly discourages residential development along the river front. This issue is discussed in greater detail in response to the City's comment letter below.

The institutional controls are proposed to prevent direct contact with contaminated soil that lie at depth below the ground surface on the city's property, and to prevent ingestion of contaminated groundwater. The contaminated soils can not feasibly be excavated in full, due to their depth or their proximity to critical infrastructure such as railroad tracks or sewage treatment plant components. Although no exposure pathways exist currently for subsurface soils, future excavation work could create exposure pathways if these soils are not properly managed. The site management plan will be written to manage these exposure pathways, which may develop in the future.

Even if all the contaminated soil could be removed from the City's property, tar contamination in the underlying bedrock would remain. Groundwater that comes into contact with these materials will continue to become contaminated. Thus, an institutional control to prevent ingestion of this groundwater would be necessary even if all the soil contamination could be removed. Such an institutional control is not burdensome. Public water is available throughout the affected area, no wells are currently in service, and the presence of the sewage treatment plant would make groundwater use unattractive, even if the MGP contamination were absent. The NYSDEC does not believe that such restrictions violate any of the programs and statutes cited.

Comment 54: Perhaps the most objectionable institutional control would be the use of signage warning against anchoring in the affected areas of the Hudson River. We know of no similar warning signs anywhere on the Hudson River where such a limitation has been imposed due to environmental impairment.

Response: The PRAP does not call for an institutional control or signage prohibiting anchoring, and the NYSDEC does not anticipate that such a prohibition will be necessary.

It must be noted that both dredging and anchoring are already subject to restrictive signage at the north end of the STP property, a few hundred feet to the north of the area in question, due to the presence of a major natural gas pipeline that crosses the river at this point. If some future development were to call for removal of the sediment cap, this could be accomplished as well, provided that the mass of contaminated sediment below the cap is removed at the same time.

Comment 55: The Department should consider dredging to depths sufficient to allow unrestricted boating and navigational uses; specifically the proposed depth of remediation of four feet would limit the use of a future pump out station at the Sewage Treatment Plant (STP). If the MGP contamination is properly remediated, we see no reason why such a restriction would be necessary.

Response: The PRAP cites water depths as minimum figures, subject to adjustment upward during the Remedial Design in keeping with anticipated recreational boating uses. The NYSDEC has used a 4 foot minimum depth for boat docks at recreational facilities elsewhere in New York State. Due to tidal variations, this is equivalent to an average water depth of 6 feet. If boat access requires a greater water depth, then the cap design will be adjusted to accommodate this.

Comment 56: Excavation is being limited to “grossly contaminated material” (p. 19). The potential exists to excavate more material through efforts such as the relocation of gas lines. The remediation of Area A should require the complete removal of all NAPL contaminated soil, regardless of the need to relocate the metering station and associated utilities.

Response: The overall approach in area A is to remove as much NAPL-impacted soil and bedrock as practicable through excavation and to limit the mobility of what is left behind through gradual collection. The removal is targeted on two known or suspected source areas: the southeast corner of the site and the former relief holder. In both locations, the presence of infrastructure such as city streets or gas storage facilities will limit how far contamination can be “chased” into outlying areas.

The gas regulator station is not the critical limit here. If a tar source area is identified beneath the regulator station, then the regulator station will be either relocated or bypassed to allow excavation. In addition to the regulator station, there is also a gas storage facility close by, consisting of three very large subsurface propane storage tanks that would be far more difficult to relocate. There are serious safety and reliability issues involved in relocating large scale gas storage and transmission facilities that must be weighed against the benefits of additional contaminant removal. These tanks are located uphill from the tar source areas and as such the soils beneath them are not likely to be heavily contaminated. While it is possible that some tar has moved into this area, and will not be excavated, direct exposures would be minimal: this tar would be located at depth and the entire CHGE site is already fenced, secured and under 24-hour video surveillance. There is also a “second line of defense” against off site migration of any tar-contaminated material left behind, in the form of tar collection wells in both the overburden and the bedrock.

Comment 57: The barrier to prevent Central Hudson’s wastes from leaving its property is insufficient to protect the City’s property and the Hudson River from re-contamination. Further efforts to ensure a complete remediation of the Central Hudson property are necessary to minimize the dependency on the inadequate containment measures proposed.

Response: The barrier, in this case the row of wells along the eastern boundary of the MGP site, is only a part of the overall strategy to control tar leaving the MGP site. The selected remedy for Area A needs to be considered in its entirety, with tar collection wells being used in combination with the other components of the remedy. The remedial goal is to prevent the migration of tar away from the MGP site. This is to be achieved through a combination of several removal efforts targeting specific areas.

The principal removal is being achieved through excavation. The known or suspected sources of concentrated tar contamination are the tar-contaminated soils in and near the former relief holder and the former plant site. These two areas contain the largest reservoirs of liquid tar, and their topographic elevation means that this is the

tar with the greatest hydraulic head, which thus poses the greatest threat to move off site. With these areas delineated and removed to the extent practicable, the balance of hydrodynamic forces that cause tar to move through the subsurface should shift significantly.

Beyond these excavations, there will still be lesser amounts of mobile tar present beneath the MGP site in the bedrock, and possibly in some areas of inaccessible soils as well. Tar collection wells will be installed in the interior of the MGP site in any areas where tar could not be excavated. It will not be possible to identify and intercept every bedrock fracture or soil structure along which the tar is moving. On a site-wide basis, however, the collection wells should further reduce the overall hydraulic head of the remaining tar, and in so doing greatly reduce the hydrodynamic forces that cause it to move through the subsurface. It is not necessary to remove all of the tar in order to achieve this goal. The freely drainable fraction that is most likely to move into collection wells is also the fraction most likely to move off site.

Combined, these efforts will greatly reduce the supply of tar available for off site migration, and remove much of the tar that is already in transit. The perimeter tar collection wells along the eastern boundary of the MGP site are intended to capture enough of the remaining tar to eliminate further movement of tar into off site areas. The long-term performance of these will be used to evaluate the effectiveness of the overall strategy. If the perimeter wells continue to yield tar after the other remedial measures are complete, this will be taken as evidence that those measures have not been fully effective.

With respect to tar migration into the Hudson River, please bear in mind that there is yet another line of defense, in the form of the barrier wall along the river front in Area B. Any tar that escapes capture at the MGP site would still be prevented from entering the river by this wall.

Comment 58: The collection wells will be passive, but will become active “if results indicate that this would increase the rate of removal.” The criterion for switching to active removal was not specified. The wells installed to capture mobile MGP wastes are too widely spaced to be effective, and neither Central Hudson, nor the Department, has studied their effectiveness. Given the spacing of the wells and the extent of contamination, we strongly recommend active collection of liquid tar by pumping, as has been employed in other remedial projects.

Response: The NYSDEC has had success at other sites using passive recovery wells to recover MGP tar from the subsurface. In some cases, tar removal can be increased by pumping the wells, but this is by no means assured. In cases where tar is moving along thin fractures or sand seams, aggressive pumping can actually be counterproductive, with the tar seams becoming “pinched off” by groundwater moving toward the pumping well. The effectiveness of such wells has not been studied because it can only be determined on a case-by-case basis, and the wells do not yet exist.

Two sets of tar collection wells are to be installed, as noted in the response above. Both sets of wells are best located using an iterative process. The initial 25 foot spacing is intended as a first round, to identify areas of tar mobility, with additional wells to be drilled based on the results of the first ones. One such round of follow-up drilling would reduce the well spacing along the eastern edge of the property to 12.5 feet. Further reductions in

spacing may be made if data generated from the first rounds warrant. This iterative approach to tar collection, with the results of each round of well installation used to guide placement of the next round, has been implemented successfully at other MGP sites and offers a higher chance of success than blindly drilling wells on a pre-set spacing.

Comment 59: Of the alternatives presented, the proposed Alternative A4 appears to offer the best plan for remediation of the former MGP plant site. To reduce movement of contaminants off-site, the Department should consider the feasibility of installing a containment wall/slurry wall along eastern portion of Area A.

Response: This additional barrier wall was considered during preparation of the PRAP and was rejected. Tar is moving away from the MGP site in both bedrock and overlying soils. A containment wall could only be constructed in the soils and, thus would only partially cut off tar migration. Tar flow through the bedrock would continue and could even increase if tar that is stopped by the soil barrier drops downward into the bedrock. The soils beyond this wall are already contaminated with tar that, as noted elsewhere, can not be removed with any available method.

Comment 60: There is a need for additional analysis of depths of removal and the reasoning/technical defense of proposed excavation depths of NAPL-impacted soils. Additional excavation is necessary –particularly around gas lines. The feasibility of relocation of all gas lines to allow for complete removal should be considered. More material can and should be excavated from Area A.

Response: The depth of soil removal near the relief holder has already been maximized–this area will be excavated to the top of rock (and somewhat beyond, if the top layer of bedrock is sufficiently fractured). In the southeast corner, the excavation will proceed as deep as practicable, with potential limits due to shoring and excavation stability. If NAPL-impacted soils are identified around gas lines, they will be removed to the extent practicable. As noted above, there are significant safety issues involved that need to be weighed against the benefits of a more complete removal.

Comment 61: A site management plan (SMP) is necessary to address residual soil contamination, potential vapor intrusion into buildings, operation and maintain issues, including tar collection, groundwater monitoring, and use restrictions regarding site development and groundwater use. Deed restrictions limiting future use of the Central Hudson site to commercial or industrial uses may be appropriate, but imposing these restrictions on neighboring properties (Area B and beyond) is a serious deficiency of the proposed remediation.

