PROPOSED REMEDIAL ACTION PLAN

NM - Troy, Smith Ave. MGP
Operable Unit Numbers: 02,03
Ingalls Avenue Purifier Waste
Hudson River Sediments
Troy, Rensselaer County
Site No. 442030
February 2011

Prepared by
Division of Environmental Remediation
New York State Department of Environmental Conservation

PROPOSED REMEDIAL ACTION PLAN

NM - Troy, Smith Ave. MGP
Troy, Rensselaer County
Site No. 442030
February 2011

SECTION 1: SUMMARY AND PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), is proposing a remedy for the above referenced site. The disposal of hazardous wastes at the site has resulted in threats to public health and the environment that would be addressed by the remedy proposed by this Proposed Remedial Action Plan (PRAP). The disposal of hazardous wastes at this site, as more fully described in Section 6 of this document, has contaminated various environmental media. The proposed remedy is intended to attain the remedial action objectives identified for this site for the protection of public health and the environment. This PRAP identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for the preferred remedy.

The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York; (6 NYCRR) Part 375. This document is a summary of the information that can be found in the site-related reports and documents in the document repository identified below.

SECTION 2: CITIZEN PARTICIPATION

The Department seeks input from the community on all PRAPs. This is an opportunity for public participation in the remedy selection process. The public is encouraged to review the reports and documents, which are available at the following repository:

Troy Public Library
100 2nd Street
Troy, NY 12180
Phone: 518-274-7071

A minimum 30-day public comment period will be established. During the comment period, a public meeting will be held.

At the meeting, the findings of the remedial investigation (RI) and the feasibility study (FS) will be presented along with a summary of the proposed remedy. After the presentation, a question-and answer period will be held, during which verbal or written comments may be submitted on the PRAP.

Written comments may also be sent to:

John Spellman
NYS Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233
jtspellm@gw.dec.state.ny.us

The Department may modify the proposed remedy or select another of the alternatives presented in this PRAP based on new information or public comments. Therefore, the public is encouraged to review and comment on the proposed remedy identified herein. Comments will be summarized and addressed in the responsiveness summary section of the Record of Decision (ROD). The ROD is the Department's final selection of the remedy for this site.

Receive Site Citizen Participation Information By Email

Please note that the Department's Division of Environmental Remediation (DER) is "going paperless" relative to citizen participation information. The ultimate goal is to distribute citizen participation information about contaminated sites electronically by way of county email listservs. Information will be distributed for all sites that are being investigated and cleaned up in a particular county under the State Superfund Program, Environmental Restoration Program, Brownfield Cleanup Program, Voluntary Cleanup Program, and Resource Conservation and Recovery Act Program. We encourage the public to sign up for one or more county listservs at http://www.dec.ny.gov/chemical/61092.html

SECTION 3: SITE DESCRIPTION AND HISTORY

Location: The site is located at the western end of Smith Avenue in Troy, Rensselaer County, New York. The site is bounded along the west side by the Hudson River, and is located approximately 300 feet south of the Troy Dam, adjacent to the southern approach to the Troy lock. The site occupies 5 acres and is comprised of two properties. One property is owned by National Grid and occupies the southern and eastern portions of the site. The other property is owned by the United States Army Corps of Engineers (USACE) and occupies the northwestern portion of the site.

Site Features: The majority of the site is flat, except for a saddle-shaped depression that exists on the western edge of the site adjacent to the sheet-pile approach wall for the lock. Most of the former MGP site is flat, with an approximate ten-foot drop in elevation near the sheet-piled approach wall that defines the western edge of the site. South of the approach wall a moderately sloped and heavily vegetated bank exists along the Hudson River. Much of the National Grid property is covered by pavement, along with an office building and maintenance buildings. In contrast, much of the USACE-owned portion of the site is covered by grass lawn, along with a building that serves as an office.

Site Zoning and Use: The site is zoned for commercial use. Properties adjacent to the site are located in an urban setting with mixed residential and commercial land use. The National Grid property is currently in use as a natural gas distribution and service facility. The USACE property is used primarily to operate the Troy Lock and Dam.

Historical Use: Manufactured gas was produced at the site from approximately 1888 to 1928. The plant used the carbureted water gas process to produce gas from coal for lighting, cooking and heating. At the peak of gas production in the 1920s, the facility had expanded to include three gas holders and three tar settling tanks. In 1928 the last gas was produced at the site. The site continued to be used for storing gas generated elsewhere for an undetermined time. In 1960 the last gas holder was removed from the site. While not part of the MGP operation, the Troy lock, dam and southern approach wall were constructed from 1913 to 1915, and thus were contemporary with the latter years of manufactured gas production.

Operable Units: During the investigation of the site it was discovered that contamination existed beyond the limits of the former MGP property. To facilitate further investigation and remediation of MGP contamination, operable units were developed. An operable unit represents a portion of the site remedy that for technical or administrative reasons can be addressed separately to eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination. The operable units are defined as follows:

Operable Unit No. 1 (OU-1): The former MGP area.
Operable Unit No. 2 (OU-2): The western end of Ingalls Avenue.
Operable Unit No. 3 (OU-3): Hudson River sediments adjacent to and downstream of the site.

A remedy was selected for OU-1 in 2007. The main components of the OU-1 remedy are removal of the contents of a former gas holder, construction of a subsurface containment wall along the Hudson River and installation of a low permeability cap. The remedy also includes land use and groundwater use restrictions.

OU-2 is an undeveloped area approximately 100 feet wide and 200 feet long owned by the City of Troy and reputedly Helen Mlock. These parcels are located about 500 feet south of OU-1. A portion of the city's parcel has been graded and paved to provide vehicle access to the Hudson River. There are no buildings at or in the near vicinity of OU-2. The parcel consists of sand and gravel fill material, with some observations of man-made materials such as ash, brick, glass, slag and asphalt pieces. A former automobile salvage business existed adjacent to OU-2. Groundwater was observed at approximately 12 feet below ground surface at the western end of the operable unit. The City of Troy has plans under development for a boat launch which includes some excavation at OU-2.

OU-3 is the Hudson River sediment adjacent to OU-1 and extending downstream about 1,000 feet. The river is an active navigation channel at the northern end of this operable unit. The sediment consists of sand and gravel with occasional silt. The sediment thickness is generally less than six feet and is underlain by weathered shale bedrock. Beyond about 100 feet from shore soft sediment was not encountered during the investigation and the river bottom is comprised of cobbles or bedrock. The water depth in the approach lock is approximately 15 feet at low tide. Navigational dredging has not taken place within the last 50 years, which indicates that the sediment deposition rate in the lock area is very low.

OU-3 lies within the 200-mile stretch of the Hudson River defined by the United States Environmental Protection Agency (USEPA) as the Hudson River PCBs NPL (National Priorities List) Site. The operable unit lies immediately downstream of the Upper Hudson River reach, the reach that USEPA has identified for remediation.

Site Geology and Hydrogeology: Shale bedrock is present from approximately 38 to 59 feet below the ground surface. The top of bedrock consists of loose and weathered shale which varies in thickness from less than one foot to approximately nine feet. Overlying the shale is a glacial till ranging from less than one foot to ten feet thick. The till is a dense clayey silt with shale fragments and some sand and gravel inclusions. Coarse material overlies the till; a fill layer of broken brick, ash, sand, gravel and cobbles is present at the surface to a depth of 10 to 34 feet. Groundwater is present in both the bedrock and unconsolidated materials starting at a depth of approximately 16 feet.

The water table aquifer flows toward the Hudson River with a slight southern component. The presence of the Troy Dam and the tidal nature of the river downstream of the dam provide for a relatively controlled surface water elevation adjacent to the site.

