PROPOSED REMEDIAL ACTION PLAN

NM - Hudson MGP
Operable Unit Number: 02
Hudson, Columbia County
Site No. 411005
February 2012

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

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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 New York State Inactive Hazardous Waste Disposal Site Remedial Program (also known as the State Superfund Program) is an enforcement program, the mission of which is to identify and characterize suspected inactive hazardous waste disposal sites and to investigate and remediate those sites found to pose a significant threat to public health and environment.

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:

A public comment period has been set from:

2/15/2012 to 3/15/2012

A public meeting is scheduled for the following date:

2/28/2012 at 6:00 PM

Public meeting location:

Hudson Area Library, 400 State Street, Hudson, NY

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 through 3/15/2012 to:

Anthony Karwiel
NYS Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233
alkarwie@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 Hudson Water Street manufactured gas plant (MGP) site is located in a former industrial area of the City of Hudson which is currently being revitalized for public use. The site comprises 1.6 acres along Water Street in the City of Hudson.

Site Features: The site is bounded to the north by an inactive oil storage facility that has been revitalized into part of the City of Hudson waterfront park program. The site is bounded to the east by the CSX rail line and to the west by the Hudson River. The western portion of the site is

presently a waterfront park, and the eastern portion is a recently-renovated warehouse owned by the City of Hudson. The former MGP was located on an embayment with direct connection to the Hudson River.

Current Zoning/Uses: The OU1 portion of the site is zoned industrial. OU2 is the segment of the Hudson River that includes Embayments 2, 3 and 4 and a portion of the shipping channel. OU2 is not subject to zoning.

Historic Use: The site was formerly a manufactured gas plant (MGP), built in 1853 by the Hudson Gas Company. This company later merged with the New York Power & Light Company, which eventually became the Niagara Mohawk Power Corp and more recently National Grid. The site consisted of a manufacturing building which still exists, and was recently used as a builder's supply warehouse.

Operable Units: The site was divided into two operable units. An operable unit represents a portion of a remedial program for a site that for technical or administrative reasons can be addressed separately to investigate, eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination. Operable unit 1 (OU1) is the on-site source area including embayment 1. OU2 is defined as a portion of the Hudson River adjacent to the site extending approximately 1,700 feet along the shoreline from the west end of Ferry Street to Holcim Ltd's storage area and approximately 300 feet offshore into the eastern edge of the shipping channel. OU2 includes Embayment 2, Embayment 3, and Embayment 4.

Site Geology and Hydrology: The site (OU1 portion) and surrounding vicinity are situated in an area of lacustrine deposits of sand, silt, and clay with underlying Normanskill gray to black shale bedrock. The Hudson River is 315 miles long and flows in a southerly direction, is tidally influenced and classified as a NYSDEC Class A water body.

Operable Unit (OU) Number 02 is 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. Operable Unit (OU) 2, which is the focus of this document, is the segment of the Hudson River that includes Embayments 2, 3, 4 and a portion of the shipping channel, therefore land use does not apply.

A comparison of the results of the investigation to the appropriate standards, criteria and guidance values (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 Department and Niagara Mohawk Power Corporation (now the National Grid Company) entered into multi-site Consent Orders D0-0001-9210 and A4-0473-0203 on December 12, 1992 and November 11, 2003. The Orders obligate the responsible party to implement a full remedial program for 33 former MGP sites across the State, including the former Hudson MGP site.

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:

- sediment

A pilot study was conducted by National Grid, with the consent of the Department, to assess the bioavailability and toxicity of PAHs in surface sediments from this site. The goal of the study was to evaluate the use of the solid phase micro extraction (SPME) analytical method as a tool to predict the toxicity of PAHs in sediments to benthic macroinvertebrates. SPME extracts PAHs directly from sediment pore water. In equilibrium partitioning (EqP) theory, toxicity best correlates with contaminant concentrations in pore water, which represents the biologically available fraction of a contaminant in sediment.

Sediment samples were collected from 62 locations (53 site locations and 9 reference locations) within and adjacent the site. The samples were analyzed for total PAH_{34} concentrations in bulk sediment, and PAHs were extracted from pore water samples with SPME. For each SPME sample, the pore water concentration of each individual PAH measured was divided by the final chronic value (FCV) for that PAH to derive an individual toxic unit (TU). The individual TUs for all of the PAHs measured in the pore water sample were summed to produce a total PAH TU_{34} for that sample.

From the original set of sediment samples, 28 day sediment toxicity tests (survival and growth endpoints) were conducted with the freshwater amphipod *Hyalella azteca* on a subset of 41 samples, selected to cover the gradient from very low to very high total PAH TU_{34}s. An assessment of the benthic macroinvertebrate community based on the NYSDEC Rapid Bioassessment methodology was also conducted.

The results of the study demonstrated that a total PAH TU_{34} of 5.4, as measured by SPME in sediment pore water, was a reasonable predictor of *H. azteca* survival and benthic community effects at the site. In other words, *H. azteca* toxicity and/or adverse impacts to the benthic macroinvertebrate community were only observed when the total PAH TU_{34} was greater than 5.4. Therefore, areas that contained a total PAH TU_{34} of 5.4 or above are expected to have toxic effects to organisms and were included in the Area of Remedial Concern (ARC) for this site.

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 for this Operable Unit at this site is/are:

coal tar
benzene
ethylbenzene
toluene
xylene (mixed)
acenaphthene
acenapthylene
anthracene
benzo[k]fluoranthene
chrysene

dibenz[a,h]anthracene	naphthalene
fluoranthene	phenanthrene
fluorene	pyrene

As illustrated in Exhibit A, the contaminant(s) of concern exceed the applicable SCGs for:

- 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.

There were no IRMs performed at this site during the RI.

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. Measures are in place to control the potential for contact with subsurface soil contamination remaining at the site. 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 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. Currently there are no occupied buildings on the site. An evaluation of the potential for soil vapor intrusion to occur will be completed should the current use of the site change. Operable Unit Number 2 (OU-2): Hudson River sediments adjacent to the site. Removal actions have been completed to remove contaminated shallow sediment in one on-site embayment, therefore people are not likely to contact contaminated 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.

The Fish and Wildlife Resources Impact Analysis (FWRIA) for OU 02, which is included in the RI report, presents a detailed discussion of the existing and potential impacts from the site to fish and wildlife receptors.

Nature and Extent of Contamination: Based upon investigations conducted to date, the primary contaminants of concern for OU2 include coal tar which is associated with high concentrations of polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs).

The term coal tar and non aqueous phase liquid (NAPL) are used interchangeably in this document. Although most coal tars are slightly denser than water, the difference in density is slight. Consequently, they can either float or sink when in contact with water. In this area of the river, the coal tar is described in association with sediments as globules and blebs, coal tar coating, coal tar in seams, and tar-like material.

The PAHs present at the site include chrysene, dibenzo(a,h)anthracene, benzo(b)fluoranthene, benzo(a)anthracene, benzo(a)pyrene. The VOC contaminants of concern include benzene, toluene, ethylbenzene and xylene (BTEX). Inorganic compounds present at the site include arsenic, chromium, mercury and zinc. These contaminants were found in the river sediment 0-14 feet below grade in Embayment 2, Embayment 3, and Embayment 4. In addition, sheens and odors were observed in the sediments that may potentially be MGP-related and/or related to other sources or natural processes. Coal tar in sediments is primarily located in the eastern portion of the river channel along the slope adjacent to Embayment 1, and in a small portion of the shipping channel where non aqueous phase liquid (NAPL) blebs were observed. Metals detected in the sediment do not appear to be site related contamination.

Special Resources Impacted/Threatened: The Fish and Wildlife Resources Impact Analysis (FWRIA) revealed that sediment from the Hudson River has been impacted from the former MGP operation. The site is in the estuary of the Hudson River and is therefore important habitat for fish, waterfowl, and benthic organisms. Two federally endangered species, the short-nose sturgeon (*Acipenser brevirostrum*) and the recently listed Atlantic sturgeon (*Acipenser oxyrinchus*), are known to occur in the vicinity of the site.

6.5: 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 action objectives for this site are:

Sediment

RAOs for Public Health Protection

- Prevent direct contact with contaminated sediments.
- Prevent surface water contamination which may result in fish advisories.

RAOs for Environmental Protection

- Prevent releases of contaminant(s) from sediments 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 or impacts from bioaccumulation through the marine or aquatic food chain.

- Restore sediments to pre-release/background conditions to the extent feasible.

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 Section 6.5. 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 B. 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 C.

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

The estimated present worth cost to implement the remedy is $15,340,000. The cost to construct the remedy is estimated to be $12,820,000 and the estimated average annual cost is $164,000.

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. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:

a) Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
b) Reducing direct and indirect greenhouse gas and other emissions;
c) Increasing energy efficiency and minimizing use of non-renewable energy;
d) Conserving and efficiently managing resources and materials;
e) Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
f) Maximizing habitat value and creating habitat when possible;
g) Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals and integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

2) Installation of appropriate engineering controls around the ARC as determined feasible to control and contain re-suspended sediments and mobile NAPL that will be generated as a result of dredging activities.

