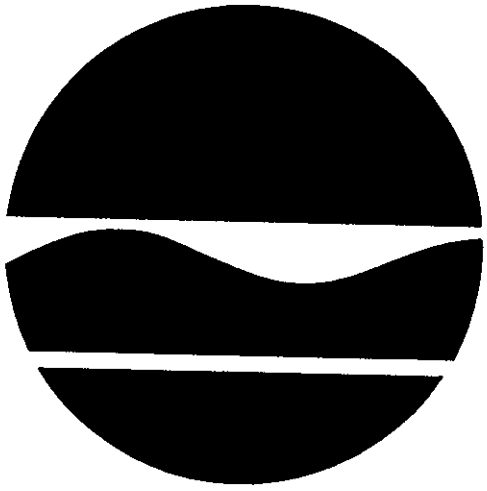
FORMER BROOKLYN BOROUGH GAS WORKS SITE

Brooklyn (C), Kings County, New York
Site No. 2-24-026

PROPOSED REMEDIAL ACTION PLAN
Operable Unit No. 1

July 2000



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

As more fully described in Sections 3 and 4 of this document, the former Brooklyn Borough Gas Works site was a carburetted-water gas processing plant whose operations have resulted in the on-site disposal of a number of hazardous wastes including coal tar and possibly purifier waste. Consequently, soil and groundwater at the site are contaminated with benzene, toluene, ethylbenzene and xylene (BTEX) and polycyclic aromatic hydrocarbons (PAHs) including non aqueous phase liquid (NAPL). Some of these contaminants were released or have migrated from the site into the Coney Island Creek. These operations gave rise to significant threats to the public health and the environment, *viz.*

- Subsurface soil and groundwater contamination above Standards, Criteria, and Guidance values (SCGs) that results in migration of contaminants, including coal tar, into the Coney Island Creek. These contaminants have caused significant environmental damage on the Creek resulting in significant adverse acute or chronic effect to fish, shellfish, crustacea and wildlife, and have the potential to adversely affect human health.

In order to restore the site to predisposal conditions to the extent feasible and authorized by law, but at a minimum to eliminate or mitigate the significant threats to the public health and the environment that the hazardous waste disposed at the site has caused, and to prevent potential future exposures to the public, the New York State Department of Environmental Conservation, (NYSDEC), in consultation with the New York State Department of Health (NYSDOH), is proposing for Operable Unit 1 of the Brooklyn Borough Gas Works Site.

- Excavation of soils from coal tar source areas down to groundwater. These soils would be consolidated under temporary enclosures, as appropriate and as described in more detail in section 3.8 and 4.2 of the Feasibility Study Report, and to, among other things, control the releases of volatile emissions and odors. Coal tar source areas are areas of the site where soils are grossly impacted by by-products of MGP processes including coal tar and NAPL as determined by visual observation and delineated on Figure 5. If coal tar

source areas are visually observed beyond the delineated boundaries, the source would be removed to the extent feasible without dewatering the site.

- Off-site transport and recycling and/or disposal of source area impacted soils materials.

- Installation of a subsurface steel sheet pile barrier wall (or other barrier wall of equal or better performance) around the site to minimize the migration of non aqueous phase liquid (NAPL) from the site into the Coney Island Creek while diverting upgradient groundwater around this site to the Coney Island Creek.

- Removal of an existing wooden bulkhead and contaminated materials with subsequent construction of a stabilized and restored creek bank.

- Installation of a NAPL collection trench along the interior of the creek barrier wall to capture migrating NAPL and aqueous waste and to reduce hydrostatic pressure exerted on the wall by tidally influenced fluctuating groundwater levels.

- Treatment of captured aqueous waste and groundwater. The waste would be treated in an on-site treatment system designed to reduce contaminant concentrations.

- Installation of a multi-component cover system to act as a low permeability barrier to minimize both infiltration and the potential for direct contact of workers with residual contaminants. At least two feet of cover material would be necessary for the protection of human health and the environment. The site would be graded to a common elevation prior to installation of the cover system.

- Passive venting and control of vapors, which may form under the cover system.

- Restoration of the Coney Island Creek bank to provide a 50-foot wide ecological buffer zone. Monitoring wells would be installed immediately outside of the barrier within the buffer zone to assess the long-term performance of the barrier wall.

- Use of institutional controls (such as notifications, deed restrictions, fencing, a health and safety plan, a contingency plan and long-term monitoring after implementation of remedial actions) to ensure continued adherence to the site's health and safety plan; continued treatment of collected groundwater, maintenance of the multi-component cover system; and prohibit the use of the site for other than commercial purposes without permission from NYSDEC.

The conceptual design for redevelopment, although not part of the remedy, must be evaluated for potential impacts to the remedy. The redevelopment design includes preparation of the site and installation of subsurface structures that are not part of the remedy for protection of human health and environment. Figure 3 is illustrative of the

accommodation of features within the area of the remedy which can provide for a continuous impermeable layer and be integrally connected to the remedy cover system. However accomplished, redevelopment cannot adversely affect, compromise the integrity of or disturb the site remedy.