The coarse fill and glacial outwash material allow for the relatively easy migration of groundwater and contaminants within these layers. However, the downward migration of contamination is impeded by the dense till material. The lock approach wall restricts the horizontal movement of contaminants from the coarse material into the Hudson River; however the integrity of this wall below the water surface is unknown.

Operable Unit (OU) Numbers 02,03 are the subject of this document.

A Record of Decision was issued previously for OU 01.

A site location map is attached as Figure 1.

SECTION 4: LAND USE AND PHYSICAL SETTING

The Department may consider the current, intended, and reasonably anticipated future land use of the site and its surroundings when evaluating a remedy for soil remediation. For this site, alternatives (or an alternative) that restrict(s) the use of the site to restricted-residential use (which allows for commercial use and industrial use) as described in Part 375-1.8(g) is/are being evaluated in addition to an alternative which would allow for unrestricted use of the site.

A comparison of the results of the investigation to the appropriate standards, criteria and guidance values (SCGs) for the identified land use and the unrestricted use SCGs for the site contaminants is included in the Tables for the media being evaluated in Exhibit A.

SECTION 5: 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 PRPs for the site, documented to date, include:

National Grid

The Department and Niagara Mohawk Power Corporation, a subsidiary of National Grid, entered into Consent Orders on December 7, 1992 (Index No. DO-0001-9210) and November 7, 2003 (Index No. A4-0473-0000). The Orders obligate the responsible party to implement a full remedial program.

SECTION 6: SITE CONTAMINATION

6.1: Summary of the Remedial Investigation

A Remedial Investigation (RI) has been conducted. The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The field activities and findings of the investigation are described in the RI Report.

The following general activities are conducted during an RI:

- Research of historical information,
- Geophysical survey to determine the lateral extent of wastes,
- Test pits, soil borings, and monitoring well installations,
- Sampling of waste, surface and subsurface soils, groundwater, and soil vapor,
- Sampling of surface water and sediment,
- Ecological and Human Health Exposure Assessments.

6.1.1: Standards, Criteria, and Guidance (SCGs)

The remedy must conform to 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.

To determine whether the contaminants identified in various media are present at levels of concern, the data from the RI were compared to media-specific SCGs. The Department has developed SCGs for groundwater, surface water, sediments, and soil. The NYSDOH has developed SCGs for drinking water and soil vapor intrusion. The tables found in Exhibit A list the applicable SCGs in the footnotes. For a full listing of all SCGs see: http://www.dec.ny.gov/regulations/61794.html

6.1.2: RI Information

The analytical data collected on this site includes data for:

- groundwater
- soil
- sediment

The data have identified contaminants of concern. A "contaminant of concern" is a hazardous waste that is sufficiently present in frequency and concentration in the environment to require evaluation for remedial action. Not all contaminants identified on the property are contaminants of concern. The nature and extent of contamination and environmental media requiring action are summarized in Exhibit A. Additionally, the RI Report contains a full discussion of the data. The contaminant(s) of concern identified at this site is/are:

For OU: 02

fluoranthene
acenaphthene
fluorene
naphthalene
benz(a)anthracene
phenanthrene
cyanides(soluble cyanide salts)

For OU: 03

coal tar
acenaphthene
fluorene
fluoranthene
naphthalene
benz(a)anthracene
phenanthrene

As illustrated in Exhibit A, the contaminant(s) of concern exceed the applicable standards, criteria and guidance for:

- soil
- sediment

6.2: 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 issuance of the Record of Decision.

The following IRM(s) has/have been completed at this site based on conditions observed during the RI.

Purifier Waste Removal IRM

Initiated by a citizen complaint in October 1998, National Grid sampled a distinct odor-causing material on property owned by the City of Troy, at the western end of Ingalls Avenue(i.e., OU 02). The property extends to the Hudson River and a paved surface provides vehicle access to the river. The investigation concluded that the material was purifier waste, which is described further in Exhibit A. Through a Department-approved plan, National Grid removed 14 tons of purifier waste on May 10, 1999 by excavation and off-site disposal. However, purifier waste remained in the subsurface following the excavation, and analysis of post excavation samples revealed polycyclic aromatic hydrocarbons (PAHs) and total cyanide concentrations in excess of recommended soil cleanup objectives. In addition, purifier waste has been observed at the surface since the removal.

6.3: Summary of Human Exposure Pathways

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure.*

Operable Unit Number 1 (OU-1): The former MGP area.
Direct contact with contaminants in the soil is unlikely because the site is fenced and the majority of the site is covered with pavement or buildings. People are not drinking the contaminated groundwater because the area is served by a public water supply that is not affected by this contamination. Volatile organic compounds in the groundwater and/or soil may move into the soil vapor (air spaces within the soil), which in turn may move into overlying buildings and affect the indoor air quality. This process, which is similar to the movement of radon gas from the subsurface into the indoor air of buildings, is referred to as soil vapor. The potential exists for the inhalation of site contaminants through soil vapor intrusion in the on-site National Grid's work crew building.

Operable Unit Number 2 (OU-2): Western end of Ingalls Avenue.
The road is unrestricted and used by persons accessing the river to boat or fish. People using the site could contact contaminants at the surface by walking on the soil, digging or otherwise disturbing the soil.

Operable Unit Number 3 (OU-3): Hudson River sediments adjacent and downstream of the site.
People may come in contact with contaminants present in shallow river sediment while entering or exiting the river during recreational activities.

6.4: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts may include existing and potential future exposure pathways to fish and wildlife receptors, wetlands, groundwater resources, and surface water.

Based upon the resources and pathways identified and the toxicity of the contaminants of ecological concern at this site, a Fish and Wildlife Resources Impact Analysis (FWRIA) was deemed not necessary for OU(s) 02,03.

Contaminants associated with the former manufactured gas plant have been identified in the local groundwater and soils at concentrations exceeding applicable standards and guidance values. In addition, groundwater at this site discharges directly into the Hudson River and represents a potential contaminant migration pathway to this Class C surface water body. Coal tar non-aqueous phase liquid is present in soil both on and off-site. The site presents a significant threat due to the ongoing releases from contaminant source areas into groundwater.

Sediments in the approach to the federal lock (OU 3) are contaminated with tar and contain PAHs which exceed the criteria for chronic toxicity to benthic aquatic life. Certain sediments in the lock approach and immediately downstream of the approach also exceed the 4 ppm screening value for total PAHs. As a result, there is a potential for adverse exposure of benthic organisms to contaminated sediment. Fish and other wildlife which consume benthic organisms in OU-3 as a food source also have the potential to be adversely affected.

The Hudson River corridor below the Troy Lock and Dam has been designated by the Department's Natural Heritage Program as a significant habitat due to the large number of wintering waterfowl which use the river and the seasonal migration of anadromous fish.

The Hudson River provides a valuable resource for habitat and is valuable as a navigable water route to Lake Champlain and the Great Lakes. The presence of contaminated surface sediment threatens surface water quality through sediment resuspension and transport.

At OU-2 (Ingalls Avenue) there is limited value for fish and wildlife resources based on the small area of the operable unit and the absence of significant vegetation communities. Since purifier waste has been observed on the surface and in the shallow subsurface, there is a potential for terrestrial wildlife exposure to purifier waste.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

To be selected, the 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. The remedy must also attain the remedial action objectives identified for the site, which are presented in Exhibit B. Potential remedial alternatives for the Site were identified, screened and evaluated in the FS report.

A summary of the remedial alternatives that were considered for this site is presented in Exhibit C. Cost information is presented in the form of present worth, which 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 does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals are not achieved. A summary of the Remedial Alternatives Costs is included as Exhibit D.