3) Removal of debris and shore-line rip-rap within the ARC for off-site disposal or if feasible reuse of the rip-rap.

4) Removal of up to 9,000 cubic yards (cy) of NAPL-containing and toxic sediment within the ARC to depths up to 15 feet below the sediment surface. A pre-design investigation (PDI) will be conducted to determine the actual depth and footprint of removal. All areas demonstrated to be toxic by the SPME pilot study and sediment determined to be saturated with NAPL will be removed to the extent feasible.

5) Additional removal may be necessary to address sheen generating sediment in areas south of and outside the ARC. The area outside of the ARC suspected of containing sheen generating sediment will be further evaluated by sediment probing during the PDI.

6) Pre-treatment of the dredged sediment in preparation for off-site treatment and disposal at a permitted facility. A temporary containment structure will be installed over the sediment staging/processing area. The fully-enclosed structure will be equipped with an air handling and treatment system. The dredged material will be segregated inside the structure to remove the debris and material not suitable for treatment and to dewater it sufficiently to allow transport to a permitted facility.

7) Installation of a temporary water treatment system to treat water removed from the dredged sediment. The elements of the water treatment system will be determined during the remedial design. Treated water will be discharged to the Hudson River under the substantive requirements of a State Pollutant Discharge Elimination System (SPDES) permit.

9) Restoration of the stream bed and banks to the original bathymetry. To the extent possible, restoration will be with material similar to the existing substrate. A restoration plan will be developed during design and will meet the requirements of Article 15 and 6 NYCRR Part 608.

10) Since contaminants over SCGs will remain on-site after remediation, monitoring of remedy effectiveness and restoration success will be conducted. A monitoring plan will be developed during design of the remedy.

Exhibit A

Nature and Extent of Contamination

This section describes the findings of the Remedial Investigation for all environmental media that were evaluated. As described in Section 6.1, samples were collected from various environmental media to characterize the nature and extent of contamination.

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 SCGs for the site. The contaminants are arranged into four categories; volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), PCBs and pesticides, and inorganics (metals and cyanide). For comparison purposes, the SCGs are provided for each medium that allows for unrestricted use.

Waste/Source Areas

As described in the RI report, waste/source materials were identified at the site and are impacting 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 and include NAPL, staining, sheens and/or odors observed in some of the sediment samples collected from the Hudson River, Embayment 2, Embayment 3, and Embayment 4.

Within the Hudson River, potential MGP-related impacts in the form of coal tar and staining were observed. In addition, sheens and odors were observed in the sediments that are MGP-related and/or related to other sources or natural processes based on preliminary finger printing analysis. Coal tar in sediments is primarily located in the eastern portion of the river channel along the slope adjacent to Embayment 1, and in a small portion of the shipping channel where NAPL blebs were observed during the 2007 Monitoring Program. Coal tar is referred to as non-aqueous phase liquid or NAPL and does not readily dissolve in water. The term NAPL and coal tar are used interchangeably in this document. Although most coal tars are slightly denser than water, the difference in density is slight. Consequently, they can either float or sink when in contact with water. In this area of the river, the coal tar is described in association with sediments as globules and blebs, coal tar coating, coal tar in seams, and tar-like material. Coal tar which contains benzene, toluene, ethylbenzene and xylene migrated into the sediment from the former MGP site, through preferential pathways to the Hudson River.

Based on the findings of the Remedial Investigation, the disposal of hazardous waste has resulted in the contamination of sediment. 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,
volatile organic compounds (VOCs) 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.

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. For example BTEX compounds were widely used as antiknock additives in gasoline, and are also found in some petroleum products such as diesel fuel and asphalt and are thus commonly found in runoff water from streets.

Certain waste/source areas identified at the site were addressed by OU1. The remaining waste/source area(s) identified during the RI will be addressed in the remedy selection process.

Groundwater contamination identified during the RI was addressed during OU1.

Sediments

Sediment samples were collected during the RI from upstream, adjacent and downstream of the site along the Hudson River. The samples were collected to assess the potential site related impacts to river sediment. The results indicate that sediment in the Hudson River exceed the Department's SCGs for polycyclic aromatic hydrocarbons (PAHs).

Between 1995 and 2008, numerous investigations were completed within OU2 to evaluate the nature and extent of MGP-related constituents, including the spatial distribution of PAHs and NAPL, in site sediments. These investigations have also included an evaluation of the bioavailability of PAHs in the OU2 sediments, the toxicity of OU2 sediments, the structure of the macroinvertebrate community in site sediments, and the extent of natural recovery of sediments containing site-related PAHs following completion of the OU1 remedial activities. Over 100 sediment samples were collected and analyzed for VOCs, semi-volatile organic compounds (SVOCs) or PAHs, polychlorinated biphenyls (PCBs), inorganics, Resource Conservation and Recovery Act (RCRA) characteristics, diesel fuel, kerosene, presence of lube oil, presence of gasoline, total petroleum hydrocarbons (TPH), total organic carbon (TOC), heating value, and percent sulfur. As part of the investigation, a pilot study was conducted using SPME as discussed in Section 6.1.2. The results of the pilot study demonstrated that a total PAH TU_{34} of 5.4, as measured by SPME in sediment pore water, was a reasonable predictor of *H. azteca* survival and benthic community effects at the site. This study, including areas observed to contain NAPL in the sediment was used to develop the Area of Remedial Consideration (ARC).

The analytical results indicate that sediment in the OU2 portion of the site has been impacted by MGP related contaminants as a result of the operation of the former MGP. Sediment impacts exceeding SCGs were detected across the study area and they were encountered at depths ranging from 0 to 14 feet below sediment surface.

The primary constituents of concern in OU2 sediments are NAPL, PAHs, and (to a lesser extent) BTEX. The distributions of other constituents within the OU2 sediments are independent of PAH distribution; therefore, the other constituents are assumed to be the result of other urban/industrial sources and are not attributable to the former MGP operations at the site. NAPLs in OU2 sediments are primarily located along the slope adjacent to Embayment 1 and in a small portion of the shipping channel. NAPL and staining were also observed near the

mouth of Embayment 2. NAPL was not observed in the sediments in Embayment 3 or Embayment 4. Deeper NAPL impacts were observed along the shoreline; the depth to NAPL decreases to the west as the river bottom slopes steeply toward the shipping channel. In addition, sheen generating sediment was observed in an area south of and outside the ARC.

In Embayment 2, PAHs are characteristic of background and petroleum constituents. Also, PAH compositional evaluation and the known presence of a storm water sewer outfall within Embayment 3 together indicate that PAHs in sediments within Embayment 3 are primarily the result of urban/industrial sources not related to the former MGP.

The extent of the MGP impact to sediment is referred to as the Area for Remedial Consideration (ARC). The ARC was defined using toxicity testing results resulting from the solid phase microextraction (SPME) pilot testing and the extent of NAPL containing sediments. The limits of the ARC are illustrated on Figures 2 and 5. Table 1 shows a summary of sediment contamination for each class of compounds of concern.

Table #1 – Sediment

Detected Constituents	Concentration Range Detected (ppm)[a]	SCG[b] (µg/gOC)	Frequency Exceeding SCG[c]
VOCs			
Benzene	ND - 7	0.6	11/160
Ethyl benzene	ND - 50	24	11/160
Toluene	ND - 12	49	1/160
SVOCs			
2-Methylnaphthalene	ND - 5700	304	1/15
Acenaphthene	ND - 5100	140	30/371
Anthracene	ND - 3200	107	41/371
Benzo(a)anthracene	ND - 2200	1.3	109/372
Benzo(a)pyrene	ND - 1700	1.3	113/372
Benzo(b)fluoranthene	ND - 1000	1.3	98/372
Benzo(k)fluoranthene	ND - 1500	1.3	98/371
Chrysene	ND - 1800	1.3	109/372
Dibenzo(a,h)anthracene	ND - 110	0.06	112/368
Fluoranthene	ND - 4900	1020	14/372
Fluorene	ND - 3800	8	69/371
Naphthalene	ND - 17000	30	36/371
Phenanthrene	ND - 9200	120	61/372
Pyrene	ND - 4600	961	18/372

Detected Constituents	Concentration Range Detected (ppm)[a]	SCG[b] (µg/gOC)	Frequency Exceeding SCG[c]
Total PAHs	ND - 63000	4 ppm	210/372
Inorganics		(ppm unless otherwise noted)	
Antimony	ND - 3	0.0008	3/95
Arsenic	ND – 23.1	6	51/159
Cadmium	ND – 9.6	0.6	37/131
Chromium	4.8 - 352	26	37/131
Copper	3 - 192	16	45/95
Iron	7040 - 34800	20000	29/95
Lead	3.2 - 6660	31	80/159
Manganese	120 - 3420	460	31/95
Mercury	ND – 6.5	0.15	64/159
Nickel	6.4 – 98.6	16	41/95
Zinc	27.3 - 714	120	48/158
Total PCBs	ND – 9.5	1.4 µg/gOC	24/66

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 - Organic chemical constituents were compared to the Department's levels of protection using site-specific total organic carbon (TOC)
LEL = Lowest Effects Level and SEL = Severe Effects Level. Sediment is considered contaminated if either of these criteria is exceeded. If the SEL criteria are exceeded, the sediment is severely impacted. If only the LEL is impacted, the impact is considered moderate.