Response: A SMP is called for in the ROD. No formal deed restrictions are to be involuntarily imposed in area B. Central Hudson is obligated to use best efforts to obtain an institutional control with the property owners in Area B that would require compliance with the approved SMP. The institutional control will also require Central Hudson institute, a periodic notification to current and future landowners or operators of facilities in Area B to remind those owners/operators of the contamination present and the need to comply with the terms of the SMP.

Comment 62: While it is recognized in the PRAP, page 1, that future activities may require additional excavation at this site, the Department does not sufficiently address the issues that arise if future activities warrant additional excavation. One of the primary issues is - who will be responsible for remedial excavation and how will such excavation be handled?

We recommend that the remedy for Area A be revised to incorporate the issues identified above.

Response: Procedures for proper handling and disposal of contaminated soils will be specified in the Site Management Plan. Future excavation in Area A, which is owned by Central Hudson, will be the responsibility of Central Hudson. Central Hudson remains legally liable for the costs of preparing and executing the remedy (including the SMP). However, there may be side agreements, which do not involve NYSDEC, that shift those costs in whole or in part to other parties.

Comment 63: There is significant off-site contamination on adjacent properties including the Newburgh Sewage Treatment Plant (STP) due to discharges from the Central Hudson property. Appropriate measures must also be taken to ensure that the STP and any other off-site areas are characterized and remediated to adequately protect public health, the environment and ensure worker safety. The use of institutional controls as an alternative to actual remediation should be minimized.

In the summary of the proposed plan on page 2, the remedy for Area B makes no mention of removal of contaminated soil at the foot of Renwick Street. However the description of Alternative B-7, on page 23, it is indicated that additional removal may occur at the foot of Renwick Street to facilitate the installation of the barrier wall. We are very concerned that the hazardous materials that are known to exist at the foot of Renwick Street will remain in place and may only be removed to the extent necessary for the function of the barrier wall. This material must be removed regardless of the depth and location of the barrier wall.

Response: The contamination at the base of Renwick Street was found at depths of roughly 10-40 feet below grade. Under current conditions, both human and ecological exposures are unlikely. The City of Newburgh has identified this as a possible area for future expansion of the STP aeration tanks. These are relatively shallow structures, and can probably be constructed without encountering MGP contamination. Ecological exposures can be addressed with the barrier wall, which will prevent movement of tar into the Hudson River.

Comment 64: Recognizing the constraints posed by existing infrastructure and the technical complexity of remediating Area B, we find that all the alternatives for Area B result in very limited, if any removal of tar and tar-contaminated soils. Despite the complications, considerably more remediation can and should be done in this area.

Response: Most of Area B is already occupied by transportation and sewage treatment infrastructure, which greatly limits remediation in this area. The remedy addresses those exposure routes that are most likely to occur in Area B through tar collection and in-situ oxidation along Water Street. With the exception of underground utility work, the potential for exposure to hazardous substances in this area is low.

Comment 65: Our concerns about the effectiveness of the proposed passive collection wells outlined

above for Area A are also applicable to Area B. The PRAP refers to "passive tar recovery wells" that will be installed in the central portion of the STP property. Recovery wells would imply active pumping to remove contaminants. Mobile subsurface tar will be difficult to locate. Tar that is not captured by collection wells will continue to migrate toward the Hudson River. To reduce this possibility the proposed remediation calls for in situ treatment and a containment wall.

Response: Since the function of the wells is to remove tar from the subsurface, labeling the wells as extraction or recovery wells is perfectly appropriate. The wells are not constructed as monitoring wells—for example, they are to be three times larger in diameter (6 inches vs 2 inches) and equipped with sumps which together provide a dramatic increase in tar storage capacity and sufficient room for installation of a pump, if necessary, in the future. As noted elsewhere, pumping on a tar recovery well does not necessarily increase tar yield. It does, however, create the need for treatment of large quantities of groundwater. The need to conduct pumping will be evaluated once the wells are installed.

Comment 66: More information should be provided on the in-situ chemical oxidation treatment outlined in the proposed Alternative B4. The PRAP should better describe how the chemical oxidation process works and cite examples of its use. Has the proposed method of in-situ chemical oxidation been utilized effectively at other MGP sites?

Response: Oxidation of hydrocarbons to carbon dioxide and water is a well known process. *In situ* oxidation has been widely applied to remove dissolved-phase contamination at sites contaminated with petroleum hydrocarbons. As with any in-situ technique, the most significant limitation is physical—getting the oxidants into close contact with the contaminants is essential. As noted in the PRAP, due to this limitation, in-situ oxidation is best considered as a “polishing step” to address dissolved phase contamination and widely dispersed drops and stringers of NAPL. It is not expected to be highly effective against discrete pools of NAPL, because the oxidants are delivered in aqueous solution and cannot mix well with discrete bodies of NAPL. No large pools of tar have been identified in this area, despite a very large number of borings drilled by both the City and Central Hudson, but some could exist. Consequently, the remedy calls for removal of all freely drainable tar prior to injection of oxidants.

Comment 67: Are there other in-situ remedies, such as steam injection or other thermal technologies that might be more effective in removing toxic materials from this highly contaminated site? Perhaps this method could be piloted at this site for potentially use at other MGP sites.

Response: At the City’s request, The NYSDEC examined the possible application of steam injection as an in-situ technology for removal of tar contamination from soils beneath the STP and adjacent areas. The technology, known as Dynamic Underground Stripping (DUS), is a new technology developed within the past 5 years in which high temperature steam is injected into the ground to mobilize and remove liquid organic contaminants such as MGP tar. The steam would warm the tar contamination, reducing its viscosity and increasing its mobility, and the steam pressure would force the tar through the subsurface to collection wells surrounding the area of steam injection. Although DUS has not been applied to MGP tars, it has been shown to be effective at a site that was contaminated with creosote. Creosote is an oily, dense, wood-preserving liquid that is similar in many respects to MGP tar.

Current land uses and proximity of the tar contamination to the Hudson River greatly limit the applicability of this technology at the Newburgh MGP site and surrounding areas. The two most grossly contaminated areas where steam stripping technology could be most promising (the central portion of the MGP site and the central portion of the STP) both contain underground utilities that would be susceptible to potentially catastrophic damage if exposed to high- temperature steam. At the MGP site, these utilities consist of natural gas pipelines. Heat induced failure of joints in these pipes would raise obvious safety issues. At the STP, the heaviest tar contamination is found in the central portion of the site where the bottoms of all three final clarifier tanks appear to be in direct contact with tar at depths of 20-25 feet. Piping enters all three of these structures from beneath. The seals where the pipes enter the tanks and seals at joints in the pipes could be subject to damage if exposed to high- temperature steam.

Steam injection may also alter the structure of the soils, allowing them to settle following treatment. Settlement would cause problems with support of subsurface piping—both the gas pipes at the MGP site and process piping at the STP. The possibility of pipe misalignment and cracking at pipe joints cannot be ruled out. Similar concerns with settlement would limit the applicability of steam injection in the area beneath the active railroad lines.

Comment 68: We are very concerned about the adequacy of the containment wall outlined in the proposed Alternative B7, which is designed to allow groundwater to flow over the top of it. We believe there is a distinct possibility of contaminated groundwater passing over the top of the wall. The proposal to leave the large volume of tar saturated soil at the base of Renwick Street ensures a perpetual contaminant source area to leach BTEX into groundwater immediately adjacent to the River.

Response: As noted elsewhere, total removal of tar from the subsurface beneath the sewage treatment plant is not feasible due to the depth of the contamination and the presence of sewage treatment plant structures. Some of this tar is clearly mobile and, consequently, a barrier to tar movement into the Hudson River is necessary. Since the tar contamination along the route of the wall is relatively deep (10 feet and greater near Renwick

Street, considerably deeper to the north) and the overlying groundwater is not impacted, there is no need to contain, collect and treat the shallow groundwater in this area since it currently meets groundwater standards.

Comment 69: Given these circumstances, we request that a long-term monitoring program be initiated to establish the quality of the groundwater entering the Hudson River.

Response: Appropriate groundwater monitoring will be included in the monitoring portion of the SMP, as provided for in the PRAP and ROD. Although monitoring will be performed along the river's edge, as noted in response 68, the quality of the water discharging to the Hudson River is not the critical issue at this site. Discharge of dissolved-phase MGP contaminants (as opposed to discharge of tar) to the Hudson River does not cause measurable impacts in the river now and is not expected to do so in the future. In the current unremediated state, with liquid tar slowly discharging to the river and sitting exposed on the river bottom, there is minimal impact on water quality in the river from the site. This situation has been observed at other MGP sites as well. With the tar removal from the sediments by dredging and further discharge cut off by the barrier wall, this situation can only improve.

Comment 70: Although Alternative B6, a subsurface containment wall along the river bank at the eastern edge of the STP property, is more costly both to install and to maintain because it requires ongoing collection and treatment of groundwater and tar, it would result in a more rigorous clean-up and assure better protection against ongoing contamination. It seems prudent to install such a containment wall prior to excavation or dredging.

Response: As noted in Section 7.1 of the PRAP, movement of tar through the subsurface toward the Hudson River is to be stopped before sediment remediation begins, otherwise continued movement of tar could potentially recontaminate the off shore sediments. The remedial design will address this necessity. A fully penetrating barrier wall (Alternative B-6) would dramatically increase the long term operation and maintenance expense of the remedy and produce little or no benefit in return. It would be necessary to collect groundwater behind a fully penetrating wall in order for it to function properly and although the shallow groundwater behind the wall is currently uncontaminated, it would become mixed with deeper water and tar as it is pumped from the ground and then require treatment prior to discharge. The costs of operating and maintaining this system to treat water contaminated by its collection would significantly, and needlessly, increase the cost of the long term operation of the remedy.