7.1: Evaluation of Remedial Alternatives

The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375. 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 Department has determined to be applicable on a case-specific basis.

The next six "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. 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.

4. 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.

5. Short-term Impacts and 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.

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 annual 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.

8. Land Use. When cleanup to pre-disposal conditions is determined to be infeasible, the Department may consider the current, intended, and reasonable anticipated future land use of the site and its surroundings in the selection of the soil remedy.

The final criterion, Community Acceptance, 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.

9. Community Acceptance. Concerns of the community regarding the investigation, the evaluation of alternatives, and the PRAP are evaluated. A responsiveness summary will be prepared that describes public comments received and the manner in which the Department will address the concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

7.2: Elements of the Proposed Remedy

The basis for the Department's proposed remedy is set forth at Exhibit E.

For OU: 02

The estimated present worth cost to implement the remedy is $810,000. The cost to construct the remedy is estimated to be $750,000 and the estimated average annual cost is $20,000.

The elements of the proposed remedy are as follows:

1. A remedial design program will be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program.

2. Purifier waste and soil will be excavated from an area approximately 100 feet wide and 200 feet in length, to a depth of ten feet below grade (see Figure 6). This area is to include all locations where purifier waste has been identified within ten feet of the ground surface. The depth of excavation will be extended beyond 10 feet in areas where purifier waste may be encountered during construction of the City of Troy’s proposed boat launch. An estimated 5,400 cubic yards (cy) of soil will be excavated. Excavated waste and soil will be treated or disposed off-site. A demarcation layer will be placed at the bottom of excavation to denote the vertical limit of excavation. Excavated material determined to meet re-use criteria may be used to backfill the lower portion of the excavated areas.

3. The excavated area will be backfilled to the existing grade with crushed stone or soil meeting the SCOs for backfill material for the protection of public health - restricted residential as set forth in 6 NYCRR Part 375-6.7(d). The backfill will be a minimum two-feet thick above the demarcation layer to act as a soil cover.

4. Soil that remains in place in the subsurface will be sampled for cyanide. If the analytical results indicate concentrations of cyanide exceeding the SCG for unrestricted use (i.e., 27 ppm free cyanide, 72 ppm total cyanide), a Site Management Plan will be developed as an institutional control to address future excavation of soil. This plan will include, but may not be limited to, details for the management of future excavations in areas of remaining contamination. A copy of the Department-approved Site Management Plan will be provided to the appropriate property owners. The Department envisions that the Site Management Plan required under the Operable Unit No. 1 Record of Decision (June 2007) will be expanded to include Operable Unit No. 2. The SMP will include a provision that allows the use and development of the controlled properties for restricted-residential use (which allows for commercial use and industrial use).

5. National Grid will provide a periodic certification of the institutional and engineering controls, prepared and submitted by a professional engineer or such other expert acceptable to the Department, until the Department notifies National Grid in writing that this certification is no longer needed. The Department envisions that the Site Management Plan required under the Operable Unit No. 1 Record of Decision (June 2007) will be expanded to include Operable Unit No. 2. This submittal will: (a) contain a certification that the institutional controls and engineering controls put in place are still in place and are either unchanged from the previous certification or are compliant with Department-approved modifications, (b) allows the Department access to the site, and (c) state that nothing has occurred that will impair the ability of the control to protect public health or the environment, or constitute a violation or failure to comply with the site management plan unless otherwise approved by the Department.

6. Green remediation and sustainability efforts are considered in the design and implementation of the remedy to the extent practicable, including:
- using renewable energy sources
- reducing green house gas emissions
- encouraging low carbon technologies
- conserving natural resources
- increasing recycling and reuse of clean materials
- utilizing native species and discourage invasive species establishment during restoration
- promoting recreational use of natural resources
- designing cover systems to be usable for habitat or recreation

For OU: 03

The estimated present worth cost to implement the remedy is $2,900,000. The cost to construct the remedy is estimated to be $2,900,000 and the estimated average annual cost is $0.

The elements of the proposed remedy are as follows:

1. A remedial design program will be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program. The design will also satisfy United States Army Corps of Engineers requirements for continued operation of the

lock. The design program will specifically include a refined delineation of the extent of NAPL-containing sediment at the south end of the lock approach.

2. Removal of sediments containing separate phase coal tar from the lock approach area. Approximately 5,300 cy of sediment will be removed from an area extending a minimum of 300 feet south from the southern lock gate and approximately 80 feet from the approach wall to the west guide wall. Vertically, the removal will extend to six feet below the mudline or to competent bedrock, if the bedrock is encountered less than six feet from the sediment surface.

3. Removed sediment will be dewatered, amended as needed for moisture content, and subsequently transported off-site for appropriate treatment and/or disposal.

4. In the area of the removal, the river bottom will receive a minimum two-foot thick layer of backfill satisfying the sediment criteria and suitable for benthic habitat.

5. Green remediation and sustainability efforts are considered in the design and implementation of the remedy to the extent practicable, including:

- using renewable energy sources
- reducing green house gas emissions
- encouraging low carbon technologies
- conserving natural resources
- increasing recycling and reuse of clean materials
- utilizing native species and discourage invasive species establishment during restoration
- promoting recreational use of natural resources
- designing cover systems to be usable for habitat or recreation

Exhibit A

Nature and Extent of Contamination

This section describes the findings of the Remedial Investigation. As described in Section 6.1.2, samples were collected from various environmental media to characterize the nature and extent of contamination. This section describes the findings for all environmental media that were evaluated.

For each medium, a table summarizes the findings of the investigation. The tables present the range of contamination found at the site in the media and compares the data with the applicable standards, criteria and guidance (SCGs) for the site. The contaminants are arranged into three categories; volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and inorganics (metals and cyanide). For comparison purposes, the SCGs are provided for each medium that allows for unrestricted use. For soil, if applicable, the Restricted Use SCGs identified in Section 6.1.1 are also presented.

Soil Cleanup Objectives (SCOs) for Cyanide

Cyanide is present at former manufactured gas plant (MGP) sites in purifier (box) wastes and to a lesser degree in some tars where coal was used as the feedstock. Although total cyanide concentrations can be quite high, the chemical form of the cyanide, whether it is free to react or is chemically bound to other elements, is an important factor in whether it can cause health effects. Studies have shown that less than 2% of the cyanide in purifier waste is present as free cyanide, the most toxic form. The remaining cyanide is present in less toxic chemical compounds mixed with elements such as iron, copper and zinc.

The SCOs established in 6NYCRR Part 375 were developed based on health and environmental assessments detailed in the accompanying Technical Support Document. The SCO for free cyanide was established as 27 ppm based on acute (short term) exposure. The SCO for total cyanide was established at 72 ppm for chronic (long term) exposure to total cyanide. Since there was no approved analytical method for free cyanide when Part 375 was issued, Part 375 only lists an SCO for total cyanide. The measurement of total cyanide was considered to be a conservative indicator of free cyanide in the absence of an approved free cyanide method. This approach was used for the investigations performed to date at the site.

An analytical method for free cyanide (SW-846 Method 9016) was approved by EPA and published in the Federal Register in June 2010. As a result, the threat of cyanide-contaminated wastes and soils can be more accurately evaluated in the future using tests for both free and total cyanide. For future delineation work at this site, and for confirmation of any remedial work, free cyanide results will be compared to an SCO of 27 ppm, and total cyanide results will be compared to a SCG (standard, criteria or guidance value) of 72 ppm.

Waste/Source Areas

As described in the RI report, waste/source materials were identified at the site and are impacting soil and sediment.