Exhibit B

Description of Remedial Alternatives

Alternative 1: No Further Action

The No Further Action Alternative recognizes the remediation of the site completed at OU1. This alternative leaves the site in its present condition and does not provide any additional protection of the environment. The No Further Action alternative will not involve implementation of any remedial activities to treat, remove, contain, or monitor NAPL containing and toxic sediment within the areas considered for remediation at the Site. No effort will be made to change or monitor future site conditions. The No Further Action alternative serves as the baseline against which other remedial alternatives may be compared in accordance with the NCP and NYSDEC DER-10 (NYSDEC 2010). The No Further Action alternative does not include long-term monitoring and therefore has no associated cost.

Alternative 2: Natural Recovery (NR) of Sediments within the Areas for Remedial Consideration (ARC) and Institutional Controls

The NR Alternative recognizes the remediation of the site completed at OU1 and that Site Management and Institutional Controls and Engineering Controls are necessary to confirm the effectiveness of OU1. This alternative maintains engineering controls which were part of the OU1 and includes institutional controls, in the form of an environmental easement and site management plan, necessary to protect public health and the environment from contamination remaining at the site after the OU1 remedial effort. Alternative 2 involves allowing for natural recovery of sediments within the ARC through naturally occurring physical/chemical processes (e.g., advection, dispersion, burial, dissolution, sorption, photo-oxidation and biodegradation). A long-term monitoring program will be designed and implemented to document and measure the progress of these natural processes toward achieving the RAOs.

The periodic monitoring to be performed as part of this remedial alternative will include the collection of sediment samples from up to 20 near-site locations spanning the ARC. In each sample, visual inspection will be performed to check for the presence of NAPL, and sediment pore water PAH34 concentrations will be measured using solid-phase micro-extraction (SPME) per USEPA and ASTM Method analytical methods. The SPME pore water TU34 values will be compared to the site-specific threshold value to measure the progress of natural recovery. Sediment sampling/analysis will be performed every 2 years for the first five years (i.e., three monitoring events during the first 5-year period), and then every five years thereafter until year 30. The historic data will be used as a general baseline for the monitoring program.

This alternative will also include preparation of an SMP describing the following:

(a) known locations of NAPL containing and toxic sediment within the ARC;
(b) protocols for sediment NR monitoring;
(c) conditions for modifying/ceasing the sediment monitoring activities;
(d) protocols (including health and safety requirements) for conducting intrusive (i.e., subsurface) activities within the ARC and managing potentially impacted material encountered during these activities; and
(e) restrictions on intrusive activities to mitigate potential exposures to impacted sediments.

Because NAPL containing and toxic sediments will remain in the Hudson River for a period of time, this alternative will also include establishment of institutional controls. Institutional controls will be in the form of governmental, enforcement, or permit controls, and/or informational devices. For example, potential

institutional controls could include, but not necessarily be limited to, designating "no anchor" zones in the ARC. Annual reports will be submitted to the NYSDEC to document that institutional controls are maintained and remain effective.

The cost to implement Alternative 2, based on an annual operation and maintenance (O&M), for a period of 30 years has been estimated as follows:

Present Worth:.....*$1,430,000*
Capital Cost:.....*$149,500*
Annual Costs:.....*$164,400*

Alternative 3: Capping Sediments within the ARC with Institutional Controls

Alternative 3 involves placing an engineered cap over the sediments within the ARC, thus providing a physical barrier to mitigate potential mobility of, and human and biota exposure to, the NAPL containing and toxic sediments. A cap monitoring and maintenance program will be implemented to assess the long-term effectiveness of the cap, and appropriate institutional controls will be established to reduce the potential for disturbance of, and damage to, the cap as a result of human activities.

The objective of the cap will 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 re-colonize. All of the PAH contamination will remain in-place, none will be removed or treated. The cap will be composed of a series of marine mattresses containing the following layers in order from top to bottom: 6-inch-thick layer of stone, a 0.25-inch-thick reactive core mat (RCM), which consists of permeable composites of geotextiles and a non-swelling granular organoclay compound designed to adsorb organics, and geogrid. A marine mattress is a system used to simplify construction of sediment caps. Marine mattresses are composed of a series of smaller individual mattresses that are built separately, joined together and then placed on the sediment. A marine mattress configured with RCM and rock provides a method to place RCM under more difficult conditions, such as high flow currents and/or deep waterways. The specific details of the cap design will be determined during the remedial design phase, based on additional data collected during the pre-design investigation (PDI) and subsequent engineering analyses.

This alternative will include the development of a site management plan (SMP). The SMP will include:

(a) inspection, monitoring and maintenance of the sediment cap;
(b) 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 or disturbed;
(c) institutional controls in a manner and form acceptable to the NYSDEC that will require compliance with the approved SMP, and require National Grid with assistance from the property owner to complete and submit an IC/EC certification; and
(d) IC/EC certification that will certify that the controls continue to protect public health and the environment in accordance with the SMP.

The cost to implement Alternative 3, based on an annual operation and maintenance (O&M), for a period of 30 years has been estimated as follows:

Present Worth:.....*$8,890,000*
Capital Cost:.....*$7,170,000*

Annual Costs:.....*$198,000*

Alternative 4: Excavation of Sediments within the ARC to a Depth of 1 foot with Treatment/Disposal of Excavated Sediments, Capping of the Excavated Area and Institutional Controls

This alternative will include the removal of 1 foot of sediment from within the footprint of the ARC. Approximately 2,000 cubic yards of sediment will be removed by the dredging activities, including all of the sediments identified during the 2009 SPME pilot study as being toxic to benthic macroinvertebrates, as well as a portion of the NAPL containing sediments. The dredged sediment will be sent to an off-site facility for treatment/disposal. An engineered cap, as discussed in Alternative 3, will be installed over the remaining NAPL containing sediments.

This alternative will include the development of a site management plan (SMP). The SMP will include the same elements describe under Alternative 3.

The cost to implement Alternative 4, based on an annual operation and maintenance (O&M), for a period of 30 years has been estimated as follows:

Present Worth:.....*$11,470,000*
Capital Cost:.....*$9,750,000*
Annual Costs:.....*$1,720,000*

Alternative 5: Excavation of Sediments within the ARC to a Depth of 2 feet with Treatment/Disposal of Excavated Sediments, Capping of the Excavated Area and Institutional Controls

Alternative 5 will include the removal and off-site treatment/disposal of the top 2 feet of sediment within the ARC, including all of the sediment identified on Figure 5, as being toxic to benthic macroinveretebrates, as well as a portion of the NAPL containing sediment. A total of approximately 4,000 cubic yards of NAPL containing and toxic sediment will be removed from the river and treated off-site via LTTD. As with Alternative 4, these removal activities will result in the reduction of the volume of impacted sediment and associated toxicity.

This alternative will include the installation of an engineered cap and the development of a site management plan (SMP) that will include the same elements as described under Alternatives 3 and 4.

The cost to implement Alternative 5, based on an annual operation and maintenance (O&M), for a period of 30 years has been estimated as follows:

Present Worth:.....*$12,940,000*
Capital Cost:.....*$11,220,000*
Annual Costs:.....*$1,720,000*

Alternative 6: Excavation of Sediments within the ARC to Variable Depths (up to 6 feet) with Treatment/Disposal of Excavated Sediments, Capping of the Excavated Area and Institutional Controls

Alternative 6 will include the removal and off-site treatment/disposal of all of the sediment identified during the 2009 SPME pilot study as being toxic to benthic macroinvertebrates, as well as a portion of the NAPL containing sediment within the ARC (a total of approximately 6,000 cubic yards of sediment will be removed from the river). As with Alternatives 4 and 5, these removal activities will result in the reduction of the volume

of NAPL- and PAH-containing sediment and associated toxicity. In addition, clean backfill and an engineered cap will be placed to isolate the NAPL containing sediments that will remain at depth within the ARC and mitigate the potential upward movement of those materials. Capping the remaining NAPL- and PAH-containing sediment will contain the sediments in place and provide a barrier, thereby reducing the potential for future human and biota exposure to those sediments. A properly designed and maintained cap will reduce the flux of NAPL to surface water, thereby reducing the potential for the remaining NAPL-containing sediments to generate sheens on the water surface.

This alternative will include the development of a site management plan (SMP) that will include the same elements as described under Alternatives 3, 4 and 5.