Comment 71: As you are aware, the New York State Department of Health (NYSDOH) currently has under review a soil vapor guidance document. It appears this proposed guidance was not used to examine this site.

Response: The NYSDOH has reviewed and concurs with the remedy. Vapor intrusion was considered in the development of the PRAP. A number of site-specific factors make it unlikely that MGP-related vapor intrusion into buildings is taking place at the City's STP site now, or would take place in the future. The shallow groundwater in the eastern portion of the STP, where occupied buildings exist, is not impacted by MGP contamination. The tar, and the groundwater contamination associated with the tar, is found at depth, with clean groundwater overlying it. The current industrial use of the STP and presence of many of the compounds of concern in the influent sewage make an evaluation of the STP unnecessary.

If shallow soil vapor contamination were to be discovered in the future, it is not at all certain that it would be related to the MGP. Much of the shallow soil at the Newburgh STP site consists of fill materials that are not derived from the MGP. Motor oil bottles, stained soil, and other indicators of hydrocarbon contamination were noted in this material during the IRM excavations in 1999. In light of this, any soil vapor contamination at the STP site would be difficult to attribute to the MGP. In conclusion, if this were to be an issue for future development, mitigation systems could also be installed as part of any new construction.

Comment 72: As environmental organizations whose collective mission is to protect the resources of the Hudson River, we do not support the proposed remedy for the river section of this site. The proposed remediation, Alternative C5, is not an acceptable remediation for the following reasons:

- **PAH-contaminated sediments in the PAH-impacted zone would not be removed, and the above-grade cap would not be an effective long-term solution.**
- **The above-grade cap proposed for the PAH-impacted zone would be more susceptible to**

disturbance from wave action, ice jams, boat-related activities, and other forces than a below-grade cap.

- **The above-grade cap would alter the natural contours off the river and create administrative difficulties, as it constitutes filling of a navigable waterway.**
- **Considerable contamination will be left in place.**

Neither the Department nor Central Hudson thoroughly understands the long-term environmental impacts of the residual contamination. We urge the Department to revise the PRAP and select a more extensive remedy that will provide for better long-term protection of the Hudson River and its resources.

Response: The selected remedy identifies the need for the additional work required during the remedial design to verify that the cap can be constructed and will remain effective. Based on currently available information it has been concluded that the cap can be constructed and will remain effective, subject to the design verification noted. With an effective, erosion-resistant cap in place, the environmental impact of the residual sediment contamination would be negligible, since environmental receptors would no longer be exposed to the contamination. Also see the responses to comments 14, 17 and 18.

Comment 73: The effectiveness of a cap is also questioned when it is stated that it is “expected” that wave action, ice scour, boat anchor disturbance and boat propeller wash will “diminish in importance as water depths increase.” (p. 27) Such qualifying statements portray the Department’s lack of certainty regarding the long-term value and stability of a cap. What happens when the unexpected happens, as must be expected!

Response: The fact that propeller wash, wave action, and ice scour diminish in intensity with increasing depth is well established. All of these disturbances take place at the surface of the water, and their effects diminish with both horizontal and vertical distance. The depth of water necessary before these effects become insignificant will be established during the remedial design. Also see the responses to comments 14, 17, 18 and 72.

Comment 74: In its review of the effectiveness of various remedies for the Hudson River PCB-contaminated Superfund site, the U.S. Environmental Protection Agency indicated “capping alternatives may be inherently less protective of human health and the environment in the long term than removal alternatives. Even though the capping concept is designed to avoid failure, cap damage caused, for example, by dragging of large trees that fall into the river during catastrophic natural events like major floods cannot be avoided.” (p. 6-16 Hudson river PCBs Reassessment RI/FS Phase 3 report: Feasibility Study, Book 1 of 6, December 2000)

Response: The characteristics of the Hudson River at this site are markedly different from those at the Hudson River PCB site, which is located in a non-tidal portion of the river, over 100 miles upstream. Flood flows are considerably more important in the upper reaches of the river. At Newburgh, these peak flows are less pronounced, and subject to daily reversals. The scale of the contamination problem at these two sites is not remotely comparable. The Hudson River PCB site covers tens of miles of the Hudson River bottom. At Newburgh, the MGP-contaminated sediment covers approximately three acres. Furthermore, the consequences of cap damage are significantly different for the two classes of contaminants at these two sites. PCB

compounds are magnified in the food chain, so PCB releases in one area can be taken up in wildlife, move, and affect a much broader area at much higher concentrations. PAH compounds do not biomagnify. Thus, cap damage at this site has far less potential for ecosystem damage than a cap over a PCB site. Also see the responses to comments 14, 17, 18, 72 and 73.

Comment 75: The ability of Central Hudson to obtain U.S Army Corp of Engineers permits is also a very questionable issue, particularly in light of the fact that it is acknowledged in the PRAP that the “conceptual 2.5 foot thickness of the cap would reduce water depths throughout the capped area, and would effectively make some of the capped area into dry land.” It is also acknowledge in the PRAP that making the river shallower could adversely affect the mixing of treated effluent with river water resulting in the need to reconstruct the STP outfall pipe. The PRAP does not address how shallower water and the creation of dry land will affect habitat.

Response: Above grade sediment caps are not unprecedented, and have been implemented elsewhere in the US, with approval of the Army Corps of Engineers. Properly designed and constructed, they can be effective in preventing contact of benthic organisms with contaminated sediments and thus restoring habitat value to the river bottom. Future use of this area of the river will remain unaffected. The cap will be designed to provide adequate draft for recreational boating. While obtaining Army Corps of Engineers permits is a potential limitation, as noted in the discussion of remedies, permits from this agency are also required for dredging.

The quote regarding making a portion of the cap into dry land is taken out of context. The effect of the cap thickness was mentioned in the PRAP to note why above-grade cap construction would not be permitted in shallow water. The remedy will not make any portion of the current riverbed into dry land; furthermore, no portion of the river bed that is currently shallower than 4 feet at low tide (6 feet average water depth), will be made shallower at all. The above grade cap is to be applied only in water deeper than this. Also see the responses to comments 14, 17, 18, and 72-74.

Comment 76: In its review of capping contaminants in the Hudson River at Hastings, the Department chose not to use capping. Below is text taken from the Hastings PRAP for Operable Unit 2, outlining why capping would not work. "Alternatives that rely solely on capping (Alternatives 2A and 2B) do not offer a permanent remedy and have poor long term effectiveness because they require extensive long term monitoring and maintenance. Long term monitoring of the river bottom to detect any disturbance of the cap would be difficult to perform, as would any required periodic maintenance. Significant damage to the cap due to human activities or an extreme flow event could cause an immediate release of contaminants that could recontaminate clean sediments or migrate beyond the current site boundaries.

Response: The remedy at this site does not rely solely on capping. The most heavily contaminated sediments will be removed. Long-term monitoring of this cap will be relatively straightforward—the water is relatively shallow, and currents are modest. Also see the responses to comments 14, 17, 18, and 72-75.

Comment 77: (Quoting from the Hastings PRAP) “With the capping alternatives, the upflow of groundwater through highly contaminated sediment and discharge into the Hudson River would

continue to occur. The resulting desorption of PCBs into the water column, which presently results in the contravention of PCB surface water standards, would likely continue. Similarly, Alternative 3, which would remove a maximum of 4 feet of sediment, would leave behind the highest levels of PCBs in the fill unit. Groundwater discharge through this unit would continue to cause contravention of the PCB surface water standard.”

Response: Again, the considerations cited at Hastings do not apply here. The highly contaminated sediments here are to be removed, not capped. Water quality standards are not exceeded in the area to be capped, even now. The material to be capped contains lower levels of contaminants that are not soluble in water and will thus not be transported upward into the water column. Also see the responses to comments 14, 17, 18, and 72-76

Comment 78: (Quoting from the Hastings PRAP) “Capping would be difficult to implement, both technically and administratively. Placing cap materials in the high flow conditions of the site would require installation of energy barriers or restricting placement of certain materials to slack tide periods. Placement of a cap would constitute the filling of a wetland habitat and navigable waterway, and the associated permits would be difficult to acquire if a reasonable alternative is available. Finally, long term protection of a cap would require an institutional control to prevent disruption from activities such as navigational dredging, anchoring, and installation of structures. This may be incompatible with navigation needs and the potential future development of the property.” (p. 26, Proposed Remedial Action Plan, Harbor at Hastings, Operable Unit No. 2 Village of Hastings-on-Hudson, Westchester County, New York Site No. 3-60-022, October 2003)

Response: Again, please note that this quote refers to the Hastings site, not Newburgh. The Newburgh site is not a high flow area nor is it a wetland. The area to be capped at Newburgh is in a relatively sheltered area, with the main river channel a considerable distance off shore. The use of energy barriers (silt curtains at a minimum) during cap placement will be required, as noted in the ROD. Also see the responses to comments 14, 17, 18, and 72- 77.

Comment 79: The PRAP requires remediation of lands underwater owned by the state of New York, some of which may have been granted for beneficial use to the City of Newburgh. Thus, whether the remedial site encompasses public trust lands owned by state or granted to the City, the PRAP’s proposal to “cap” the river and require institutional controls (in the form of an environmental easement), which essentially authorizes Central Hudson to dispose PAH’s in the Hudson River, contravenes the Public Trust Doctrine and the Public Lands Law of the State.