Wastes are defined in 6 NYCRR Part 375-1.2 (aw) and include solid, industrial and/or hazardous wastes. Source Areas are defined in 6 NYCRR Part 375 (au). Source areas are areas of concern at a site were substantial quantities of contaminants are found which can migrate and release significant levels of contaminants to another environmental medium. Wastes and source areas were identified at the site, as described below.

Two principal byproducts were produced in the manufactured gas process: coal tar and purifier waste. Coal tar is a reddish brown to black oily by-product which formed as a condensate as the gas cooled. Purifier waste is a spent filtration media containing wood chips and iron filings which was used to remove cyanide and sulfur gases from the mix prior to distribution.

Coal tar does not readily dissolve in water. Materials such as this are commonly referred to as a non-aqueous phase liquid, or NAPL. Thus the terms coal tar and NAPL are used interchangeably in this document.

Specific volatile organic compounds (VOCs) of concern in coal tar are benzene, toluene, ethylbenzene and xylenes. These are referred to collectively as BTEX in this document. Specific semivolatile organic compounds of concern are the polycyclic aromatic hydrocarbons (PAHs):

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

Total PAH concentrations as referred to in this plan are the sum of the individual PAHs listed above. The italicized PAHs are probable human carcinogens.

Unlike NAPL, purifier waste is a solid waste with an oatmeal-like consistency. Purifier waste has the potential to leach cyanide and create acidic conditions in nearby surface water and/or groundwater. It has the potential to contain high concentrations of sulfur and cyanide and has a characteristic blue color from complex ferrocyanides.

OU-2 – Ingalls Avenue

Since the 1999 removal of the majority of the purifier waste, the remaining purifier waste was found sporadically, occurring in discrete thin layers (less than two feet in thickness) in the subsurface. There have also been observations of purifier waste on the surface. No coal tar has been observed at OU-2 since the removal.

As shown on Figure 3, the purifier waste was observed in the area to the north and south of the 1999 removal location and at test pit TP-2. The depth of the waste generally ranged between 2 and 10 feet. At TP-2, purifier waste was found at a depth of 13 feet, but the test pit could not be completed beyond 15 feet, which prevented the full thickness of the purifier waste from being determined at this location. Also, purifier waste was not observed in adjacent test pits TP-1 and TP-3.

Groundwater was not observed during the excavation of the test pits, suggesting that for at least part of the year the waste is not in contact with the groundwater table.

OU-3 – Hudson River Sediments

Coal tar was observed in Hudson River sediments adjacent to the lock approach wall area at the locations shown on Figure 4. In some samples, coal tar extended the full depth of sediment to the bedrock interface, which is approximately five feet in this area. Observations from the OU-1 investigations indicate that the coal tar is continuous between the foundation of former Gas Holder No. 2 and sediments adjacent to the approach wall. Coal tar was not observed in sediments downstream of the approach wall. Coal tar was not observed in the bedrock cores collected near the approach wall.

Sheens were observed in certain sediment cores downstream of the lock approach. With the exception of sample TS-35, the sheens were characterized as “trace”.

The waste/source areas identified will be addressed in the remedy selection process.

Groundwater

A water table monitoring well (monitoring well MW-19) was installed at OU-2 between the purifier waste removal area and the Hudson River. Based on regional groundwater flow and the Environmental Site Investigation Report for the adjacent former Cox property, the well location is downgradient of the removal area. Groundwater in this well was analyzed for benzene, toluene, ethylbenzene, xylene, PAHs, and cyanide. There were no exceedances of Class GA groundwater standards or guidance values.

No groundwater contamination of concern was identified at OU-2 during the RI. Therefore, no remedial alternatives need to be evaluated for groundwater.

Soil

The soil contamination described in this section pertains to current conditions in the Ingalls Avenue area after the 1999 removal of purifier waste.

As shown in Figure 3, total cyanide exceeding the unrestricted use SCG of 27 ppm was found predominantly in the sidewall samples collected from the 1999 waste removal area. Cyanide also exceeded the unrestricted use SCG at TP-2, fourteen feet below ground surface. Cyanide also exceeded the soil SCG for restricted residential use at these locations.

PAHs exceeding the unrestricted use SCG were found throughout OU-2 (Table 1). As shown on Figure 3, higher concentrations of PAHs were located in the sidewalls of the 1999 waste removal area. Generally, PAHs did not exceed the soil SCG for restricted residential use beyond the immediate vicinity (approximately 40 feet) of the waste removal area.

Certain metals were found to exceed the unrestricted use SCG but generally satisfy the restricted residential use SCG. Lead was found as high as 2,010 ppm, exceeding the restricted residential use SCG of 400 ppm. While this sample may be an outlier, it indicates the presence of non-MGP related contaminants in the anthropogenic fill materials.

Table 1 - Soil (OU-2)

Detected Constituents Exceeding Unrestricted Use	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG	Restricted Residential SCG[c] (ppm)	Frequency Exceeding Restricted Residential SCG
Contaminant					
Cyanide[d]	ND-372	27	8/17	27	8/17
VOCs					
Benzene	ND-0.074	0.06	1/10	4.8	0/10
Toluene	ND-0.72	0.7	1/10	100	0/10
Xylene (mixed)	ND-2.2	0.26	1/10	100	0/10
SVOCs					
Acenaphthene	ND-68	20	2/10	100	0/10
Acenapthylene	ND-190	100	1/10	100	1/10
Benzo(a)anthracene	ND-290	1	8/10	1	8/10
Benzo(a)pyrene	ND-84	1	8/10	1	8/10
Benzo(b)fluoranthene	ND-230	1	9/10	1	9/10
Benzo(g,h,i)perylene	ND-110	100	1/10	100	1/10
Benzo(k)fluoranthene	ND-120	0.8	7/10	3.9	3/10
Chrysene	ND-390	1	9/10	3.9	4/10
Dibenz(a,h)anthracene	ND-43	0.33	6/10	0.33	6/10
Fluoranthene	<1-600	100	4/10	100	4/10
Fluorene	<1-270	30	4/10	100	1/10
Indeno(1,2,3-cd)pyrene	ND-110	0.5	8/10	0.5	8/10
Naphthalene	ND-73	12	4/10	100	0/10
Phenanthrene	<1-1400	100	3/10	100	3/10
Pyrene	<1-770	100	3/10	100	3/10
Metals					
Arsenic	3-77	13	2/6	16	1/6
Barium	32-422	350	2/6	400	0/6
Copper	21-281	50	1/6	270	1/6
Lead	12-2010	63	5/6	400	1/6
Total Mercury	ND-0.65	0.18	3/6	0.81	0/6
Selenium	ND-11	3.9	1/6	180	0/6

Detected Constituents Exceeding Unrestricted Use	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG	Restricted Residential SCG[c] (ppm)	Frequency Exceeding Restricted Residential SCG
Zinc	47-390	109	4/6	10,000	0/6

a - ppm: parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
b - SCG: Part 375-6.8(a), Unrestricted Soil Cleanup Objectives.
c - SCG: Part 375-6.8(b), Restricted Use Soil Cleanup Objectives for the Protection of Public Health for Restricted Residential Use, unless otherwise noted.
d – Investigation results for cyanide are based on total cyanides, due to the lack of an approved method for free cyanides when the investigation was conducted.

Based on the findings of the remedial investigation, the disposal of hazardous waste has resulted in the contamination of soil. The site contaminants identified in soil which are considered to be the primary contaminants of concern, to be addressed by the remedy selection process, are cyanide and PAHs. Higher concentrations of PAHs were found co-located with higher cyanide concentrations suggesting the removal of soil with higher concentrations of cyanide would address higher concentrations of PAHs of MGP origin.