The cost to implement Alternative 6, based on an annual operation and maintenance (O&M), for a period of 30 years has been estimated as follows:

Present Worth:.....*$15,170,000*
Capital Cost:.....*$13,450,000*
Annual Costs:.....*$1,720,000*

Alternative 7: Excavation of Sediments within the ARC to Full Depth of NAPL (up to 15 feet) with Treatment/Disposal of Excavated Sediments and Backfill of the Excavated Area

Alternative 7 involves the removal of all NAPL containing sediment and toxic sediment from within the footprint of the ARC (removal depths up to 15 feet). Approximately 9,000 cubic yards of sediment will be removed by the dredging activities. Dredged material will be managed and disposed of consistent with that described in Alternative 4. Dredging, treatment and disposal of the NAPL-containing and toxic sediments in the ARC will permanently remove those sediments, resulting in achievement of the site-specific threshold value and the RAOs.

The cost to implement Alternative 7, based on an annual operation and maintenance (O&M), for a period of 30 years has been estimated as follows:

Present Worth:.....*$15,340,000*
Capital Cost:.....*$12,820,000*
Annual Costs:.....*$164,000*

Alternative 8: Sediment Excavation to 4 mg/kg PAH with Treatment/Disposal of Excavated Sediments and Backfill of the Excavated Area

Alternative 8 involves the removal of all sediment with PAH concentrations greater than 4 mg/kg to full depth (up to 15 feet) within OU2, with the exception of sediments within Embayment 3 which have been determined to be non-site-related. The estimated remedial area measures 6.1 acres. A total of approximately 41,000 cy of sediment will be removed by the dredging activities. Under this alternative, all sediment containing PAHs at concentrations greater than 4 mg/kg will be dredged and transported off-site for treatment and/or disposal, resulting in achievement of the NYSDEC sediment screening criteria of 4 mg/kg. Debris removed from the dredge area and dredged material will be characterized in accordance with 40 CFR Part 261 and 6NYCRR Part 371 to determine appropriate offsite treatment/disposal requirements. The dredging within the ARC is assumed to be carried out within containment (sheet pile walls), which will minimize surface water impacts (turbidity and sheens); however, dredging outside the ARC will be performed without full containment. There is

uncertainty regarding the technical feasibility to install the sheet pile walls around the ARC. Without the containment system around the ARC, there will be the potential for NAPL transport, excessive sheen generation and exceedances of turbidity standards from dredging within the ARC.

The cost to implement Alternative 8, based on an annual operation and maintenance (O&M), for a period of 30 years has been estimated as follows:

Present Worth: *$41,710,000*
Capital Cost: *$41,710,000*
Annual Costs: *$0*

Exhibit C

Remedial Alternative Costs

Remedial Alternative	Capital Cost ($)	Annual Costs ($)	Total Present Worth ($)
1-No Further Action	0	0	0
2-Monitored Natural Recovery(NR) of Sediments within the Areas for Remedial Consideration(ARC) and Institutional Controls	150,000	1,280,000	1,430,000
3- Capping Sediments within the ARC with Institutional Controls	7,170,000	1,720,000	8,890,000
4- Excavation of Sediments within the ARC to a Depth of 1 foot with Treatment/Disposal of Excavated Sediments, Capping of the Excavated Area and Institutional Controls	9,750,000	1,720,000	11,470,000
5- Excavation of Sediments within the ARC to a Depth of 2 foot with Treatment/Disposal of Excavated Sediments, Capping of the Excavated Area and Institutional Controls	11,220,000	1,720,000	12,940,000
6- Excavation of Sediments within the ARC to Variable Depths (up to 6 feet) with Treatment/Disposal of Excavated Sediments, Capping of the Excavated Area and Institutional Controls	13,450,000	1,720,000	15,170,000
7- Excavation of Sediments within the ARC to Full Depth of NAPL (up to 15 feet) with Treatment/Disposal of Excavated Sediments and Backfill of the Excavated Area	12,820,000	164,000	15,340,000
8-Sediment Excavation to 4 mg/kg PAH with Treatment/Disposal of Excavated Sediments and Backfill of the Excavated Area	41,710,000	0	41,710,000

Exhibit D

SUMMARY OF THE PROPOSED REMEDY

The Department is proposing Alternative 7, excavation of sediments within the ARC to remove NAPL and toxic sediment impacts (up to 15 feet) to the extent feasible with treatment/disposal of excavated sediments and backfill of the excavated area as the remedy for this site. Alternative 7 will achieve the remediation goals for the site by removing all NAPL containing sediment and toxic sediment from within the footprint of the ARC to the extent feasible. Approximately 9,000 cy of sediment will be removed by the dredging activities. The elements of this remedy are described in Section 7. The proposed selected remedy is depicted in Figure 5.

Basis for Selection

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

The proposed remedy, Alternative 7 will satisfy this criterion by removing the contaminated sediment from the Hudson River which is the most significant threat to public health and the environment. Alternative 1 (No Further Action) does not provide any protection to public health and the environment and will not be evaluated further. Alternative 2 (Natural Recovery of Sediments within the ARC with Institutional Controls), does not include any removal, treatment, or containment actions to address potential human health and ecological risks and will not be evaluated further. Alternatives 3 (Capping Sediments within the ARC with Institutional Controls) through excavation of sediments within the ARC to variable depths of up to 6 feet) with treatment/disposal of excavated sediments, partial backfill and capping of the excavated area, and institutional controls) will not provide adequate protection to human health and the environment as significant amount of impacted sediments will be left in place. Alternatives 3, 4, 5 and 6 will all include either capping or partial removal which will not conform to Article 15 and 6 NYCRR Part 608 . Also, Alternatives 3, 4, 5 and 6 will all require long-term cap maintenance as well as implementation of institutional controls to reduce the potential for disturbance of the cap, neither of which will be necessary under Alternative 7. Alternative 8 with near total removal of the impacted sediments will provide protection to human 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.

Alternative 7 will comply with SCGs to the extent practicable. It addresses source areas of contamination, ecological impacts and demonstrated toxic sediments through dredging, treatment, and disposal of the impacted sediments in the ARC. Alternative 7 will permanently remove the impacted sediments, resulting in compliance with SCGs, notably addressing sheen producing sediments which are a contravention of Water Quality standards. Alternatives 3, 4, 5 and 6 also comply with this criterion but to a lesser degree or with lower

certainty. Because Alternatives 3, 4, 5 and 6 do not completely satisfy the threshold criteria, the remaining criteria are particularly important in selecting a final remedy for the site. Alternative 8 also complies with SCGs but costs are prohibitive and are discussed further in the cost effectiveness section below.

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.

Long-term effectiveness is best accomplished by those alternatives involving excavation of the contaminated sediments (Alternatives 4 through 8). Since the sediment contamination is found at various depths and locations, the only permanent remedial approaches are Alternatives 7 and 8. These alternatives permanently remove NAPL- and PAH - containing sediments in the ARC to the extent practicable. Alternatives 4 through 6 involve capping or partial removal and capping. These alternatives all involve long term monitoring and institutional controls. Additionally, these alternatives prevent the re-establishment of habitat in the removal area and therefore result in permanent habitat loss within the river. Alternatives 5 and 6 have slightly more permanence than Alternative 4 due to the partial removal of sediments.

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.

Alternative 3, which relies on capping will only reduce the mobility, but not the toxicity or volume of sediments. The engineered cap will require monitoring and maintenance, along with potential activity restrictions within the capped area. Alternatives 4, 5 and 6 require the partial excavation and capping of contaminated sediments. Although the volume of the contaminated sediment will be reduced to different degrees, these alternatives will still require monitoring and maintenance, along with potential activity restrictions within the capped area. The capped areas will contain residual contamination, entailing restrictions on the use of the impacted area and long-term maintenance of these areas. Only Alternatives 7 and 8 will permanently reduce the toxicity, mobility and volume of contaminants by dredging, treatment, and disposal of the NAPL containing and toxic sediments in the ARC.

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.

Alternative 3 may result in potential minor impacts to the water column due to re-suspension of sediments and slight sheen generation during the capping activity. Short term impacts from Alternatives 4 through 8 include potential impacts to the water column due to re-suspension of sediments and sheen generation. Sheen generation during excavation and or cap placement is expected and will be addressed through the deployment of absorbent booms. Implementation of this alternative will also result in temporary impacts to biota in the Hudson River area during capping activities due to temporary alteration/destruction of existing habitat in the area subject to capping. Following restoration, recovery of benthic communities is expected to occur in relatively short timeframes as a result of re-colonization. Alternative 8 will result in greater short term impacts compared to

Alternative 7 as a larger volume of impacted sediments will be removed beyond the ARC. Alternative 7 will take approximately 6 months to complete. Alternatives 3, 4, 5 and 6 will take approximately 3 to 5 months to complete, respectively. Alternative 8 with larger removal will take about 21 months to complete.

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.