Response: Much of the contamination in Hudson River sediments is historic, having reached its current position either through direct discharge during the period of plant operations (which ceased over 50 years ago) or through slow, subsurface migration over the decades. Some migration of MGP tar through the subsurface and into the river sediments is still taking place today. The selected remedy specifically addresses this ongoing migration with the construction of a vertical barrier wall and tar collection system along the river’s edge. Thus, the only portion of the MGP contamination that could logically be considered “disposal” in the present tense will cease upon completion of the remedy. The selected remedy calls for removing all sediments in the area

that contain MGP tar, and for removing or isolating the surrounding sediments that are contaminated at much lower levels. Over 95 percent of the contaminant mass in the sediments is to be removed, and the remainder will be capped to eliminate exposures. The soft sediment upper layer of the cap will restore the surface of the river bed to pre-disposal conditions.

The institutional control for Area C amounts to limitations on dredging or removal of the cap. Such activities can hardly be considered routine uses of the river and are already subject to permit controls at both the state and federal levels. The institutional controls will be drawn up in such a manner as to allow removal of the cap in the future, provided that the underlying sediments are removed as well.

Comment 80: One of the primary concerns regarding the installation of an above grade cap is its potential impacts on habitat. In river capping procedures can be highly invasive and disruptive to natural riverine processes. During the capping process, large amounts of the capping material, such as gravel and sand, are dumped directly into the river over the area to be capped. This dumping action should require the use of silt curtains with flotation booms to mitigate the invasive nature of this process.

Response: The benthic habitat will be extensively disrupted by either dredging or capping. In either case, the disruption is expected to be temporary, with a dramatic improvement in benthic habitat once remediation is complete. Although some water column impacts (largely related to turbidity from disturbed sediments) are expected in the work area during cap placement, these impacts are unavoidable in any sediment remediation and are expected to be short term and addressed by engineering controls. Above-grade capping will be conducted inside silt curtains, and the below-grade capping (because it will follow partial dredging) will be conducted inside the sheet pile enclosure. Similar, if not greater, levels of turbidity could be anticipated during dredging. Both dredging and capping will require measures to control the migration of turbid water into surrounding areas. As noted in the ROD, dredging will be conducted inside a sheet-pile enclosure or equivalent.

The construction details of the cap will be refined during the remedial design; however, it should be noted that all designs under consideration will provide for a layer of soft sediment, comparable to existing river bottom sediments, as the top layer. Thus, following remediation, the river bottom will be a clean, soft-bottom habitat that closely mimics existing conditions in all respects except water depth.

Comment 81: In order to avoid unnatural riffles and currents, the containments (*sic*) should be dredged, with proper mitigation measures in place, to below grade so as to bring the capped area in line with the elevation of the surrounding area after post removal backfilling is complete. Organisms that live within contaminated areas are at an increased risk of developing diseases, impaired function and altered physiological responses. Therefore a better and more cost efficient solution would be a clean up plan that incorporates habitat needs and self-sustainability into it from the beginning.

Response: Following remediation, benthic organisms will not be living in a contaminated area, and, thus, will not be at increased risk. The remaining contamination will be below the cap, isolated from contact with the clean, soft-bottom material placed on top.

Comment 82: The project should result in no net loss of intertidal and shallow sub tidal habitat. Clean backfill should closely resemble contaminated substrate that was removed for habitat rehabilitation. What will be the cap performance criteria?

Response: The remedy does not result in loss of intertidal or shallow subtidal habitat. The above-grade portion of the cap will raise the river bottom by approximately 2.5 feet, but in no case will this result in finished water depths less than an average of 6 feet (4 feet at low tide). The cap needs to stay in place in order to effectively isolate the sediments beneath, and to retain its soft-sediment cover in order to provide a suitable habitat for benthic life. In addition, any material used to construct the cap, must contain less than 4 ppm total PAHs. Thus, the primary performance criteria relate to physical presence of the cap and adequate thickness of its sediment cover. Also see response to comment 80.

Comment 83: What is the likelihood of controlled placement with the estuarine habitat?

Response: With careful design and construction, the NYSDEC believes that controlled placement can be reliably achieved. Under water capping has been successfully implemented at other sites outside New York State.

Comment 84: What is the prognosis for long-term containment of contaminants?

Response: The NYSDEC believes the prognosis is very good. The contaminants beneath the cap are tightly bound to the sediments and are thus immobile unless subjected to erosion. The cap will prevent this erosion and ensure the contaminants remain isolated. Also see the response to comments 16 and 84.

Comment 85: What will be the impact to natural successional processes by the cap design and function?

Response: Following remediation, the river bottom will consist of uncontaminated, soft sediment comparable to the naturally occurring material that forms the river bed now. This surface will be available for recolonization, which is anticipated to take place naturally. This will be the case regardless of whether dredging/backfill or capping is performed. In both cases, the remediation work would temporarily disrupt whatever impacted benthic community is currently present and replace the river bottom substrate with uncontaminated materials. In both cases, natural successional processes would be the same.

Comment 86: Has ground water upwelling been considered in the cap design?

Response: Groundwater upwelling has been considered. The cap is not intended to be water tight, and it is expected that groundwater will continue to discharge into the river in the capped area. Also see response to comment 80.

Comment 87: Has gas ebullition been considered in cap design?

Response: Gas ebullition has been considered. The cap design does not include an impermeable barrier that could potentially accumulate gas and direct it toward the edge of the cap. With the sediments which contain

liquid tar removed by dredging, gas ebullition will not be a significant contaminant transport mechanism. Although liquid tar could be transported to the surface along with gas bubbles, sediment-bound contaminants beneath a cap should not be. Also see response to comment 80.

Comment 88: Has the migration of the contaminants below the cap been considered? : Has upward migration of the contaminants been considered?

Response: Transport by upwelling groundwater has been considered, and is one of the principal reasons that capping of tar-contaminated sediments was rejected in the PRAP. Whereas drops or stringers of liquid tar could be moved by upward groundwater flow, low-level PAH contamination tightly bound to sediment particles will not move unless the particles move. One function of the cap is to prevent this. Also see response to comment 80.

Comment 89: Has the migration of the cap itself been considered?

Response: The overall stability of the cap, including movement of the cap due to settlement or river currents, will be a primary focus of the remedial design. Based on currently available site information, it appears that bottom currents are relatively modest: this is borne out by numerous site visits and by the distribution of sediments on the river bottom, which suggest that the area is undergoing net sediment deposition, not erosion. To provide an increased margin of safety, a stone armoring layer has been included in the cap design. Also see response to comment 80.

Comment 90: Has sediment slope stability been considered?

Response: This factor will be considered in the remedial design. At present, there is no reason to doubt that a stable slope can be established at the edge of the cap. Also see response to comment 80.

Comment 91: Can the cap be designed to better accommodate positive habitat value?

Response: The overall concept of the cap is to cover it with soft sediment materials as close to existing river bottom materials as possible. Also see response to comment 80.

Comment 92: The remedy summary for Area C on page 3 indicates that existing riprap would be removed and replaced. While cleanup and containment are of foremost importance, the Department should also consider augmenting rip rap replacement with native vegetation along the shoreline which could improve estuarine habitat conditions, provide a buffer between uplands activities, slope stability and erosion protection and function as a storm water runoff filter.

Response: The City of Newburgh has raised similar concerns regarding the finished appearance of the shore line and near-shore areas following remediation. Some limitations on rebuilding the shoreline will need to be considered, specifically any plans the City has for water front access, the necessary erosion control, and the need to preserve adequate dispersion of the STP effluent. Beyond this, the remedy allows this issue to be resolved during the remedial design. The NYSDEC would not oppose augmentation of the rip rap shoreline, or

replacement with native vegetation, provided that such a change did not degrade the effectiveness of the remedy.

Comment 93: PAH's are of particular concern in an aquatic setting because of the solubility and bioaccumulative properties of many PAHs. Therefore, we urge the NYSDEC to make the fullest use of this opportunity to physically remove as much of the PAH-contaminated sediments as technically feasible.

Response: The technical basis for this comment is unclear. PAH compounds are in general not soluble in water, which helps explain their persistence in the environment. Some biological uptake of PAH compounds does take place; however, magnification of PAH contamination in the food chain (such as what takes place in the case of PCB compounds) has not been documented.

Comment 94: Regardless of whether capped or removed, the Department needs to ensure that the eastern edge of the MGP-contaminated sediment zone is clearly delineated.

Response: Defining the eastern boundary of the PAH contamination will be an important component of the pre-design investigation.

Comment 95: As previously indicated, we urge the Department to choose a more protective cleanup goal for PAH-impacted sediment. The proposed 20 ppm total PAH is 5 times above the standard that is protective of aquatic benthic organisms. The Department should choose the more protective PAH level of 4ppm.

Response: See response to comment 17 .

Comment 96: We urge the Department to consider the use of dry excavation by constructing a containment barrier and dewatering the area prior to dredging. Such measures would allow greater accuracy, and minimize the potential environmental impacts that may be associated with dredging.

Response: Dry excavation would require dewatering the dredging area, and maintaining this dewatered condition throughout the period that dredging is taking place. Under these conditions, the sheet pile wall surrounding the dredging area would have to function as a coffer dam, and not simply as a barrier to migration of suspended sediment. The coffer dam would have to hold back roughly 10-15 feet of head at high tide, thus requiring far heavier sheeting and much tighter joints between sheets than would be required otherwise. Any water that leaked into the enclosed area, or fell into it as rainfall, would have to be collected and treated.