Surface Water

During the RI, six Hudson River water samples were collected in and near OU-3 and analyzed for VOCs, SVOCs, PCBs, pesticides, metals and cyanide. With one exception, contaminants were either not detected or were present in concentrations below Class A surface water quality standards. Only bis (2-ethylhexyl) phthalate, a common laboratory contaminant, exceeded the SCG of 0.6 ppb, with a concentration of 1 ppb in two samples. Bis (2-ethylhexyl) phthalate is not an MGP contaminant of concern.

No site-related surface water contamination of concern was identified during the RI. Therefore, no remedial alternatives need to be evaluated for surface water.

Sediments

Certain sediments at OU-3 exceeded sediment SCGs for PAHs and metals. Sediment SCGs for PAHs are calculated taking into account the organic carbon content of the sediment. Thus, the sediment criteria values for each PAH vary depending on the organic carbon content of each sample. Table 2 presents the SCG range for the each PAH that was exceeded. For ease of representing the extent of contamination, a total PAH screening value of 4 ppm is also used for comparison. Total PAHs in this PRAP refer to the 17 PAHs presented in “Waste/Source Areas” above. Certain sediments were also analyzed for the National Oceanographic and Atmospheric Administration (NOAA) list of 34 PAHs by a different analytical method. This analysis appears in the 2008 RI report. The sediments which exceeded the site-specific SCGs were generally located along the lock approach wall, in the same area as observations of coal tar.

Samples that contained coal tar were not analyzed, based on the assumption that sediment containing coal tar exceeds the SCGs for BTEX and PAHs.

PAHs in sediment that exceeded the 4 ppm screening value but did not contain coal tar were found adjacent to the site and as far as 500 feet downstream of OU-1 (see Figure 5). The highest PAH concentration (62 ppm) was found at the south entrance to the lock approach, adjacent to former gas holder no. 2. The highest PAH concentration found downstream of the lock approach was 37 ppm at TS-35.

Toxicity tests were conducted on OU-3 sediment using the freshwater amphipod Hyalella azteca. Three sediment samples out of twenty were found to be toxic to this organism. Two of the three samples (TS-02 and TS-04) were located within the lock approach, adjacent to the approach wall. The third sample (TS-20) was found approximately 250 feet downstream of the lock approach. Unlike samples TS-02 and TS-04, sample TS-20 was relatively low in total PAH concentration (6.4 ppm), and a portion of the PAHs was attributed to non-MGP origins. Sample TS-20 also contained a high percentage of sand, which is expected to contribute to lower survival of benthic organisms. Samples collected between TS-04 and TS-20 were found to be non-toxic.

Certain sediment samples were also tested for concentrations of contaminants in pore water using solid phase microextraction. Recent studies have indicated that for certain contaminants, including PAH mixtures, pore water concentrations of contaminants may be a better predictor of sediment toxicity than total sediment concentrations. When the site sample results were compared to literature toxicity values based on EPA's narcosis model for PAH mixtures, two sediment samples collected adjacent to the lock approach wall were determined to be toxic. While the Department does not endorse the pore water toxicity method as a stand-alone approach at this time, it is useful as an additional line of evidence in determining appropriate sediment remediation goals.

The RI included an investigation to determine the relative contributions of MGP and other sources of PAH contamination in sediments. Boat traffic that proceeds through the lock and urban runoff can also contribute PAHs to the sediment. Based on a chemical forensic analysis of PAH patterns, the report concluded that 15 out of 17 samples appeared to have some MGP related impacts, ranging from trace to extensive. The balance of the PAH impacts is from non-MGP origins. The PAH impacts in sample TS-20, mentioned above, were concluded to be from both MGP and urban background (non-MGP). The remaining two samples (TS17 and TS18) consisted of urban background impacts only. The samples with extensive MGP impacts (TS02 and TS04) were collected adjacent to the lock approach wall.

As part of the RI, the sediment was analyzed for PCBs despite no association between PCBs and the manufactured gas process. The highest concentration was 0.77 ppm.

Table 2 – Sediment (OU3)

Detected Constituents Exceeding SCG	Concentration Range Detected (ppm)[a]	SCG[b]	Frequency Exceeding SCG	Site Derived Value [c] (ppm)	Frequency Exceeding Site Derived Value
SVOCs			0		
Acenaphthene	ND-26	140 µg/gOC[d]	0	0.37-21	12/55
Anthracene	ND-6	107 µg/gOC	0	0.28-16	1/55
Benzo(a)anthracene	ND-1.6	12 µg/gOC	0	0.031-1.8	19/55
Fluorene	ND-12	8 µg/gOC	0	0.21-1.2	18/55
Naphthalene	ND-8.3	30 µg/gOC	0	0.078-4.6	6/55

Detected Constituents Exceeding SCG	Concentration Range Detected (ppm)[a]	SCG[b]	Frequency Exceeding SCG	Site Derived Value [c] (ppm)	Frequency Exceeding Site Derived Value
Phenanthrene	ND-10	120 µg/gOC	0	0.32-18.6	2/55
Total PAHs	ND-62	4 mg/kg	25/55	NR	
Metals[d]					
Arsenic	2.9-10	6.0 mg/kg	4/8	NR	
Copper	13-42	16.0 mg/kg	7/8	NR	
Iron	1.6%-3.3%	2%	5/8	NR	
Lead	12-98	31.0 mg/kg	3/8	NR	
Manganese	190-690	460 mg/kg	2/8	NR	
Mercury	0.04-0.23	0.15 mg/kg	1/8	NR	
Nickel	13-31	16 mg/kg	5/8	NR	
Zinc	69-154	120 mg/kg	1/8	NR	

a - ppm: parts per million, which is equivalent to milligrams per kilogram, mg/kg, in sediment;
b - SCG: The Department's "Technical Guidance for Screening Contaminated Sediments."
c – Site derived value based on site-specific organic carbon levels
d – The SCG listed for metals is Lowest Effects Level (LEL), which indicates a moderate impact. None of the sediments exceeded the Severe Effects Level (SEL) for any metals.

NR = Not Required

The site contaminants that are considered to be the primary contaminants of concern which will drive the remediation of sediment to be addressed by the remedy selection process are NAPL and PAHs.

Exhibit B

SUMMARY OF THE REMEDIATION OBJECTIVES

The objectives for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. The goal for the remedial program is to restore the site to pre-disposal conditions to the extent feasible. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified at the site through the proper application of scientific and engineering principles.

The remedial objectives for this site are:

Public Health Protection

Soil (OU-2)
- Prevent ingestion/direct contact with contaminated soil.

Sediment (OU-3)
- Prevent direct contact with contaminated sediments.
- Achieve pre-release/background conditions to the extent feasible

Environmental Protection

Soil (OU-2)
- Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.

Sediment (OU-3)
- Prevent releases of contaminants from sediment that would result in surface water levels in excess of ambient water quality criteria.
- Prevent impacts to biota from ingestion/direct contact with sediments causing toxicity and impacts from bioaccumulation through marine and aquatic food chain.

Exhibit C

Description of Remedial Alternatives

The following alternatives were considered based on the remedial action objectives (see Exhibit B) to address the contaminated media identified at the site as described in Exhibit A:

Operable Unit #2 – Ingalls Avenue

Alternative 1: No Further Action

The No Further Action Alternative recognizes the remediation of the site completed by the IRM(s) described in Section 6.2. This alternative leaves the site in its present condition and does not provide any additional protection of the environment or human health.

Alternative 2: Institutional Controls

Under this alternative a sampling program would be conducted to collect soil samples for free cyanide analysis. Where the analytical results exceed the SCOs for either total or free cyanide, institutional controls would be placed on the affected property or properties. A Health and Safety Plan and Site Management Plan would be developed and implemented to describe adequate control measures, personal protective equipment and monitoring to be implemented during intrusive activities. The site management plan would include Institutional and Engineering Control Plans, and would identify the requirements for periodic reporting.