Alternative 3 is readily implementable. Alternatives 4, 5, 6, 7 and 8 are also readily implementable but with greater difficulties compared to Alternative 3. Technical implementability issues for these alternatives will be associated with the ability to install containment sheeting or other engineering controls and the potential for severe weather conditions (conducting activities in water may be limited by conditions such as winds and storms and the potential presence of underwater structures). There is uncertainty regarding the technical feasibility of installing the sheet pile containment due to site conditions, including water depths of up to 45 feet at the far edge of the removal area. Water velocity in the ARC is greater than 3 ft/sec with 4-foot tidal fluctuations, and an assumed depth of 30 feet of sediment above bedrock. If it can be installed, the sheet pile containment wall will not be able to withstand vessel impacts (a potential risk due to the known boat traffic in this section of the river), nor will it be able to withstand ice loading. Alternative 7 or 8 will require additional information be collected during the PDI, and additional engineering analyses will be performed during the remedial design, to determine if the sheet pile walls can be installed safely and effectively. Conducting sediment remediation activities within and adjacent to an active shipping channel that is maintained by the USACE and that falls within an area of the Hudson River that is used for recreational and other purposes presents numerous logistical challenges. Coordination with the USACE and other river users (e.g., Hudson Cruises) will be required. These remedial alternatives have been assumed to be both technically and administratively implementable. However, if Alternative 7 or 8 will need to be further evaluated and verified during the PDI and remedial design, particularly with respect to the ability to install safe and effective containment.

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.

The costs of the alternatives vary significantly. With its large volume of sediment to be handled, Alternative 8 (excavation and off-site disposal) will have the highest present worth cost. Partial excavation and capping (Alternatives 4 through 6) will be much less expensive than Alternative 8, but it will not provide equal protection of the resource. Alternative 8 will only marginally increase in protectiveness over Alternative 7, but will result in over 26 million dollars of additional cost compared to Alternative 7.
The present worth costs of Alternatives 4, 5, 6 and 7 are similar to each other, although the capital costs rise with the volume of sediment removed, therefore alternatives 5, 6, and 7 will be higher than that of Alternative 4. The long-term maintenance cost of the capped area with Alternatives 3, 4, 5 and 6 are similar. Alternatives 7and 8 have no long term maintenance costs because these alternatives do not include capping.

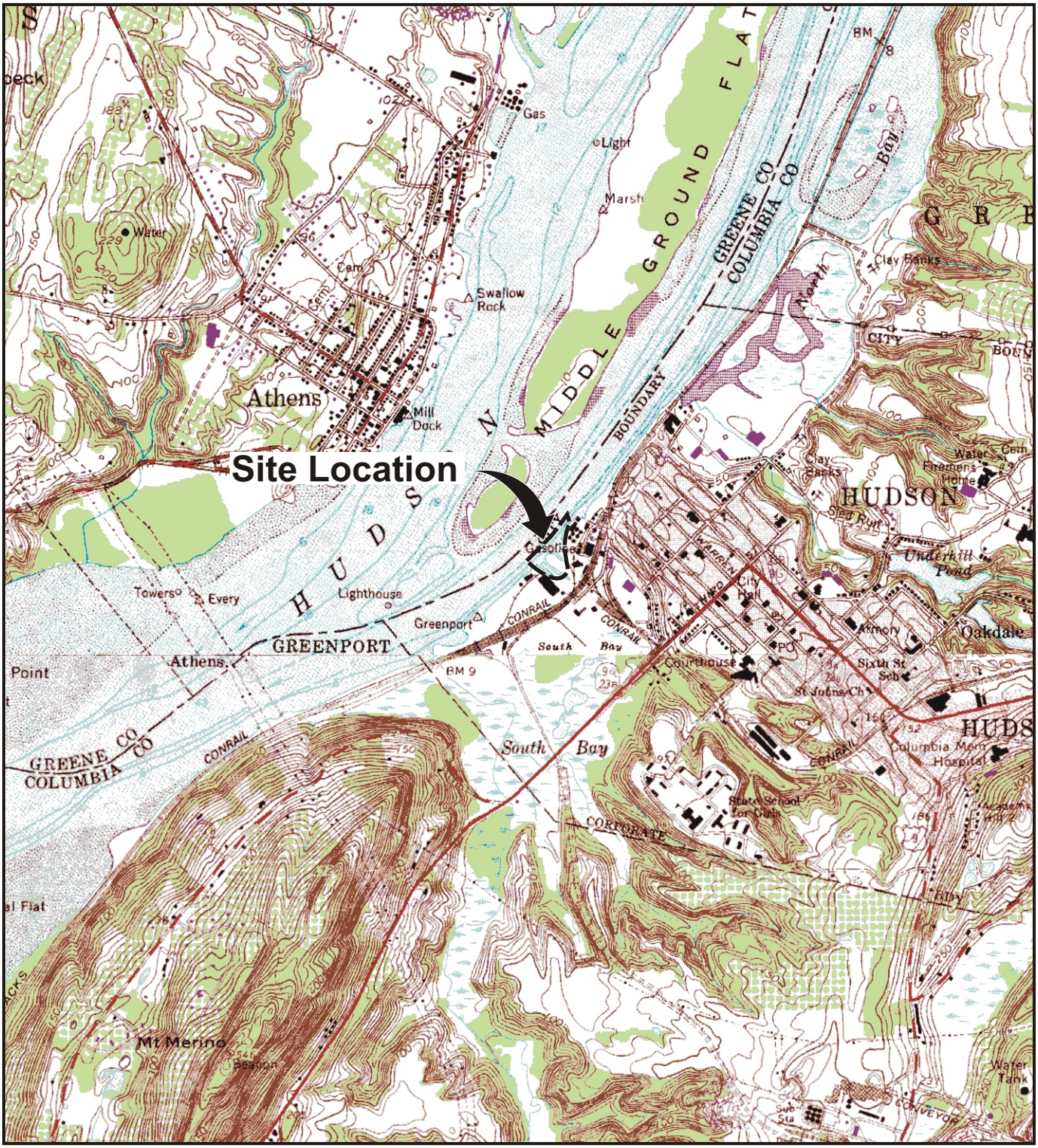
8. Land Use. When cleanup to pre-disposal conditions is determined to be infeasible, the Department may consider the current, intended, and reasonable anticipated future land use of the site and its surroundings in the selection of the soil remedy.

The current and anticipated future use of the property adjacent to the river is a mixed commercial/residential urban setting, including a city-owned park and nearby commuter rail station. The current and anticipated future use of the river itself is as a navigable waterway and for river-based recreation activities. Although the potential for human exposure to MGP constituents in the OU2 sediments is low due to the existing land use and the physical attributes of the site, taking no actions (i.e., active treatment, isolation, or removal) to address the NAPL- and PAH-containing sediments could discourage the use of the waterfront and therefore the elimination of Alternative 2. The implementation of Alternatives 3, 4, 5 and 6 is not expected to significantly affect the use of the river for navigation or recreational purposes. The only land use changes that are expected to result from the implementation of these alternatives will be activity restrictions associated with the selected institutional controls. The implementation of Alternatives 7 and 8 will not result in any future limitations on the use of the river for navigation or recreational purposes.

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.

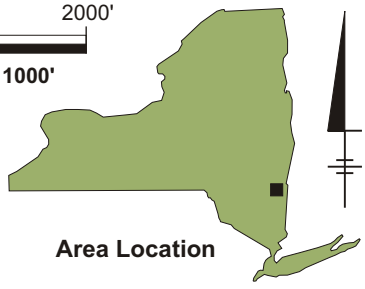
Alternative 7 is being proposed because, as described above, it satisfies the threshold criteria and provides the best balance of the balancing criterion.



REFERENCE: BASE MAP USGS 7.5 MIN. QUAD.,HUDSON NORTH, NY, 1953, AND HUDSON SOUTH, NY, 1963. PHOTOREVISED 1980.

2000' 0 2000'

Approximate Scale: 1" = 1000'