Due to the soft, fine-grained nature of the sediments, it is likely that excavation machinery would be unable to maneuver on the dewatered river bed. It would probably be necessary to build temporary haul roads and staging pads on the river bottom in order to provide a safe working environment during excavation. The material to build these roads (crushed stone, wooden or metal planking) would need to be removed and decontaminated once the work is complete, adding to project costs and lengthening the process. Although excavation in the dry would make direct observation of the work area easier, it would also expose heavily tar-

contaminated sediments to the atmosphere over the entire dewatered area.

Comment 97: The PRAP indicates that under the preferred remedy the average depth of removal in the tar impacted zone would be approximately 4 feet, however the maximum depth could be roughly 12 feet with an estimate of 7,500 cubic yards of material being removed. It is not clear however if such proposed depths will remove all of the tar-impacted sediments. The remedy should provide for removal to a depth that meets specific cleanup objectives and should not be based on visual observation of tar in the river.

Response: The RODs provide a specific cleanup objective: the removal of all visibly tar-impacted sediments. The depths quoted are included for planning purposes. The lateral and vertical extent of tar contamination has been determined during the RI; however, it is necessary to maintain some degree of flexibility in the remedy in case additional contamination is detected as excavation proceeds. Within the dredged area, excavation will proceed to the depths necessary to reach all of the tar-contaminated sediment. Any unevenness in the river bottom created during the excavation will be smoothed out during backfilling and/or capping once excavation is completed.

Comment 98: In addition as part of the preferred remedy it is indicated “approximately 1500 cubic yards may be dredged from PAH-impacted near shore areas located immediately to the north and south of the tar-impacted zone, and potentially to the east as well. This would lower the river bottom elevation, up to 2.5 feet, to allow for construction of a below grade cap in these areas.” p. 28. Based on what criteria is the ‘targeted’ removal of PAH-impacted sediment based on? Such selected removal of PAH-impacted areas seemingly will create greater unevenness in the proposed cap and create more opportunity for erosion and compromised integrity of the cap. While 2.5 feet of removal will allow for an at grade cap, the PRAP does not indicate whether the 2.5 feet of removal is sufficient to remove PAH-impacted sediment.

Response: The areas in question lie to the north and south of the tar-impacted area, and contain only PAH-impacted sediment, not tar. We anticipate that some PAH-impacted sediment will remain in these areas, which is why the selected remedy calls for capping. Because these two areas are located in shallow water close to shore, it is necessary to remove 2.5 feet of sediment first to accommodate the cap in order to avoid raising the river bed. Potential interference with navigation will be considered during the remedial design. In no case will any section of the riverbed that is currently deeper than 6 feet (4 feet at low tide) be made shallower than it is currently.

Comment 99: At a minimum dredging should be performed to a depth sufficient to allow for the installation of an at-grade cap. As indicated an above-grade cap would potentially interfere with navigation in the area, and may not survive the Hudson River’s harsh tidal environment.

Response: The sedimentary environment in this area does not appear to be “harsh” in any significant sense. It is an area of shallow, quiet water that appears to be undergoing deposition of fine-grained sediments such as clay and silt. See also the response to comment 98

Comment 100: The PRAP is very vague on information regarding the handling, treatment and disposal

of excavated and dredged material. Does the Department plan to site a dewatering facility off site? While it is customary to wait until the remedial design phase to determine the specifics of this aspect of the plan, more information should be provided in a revised PRAP.

Response: The ROD has been revised to more clearly state how the dredged sediments will be handled. In brief, all available dredging technologies produce a material that contains excess water that must be removed before the dredged material can be transported, treated or disposed. Logic dictates that this dewatering work be performed in close proximity to the point where the sediments are dredged, so it is anticipated that the dewatering facility will be located immediately to the south or north of the existing STP. Water produced by this facility may contain some small amount of NAPL, and in most cases will contain dissolved BTEX compounds and trace amounts of the lighter PAH compounds. The NAPL must be removed, most likely by settling or flocculation. The dissolved contaminants are highly amenable to biological treatment, so the most desirable alternative would be to treat them in the existing STP. If this proves unworkable, there are a number of readily available treatment technologies available for removing and destroying these contaminants prior to discharge. The choice of treatment technology will be made during the remedial design.

Comment 101: A SMP would also be necessary to include institutional and engineering controls for inspection, monitoring, repair and integrity of the cap, however no time frame is suggestion for such an institutional controls (sic). If the Department goes forward with a cap such an institutional control in the form of an easement must be in perpetuity.

Response: Any institutional control would remain in force until otherwise approved by the NYSDEC.

Comment 102: It is indicated in the PRAP on page 26 that “conventional dredging” will be used. No further details are provided. While specifics regarding dredge equipment usually are part of design, more information should have been provided in the PRAP as to whether mechanical or hydraulic dredging or a combination of both will be used. A brief explanation on the difference between navigational and environmental dredging would also be useful. As indicated above, serious consideration should be given to dry excavation. If dry excavation is not used the Department and Central Hudson should evaluate the use of specialty dredges be used to expand removal effort – including but not limited to pneuma pump and cassion dredging.

Response: The remedial design will specify the means and methods to be employed in dredging. At this stage, it is sufficient to note that a variety of methods are available, since with the area to be dredged enclosed by sheet piling, the differences between the various methods would not be considered significant relative to the remedial goals. One significant consideration is the presence of man-made debris in off shore sediments (such as bricks, pilings, and other wood materials), which complicates the use of hydraulic dredging techniques.

Comment 103: As is indicated in the PRAP, both capping and dredging – “would require measures to control release of suspended sediments into downstream areas.” We strongly urge the Department to take a preventative approach to controlling resuspension and minimize the loss of contaminated sediments to other parts of the Hudson. Being that “the principal risks posed by this contamination are the generation of slicks and sheens on the river surface and potential toxicity to aquatic life, including

bottom-dwelling benthic organisms which inhabit the river bottom.” (p. 23), we urge the Department to require the use of floating oil booms.

Response: The NYSDEC will take a preventative approach with regard to suspended sediments and sheens. Floating slicks and sheens would constitute violations of New York State Ambient Water Quality Standards and will not be permitted. Oil booms will be employed if necessary. However, the sheet pile enclosure that will surround the excavation is a superior technique to the use of floating booms, so the booms are not regarded as the primary control.

Comment 104: Contaminant containment measures such as sheet piling can be used in this area of the river, however resuspension caused by sheet piling should be carefully monitored and controlled. The use of silt curtains for containment or other means of reducing energy of the river should be considered.

Response: Silt curtains will be used for all activities (such as driving of sheeting into the river bed and placement of the cap) that generate turbidity in the water column.

Comment 105: It is indicated in the PRAP that “Any dredging work would be conducted behind sheet piling unless an acceptable alternative is identified during remedial design” (p.24). What does the Department consider an acceptable alternative?

Response: The NYSDEC has not identified any acceptable alternatives at this time. To be acceptable, an alternative technique would need to be equally effective in preventing migration of turbid and/or sheen-covered water. NYSDEC approval would be required for any substitute method.

Comment 106: Although more expensive sheet piling should also be used as dredging moves further from the shore. When designing the dredging remedy, an extensive monitoring system should be put in place to keep a handle on resuspension. Pre-implementation monitoring should also be done to establish baseline conditions. Plans should be in place if resuspension problems occur. Again the use of dry excavation can help avoid resuspension and recontamination issues.

Response: With the entire dredged area surrounded by sheeting, extensive resuspension monitoring is unnecessary. It is taken for granted that extensive sediment resuspension will occur within the sheeted area, with the sheeting isolating the turbid water from the main body of the river. The sheeting will only be removed when turbidity inside the sheeting has fallen to acceptable levels. Downstream turbidity monitoring will be performed when capping operations outside the sheet pile enclosure are underway.

Comment 107: We recognize that our recommendation will lead to increased remedial costs, however the increased cost will provide lasting long-term economic and environmental benefits. Below is a summary of the estimated increase in cost based on our recommendations:

Remedial Alternative B6, instead of B7 + \$4,400,000
Remedial Alternative C6, instead of C7 + \$5,100,000
Total Additional Costs + \$9,500,000

Total Projected Project Cost \$ 32,400,000

In addition, there will be additional costs associated with active collection wells, extending the sheet piling across the eastern border of the Central Hudson site (Area A), expansion of Alternative C6, and other suggested recommendations. Construction phase and post-construction phase monitoring are very important.

Response: The increased costs are noted. A post-remediation monitoring program will be instituted as part of the SMPs for the three remedial areas. These programs will be tailored to match the goals of the remedy in each area. In areas A and B, the NYSDEC recognizes that groundwater quality will remain substantially above drinking water standards indefinitely. With these limitations recognized at the outset, conventional periodic monitoring of groundwater conditions over time is of lesser importance. Instead, the goal of this groundwater monitoring program will be to assure that the plume has not shifted position or increased in concentration over time. In area C, monitoring will consist of a periodic inspection of the sediment cap to verify that it is still in place and still covered with fine-grained sediment suitable for colonization by benthic organisms. The perimeter of the cap will also be periodically examined for evidence of tar seepage.

Comment 108: The PRAP is lacking in any discussion about contaminated fish as a potential route of exposure to site contaminants, particularly PAHs. We would urge the Department to require Central Hudson to immediately begin a fish sampling program and take appropriate measures to address contamination. While the use on institutional controls must be limited, fish consumption advisory signs, at a minimum, are necessary at this site due to the incomplete remedy proposed. We urge the Department, and the NYS Department of Health to require Central Hudson to conduct local public outreach and education regarding the health impacts associated with the consumption of contaminated fish.