The proposed remedy, discussed in detail in Section 7 of this document, is intended to attain the remediation goals selected for this Operable Unit 1 in Section 6 of this Proposed Remedial Action Plan (PRAP), in conformance with applicable standards, criteria, and guidance (SCGs) and with 6 NYCRR Part 375, *viz.*

- Eliminate, to the extent practicable, off-site migration of contaminants of potential concern (COPCs) within the site groundwater.
- Eliminate, to the extent practicable, human exposures to contaminants.
- Eliminate, to the extent practicable, the migration of contamination into Coney Island Creek.
- Eliminate, to the extent practicable, the exposure of fish and wildlife to levels of contaminants above standards/guidance values.

This PRAP identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for this preference. The NYSDEC will select a final remedy for the site only after careful consideration of all comments received during the public comment period.

The NYSDEC has issued this PRAP as a component of the Citizen Participation Plan developed pursuant to the New York State Environmental Conservation Law (ECL) and 6 NYCRR Part 375. This document is a summary of the information that can be found in greater detail in the Remedial Investigation (RI), Focused Feasibility Study (FS) and other relevant reports and documents available at the document repositories.

To better understand the site and the investigations conducted, the public is encouraged to review the project documents at the following repositories:

- City of New York
  Brooklyn Community Board 13
  2900 West 8th Street
  Brooklyn, NY 11224
  Phone #: (718) 266-3001
  Hours of Operation: 9am - 5pm
  Contact: Chuck Reitchenthal
- NYSDEC, Region 2 Headquarters
  1 Hunters Point Plaza
  47-40 21st Street
  Long Island City, NY 11101-5407
  Phone #: (718) 482-4995
  Hours of Operations: 9am - 4pm
  Contact: Tom Lang, P.E.

The NYSDEC seeks input from the community on all PRAPs. A public comment period has been set from July 11, 2000 to August 10, 2000 to provide an opportunity for public participation in the remedy selection process for this site. A public meeting is scheduled for July 10, 2000 at the Coney Island Hospital Auditorium, 2601 Ocean Parkway, Brooklyn, New York beginning at 7:00 PM.

At the meeting, the results of the RI/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 you can submit verbal or written comments on the PRAP.

The NYSDEC may modify the preferred alternative 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 all of the alternatives identified here.

Comments will be summarized and responses provided in the Responsiveness Summary section of the Record of Decision. The Record of Decision is the NYSDEC's final selection of the remedy for this site. Written comments may be sent to:

Amen M. Omorogbe, P.E.
Project Manager
NYSDEC
Div. of Environmental Remediation
Bureau of Construction Services
50 Wolf Road
Albany, NY 12233-7010

Phone #: (518) 457-9285

SECTION 2: SITE LOCATION AND DESCRIPTION

The former Brooklyn Borough Gas Works site (Site # 2-24-026) is located in the Borough of Brooklyn, Kings County, New York (see figures 1 and 2). It is located on 873 Neptune Avenue, Coney Island. The site is bordered by the right of way of the Shore Parkway and the New York Metropolitan Transit Authority (MTA) railyard to the north and west, and Coney Island Creek to the south and east. The site is approximately 16.4 acres in size. The area surrounding the property is a relatively flat, densely populated commercial/residential zone.

An Operable Unit represents a portion of the site remedy which 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. Operable Unit 1, which is the subject of this PRAP, consists of the investigation and remediation of land portions of the site. The remaining operable unit for this site is Operable Unit 2 for the investigation, risk assessment, and engineering evaluation to restore the upper reach of Coney Island Creek. This investigation is ongoing at this time and would be the subject of a separate PRAP at a future date.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

The Manufactured Gas Plant (MGP) is a facility where gas for lighting and heating homes and businesses was produced as a result of heating coal and from combination of oil and water called "carburetted water-gas" process. The former Brooklyn Borough Gas works began construction of the first generator at the facility in 1908.

On-site disposal of by-products such as coal tar resulting from the operation of the plant has resulted in the contamination of soil, groundwater and Coney Island Creek through the combination of leaks from storage facilities

including gas holders and direct discharge to the creek.

In 1951, Brooklyn Borough Gas transformed its gas delivery operations to a natural gas-based system. Between 1952 and 1959, the Brooklyn Borough Gas Company operated the MGP for the purpose of meeting gas supplies during high demands. By 1966, the facility was almost completely decommissioned and demolished.

3.2: Remedial History

In 1994, Brooklyn Union performed the following at the site to mitigate the effect of the contaminants to public health and the environment: 1) installation of inland NAPL recovery wells; 2) installation of booms in Coney Island Creek; and 3) installation of light non aqueous phase liquid (LNAPL) skimmer and collection system.