NATIONAL GRID
HUDSON (WATER STREET) SITE, HUDSON, NEW YORK
OU2

SITE LOCATION MAP

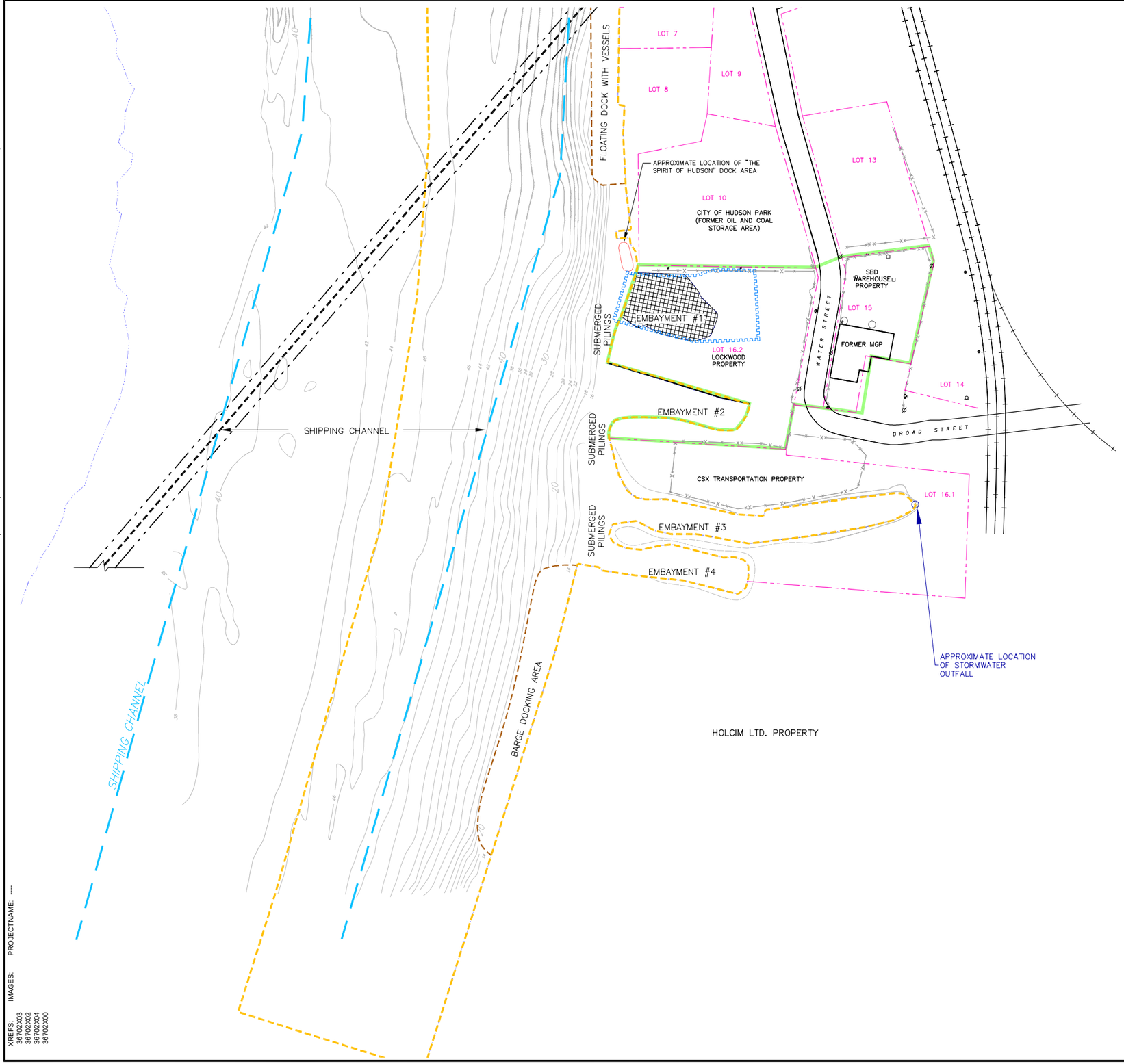
FIGURE 1

04/05/2011 SYRACUSE, NY-ENV/CAD-141 DJHOWES
B0036702/0001/00004/CDR/36702N01.CDR

Hudson (Water Street) MGP Site

Aerial Site Location

FIGURE 2



LEGEND:

- BOUNDARY OF OPERABLE UNIT 1
- APPROXIMATE EXTENT OF OPERABLE UNIT 2
- APPROXIMATE PROPERTY LINE (SEE NOTE 6)
- CHAIN–LINK FENCE
- AMTRAK RAIL LINES
- BATHYMETRIC CONTOUR (2–FOOT INTERVAL) (SEE NOTE 5)
- AREAS NOT ACCESSIBLE BY BATHYMETRIC SURVEY BOAT
- APPROXIMATE FIBER OPTIC CABLE EASEMENT
- APPROXIMATE FIBER OPTIC CABLE LOCATION (SEE NOTE 4)
- APPROXIMATE BOUNDARY OF THE SHIPPING CHANNEL
- EMBAYMENT 1 REMEDIATED AREA
- AS–BUILT SHEETPILE (SEE NOTE 7)

NOTES:

1. BASE MAP FROM TOPOGRAPHIC SURVEY BY BOSK ASSOCIATES, DRAWING FILE HUDSONDL.DWG, DATED 3/24/95.
2. OU2 IS IDENTIFIED BY NYSDEC AS A PORTION OF THE HUDSON RIVER ADJACENT TO THE SITE INCLUDING SEDIMENTS IN EMBAYMENTS #2, #3, AND #4.
3. PROPERTY BOUNDARIES AND ADDITIONAL SHORELINE INFORMATION NORTHEAST OF LOT 10 WERE OBTAINED FROM CITY OF HUDSON TAX MAP, 1009.11, DATED MARCH 1987.
4. APPROXIMATE LOCATION OF BURIED FIBER OPTIC CABLES SCANNED FROM SHEET 2 OF 2 "PLAN & PROFILE HUDSON RIVER CROSSING BETWEEN HUDSON AND ATHENS, COLUMBIA AND GREEN COUNTIES, NEW YORK" BARRETT, BONACCI, HYMAN AND VANWEELE, P.C., 175 A COMMERCE DRIVE, HAUPPAUGE, NEW YORK, OCTOBER 13, 1993. RECEIVED FROM DAVID FINGER, CHIEF ENGINEER, MID–HUDSON CABLEVISION, INC., CATSKILL, NEW YORK.
5. BATHYMETRIC SURVEY CONDUCTED BY OCEAN SURVEYS INC., ON APRIL 26, 2002.
6. THE HUDSON RIVER, INCLUDING THE BED OF THE HUDSON RIVER, IS OWNED BY THE STATE OF NEW YORK.
7. AS DESCRIBED IN THE FINAL ENGINEERING REPORT – REMEDIAL ACTION IMPLEMENTATION OF OPERABLE UNIT 1, A PERMANENT SHEET PILE WALL WAS INSTALLED AROUND THE SEDIMENT REMOVAL AREA AND ALONG THE WESTERN ALIGNMENT OF EMBAYMENT #1. THIS STEEL SHEET PILE WALL WAS LEFT IN–PLACE TO PROVIDE ADDITIONAL PROTECTION AGAINST THE POTENTIAL LATERAL SUBSURFACE MIGRATION OF IMPACTED MATERIAL FROM SURROUNDING PROPERTIES INTO EMBAYMENT #1. THE SHEETPILE WALL AT THE MOUTH OF EMBAYMENT #1 WAS CUT OFF AT THE MUDLINE FOLLOWING COMPLETION OF THE OU1 REMEDIATION.