Response: The New York State Department of Health has issued extensive fish advisories for most of the Hudson River (including the vicinity of the Central Hudson site) due to PCB contamination. The Hudson River fish advisories are communicated to anglers and the general public via press releases, the Internet, a toll-free number, printed materials and signs posted at fishing access points.

Since the remedy calls for removal or isolation of the PAH contamination attributable to this site and there are other, ongoing sources of PAHs into the river in the immediate vicinity of the site, monitoring of PAHs in fish would be inconclusive regarding site impacts.

Moreover, data on fish from other waters with PAH contamination indicate that PAHs are generally not detected or are present at relatively low levels in the portion of fish commonly consumed by humans (fillets). Thus, even if fish data were available, the PAH levels in those fish would be unlikely to result in any changes to the current Hudson River fish advisories.

Comment 109: Again, this remediation is precedent setting and should be rigorous enough to address

current and future uses in a densely populated urban area. Residents of cities such as Newburgh deserve the best remedial project possible. Resident of such cities are usually exposed to a higher than average amount of toxic contaminants. The site should be remediated to address the significant exposure issues that city residents often face.

Response: Regardless of the urban nature of the site and surrounding area, there are no identified human exposure pathways to the contaminants at this site. The site is in large part covered with fill materials and pavement unrelated to historic MGP operations. MGP-impacted soils are only exposed at the ground surface in a small portion of Area A and this material will be removed during remediation. Area A is also surrounded by a chain link fence and subject to 24-hour video surveillance.

No human exposure pathways exist in Area B, except during deep excavation work which is isolated from public contact and subject to the SMP. In Area C, tar-contaminated sediments lie at the bottom of the Hudson River, where human exposures are infrequent, largely limited to extreme low tide periods when slicks and sheens form on the water surface. Again, the remedy will remove this exposure. Fishing occurs at the Newburgh dock; however, the dock is located far outside the MGP-impacted area and as noted in the response to comment 108 all fishing in the Hudson is subject to fish consumption advisories unrelated to the MGP site.

Comment 110: In its decision, the Department must consider the potential future use of this site as well as the river. The PRAP has not adequately considered the full range of options for the City of Newburgh, CSX and other neighboring properties. We especially urge the Department to consider the potential future uses of the Newburgh waterfront, including public access and recreational uses that are now blossoming at so many different locations all along the Hudson.

Response: These uses have been considered and specifically addressed.

Comment 111: The Department's remedy should be consistent with the city's Local Waterfront Revitalization Program, the New York State Waterfront Revitalization Act, and the federal Coastal Zone Management Act. Central Hudson must remain the responsible party for any future remedial costs, beyond the initial remediation. What if STP infrastructure or gas pipelines need repair or replacement in future, or gas pipelines or another pocket of concentrated contamination is discovered that was not remediated under currently proposed Remedial Action Plan?

Response: Gas pipeline work in Area A will remain the responsibility of Central Hudson, which has complete and secure control of the former MGP site. Future subsurface work in the STP will be subject to controls in the Site Management Plan. Also see the response to comments 11, 12 and 42

Comment 112: We strongly encourage the Department to thoroughly review all remedial alternatives and select an active remedy that removes as much contamination from both on-site and off-site as possible, to ensure protection of public health and the environment. Storage and transportation systems and equipment should be enclosed to minimize unnecessary release of contaminants into the environment during the remediation process.

Response: Protection of the public from vapor exposure and nuisance odors during excavations is a recognized necessity at all MGP sites. NYSDOH has developed a Community Air Monitoring Program (CAMP) that is now standard procedure for all site remediation work. All remedial activities will be performed consistent with the CAMP requirements, which includes a variety of monitoring and control provisions for both nuisance odors, dust and volatile contaminants. A variety of vapor and dust control measures can and will be employed during remediation. Selection of the appropriate techniques will be made during the remedial design, implemented by the remedial contractor subject to the design specification and may be modified as necessary based on monitoring results. The NYSDEC will also encourage CHGE to use low-sulphur fuels in appropriate machinery on the site.

Comment 113: In addition, we would urge the Department to initiate a Natural Resources Damages Assessment at this site and pursue an NRD claim.

Response: Comment noted.

Comment 114: We strongly urge the Department to keep the process open and transparent during the remedial design and implementation phase so that all stakeholders can stay informed and continue to have input into this remedy. We recommend that the Department initiate and convene a community advisory group or committee that can actively participate in future activities and discussions at this site.

Response: The NYSDEC intends to keep all stakeholders informed during the remedy selection and design process. In keeping with that intent, we note that no copy of this comment letter was sent to Central Hudson, and we have provided a copy to them as a courtesy.

The City of Newburgh submitted a letter dated April 20, 2005 which included the following comments:

Comment 115: The City of Newburgh (Newburgh) opposes several key aspects of the Proposed Remedial Action Plan (PRAP) for the area of the former Manufactured Gas Plant (MGP) owned by Central Hudson Gas & Electric (Central Hudson) and the adjacent areas described as part of the Project Area, most of which are owned by the City of Newburgh. The remedies proposed for the project area are only partial remedies that will result in an incomplete remediation which will leave large amounts of MGP tar in the project area to perpetually adversely affect both the project and downgradient areas. The City is also concerned about the potential significant threats to the Hudson River and other ecological resources, and the restrictive and therefore permanent negative impacts the PRAP will have on property owned by the City of Newburgh in the project area

Response: The NYSDEC does not anticipate that there will be a need for future remedial measures at the site. The selected remedy, once implemented, will remove and/or contain the MGP contamination in a way which permanently removes ecological exposures to this contamination. The potential for human exposures will be significantly reduced by the remediation work, and the remainder will be addressed through institutional controls.

Comment 116: As long as significant amounts of hazardous materials remain at the site, on the adjacent

property owned by Newburgh including the shoreline of the Hudson River, human health and safety could be compromised, the natural environment continually contaminated, and the value of, access to and future use of Newburgh's water front property severely limited.

Response: See the response to comment 53.

Comment 117: Newburgh continues to have great concerns for the protection of workers at its waste water treatment facility as well as those who will need to conduct business or repairs at the facility. Based on past history, it is expected that areas of the site will need to be excavated occasionally to repair or replace piping, or to make necessary upgrades. Some of these pipes are at depths extending well below the water table, potentially exposing workers to not only contaminated groundwater and soil, but potentially hazardous tar as well.

Response: Workers engaged in routine operations at the STP are not exposed to MGP contamination under current conditions, and the potential for exposure will be addressed by the SMP in the future. Also see the response to comments 12 and 53.

Comment 118: The investigation conducted to date at the Central Hudson site (Area A) has been deficient. We therefore request the scope of the proposed investigation of Area A be expanded to include all piping and a more thorough evaluation of the relief holder.

Response: The investigation of the former relief holder has been less extensive than would ordinarily take place due to the presence of the regulator station on the ground surface. In light of this, the NYSDEC has taken a very conservative approach in evaluating contamination in this area and has assumed that the entire relief holder and its immediately surrounding soils will require removal. The remedial design investigation will include verification of the holder contents and the soils and bedrock surrounding the holder foundation. It is common to encounter undocumented subsurface piping during MGP remedial excavations which may contain tar or serve as a tar migration pathway. Locating such pipes before excavation begins, however, is often a futile exercise. It is far more efficient to start at the locations where the pipes originated or terminated (i.e. the relief holder and the MGP facility itself) and then follow the pipes and associated contamination outward from these central locations. This approach has been successfully implemented at a large number of MGP sites statewide and is the approach included in the remedy for this site. When encountered these pipes and surrounding contaminated soils "chased" and removed to the extent practicable.

Comment 119: The PRAP indicates excavation of tar-contaminated soils would terminate at Renwick and South Water Streets. Although the presence of underground utilities may complicate further excavation, the Department must maintain flexibility to pursue plumes of tar if encountered in this area as anticipated based on the downgradient observations of tar.

Response: The remedial design investigation will define the boundaries of the southeast corner excavation area, including the boundaries along Water and Renwick Streets. Excavation may extend outward into Renwick Street, if necessary; however, it is not the NYSDEC's intent to extend the excavation outward into South Water Street. Traffic levels on South Water Street are far higher than on Renwick, and there is substantially more buried infrastructure there as well.

Comment 120: The proposed removal of MGP tar contaminated soils will likely leave surface soils impacted with analyte concentrations above direct exposure criteria. The PRAP must require complete sampling of the remaining shallow soils on site, particularly in areas not adequately investigated, such as the northwest quadrant of the site.

Response: See response to comment 109.

Comment 121: While Newburgh agrees with the Department that monitoring and suppressing vapors, as needed, will be necessary during the excavation of tar impacted soils, the City is concerned that such vapors present not only a nuisance as described in the PRAP, but also a serious potential for exposure to workers and the nearby public. The handling of the excavated soil must minimize potential human exposure by minimizing to the maximum extent practicable, the handling and storage of the tar contaminated materials on site and in the project area.

Response: See response to comment 112.

Comment 122: The City of Newburgh strongly disagrees with the dependence on the proposed use of passive wells for the collection of tar, most notably, the use of a row on these wells along the east side of the former MGP in an attempt to prevent or minimize the continued off-site migration of mobile tar. In the event that the Department intends to use this method to control tar migration, we respectfully request that Central Hudson and/or the Department provide technical justification as to how this technology will accomplish this goal, and specifically what is the capture zone for these wells and how was it determined. Based on a review of the selected alternative (A4), these wells would be spaced 25 feet apart. Newburgh also requests that the Department and/or Central Hudson provide documentation to support the decision to drill the wells at 25 foot intervals.