In compliance with its obligations under Department Order Index No. D2-001-94-12 issued in May 1995, Brooklyn Union Gas Company (a subsidiary of KeySpan Energy) performed supplemental remedial investigations in 1996 and 1997 to characterize the nature and extent of contamination resulting from manufactured gas operations. Additional investigation to determine the impact of site operations to the adjacent Coney Island Creek is underway (Operable Unit 2). In 1997, additional remedial measures were conducted at the site as discussed in section 4.2 below.

SECTION 4: SITE CONTAMINATION

To evaluate the contamination present at the site and to evaluate alternatives to address the significant threat to human health and the environment posed by the presence of hazardous waste, KeySpan Energy, the parent company of Brooklyn Union Gas Company, has recently conducted a Remedial Investigation/Feasibility Study (RI/FS).

The Commissioner may find that hazardous waste disposed at the site constitutes a significant threat to the environment if, after reviewing the available evidence and considering the factors the Commissioner deems relevant set forth in 6 NYCRR 375-1.4(b), the Commissioner determines that the hazardous waste disposed at the site or coming from the site results in, or is reasonably forseeable to result in:

(a) subsurface soil and groundwater contamination above SCGs that result in significant environmental damage.

(b) significant environmental damage due to contaminant levels that caused significant adverse acute or chronic effects to fish, shellfish, crustacea and wildlife (6 NYCRR 375-1.4[a][2]).

In making a finding as to whether a significant threat to the environment exists, among others, the Commissioner may take into account any or all of the following matters, as may be appropriate under the circumstances of the particular situation.

- Groundwater hydrogeology at and near the site (6 NYCRR 375-1.4[b][5]).
- Location, nature, and size of surface waters at and near the site (6 NYCRR 375-1.4[b][6]).

- Levels of contaminants in groundwater, surface water, air, and soils at and near the site and areas known to be directly affected or contaminated by waste from the site, including, but not limited to, contravention of ambient surface water standards set forth in 6 NYCRR Part 701 or 702, and ambient groundwater standards set forth in 6 NYCRR Part 703.

- The extent to which hazardous waste and/or hazardous waste constituents have migrated or are reasonably anticipated to migrate from the site to the Coney Island Creek (6 NYCRR 375-1.4[b][9]).

(For a more detailed discussion respecting the Department's "significant threat" determinations and the rationale for its use of the above and other factors in its decision making, see the Draft Regulatory Impact Statement for 6 NYCRR Part 375, dated April 1991, at pages 19 to 25, and the Hearing Report, Responsiveness Summary, and Revision to the Draft Regulatory Impact Statement for 6 NYCRR Part 375, dated March 1992, at pages II-7 to II-19.)

The bases for the determination that the site poses a significant threat to human health and the environment are founded on the following:

Respecting Operable Unit 1: the hazardous wastes present in areas investigated in the most recent RI/FS program contribute to or result in:

- Contravention of groundwater standards for VOCs including benzene, and PAHs (for concentrations of contaminants in groundwater at the site, see Table 1.

- Impacts of site contaminants including coal tar and PAHs on the Coney Island Creek.

The determination of significant threat associated with Operable Unit 1 is therefore based primarily on the significant environmental damage associated with impacts of contaminants (coal tar and PAHs) on the site soil, groundwater and the Coney Island Creek, causing significant adverse acute or chronic effect to fish, shellfish, crustacea and wildlife including potential human health.

4.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site.

The RI was conducted in several phases including: Phase I- Contaminant Investigation in 1989; Phase II - Geotechnical Investigation conducted in May 1993; Phase III- Geotechnical Investigation in July 1993; Phase IV - Geotechnical and Hydrogeological Investigation in August 1993; Phase V- Geotechnical and Hydrogeological Investigation in October 1993; and Phase VI - Supplemental Remediation Investigation in November 1997. A report entitled Remedial Investigation Report for the Brooklyn Borough Gas Works dated November 1997 has been prepared which describes the field activities and findings of the Phase VI supplemental RI in detail and also included a

summary of the investigation reports for Phases I through V.

To determine which media (soil, groundwater, *etc.*) contain contamination at levels of concern, the RI analytical data were compared to environmental Standards, Criteria, and Guidance values (SCGs). Groundwater SCGs identified for the former Brooklyn Borough Gas Works site are based on NYSDEC Ambient Water Quality Standards and Guidance Values and Part 5 of the New York State Sanitary Code. For soils, NYSDEC Technical and Administrative Guidance Memoranda (TAGM) 4046 provides soil cleanup guidelines for the protection of groundwater, background conditions, and health-based exposure scenarios.

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

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

The Remedial Investigation included among other things, the following activities:

- Installation of soil borings and monitoring wells for analysis of soils and groundwater as well as physical properties of soil.