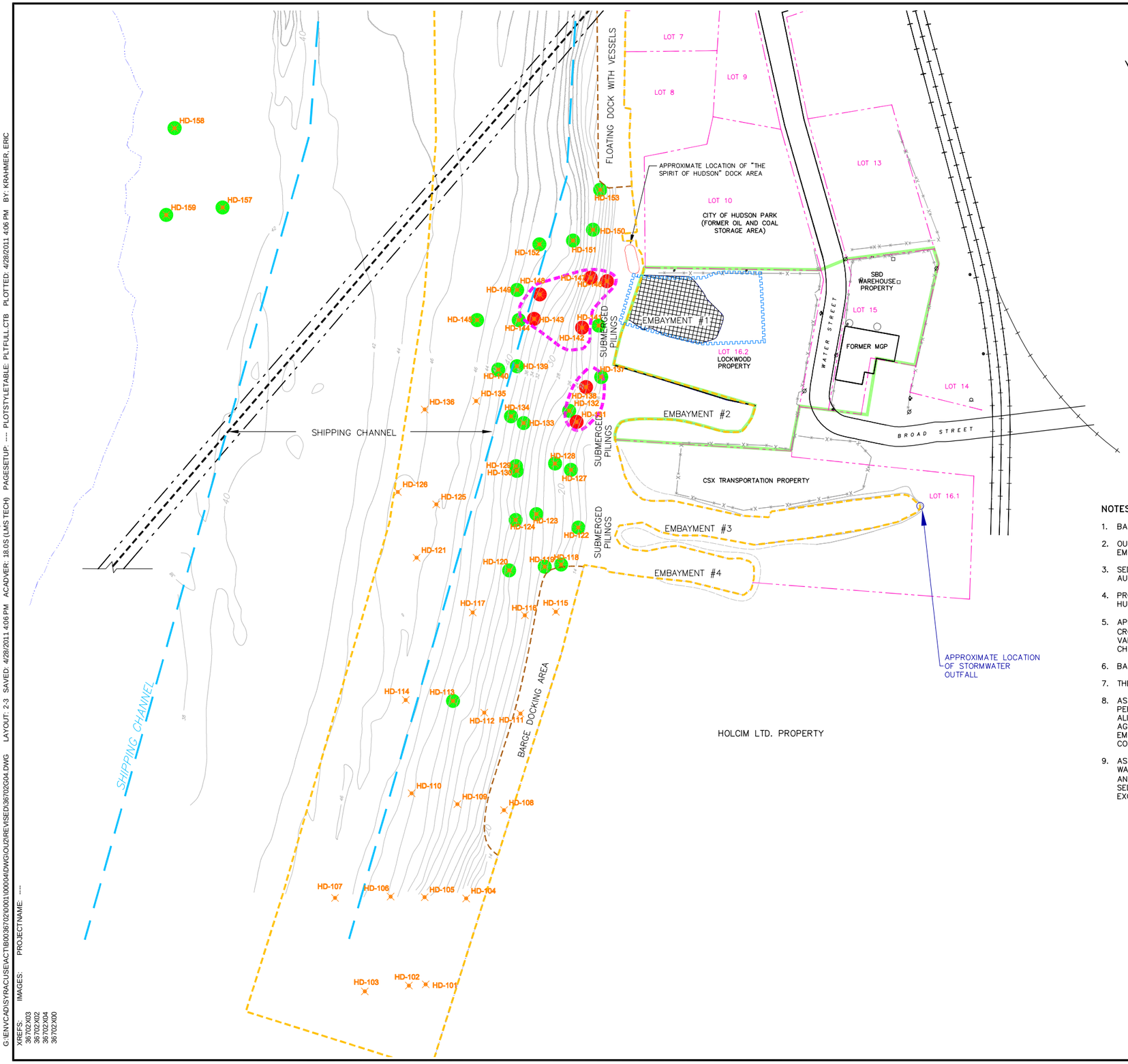
0 80' 160'
GRAPHIC SCALE

NATIONAL GRID
HUDSON (WATER STREET) SITE, HUDSON, NEW YORK
OU2

SITE PLAN

FIGURE 3

CITY: SYRACUSE DIV/GROUP: ENVCAD DB: W. JONES A. SCHILLING L. FORAKER LD: PIC: J. NUSS PM: A. WEEKS TM: A. WEEKS LYR: ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIVE\367020100011000041\DWG\OU2\REVISED\367020G01.DWG LAYOUT: 1-2 SAVED: 4/28/2011 3:51 PM ACADVER: 18.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 4/28/2011 3:52 PM BY: KRAHMER, ERIC
XREFS: IMAGES: PROJECTNAME: ---
367020X03
367020X02
367020X04
367020X00



LEGEND:

- HD-132 — BIOAVAILABILITY STUDY SAMPLING LOCATION
- BOUNDARY OF OPERABLE UNIT 1
- APPROXIMATE EXTENT OF OPERABLE UNIT 2
- APPROXIMATE PROPERTY LINE (SEE NOTE 7)
- CHAIN–LINK FENCE
- AMTRAK RAIL LINES
- BATHYMETRIC CONTOUR (2–FOOT INTERVAL) (SEE NOTE 6)
- AREAS NOT ACCESSIBLE BY BATHYMETRIC SURVEY BOAT
- APPROXIMATE FIBER OPTIC CABLE EASEMENT
- APPROXIMATE FIBER OPTIC CABLE LOCATION (SEE NOTE 5)
- APPROXIMATE BOUNDARY OF THE SHIPPING CHANNEL
- EMBAYMENT 1 REMEDIATED AREA
- AS–BUILT SHEETPILE (SEE NOTE 8)
- AREA OF POTENTIAL SEDIMENT TOXICITY (SEE NOTE 9)
- 2009 SEDIMENT TOXICITY TEST RESULTS (H. AZTECA) SIGNIFICANTLY REDUCED SURVIVAL (SEE NOTE 9)
- 2009 SEDIMENT TOXICITY TEST RESULTS (H. AZTECA) SURVIVAL NOT IMPACTED (SEE NOTE 9)

NOTES:

1. BASE MAP FROM TOPOGRAPHIC SURVEY BY BOSK ASSOCIATES, DRAWING FILE HUDSONDL.DWG, DATED 3/24/95.
2. OU2 IS IDENTIFIED BY NYSDEC AS A PORTION OF THE HUDSON RIVER ADJACENT TO THE SITE INCLUDING SEDIMENTS IN EMBAYMENTS #2, #3, AND #4.
3. SEDIMENT SAMPLE LOCATIONS WERE SURVEYED BY ARCADIS USING SURVEY–GRADE GPS EQUIPMENT IN DECEMBER 1995, AUGUST 1996, MARCH 1998, SPRING 2002, AND OCTOBER 2009.
4. PROPERTY BOUNDARIES AND ADDITIONAL SHORELINE INFORMATION NORTHEAST OF LOT 10 WERE OBTAINED FROM CITY OF HUDSON TAX MAP, 109.11, DATED MARCH 1987.
5. APPROXIMATE LOCATION OF BURIED FIBER OPTIC CABLES SCANNED FROM SHEET 2 OF 2 "PLAN & PROFILE HUDSON RIVER CROSSING BETWEEN HUDSON AND ATHENS, COLUMBIA AND GREEN COUNTIES, NEW YORK" BARRETT, BONACCI, HYMAN AND VANWEELE, P.C., 175 A COMMERCE DRIVE, HAUPPAUGE, NEW YORK, OCTOBER 13, 1993. RECEIVED FROM DAVID FINGER, CHIEF ENGINEER, MID–HUDSON CABLEVISION, INC., CATSKILL, NEW YORK.
6. BATHYMETRIC SURVEY CONDUCTED BY OCEAN SURVEYS INC., ON APRIL 26, 2002.
7. THE HUDSON RIVER, INCLUDING THE BED OF THE HUDSON RIVER, IS OWNED BY THE STATE OF NEW YORK.
8. AS DESCRIBED IN THE FINAL ENGINEERING REPORT – REMEDIAL ACTION IMPLEMENTATION OF OPERABLE UNIT 1, A PERMANENT SHEET PILE WALL WAS INSTALLED AROUND THE SEDIMENT REMOVAL AREA AND ALONG THE WESTERN ALIGNMENT OF EMBAYMENT #1. THIS STEEL SHEET PILE WALL WAS LEFT IN–PLACE TO PROVIDE ADDITIONAL PROTECTION AGAINST THE POTENTIAL LATERAL SUBSURFACE MIGRATION OF IMPACTED MATERIAL FROM SURROUNDING PROPERTIES INTO EMBAYMENT #1. THE SHEETPILE WALL AT THE MOUTH OF EMBAYMENT #1 WAS CUT OFF AT THE MUDLINE FOLLOWING COMPLETION OF THE OU1 REMEDIATION.
9. AS DESCRIBED IN THE COMPREHENSIVE SEDIMENT INVESTIGATION REPORT, THE AREA OF POTENTIAL SEDIMENT TOXICITY WAS DETERMINED USING A WEIGHT OF EVIDENCE ASSESSMENT CONSISTING OF SEDIMENT CHEMISTRY, TOXICITY TESTING, AND BENTHIC MACROINVERTEBRATE SURVEY (I.E., SEDIMENT QUALITY TRIAD ASSESSMENT). THE AREA OF POTENTIAL SEDIMENT TOXICITY CORRESPONDS TO BOTH SOLID PHASE MICRO EXTRACTION PORE WATER TU34 CONCENTRATIONS THAT EXCEED 5.4 TOXIC UNITS AND SIGNIFICANT REDUCTION IN H. AZTECA SURVIVAL.