Response: See response to comments 57 and 58.

Comment 123: Additionally, Newburgh also questions the PRAP's initial reliance on the wells as passive recovery wells and subsequent potential use for pumping out contaminants. The pumping of the bedrock wells could not only recover tar contained in the fractures within this unit, but also potentially reduce the forces driving tars eastward towards the river.

Response: See response to comment 57.

Comment 124: Without appropriate spacing and pumping, the proposed tar recovery wells will not serve to recover significant volumes of tar, or provide for any effective containment. Instead, these wells will function as sentinel wells to evaluate the effectiveness of the proposed soil excavation. If tar is observed in any of these sentinel wells, thereby demonstrating tar is in fact migrating off site, Central Hudson must be required to re-mobilize to the site to delineate and completely remove (through excavation and off-site disposal) any tars remaining on its property. The ROD must be clear on this point to ensure there are no misconceptions on the requirement for complete MGP tar source removal.

Response: The NYSDEC does not agree that tar yields from the recovery wells will be insignificant. In a similar setting along the banks of the Hudson, a single passive, overburden tar collection well has produced nearly 500 gallons of tar since late 2003. At the Newburgh site, continued yield of tar in the wells along the eastern site boundary would be considered as a sign that source areas remain in place on the MGP site. It would also be considered as a sign that additional “step-out” wells should be installed on either side of the producing well. Beyond this, however, specifying in advance what actions will be taken is inappropriate. For example, if the major remaining source of tar on the MGP was found to be in the fractured bedrock, additional excavation would not be an option.

Comment 125: The spacing of these sentinel wells should be such that they can provide a high level of confidence that no tars are migrating off site. The City of Newburgh requests that wells be installed along the entire east end of the former MGP on 10-foot centers within the overburden (50 wells). Additionally, bedrock sentinel wells should be installed on no more than 20-foot centers throughout the areas found to contain tars (25 wells) in order to facilitate the identification, and to the extent possible, the removal of tar from the bedrock.

Response: See response to comment 58.

Comment 126: In the event adequate technical justification cannot be provided by Central Hudson or the Department on the ability of the proposed wells to capture all tar migrating in the overburden, a slurry wall should be constructed as part of the remedy for this area.

Response: See response to comment 59.

Comment 127: One of the properties adjacent to the project area is slated for development of affordable housing. Furthermore, the entire project area is located within an Environmental Justice Community. Therefore, any proposed remedy for this area which includes engineering controls such as fencing or capping must include a landscape plan to ensure that the end product is compatible with the proposed redevelopment of adjacent parcels and does not disproportionately impact the environmental justice community.

Response: The MGP site is currently in use as a gas storage and regulation facility, and is securely fenced for this reason. Both the storage and regulation functions are expected to remain following completion of the remedial project and consequently the site is likely to require secure fencing indefinitely. Landscaping, particularly in the northernmost portion of the site (near the proposed housing project) where little or no remediation work is anticipated, is beyond the scope of the remediation project and could be the subject of discussion between the City and Central Hudson.

Comment 128: The proposed remedy for Area B relies almost entirely on containment, the result of which is to make the City property into a permanent waste disposal facility for wastes generated from the former MGP in Area A. The presence of MGP waste at the sewage treatment plant has already hindered development and MGP wastes are currently a cause for concern as the City contemplates expansion of its primary STP settling tanks to occur later this year. Additionally, since the initial construction of the STP in the 1960s, plans have existed for the expansion of the aeration capacity through the installation of two additional tanks east of the existing aeration tanks. The PRAP could potentially foreclose this long planned expansion.

Response: See response to comment 12.

Comment 129: As discussed above regarding Area A, the best available technology to address the MGP contamination in the project area is through the direct removal of tar impacted soils by excavation. Accordingly, the ROD must require the excavation of areas of free flowing tar in the embayment (TB-25) area as well as areas downgradient of the relief holder. Furthermore, leaving this tar in place creates the possibility of its migration downward, below the proposed containment wall, or potentially laterally around the proposed wall. Additionally, leaving the tar in place may result in ongoing groundwater contamination as components of the tar dissolve into groundwater, destined to discharge directly to the Hudson River.

Response: The tar in this area rests on a clay layer whose permeability is several orders of magnitude lower than the sandier materials in which the tar resides. No significant tar penetration of this layer has been noted, despite the fact that it has been resting on the clay for many decades. Consequently, the NYSDEC does not view downward migration as likely. The barrier wall is to be keyed into this confining unit, cutting off the potential for the tar to migrate beneath the wall. Full excavation of this area to 28 feet would entail a deep excavation in close proximity to the river bank and to existing STP structures. With the barrier wall installed immediately adjacent to this area, the NYSDEC has judged this additional excavation to be unnecessary. Dissolved-phase groundwater contamination would be at concentration levels far lower than what is there now, so it is difficult to imagine a situation in which it would be significant. Dissolved-phase contamination consists almost entirely of BTEX compounds, which are readily and rapidly degraded in oxygenated surface water. Discharge of contaminated groundwater into the Hudson River is also discussed in the response to comment 68.

Comment 130: The continued monitoring of tar at wells to the north of the existing primary settling tanks has demonstrated the presence of significant amounts of mobile tar in this area. Although the removal of this large area of mobile tar will be inhibited by adjacent structures such as the existing primary settling tanks, the contamination can be removed provided adequate sheeting is properly designed and installed. The removal of this material is necessary to prevent the continued migration of this material across the site as well as potentially downward into bedrock and to assist in reducing the further degradation of groundwater quality from the tar.

Response: See response to comment 12.

Comment 131: The scope of the remediation as proposed is premised on the findings of the 2001 Baseline Human Health Risk Assessment prepared for Central Hudson which may underestimate potential inhalation risks to current or future occupants of the City property. The evaluation of the City property in the 2001 report is based entirely on modeled data with no actual air or soil gas samples taken on site. The Draft Soil Vapor Intrusion Guidance issued by the New York State Department of Health, which is currently available for comment, will likely be finalized prior to the proposed remediation and requires an actual investigation

Response: See the response to comment 71.

Comment 132: To date, proposed remedies for the site have by and large assumed that the land use in Area B will remain a wastewater treatment facility. However, this scenario fails to recognize the potential of the site. As previously discussed, the waterfront is an essential component of Newburgh's redevelopment and

its LWRP. Admittedly, while relocating the WWTP would be a major undertaking and current plans are to expand the facility, increasing waterfront land values and changes in wastewater treatment technologies may very well warrant the relocation of the facility in the future. The discussion in the PRAP on the possible relocation of the WWTP (identified as STP in the PRAP), fails to note the obvious factor that the costs for relocation must include the resale value of the land underlying the WWTP versus the value of land at another (new WWTP) location, thereby reducing the overall cost of the relocation. However, the presence of MGP contamination underlying the City property will greatly reduce its monetary value.

Response: Relocating the STP would be extraordinarily and unnecessarily expensive, and would present a severe administrative challenge in siting a new treatment facility and discharge location somewhere else along the Hudson River. Although the discussion in the PRAP does not fully explore the offsetting value of the land the STP sits on, it also does not discuss these complicating factors which would increase STP relocation costs.

Increasing waterfront land values along the Hudson have largely been driven by residential development pressure, and the City's own planning documents appear to rule out development of this kind. The City's existing zoning ordinance classifies the STP property as Industrial. In addition, the Local Waterfront Redevelopment Plan states (Page IV-14, Section 18) that "The City has determined that any vacant underutilized/vacant land within the waterfront planning subarea should be nonresidential in character to enhance the City's ratable base....Residential uses are to be limited to adaptive reuse of the Regal Bag Company building." The Regal Bag Company Building is located over 4000 feet north of the STP.

Comment 133: The proposed remedy in Area B depends heavily on the use of institutional and engineering controls. The institutional controls, as described in the PRAP take the form of a Soil Management Plan (SMP) which in addition to guidance on soil handling and remedial activities includes a provision to "identify any use restrictions for Area B site development or groundwater use". (PRAP at 2). Specifically, the PRAP calls for institutional controls on Area B that would "limit the use and development of the property to commercial, industrial or restricted residential (subject to The Department and NYSDOH approval) uses". (PRAP at 37). Such institutional controls appear to impose a deed restriction on the City due to Central Hudson's past discharges.

Response: No deed restriction is proposed for the STP site, and the language of the ROD has been revised to clarify this. Much of the limitation on potential redevelopment of the STP property is already in place. As noted above, the City's planning documents, including the local zoning map and the Local Waterfront Revitalization Plan, already limit land use. Area B is already zoned for industrial uses, and the LWRP already strongly discourages residential redevelopment. The controls noted in the ROD would restrict only one form of redevelopment, single family homes (unrestricted use). Part of the reasoning is that for single family residential development it is difficult, if not impossible, to control exposures to contaminated surficial soils from gardening. The shallow soils that would be encountered during gardening would be restricted not by the underlying MGP waste twenty feet below grade, but by materials present in the historic fill that created this land.

Comment 134: The imposition of such use restrictions on all of the City's property within the project area is unprecedented and excessive. Although the use of restrictions to prevent the untreated potable use of groundwater may be appropriate, restricting the future uses of the site, in part or in its entirety, is unacceptable. Of immediate concern to the City are the periphery areas of the site to the north and south

of the wastewater treatment plant where significant contamination has not been identified and no remedy is proposed. As previously discussed, the waterfront is essential to the Newburgh's redevelopment; in fact, a rowing club is currently under construction immediately south of the existing aeration tanks.