4.1.1 Site Geology and Hydrogeology

Site investigations revealed site geology consisting of unconsolidated pleistocene deposits from 10 to 172 feet below ground surface (BGS) that consist mainly of fine to coarse grained sands with a clay/silt layer from 59 to 60 feet BGS and clay from 170 to 172 feet BGS. The sand, which at some depths contained a trace of gravel, varied with depth in grain size and color. Above the pleistocene deposits is a thin (5 to 10 feet) layer of near shore and estuary type deposits. The glacial aquifer encountered at the site is composed almost entirely of the sands of the till and outwash deposits and extends from just below the surface to 170 feet BGS.

4.1.2 Nature of Contamination:

As described in the RI Report, many soil and groundwater samples were collected at the site to characterize the nature and extent of contamination. The main categories of contaminants which exceed their SCGs are polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), and inorganics.

The carcinogenic PAH contaminants of concern are chrysene, dibenzo(a,h)anthracene, benzo(b)fluoranthene, benzo(a)anthracene, benzo(a)pyrene, benzo(k)fluoranthene, and Indeno(1,2,3-cd)pyrene. The VOC contaminants of concern include benzene, toluene, ethylbenzene and xylene (BTEX), and acetone. The inorganic contaminants of concern include but are not limited to the following arsenic, lead, manganese, nickel and zinc.

4.1.3 Extent of Contamination

Table 1 summarizes the extent of contamination for the contaminants of concern in soil and groundwater and compares the data with the SCGs for the site. The following sections summarize the media which were investigated and the findings of the investigation.

Soils

The soils at the Brooklyn Borough Gas Works Site are contaminated with various chemical constituents related to the gas manufacturing processes that took place at the site. Most of the contaminants were detected primarily at a depth of 4 to 12 feet below ground surface across the entire site. Certain areas of the site contain coal tar and are considered the source area as delineated on Figure 5. Coal tar is associated with high concentrations of PAHs and BTEX and is the source of NAPL. Source materials are observed to co-exist in the same area of the site with elevated level of PAHs and BTEX. The majority of the source materials are located just above the groundwater table, which is generally present at about 6 feet below ground surface.

Site investigation reveals that concentrations of contaminants tend to decrease with depth. Throughout the entire site, total PAHs were observed in soil at concentrations ranging from less than 1 ppm to over 40,000 ppm and BTEX constituents were detected at concentrations ranging from 0.0014 ppm to 1,600 ppm. Below the groundwater table, however, for the most part total PAHs were observed in soil at concentrations ranging from no detect to 4,500 ppm and total BTEX ranged from no detect to 175 ppm. (One exception is a small area in the eastern portion of the site with elevated concentrations at a depth of about 12 feet below the ground surface.) The majority of the source materials are typically located within the upper six feet of the soil in the area delineated on Figure 5.

Surface soil contaminant concentrations were generally low with the exception of PAHs. The concentrations of total PAHs in surface soil ranged from 0.02 to 1,300 ppm.

Inorganic constituents of concern at the site include lead, manganese, nickel, arsenic and zinc at concentrations ranging from not detectable to 8,500 ppm for zinc. It should be noted that in 1997 lead contaminated soils were removed from approximately 4 acres on the western part of the site as an Interim Remedial Measure (IRM).

Groundwater

The groundwater under this site has measurable levels of various chemical constituents of concern due to the deposition of these chemicals at depth. Floating oils including NAPL were also observed in wells and soil borings. It should be noted that the saline groundwater is not used as a potable water source. Groundwater at this site flows generally towards the south and discharges to the Coney Island Creek. There is no evidence of off-site impact of groundwater beyond the Coney Island Creek. The issue of off-site impacts would be further addressed under Operable Unit 2. Total PAH concentrations in the monitoring wells ranges from not detectable to 21,900 ppb with a majority of the wells showing no traces of contamination. Concentrations of VOCs ranged from not detectable to 16,400 ppb.

Soil Gas

Soil gas investigations at the site indicated elevated concentrations of BTEX constituents, naphthalenes, cycloalkanes, and cycloalkenes. The presence of these vapors is consistent with the elevated concentrations of these contaminants in subsurface soil with identification of coal tar source areas.

Surface Water/Sediments

Site related contaminants have been detected in adjacent surface water and sediments in the Coney Island Creek. These media are being further investigated and would be addressed under Operable Unit 2.

4.2 Interim Remedial Measures:

Interim Remedial Measures (IRMs) are discrete sets of activities to address both emergency and non emergency site conditions, which can be undertaken without extensive investigation or evaluation, to prevent, mitigate, or remedy environmental damage to the consequences of same attributable to a site.

In October 1997, an IRM was conducted to remove high concentrations of lead in surface soils on the western portion of the site. This action removed the highest levels of lead contamination on the site by removing the top 1 foot of soil from approximately 4 acres on the western portion of the site. This included the removal and disposal of approximately 250 tons of lead contaminated nonhazardous soil and over 1500 tons of soil that was characteristic hazardous waste for lead.