Present Worth (30-year):	$130,000
Capital Cost:	$77,000
Annual Costs (years 1-5):	$20,000

Alternative 3: Removal and Disposal of Purifier Waste and Soil

This alternative would include the removal of purifier waste and soil in the area of the proposed access road for the boat launch project. Approximately 5,400 cubic yards (cy) of purifier waste and soil would be excavated from an area currently estimated to be 100 feet wide and 200 feet in length, to a depth of ten feet below ground surface. The depth of excavation would be extended beyond 10 feet in areas where purifier waste may be encountered during construction of the City of Troy's boat launch. However this alternative would not target contaminated soils deeper than 10 feet in areas not expected to be disturbed during the boat launch construction. A demarcation fabric would be placed at the limits of the excavation prior to backfill. Soil that remains in place would be sampled for cyanide. If the analytical results indicate concentrations of cyanide exceeding the cyanide soil cleanup objectives (SCOs) for unrestricted use (27 ppm free cyanide, 72 ppm total cyanide), a Site Management Plan would be developed to address these soils. The excavated area would be backfilled to the existing grade with crushed stone or soil meeting the SCOs for backfill material for the protection of public health – restricted residential as set forth in 6 NYCRR Part 375-6.8(d). The backfill would be a minimum two-feet thick above the demarcation layer to act as a soil cover. Excavated material determined to meet the re-use criteria may be used to backfill the lower portion of the excavated area. The site management plan would include Institutional and Engineering Control Plans, and would identify the requirements for periodic reporting.

Present Worth (30-year):	$810,000
Capital Cost:	$750,000
Annual Costs (years 1-5):	$20,000

Alternative 4: Excavation to Pre-Disposal Conditions

This alternative achieves all of the SCGs discussed in Section 5.1.1 and soil meets the unrestricted soil cleanup objectives listed in Part 375-6.8 (a). This alternative would include the excavation and off-site disposal of all waste and soil containing contaminants that exceed the unrestricted use soil cleanup objectives. This includes detections of cyanide at 14 feet below grade in two separate areas of the site. Approximately 12,000 cy of soil would be excavated from approximately 0.7 acres followed by backfill satisfying unrestricted use SCOs to the existing grade.

Present Worth (30-year):	$1.5 million
Capital Cost:	$1.5 million
Annual Costs:	$0

The following alternatives were considered for OU-3 to address the contaminated media identified at the site as described in Exhibit A:

<u>Operable Unit #3- Hudson River Sediments</u>

Alternative 1: No Action

Similar to the no action alternative for OU-2, this alternative leaves the site in its present condition and does not provide any additional protection to public health and the environment.

Alternative 2: Institutional Controls

No active remediation at OU-3 would occur under this alternative. All sediments, including tar-containing sediments, would be left in place. A Health and Safety Plan and Sediment Management Plan would be developed and implemented to describe control measures and monitoring to be implemented during potential navigational dredging activities in areas where MGP-related contamination was observed in the sediment. Monitoring would be conducted for five years, after which a review would also be performed to assess changes in the potential risk and the environment posed by OU-3.

Present Worth(30-year):	$110,000
Capital Cost:	$52,000
Annual Costs (years 1-5):	$20,000

Alternative 3: Removal of Coal Tar Contaminated Sediment Within the Lock Approach

This alternative includes the removal of approximately 5,300 cy of sediments containing separate phase coal tar from the lock approach. This removal would extend a minimum of 300 feet south from the southern lock gate and extend approximately 80 feet from the approach wall to the west guide wall. Vertically the removal would extend to six feet below the mudline or to bedrock, if the bedrock is encountered less than six feet from the sediment surface.

This would remove all sediment containing free phase coal tar. Sediment would be treated or disposed off-site. The removal area would be backfilled with material appropriate for benthic habitat.

Present Worth (30-year): $2.9 million
Capital Cost: $2.9 million
Annual Costs (years 1-5): $0

Alternative 4: Removal of Sediment with Site-Related PAHs Exceeding Background Concentrations

This alternative would remove sediment exceeding the upstream PAH concentration of 2.8 ppm. Approximately 25,000 cy of sediment from the lock approach to approximately 1,000 feet downstream would be removed to a sediment depth of seven feet. Sediment would be treated or disposed off-site. The removal area would be backfilled with material appropriate for benthic habitat. This alternative would restore the sediment to pre-disposal conditions initially, however, the forensic studies support an ongoing contribution of non-MGP related PAHs.

Present Worth (30-year):: $12 million
Capital Cost: $12 million
Annual Costs: $0

Exhibit D

Remedial Alternative Costs

Remedial Alternative	Capital Cost ($)	Annual Costs ($)	Total Present Worth ($)
Operable Unit #2 – Ingalls Avenue			
Alternative 1: No Further Action	0	0	0
Alternative 2: Institutional Controls	77,000	20,000	130,000
Alternative 3: Removal of Purifier Waste	750,000	20,000	810,000
Alternative 4: Pre-disposal removal	1,500,000	0	1,500,000
Operable Unit #3 – Hudson River Sediments			
Alternative 1: No Action	0	0	0
Alternative 2: Institutional Controls	52,000	20,000	110,000
Alternative 3: Removal of NAPL-containing Sediment Within the Lock Approach	2,900,000	0	2,900,000
Alternative 4: Removal to Pre-Disposal (Background) Conditions	12,000,000	0	12,000,000

Exhibit E

SUMMARY OF THE PROPOSED REMEDY

The Department is proposing Alternative 3, Removal and Disposal of Purifier Waste and Soil, as the remedy for OU-2 Ingalls Avenue. The Department is proposing Sediment Alternative 3, Removal of Sediment Within the Lock Approach, as the remedy for OU-3, Hudson River Sediments. The proposed remedy is depicted in Figures 6 and 7.

Basis for Selection

The proposed remedy is based on the results of the RI and the evaluation of alternatives.

Operable Unit #2 – Ingalls Avenue

Alternative 3 is being proposed because, as described below, it satisfies the threshold criteria and provides the best balance of the balancing criterion criteria described in Section 7.2.

Protection of Human Health and the Environment

The No Further Action Alternative would not be protective of human health or the environment since it would not achieve the remediation goals described in Exhibit B. Alternative 2 would not eliminate the potential for inadvertent human exposure to contamination or future nuisance odors associated with the waste. Alternative 2 would not reduce the potential for wildlife exposures nor reduce the toxicity, mobility or volume of the waste as explained below and thus is not as protective of the environment as Alternatives 3 and 4. Alternative 3 would protect public health by eliminating the potential for exposure, including direct contact and ingestion, to the waste and impacted soil. Alternative 3 would also protect the environment by eliminating plant and terrestrial wildlife exposure to the waste. Alternative 4 is the most protective of human health and the environment, eliminating potential direct contact exposure to all contamination, including contamination not related to the MGP, through removal of all soil that exceeds unrestricted soil cleanup objectives.

Compliance with New York State Standards, Criteria, and Guidance (SCGs)

The alternatives can all be implemented in compliance with action- and location-specific SCGs. Alternatives 1 and 2 do not achieve chemical-specific SCGs within a reasonable timeframe, since they do not include any removal of purifier waste or soil from the Ingalls Avenue Site. Soil cleanup objectives for both restricted and unrestricted uses would continue to be exceeded with the no action and institutional control alternatives. Alternative 3 includes removal of purifier waste and soil, achieving chemical-specific SCGs within the footprint of the ramp access road to a depth of approximately 10 feet. This depth would prevent exposure due to inadvertent public intrusion and typical future construction work, including the current plans for the boat launch. Alternative 4 would achieve SGCs to the greatest extent of the alternatives under consideration.