Response: The area subject to the institutional controls will be limited to those areas where MGP contamination is present in the subsurface. The peripheral areas to the north and south will not be included in this definition.

Comment 135: Any proposal that leaves MGP-related contamination on any part of the City property must provide for the responsible party (Central Hudson Gas & Electric) to develop and pay for the full implementation of a Site Management Plan including the handling of any MGP-contaminated materials encountered through expansion, modification or operation and maintenance of the wastewater treatment plant and other affected City-owned properties. Additionally, the Site Management Plan must account for MGP-contaminated materials that may be encountered in the future as a result of any adaptive reuse of the site including the cost of the management, treatment and disposal of contaminated soils during excavation and construction.

Response: Central Hudson remains legally liable for the costs of preparing and executing the remedy (including the SMP). As noted in Response 12, the ROD has been revised to more clearly specify how soil contamination encountered in the next phase of STP expansion will be handled.

Comment 136: The proposal for preventing tar migration to the Hudson through use of a containment wall and recovery wells or trenches is expected to be effective as part of the remedy, however, the proposed plan leaves far too much MGP contamination in this area of the site. Leaving any significant quantity of tar-impacted soils in place, as has been discussed regarding the embayment area, would result in the potential discharge of highly contaminated groundwater to the River.

Response: See the response to comments 63 and 12.

Comment 137: The proposal for the installation of tar recovery wells to be subsequently used for chemical oxidation injection for inaccessible areas is acceptable to further delineate the extent of tar contamination and to provide for some recovery. However, as discussed for Area A, these wells will not provide for any significant containment of the tar. Since tar was observed in all borings of adequate depth along River Street, specifically TB-17 through TB-20, the proposed 50 foot spacing of these wells appears excessive and therefore we request the initial spacing be reduced to 15 feet. This change will allow for better characterization of the area and more effective recovery and subsequent in-situ chemical oxidation treatment. As discussed for the tar recovery wells for Area A, the effectiveness of these wells should be evaluated through pumping in an attempt to recover any nearby tars, rather than to have them sit passively. This will not only facilitate greater and more timely recovery of tar, but will expedite the time frame to in-situ chemical oxidant injections to assist in the remediation of the site.

Response: There is already a high density of drilling data available along River Street, obtained from both the Central Hudson Remedial Investigation and the City's independent work, which was performed concurrently. The NYSDEC intends to use this information to guide the placement of tar collection wells. Additional rounds of

collection well installation may be required if results from the first wells indicate that such additional wells would increase the effectiveness of tar recovery.

Comment 138: The effective remediation of the shoreline of the Hudson River is critical to protecting human health and the environment and not inhibiting future use of the project area and adjacent sites. The proposal to allow contaminants to remain, and to fill the river through the installation of an above grade cap is unprecedented. We urge the Department to reconsider this alternative and require the implementation of option C6

Response: See the response to comment 75.

Comment 139: The need for the removal of tar-contaminated sediments is obvious as they directly degrade surface water through the release of sheens and the Department's recommended option also calls for their removal. The PRAP describes tar impacted sediment extending to depths of up to 10 feet (listed as 15 feet in the Draft PRAP) while an investigation conducted for the City of Newburgh identified tars in sediment down to 12 ½ feet adjacent to the embayment area. This indicates the previous investigations conducted by Central Hudson have been inadequate to fully characterize the extent of tar-impacted sediments. Therefore, the only way to ensure the complete remediation of this area is to conduct the dredging in the dry to allow for visual inspection of the area during excavation activities.

Response: Tar contaminated sediment will be removed, regardless of depth. Confirmation inspections and/or sampling will be required following completion of the dredging work to verify that this goal has been achieved. See the discussion of dry excavation in the response to comment 96.

Comment 140: The selection of this option (C6 versus C5) is that C6 will have the added benefits of providing for the maximum mass removal of contaminants and minimize the need for institutional controls. Furthermore, by avoiding the net filling of the Hudson River, (as would otherwise be the case with option C5), option C6 could reduce or eliminate the need for Army Corp of Engineers review associated with filling of the River. Army Corps of Engineer jurisdiction may also require that the remedy be reviewed by the Department of State for coastal consistency.

The unprecedented use of an above grade cap within the Hudson River raises the concern for scouring and the long-term stability of the cap. In particular there is concern not only for overall stability of such a cap but also for the integrity of the soft sediments on top of the proposed cap necessary for biota.

Response: As noted elsewhere, the remedial design will include an investigation to verify that the cap can be constructed and will function as designed. Physical erosion of the entire cap is unlikely, due to the presence of armoring stone in the cap design. There is no evidence that existing materials of this size currently on the river bottom (19th century brick fragments, etc) are being moved today. Erosion of the soft sediment upper layers of the cap is potentially more significant. It will be up to Central Hudson during the design process to undertake the necessary evaluations to confirm that this cap can be constructed and that it will remain in place. It will also be Central Hudson's responsibility to replace or redesign the cap if it fails to function as designed.

Comment 141: The discussion of depth of removal of PAH-impacted sediments and elevation of the cap calls for a minimum depth of four feet (reduced from six feet in the draft PRAP) which would prevent larger

motor boats and most sailboats from using a proposed pump out station therefore we request this minimum water depth be restored.

Response: The six-foot figure for water depth refers to average water depth, which is equivalent to four feet at low tide. At other locations in New York State where the NYSDEC has constructed docks for recreational boats, four feet has proven adequate. If the remedial design investigation indicates that a greater depth is required for recreational boats the cap will be redesigned to accordingly. It is not the intent of the remedy to increase the depth of the river beyond its current depth.

Comment 142: Newburgh respectfully requests that DEC hold a public hearing on the PRAP to provide the public an opportunity to review and provide comments. While the City has been involved in this process from the outset, individuals, organizations, local business and others with regional interests must be permitted the opportunity for meaningful public comment on this critically important issue the resolution of which will have lasting affects on their health, safety and welfare.

Response: See the response to comment 49.

The Town of Newburgh submitted a letter dated March 28, 2005, which included the following comment:

Comment 143: As detailed in the PRAP, Central Hudson's MGP Site has impacted an off-site area between the MGP Site and the Hudson River, which the Department has designated as "Area B." The City of Newburgh's sewage treatment plant ("STP") is located in Area B. However, it proposes only minimal soil excavation to remove the subsurface tar contamination, even though it notes that the tar is widely distributed throughout the area, on the basis that it cannot be readily executed due to the presence of STP structures and piping. As the Department is aware, the Town has rights in the STP, and therefore is adversely impacted by the contamination on that property.

The Town believes that the PRAP and the remedial measures proposed by the Department must take into consideration the expansion plans for the STP and require that the remedial measures undertaken by Central Hudson at the STP include the proper removal of contaminated soils and treatment and/or disposal of contaminated groundwater encountered during construction of the STP expansions.

Response: It is important to consider the two expansions of the STP separately. The first one, for which plans and specifications have been drawn up and for which construction began in June 2005, had been adequately addressed prior to preparation and release of the PRAP. The second expansion has not progressed to the same level of planning and is thus considered a future redevelopment event. The response to comment 12 addresses this in more detail.

APPENDIX B

Administrative Record

Administrative Record

Central Hudson Newburgh MGP Site
Newburgh, Orange County, New York
Site No. 3-36-042

1. Proposed Remedial Action Plan for the **Central Hudson Newburgh MGP Site**, dated April, 2005, prepared by the NYSDEC.
2. Order on Consent, Index No. D3-0001-95-06, between NYSDEC and Central Hudson Gas and Electric Corporation, executed on October 20, 1995.
3. "Phase I Investigation Newburgh Coal Gasification Plant Site", January, 1987, prepared by EA Science and Technology.
4. "Soil Vapor Survey Results, Former Newburgh Coal Gasification Plant Site", January 1987, prepared by EA Science and Technology.
5. "Initial Subsurface Investigation at Newburgh, New York Sewage Treatment Facility", July, 1995, prepared by First Environment.
6. "Source Investigation Technical Memorandum", October, 1996, prepared by Blasland, Bouck, and Lee.
7. "Hudson River Investigation Technical Memorandum", November, 1996, prepared by Blasland, Bouck, and Lee.
8. "Hydrogeologic Investigation Technical Memorandum", November, 1996, prepared by Blasland, Bouck, and Lee.
9. "Document Appendix", March 1998, Historical background documents submitted by the City of Newburgh
10. "Newburgh Project Remedial Investigation Report Revised June 1999 Volume 1 of 2", prepared by Blasland, Bouck, and Lee.
11. "Newburgh Project Remedial Investigation Report Revised June 1999 Volume 2 of 2", prepared by Blasland, Bouck, and Lee.
12. "Closing Binder, Settlement of the 'MGP Litigation' With the City of Newburgh" March 4, 1999
13. "Boring Logs G98-1 to G98-85" Logs Dated September 1998, as forwarded to NYSDEC in August, 2000, prepared by First Environment.

14. "City of Newburgh Local Waterfront Revitalization Plan" May 2001, prepared by Stuart Turner and Associates.
15. "Newburgh Project Ecological Assessment Revised June, 2001", prepared by Blasland, Bouck, and Lee.
16. "Baseline Human Health Risk Assessment Revised June 2001", prepared by Blasland, Bouck, and Lee.
17. "Revised Feasibility Study Report, Newburgh Project", October, 2003, prepared by Blasland, Bouck, and Lee.