4.3 Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the health risks can be found in section 4 of the report titled Final Baseline Risk Assessment Report for the Brooklyn Borough Gas Works Site, Brooklyn, New York dated October 16, 1998.

An exposure pathway is a manner by which an individual may come into contact with a contaminant. The five elements of an exposure pathway are: 1) the source of contamination; 2) the environmental media and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events.

Potential Current Exposure Pathways

- Inhalation of vapors and airborne particulates from surface soil by on-site workers, on-site construction workers, off-site MTA railyard workers and nearby off-site residents.
- Dermal contact with and/or inhalation of volatiles from NAPL in subsurface soil and groundwater.
- Dermal contact with contaminated surface and subsurface soil and incidental ingestion of this soil by on-site construction workers.

Potential Future Exposure Pathways

Future uses of the site are expected to include commercial/industrial uses. If the site is not properly remediated, future workers and visitors on site may be exposed to contaminants of potential concerns (COPCs) through the following pathways:

- Inhalation of vapors in ambient, outdoor air and inhalation of vapors accumulating in indoor structures.
- Inhalation and/or ingestion of airborne particulates from surface soil.
- Dermal contact with contaminated surface soil.

4.4 Summary of Environmental Exposure Pathways:

This section summarizes the types of environmental exposures and ecological risks which may be presented by the site. The Fish and Wildlife Impact Assessment included in the Baseline Risk Assessment Report (section 5.4) presents a more detailed discussion of the potential impacts from the site to fish and wildlife resources.

Analytical results from surface water and sediment samples obtained from the Coney Island Creek indicate that the Creek has been and continues to be impacted by contamination resulting from the operation of the former MGP at the former Brooklyn Borough Gas Works site and the continuing migration of subsurface contamination to the creek. Impact to the Coney Island Creek would be addressed under Operable Unit 2 which is for the investigation and restoration of the Coney Island Creek.

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.

On May 12, 1995, NYSDEC issued on KeySpan Energy's consent Department Order Index No. D2-001-94-12. The Order obligates the responsible party, KeySpan Energy, to implement the NYSDEC selected remedy as would be described in the Record of Decision.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR 375-1.10. The overall remedial goal is to restore the site to predisposal conditions, to the extent feasible and authorized by law, with the minimum remedial objective being to eliminate or mitigate, through the proper application of scientific and engineering principles, all significant threats to the public health and to the environment presented by the hazardous waste disposed at the site.

The goals selected for this site are to:

- Eliminate, to the extent practicable, off-site migration of contaminants of potential concern (COPCs) within the site groundwater.

- Eliminate, to the extent practicable, human exposures to contaminants.

- Eliminate, to the extent practicable, the migration of contamination into Coney Island Creek.

- Eliminate, to the extent practicable, the exposure of fish and wildlife to levels of contaminants above standards/guidance values.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost effective, comply with other statutory laws and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the former Brooklyn Borough Gas Works site were identified, screened and evaluated in the report entitled Focused Feasibility Study for the Former Brooklyn Borough Gas Works Site, dated May 2000.

A summary of the detailed analysis follows. As presented below, the time to implement reflects only the time required to implement the remedy, and does not include the time required to design the remedy, procure contracts for design and construction, or to negotiate with responsible parties for implementation of the remedy.

7.1: Description of Alternatives

The potential remedies for Operable Unit 1 are intended to address the contaminated soils and groundwater at the site.

With the exception of Alternative 1 (No Action), the alternatives involve excavation of two different amounts of contaminated soil and two different options for disposal of treated water. Under Alternatives 2 and 3, a large amount of soil with contaminant concentrations above SCGs would be removed. Under Alternatives 4 and 5, only the coal tar source areas where contaminant levels are the highest would be removed. Treated groundwater would be discharged to Coney Island Creek or public owned treatment works (POTW). The site investigations indicate that the majority of source contamination including coal tar, PAHs, and volatile organic compounds is located above the groundwater table. The excavation Alternatives, 2 through 5, would remove contaminated materials to the groundwater table leaving some residual contaminated material above SCGs below the groundwater table to a depth of 12 feet below the surface. Alternatives 2 through 5 all include the construction of a barrier wall system which would completely enclose the site in the subsurface. The barrier wall system is designed to control the migration within the groundwater of residual site contaminants that would not be excavated. It is noteworthy that contaminants within the saturated zone would be removed by a NAPL and groundwater collection and treatment system that would be designed as part of the remedy.

The cost to implement all Alternatives has been estimated using a discount rate of 3.5% for the initial investment over a 30-year period for groundwater monitoring and site maintenance.