Short-term Effectiveness

Alternatives 1 and 2 would have the lowest short-term impacts. There would be no potential risks to workers or the public during implementation of these alternatives, since no active remediation would be performed. The short-term impact and short-term effectiveness of Alternative 3 would also be favorable, as risks to workers and the public would be minimal, and would be mitigated through appropriate health and safety procedures and engineering controls, as necessary. This alternative would also be implemented in a relatively short period of time. Impacts from excavation and soil transport would be minimized through proper construction and transportation procedures, and engineering controls. Alternative 4 would have the highest short-term impacts due to the longer period of excavation and additional 600 trucks required for transport of the contaminated soil and well as the clean soil backfill.

Long-term Effectiveness and Permanence

Alternatives 3 and 4 are effective at reducing potential human and ecological exposure, as they would include the removal of purifier waste and soil. Under Alternative 3, the areas of remaining contamination would be subject to institutional controls to prevent exposure. Long-term site management would be required to ensure that this alternative continues to be effective, as would maintenance of land use restrictions. Alternative 2 is less effective, since all existing contamination would remain on-site. Human exposure would be minimized through institutional controls, which are less reliable for contamination near the surface on public land. Long-term Alternative 1 would not be effective, since it would not reduce potential human exposure.

Reduction of Toxicity, Mobility or Volume

Alternatives 1 and 2 offer no reduction in mobility, toxicity, or volume since no active remediation would be performed. Alternative 3 offers a significant reduction in mobility, toxicity, and volume of contaminated soil, since purifier waste and soil would be excavated within the boat ramp access road footprint along the Ingalls Avenue right-of-way to approximately 10 feet below ground surface for disposal. Alternative 4 provides a greater reduction in volume, but much of that volume is historic fill that does not contain MGP-related contamination.

Implementability

All of the alternatives evaluated are technically feasible. Alternative 1 is the easiest to implement, since no remedial activities are employed in this alternative. Alternative 2 is somewhat easy to implement, since it involves placing institutional controls. However these may be somewhat difficult to implement administratively on public lands. Alternative 3 would be moderately difficult to implement, requiring excavation and transport of purifier waste and soil. Alternative 4 would be the most difficult to implement due to the increased scale of the excavation required.

Cost-Effectiveness

Alternative 1 has no capital or annual costs, associated only with five year reviews. Alternative 1 has the next lowest capital and annual costs for implementation of institutional controls. Alternative 3 has a higher capital cost and a similar annual cost. Alternative 4 has the highest capital cost and no annual cost, but the present value cost of Alternative 4 is the highest.

The estimated present worth cost to implement the OU-2 remedy is $810,000. The cost to construct the remedy is estimated to be $750,000 and the estimated average costs for five years of post remediation is $20,000.

Operable Unit #3- Hudson River Sediments

Sediment Alternative 3, removal of sediment within the lock approach, is being proposed because, as described below, it satisfies the threshold criteria and provides the best balance of the balancing criterion described in Section 7.2.

Protection of Human Health and the Environment

The No Action Alternative would not be protective of human health or the environment since it would not achieve the remediation goals described in Exhibit B. Alternative 2, Limited Action, would not be protective of the environment because benthic and aquatic life would continue to be exposed to tar-containing sediment. Alternative 3 would achieve the remediation goals for the site by removing all tar-contaminated sediment, thus preventing human and biotic exposure to grossly contaminated sediment. In addition, by removing all NAPL contaminated sediment, migration of coal tar within the Hudson River would be eliminated, particularly when accompanied by upland containment of coal tar that is provided by the on-site (OU-1) remedy. Alternative 4 would provide the highest degree of environmental protection by removing site-related contamination to background levels.

Compliance with New York State Standards, Criteria, and Guidance (SCGs)

Alternatives 1 and 2 do not remove contamination from river sediments and would not achieve SCGs in a reasonable time frame. Alternative 3 removes potential source material and eliminates toxicity to aquatic organisms by removal of sediment containing coal tar and high concentrations of PAHs. Alternative 4 achieves background conditions by removal of all sediments within and 1,000 feet downstream of the lock approach.

Short-term Effectiveness

Alternatives 1 and 2 would have the lowest short-term impact. There would be no potential risks to workers or the public during implementation of these alternatives, since no active remediation would be performed. Alternatives 3 and 4 would have a higher short-term impact and lower short-term effectiveness, since dredging would disturb the sediments and any dredged material would need to be transported through off-site areas for off-site treatment/disposal. Each of these alternatives could potentially increase risk of exposure to workers. These impacts would be minimized through proper dredging and transportation procedures, engineering controls, and health and safety procedures. However, Alternative 4 would require dredging and transportation of a large volume of sediment, approximately five times as much as Alternative 3, thereby substantially increasing potential short term impacts. These impacts include the suspension of sediment into the water column, elimination of benthic habitat, the inconvenience and increased carbon emissions from truck traffic, and noise from equipment and trucks. Coordination with USACE would be required for the design and implementation of Alternatives 3 and 4 to mitigate impacts to boat traffic through the lock.

Long-term Effectiveness and Permanence

Alternatives 1 and 2 would not be effective in the long term, since they would not reduce the potential for human or environmental exposure to contaminated sediments. Alternatives 3 and 4 both reduce the potential for exposures, as they both would entail removal of sediment containing coal tar. Alternative 4 also removes all sediment with PAH concentrations above background, and would provide the highest level of long-term effectiveness.

Reduction of Toxicity, Mobility or Volume

Alternatives 1 and 2 offer no reduction in mobility, toxicity, or volume since no active remediation would be performed. Alternative 3 offers a significant reduction in mobility, toxicity, and volume of contaminated sediments since sediments containing coal tar, which are located within the lock approach, would be dredged to bedrock (approximately 6 feet) for appropriate off-site treatment and disposal. Alternative 4 offers the most significant reduction in mobility, toxicity, and volume of PAHs in sediments, as it would remove PAHs above background. However, both Alternatives 3 and 4 offer an equal reduction in the volume of sediment containing coal tar.

Implementability

All of the alternatives evaluated are technically and administratively feasible. Alternative 1 is the easiest to implement, since no remedial activities are employed in this alternative. Alternative 2 is also easy to implement, involving only institutional controls. Sediment dewatering and off-site disposal is a large component of the sediment removal alternatives. In addition, coordination with the US Army Corps of Engineers to maintain the navigation channel would be required for the sediment removal alternatives under consideration. Alternative 3 is moderately difficult to implement and would require careful coordination with the USACE because it would occur entirely within the lock. Alternative 4 would involve dredging and transporting a significantly larger volume of sediment over a longer period of time, and would therefore be the most difficult to implement.