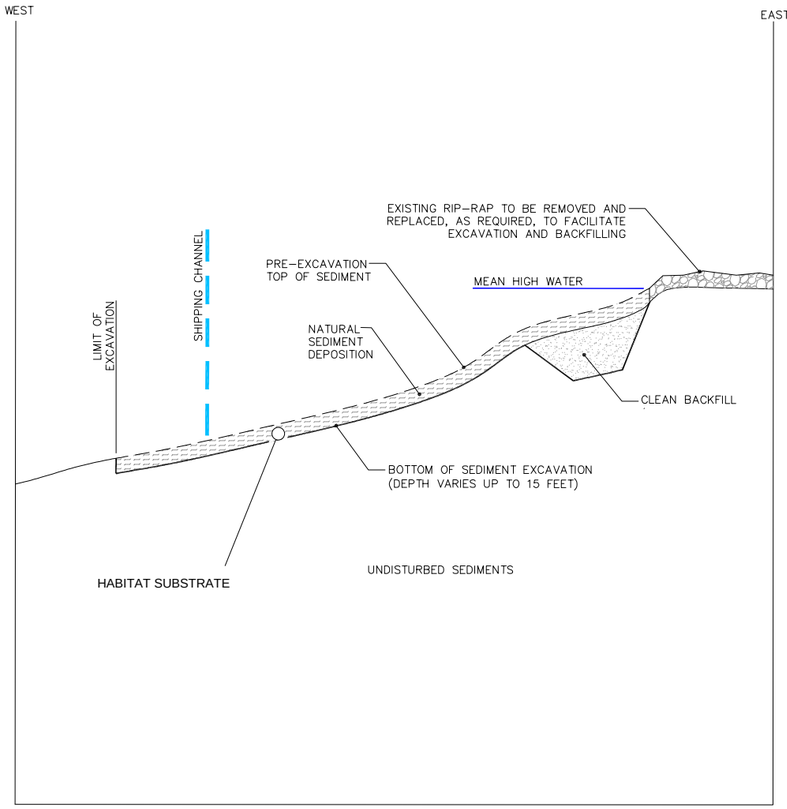
0 80' 160'
GRAPHIC SCALE

NATIONAL GRID
HUDSON (WATER STREET) SITE, HUDSON, NEW YORK
OU2

EXISTING SITE CONDITIONS AREAS OFSEDIMENT TOXICITY

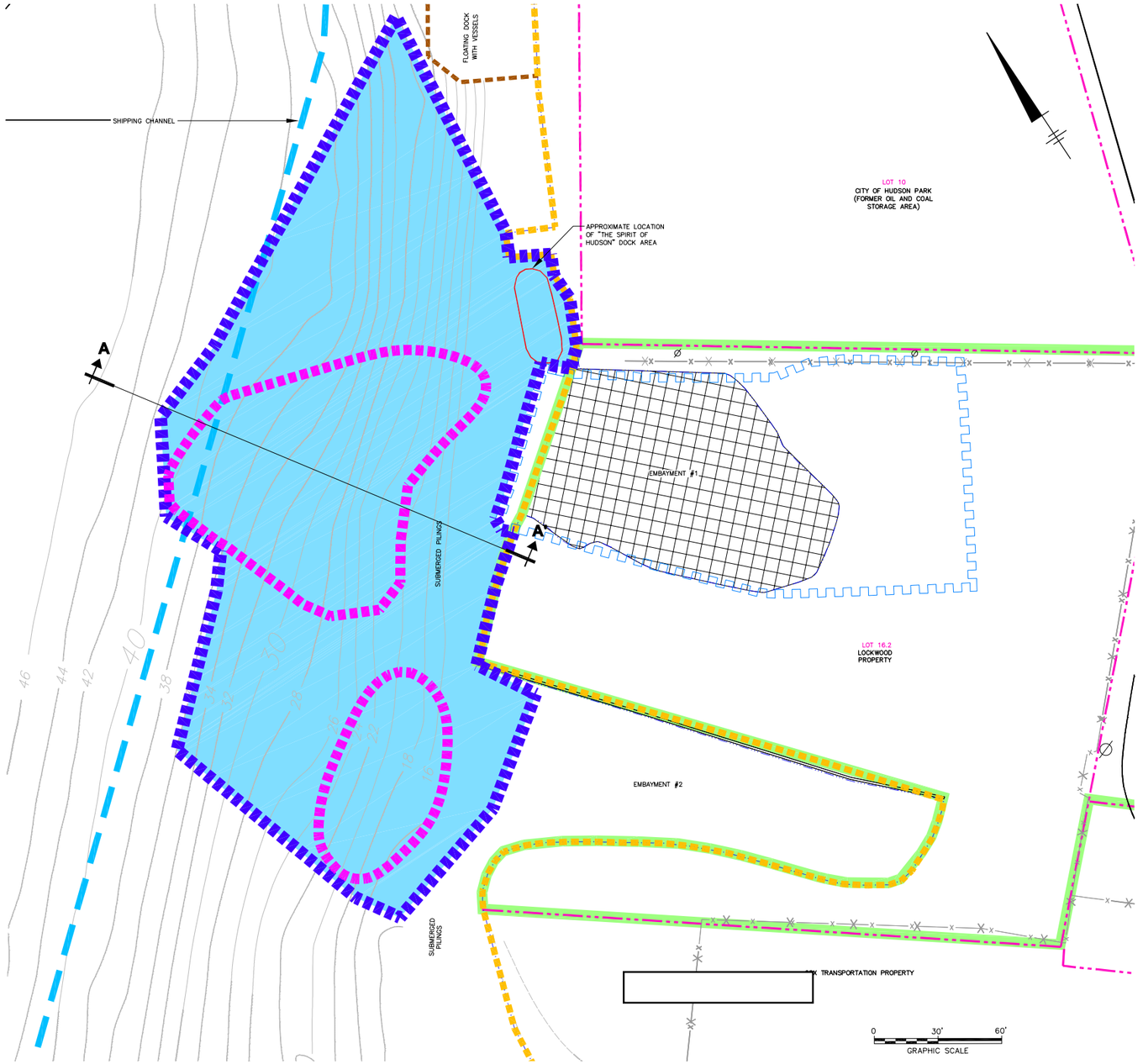
FIGURE 4

CITY: SYRACUSE DIV/GROUP: ENVCAD DB: W. JONES A. SCHILLING L. FORAKER LD: PIC: J. NUSS PM: A. WEEKS TM: A. WEEKS LYR: ON=*; OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0036702\0001\000041\DWG\OU2\REVISED\367026G4.DWG LAYOUT: 2-3 SAVED: 4/28/2011 4:06 PM ACADVER: 18.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 4/28/2011 4:06 PM BY: KRAHMER, ERIC
XREFS: IMAGES: PROJECTNAME: ---
367026X03
367026X02
367026X04
367026X00



SECTION A-A'

VERTICAL SCALE: 1"=20'±



NOTES:

1. BASE MAP FROM TOPOGRAPHIC SURVEY BY BOSK ASSOCIATES, DRAWING FILE HUDSONDL.DWG, DATED 3/24/95.
2. THE RIVER SHORELINE WAS SURVEYED BY ARCADIS USING SURVEY-GRADE GPS EQUIPMENT IN DECEMBER 1995, AUGUST 1996, MARCH 1998, SPRING 2002, AND OCTOBER 2009.
3. PROPERTY BOUNDARIES AND ADDITIONAL SHORELINE INFORMATION WERE OBTAINED FROM CITY OF HUDSON TAX MAP, 109.11, DATED MARCH 1987.
4. THE HUDSON RIVER, INCLUDING THE BED OF THE HUDSON RIVER, IS OWNED BY THE STATE OF NEW YORK.
5. APPROXIMATE LOCATION OF BURIED FIBER OPTIC CABLES SCANNED FROM SHEET 2 OF 2 "PLAN & PROFILE HUDSON RIVER CROSSING BETWEEN HUDSON AND ATHENS, COLUMBIA AND GREEN COUNTIES, NEW YORK" BARRETT, BONACCI, HYMAN AND VANWEELE, P.C., 175 A COMMERCE DRIVE, HAUPPAUGE, NEW YORK, OCTOBER 13, 1993. RECEIVED FROM DAVID FINGER, CHIEF ENGINEER, MID-HUDSON CABLE, CATSKILL, NEW YORK.
6. BATHYMETRIC SURVEY CONDUCTED BY OCEAN SURVEYS INC., ON APRIL 26, 2002.
7. AS DESCRIBED IN THE FINAL ENGINEERING REPORT – REMEDIAL ACTION IMPLEMENTATION OF OPERABLE UNIT 1, A PERMANENT SHEETPILE WALL WAS INSTALLED AROUND THE SEDIMENT REMOVAL AREA AND ALONG THE WESTERN ALIGNMENT OF EMBAYMENT #1. THIS STEEL SHEET PILE WALL WAS LEFT IN PLACE TO PROVIDE ADDITIONAL PROTECTION AGAINST THE POTENTIAL LATERAL SUBSURFACE MIGRATION OF IMPACTED MATERIAL FROM SURROUNDING PROPERTIES INTO EMBAYMENT #1. THE SHEETPILE WALL AT THE MOUTH OF EMBAYMENT #1 WAS CUT OFF AT THE MUDLINE FOLLOWING COMPLETION OF THE OU1 REMEDIATION.

LEGEND:

- BOUNDARY OF OPERABLE UNIT 1
- APPROXIMATE EXTENT OF OPERABLE UNIT 2
- PROPERTY LINE (SEE NOTE #4)
- CHAIN-LINK FENCE
- AMTRAK RAIL LINES
- BATHYMETRIC CONTOUR (2-FOOT INTERVAL) (SEE NOTE #6)
- AREAS NOT ACCESSIBLE BY BATHYMETRIC SURVEY BOAT
- APPROXIMATE FIBER OPTIC CABLE EASEMENT
- APPROXIMATE FIBER OPTIC CABLE LOCATION (SEE NOTE #5)
- APPROXIMATE BOUNDARY OF THE SHIPPING CHANNEL
- EMBAYMENT #1 REMEDIATED AREA
- AS-BUILT SHEETPILE (SEE NOTE #7)
- AREA FOR REMEDIAL CONSIDERATION
- AREA OF POTENTIAL SEDIMENT TOXICITY
- AREA SUBJECT TO DREDGING AND BACKFILLING

NATIONAL GRID
HUDSON (WATER STREET) SITE, HUDSON, NEW YORK
OU2

PROPOSED REMEDY

FIGURE 5

CITY SYRACUSE DIV/GROUP: ENVCAD DB: W. JONES A. SCHILLING E. KRAHMER LD: PIC: J. NUSS PM: A. WEEKS TM: A. WEEKS LYR: ON=*; OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIVE\036702\000\100004\DWG\OU2\CROSS-SECTION\S36702V08.DWG LAYOUT: 6-6 SAVED: 4/29/2011 9:48 AM ACADVER: 18.0S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 4/29/2011 9:49 AM BY: KRAHMER, ERIC
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36702X03
36702X02
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36702X00