Alternative 1: No Action

The "no action" alternative is evaluated as a procedural requirement and as a basis for comparison. It requires continued monitoring of the existing monitoring wells, and continued operation and maintenance of the NAPL recovery, booms and skimmer systems, allowing the site to remain in an unremediated state. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

The cost to implement Alternative 1, based upon 30 years of operation and maintenance (O&M) of the existing control systems, has been estimated as follows:

Present Worth:	*$ 4,667,000*
Capital Cost:	*$ 0.0*
Annual O&M:	*$ 253,000*

Time to Implement *3 months - 6months*

Alternative 2: Excavation of contaminated soil, NAPL treatment, and discharge of treated water to Coney Island Creek.

The components of Alternative 2 are as follows:

- Excavation (to groundwater table) of approximately 85,000 cubic yards of soils contaminated with coal tar, PAHs and VOCs for on-site consolidation and off-site recycling and disposal.
- Multi-component cover system (encapsulation) on top of a prepared surface for containment of contaminated soils and for ventilation of subsurface gas.
- Perimeter subsurface barrier walls to isolate groundwater and contaminants within their boundaries and effectively control the horizontal movement of contaminants.
- Chemical and physical treatment of contaminated groundwater and discharge to the Coney Island Creek.
- Institutional controls including deed restrictions; and
- Long-Term Monitoring.

The cost to implement Alternative 2 has been estimated as follows:

Present Worth:	*$37,653,000*
Capital Cost:	*$27,508,000*
Annual O&M:	*$ 550,000*

Time to Implement *20 months - 24 months*

Alternative 3: Excavation of contaminated soil, NAPL treatment, and discharge of treated water to POTW.

The components of Alternative 3 are identical to Alternative 2 with the exception of discharge of treated groundwater which will be discharged to POTW.

The cost to implement Alternative 3 has been estimated as follows:

Present Worth:	*$39,147,000*
Capital Cost:	*$27,508,000*
Annual O&M:	*$ 631,000*
Time to Implement	*20 months - 24 months*

Alternative 4: **Excavation of coal tar source areas , NAPL treatment and discharge of treated water to Coney Island Creek.**

The components for Alternative 4 are as follows:

- Excavation and removal of approximately 22,000 cubic yards of coal tar source areas to the assumed depth of groundwater six feet below ground surface (see figure 5) for on-site consolidation and off-site recycling and disposal.
- Multi-component cover system on top of a prepared surface for containment of contaminated soils and for ventilation of subsurface gas (see figure 3).
- Perimeter subsurface barrier walls to isolate groundwater and contaminants within their boundaries and effectively control the horizontal movement of contaminants (see figure 4).
- Chemical and physical treatment of contaminated groundwater and discharge to the Coney Island Creek.
- Institutional controls including deed restrictions.
- Long-Term Monitoring.

The cost to implement Alternative 4 has been estimated as follows:

Present Worth:	*$26,440,000*
Capital Cost:	*$16,295,000*
Annual O&M:	*$ 550,000*
Time to Implement	*16 months - 20 months*

Alternative 5: **Excavation of coal tar source areas, NAPL treatment and discharge of treated water to POTW.**

The components for Alternative 5 are identical to alternative 4 with the exception of discharge option for the contaminated groundwater which would be discharged to the POTW.

The cost to implement Alternative 5 has been estimated as follows:

Present Worth:	*$27,934,000*
Capital Cost:	*$16,295,000*
Annual O&M:	*$ 631,000*
Time to Implement	*16 months - 20 months*

7.2 Evaluation of Remedial Alternatives

The criteria used to compare the potential remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste disposal sites in New York State (6 NYCRR Part 375). For each of

the criteria, a brief description is provided, followed by an evaluation of the alternatives against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is included in the Feasibility Study.

1. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance.

Alternative 1 (No Action) would not bring the site into compliance with SCGs for soil and groundwater. The No Action alternative would not address residual concentrations of contaminants in excess of SCGs. Contaminants in groundwater would persist in excess of applicable standards. It should, however, be noted that groundwater at the site is saline and would not be used for potable water supply. In addition, it is technically impracticable from an engineering perspective to achieve compliance with all SCGs at this site since compliance would necessitate the removal of over 300,000 cubic yards of material from the site (excavation of some 16 acres of material down to a depth of about 12 feet). The excavation of these materials to a depth of 12 feet would require major groundwater handling/dewatering efforts. Groundwater dewatering at this site is not feasible due to high groundwater table and its close proximity to the ocean. Alternatives 2 and 3 would achieve compliance with applicable chemical-specific SCGs for soils above groundwater level only, as contaminant concentrations in soils down to groundwater level would be removed to meet SCGs, while contaminants in the groundwater would persist in excess of applicable standards. Alternatives 4 and 5 also would not bring the site into compliance with all applicable chemical-specific standards. While the bulk of contaminants would be removed by excavating coal tar source areas, residual soil contaminant concentrations above SCGs would remain at certain subsurface locations on site. Contaminants in groundwater would persist in excess of applicable standards. However, the use of a multi-component cover system and a subsurface sheet pile barrier wall around the site would mitigate residual contaminant effects on the groundwater by minimizing infiltration through the soil for all alternatives with the exception of Alternative 1. Additionally, contaminants within the groundwater would be treated over time as a result of collection and treatment of NAPL and groundwater.