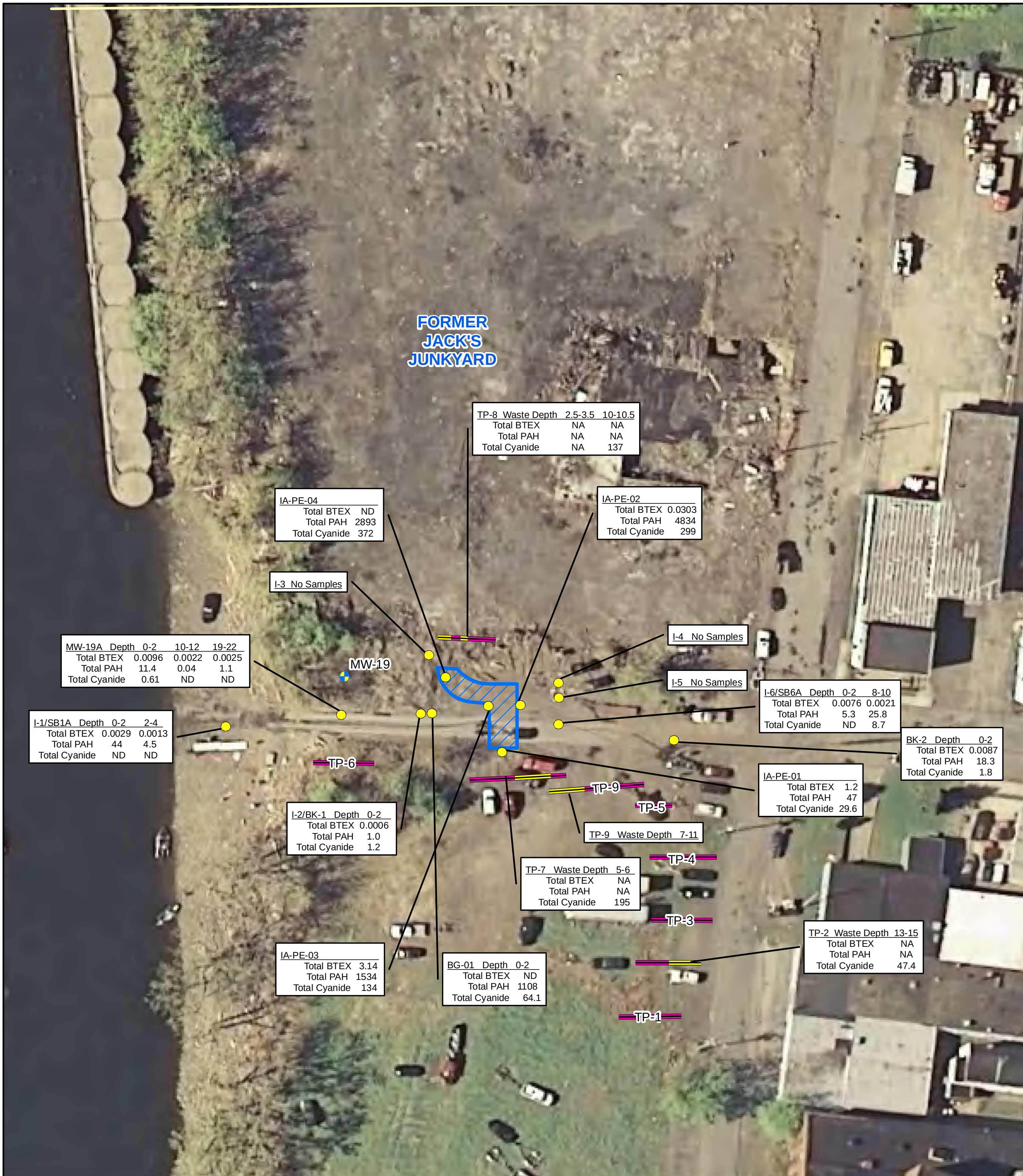
Cost-Effectiveness

Alternative 1 has no capital costs and limited annual costs, associated only with periodic reviews. Alternative 2 has the next lowest capital and annual costs for implementation of controls. Alternative 3 has a higher capital cost, but no annual cost. Alternative 4 has the highest capital cost and no annual cost, and the present value cost of Alternative 4 is the highest.

FIGURE 1 SITE LOCATION

Troy Smith Ave. MGP Site Site No. 4-42-030

Figure 2
Troy Smith Avenue
Former Manufactured Gas Plant Site
Site # 442030



T:\GIS\National_Grid\Troy_SmithAve_OU1\Spatial\MXD\Figure_3_Ingalls_Ave_WasteRemoval_122109.mxd

SOURCE:
NY STATE GIS DATA CLEARINGHOUSE
2007 NATURAL COLOR ORTHOIMAGERY

NOTES:
- DEPTH IS IN FEET BELOW GROUND SURFACE
- ALL CONCENTRATIONS ARE IN mg/kg
- NA = NOT ANALYZED
- ND = NOT DETECTED
- WHERE NO DEPTH IS INDICATED, SAMPLES ARE OF SURFICIAL MATERIAL
- WASTE MATERIAL WAS PRESENT AS DISCRETE LAYERS IN TP-2, TP-7 AND TP-8
- WASTE MATERIAL IN TP-9 WAS PRESENT AS SMALL PIECES, AND POCKETS NO MORE THAN 5 ft x 2 ft IN SIZE

0 30 60
Feet

Legend
- Monitoring Well
- Sample and Boring Locations
- Test Pit (waste observed)
- Test Pit (no waste observed)
- Approximate Area of 1999 Waste Removal

TETRA TECH EC, INC.

FIGURE 3

INVESTIGATION SUMMARY
TROY (SMITH AVE)
INGALLS AVENUE (OU-2)

TROY, NY

NOTES:

- * NO SAMPLES WERE TAKEN DUE TO LACK OF RECOVERABLE SEDIMENT
- (0-1) - INTERVAL BELOW TOP OF SEDIMENT

0 125 250
Feet

Legend

- 2006 SAMPLE LOCATIONS
- 2007 SAMPLE LOCATIONS
- 2008 SAMPLE LOCATIONS
- NAPL
- Sheen or Trace Sheen
- None

FIGURE 4

OBSERVED OCCURRENCE OF
NAPL AND SHEENS IN SEDIMENT CORES

TROY (SMITH AVE.) OU-3
TROY, NY

NOTES:

- PAH CONCENTRATIONS IN mg/kg
- * NO RECOVERABLE SEDIMENT
- ** NO SAMPLE COLLECTED FOR PAH ANALYSIS DUE TO THE PRESENCE OF NAPL
- PAH ANALYSIS PERFORMED BY NYSDOH CERTIFIED LABORATORIES

0 125 250
Feet

Legend

- 2006 SAMPLE LOCATIONS
- 2008 SAMPLE LOCATIONS
- TROY SMITH AVE. OU-1

TETRA TECH EC, INC.

FIGURE 5

SEDIMENT SAMPLE LOCATIONS AND ASSOCIATED PAH CONCENTRATIONS

TROY (SMITH AVE.) OU-3
TROY, NY

T:\GIS\National_Grid\Troy_SmithAve_OU1\Spatial\MXD\Figure_7_Sediment_&_PAH_091709.mxd

SOURCE:
NY STATE GIS DATA CLEARINGHOUSE
2007 NATURAL COLOR ORTHOIMAGERY

NOTES:
* APRROXIMATE DEPTH OF UP TO
10 FEET BELOW GROUND SURFACE

0 25 50
Feet

Legend

Area of Proposed Waste and Soil Removal*

TETRA TECH EC, INC.

FIGURE 6

TROY (SMITH AVE)
INGALLS AVENUE (OU-2)
ALTERNATIVE 3

TROY, NY

NOTES:

- PAH CONCENTRATIONS IN mg/kg
- * NO RECOVERABLE SEDIMENT
- ** NO SAMPLE COLLECTED FOR PAH ANALYSIS DUE TO THE PRESENCE OF NAPL
- PAH ANALYSIS PERFORMED BY NYSDOH CERTIFIED LABORATORIES

0 125 250

Feet

Legend

- PROPOSED AREAL EXTENT OF SEDIMENT REMOVAL
- 2006 SAMPLE LOCATIONS
- 2007 SAMPLE LOCATIONS
- 2008 SAMPLE LOCATIONS
- TROY SMITH AVE. OU-1

TETRA TECH EC, INC.

FIGURE 7

ALTERNATIVE S-3

TROY (SMITH AVE.)
TROY, NY

T:\GIS\National_Grid\Troy_SmithAve_OU1\Spatial\MXD\Figure_10_Alternative_S3_rev1_122109.mxd