2. 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.

Alternative 1 would not provide overall protection of human health and the environment. Future site users and construction workers would potentially be exposed to contaminants at the site. Alternatives 2,3,4 and 5 would provide protection of human health and the environment. The use of a cover system and subsurface perimeter barrier wall would minimize migration of subsurface contaminants and thereby potential exposure. Exposures to humans, particularly future site users, would also be minimized by controlling the release of volatile emissions through a passive venting system. These measures, coupled with institutional controls, would mitigate potential exposure to residual contamination. Moreover,

Alternative 2 and 3 would not provide additional protection of public health and the environment over Alternatives 4 and 5.

3. Short-Term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

Alternative 1 would not provide short-term impacts upon the workers, community, and the environment since there is no proactive action proposed under this Alternative. The existing hard boom and skimmer would continue to capture seeping contaminants and prevent their spread into the creek. Alternatives 2 and 3 would have some short-term impacts on the workers and the community. Workers would be required to comply with all safety standards and regulations to prevent or minimize exposure to contaminants. Noise level and odors to the community would increase due to soil excavation and handling operations and significant truck traffic during delivery of construction materials, fill materials, and off-site transportation of approximately 85,000 cubic yards of contaminated soils and coal tar source material. A traffic control plan would be employed to minimize the adverse impacts to the community and workers. There would be vapor and dust control measures to reduce impacts of airborne contaminants. Work within the coffer dam along the Coney Island Creek would effectively minimize short-term effects on the creek. Implementation of Alternatives 2 and 3 would have greater short-term impacts than implementation of Alternatives 4 and 5 due to higher levels of soil excavation, handling operations and off-site transportation. Odors, vapor and dust, noise and traffic caused by Alternatives 4 and 5 would all be at lower levels than for Alternatives 2 and 3, due to the lower volumes of contaminated material to be hauled off site, amounting to approximately 22,000 cubic yards of coal tar source material.

4. Long-Term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks; 2) the adequacy of the controls intended to limit the risk; and 3) the reliability of those controls.

Alternative 1 would not provide any long-term effectiveness and permanence as there are no remedies associated with this alternative. Risk to human health and the environment would continue to persist. Alternatives 2,3,4 and 5 would provide effectiveness and permanence in the treatment/disposal of the excavated material. The contaminated soil excavation option under Alternatives 2 and 3 would remove the bulk of waste in the unsaturated zone and reduce exposure to unprotected construction workers. Under Alternatives 4 and 5, residual concentrations of contaminants would not pose an exposure potential to any individual, except unprotected construction workers, and then only if they penetrate the cover system and conduct work in violation of a site health and safety plan. The technologies proposed for Alternatives 2,3, 4 and 5 are proven and used routinely as reliable measures to control MGP-related wastes. Alternative 1, through the use of fences and security guards,

would provide adequate protection against trespassers. Routine maintenance of the hard boom and skimmer would provide adequate and reliable collection of floating contaminants in the Creek.

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

Alternative 1 does not incorporate a technology option to reduce toxicity, mobility or volume of contamination. Alternatives 2 and 3 would provide reduction of toxicity, mobility or volume. Approximately 85,000 cubic yards of contaminated soil and coal tar sources would be excavated from the site and transported for treatment and/or disposal. Alternatives 4 and 5 would reduce toxicity, mobility or volume but at a lesser degree than Alternatives 2 and 3 since only approximately 22,000 cubic yards of coal tar material would be removed for treatment or disposal under Alternatives 4 and 5. However, implementation of Alternatives 4 and 5 eliminates potential exposure to remaining contamination at the site due to the cover system, and implementation of Alternatives 2 and 3 would not provide any additional level of public safety.

6. Feasibility. A feasible remedy is one that is suitable to site conditions, capable of being successfully carried out with available technology, and that considers, at a minimum, implementability and cost-effectiveness.

"Implementability" has two components: technical feasibility and administrative feasibility. Technical feasibility includes the difficulties associated with the construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, *etc.*

An alternative is cost-effective if its overall effectiveness is proportional to its overall cost. Overall effectiveness is a combination of long-term effectiveness and permanence, short-term effectiveness, and reduction of toxicity, mobility, and volume through treatment.

Excavation of contaminated soil in the saturated zone at the former Brooklyn Borough Gas Works site would be difficult due to groundwater handling and excessive cost. However, residual contaminants within the groundwater would be removed by NAPL and groundwater collection and treatment. As noted earlier, groundwater in the vicinity of the site is not a source of potable water supply due to its salinity.

Alternative 1 would be easily implemented since there are no active remedial activities involved. Alternatives 2,3,4 and 5 would be easily implemented but would require an increased level of remedial activities compared to Alternative 1. Permit approvals for Alternatives 3 and 5 would require a higher level of effort for the discharge of treated groundwater to the New York City POTW. Permit required under Alternatives 2 and 4 would be easy to meet as its required only to comply with substantive technical requirements of applicable state permits pursuant to the negotiated consent order between KeySpan and the Department of Environmental Conservation. However, at the

federal level, work along the Coney Island Creek and disturbance of tidal wetlands as part of the four alternatives would trigger the United States Army Corps of Engineers' (USACE) permit requirements.

The Operation and Maintenance (O & M) cost for Alternative 1 includes cost for groundwater sampling and analysis, site security, maintenance of booms, skimmer and collection system. The capital cost for Alternative 2 and 3 are the same since the same amount of soil would be removed under both Alternatives while O & M differs due to water discharge options. The increase in O & M cost for Alternative 3 over Alternative 2 is primarily due to POTW discharge fee per gallons of treated water. Capital cost for Alternatives 4 and 5 is less than that for Alternatives 2 and 3 because lesser amount of contaminated soils would be removed under Alternatives 4 and 5. Alternative 2 and 3 would cost greater than $10 million more than Alternatives 4 and 5 and would provide no additional safety or reduction in potential exposure to the public or the environment. The costs for each alternative are presented in Table 2.

7. Community Acceptance. The final criterion, community acceptance, is taken into account after evaluating those above, after public comments on the Proposed Remedial Action Plan have been received.

Concerns of the community regarding the RI/FS reports and the Proposed Remedial Action Plan are evaluated. A "Responsiveness Summary" will be prepared that describes public comments received and how 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.

SECTION 8: SUMMARY OF THE PROPOSED REMEDY

Based upon the results of the RI/FS, and the evaluation presented in Section 7, the NYSDEC is proposing Alternative 4.

The proposed remedy for Operable Unit 1 would eliminate or mitigate, through the proper application of scientific and engineering principles, all significant threats to public health and the environment presented by the hazardous waste disposed at the site. The remedy would essentially eliminate potential exposure to residual contaminants to future site workers and visitors.

This selection is based upon the evaluation of the five alternatives developed for this site, which demonstrates the advantages discussed below that Alternative 4 has over the other evaluated plans in meeting the remedial action objectives.

Alternative 1 would fail to meet remediation goals and therefore would be eliminated from further evaluation. Alternatives 2,3,4 and 5 would all meet remediation goals. Alternatives 2 and 3 would meet SCGs for soil above groundwater level by removing approximately 85,000 cubic yards of contaminated soils above SCGs values. SCGs for groundwater in all four alternatives are not achieved but would over time comply as the major sources of contaminants would be removed. Alternatives 4 and 5 would remove the most significant sources of unsaturated zone contaminant and most of the contaminant mass leaving behind

residual contaminants in the environment that would pose an exposure potential only to unprotected construction workers who ignore institutional controls and health and safety plan.

It is recognized that it's not technically feasible nor cost effective to remediate this site to a predisposal condition. However, the proposed remedy is designed to address the following: 1) eliminate or minimize exposure pathways; 2) address residual contaminants left at the site; and 3) to prevent releases of contamination to the Coney Island Creek. The installation of a multi-layer cover system across the site would minimize exposures to future on-site workers, site visitors, and the surrounding community while contaminants within groundwater would be treated over time as a result of collection and treatment of approximately 72,000 gallons daily of NAPL impacted groundwater. The installation of a subsurface barrier wall around the entire site would eliminate continuous discharge of contaminants to the Coney Island Creek. In addition, groundwater would be diverted around the site to the Coney Island Creek to facilitate the effectiveness of the collection and treatment system. Due to these engineering and additional institutional controls under Alternative 4, potential exposures to residual contaminants would be essentially eliminated. There would be no clear advantage presented by Alternatives 2, 3 over Alternatives 4 and 5 with respect to prevention of potential exposures. Alternatives 4 and 5 are preferred relative to Alternatives 2 and 3 due to less disturbance to the site, less contaminated soil management, fewer trucks and related traffic and therefore lesser noise and airborne particulate impact to the community. Additionally, Alternatives 4 and 5 would have shorter overall duration for completion of remedial actions, and therefore a shorter period of community disturbance as well as faster redevelopment opportunities with associated economic benefits. Also, Alternatives 4 and 5 would provide significant cost savings without sacrificing remedial effectiveness by excavating coal tar source areas instead of excavating a larger area of the site soils impacted by other contaminants including PAHs and VOCs. Based on the foregoing, Alternatives 2 and 3 would be removed from further consideration. Alternatives 4 and 5 are further evaluated on the basis of discharge option factors. Discharge to POTW would involve more extensive coordination with different government agencies than with discharge to the Coney Island Creek. Discharge to the Coney Island Creek, which is a component of Alternative 4, would result in a lesser amount of contaminant being put back into the environment as on-site treatment would reduce most contaminants in groundwater to non-detectable levels. Alternative 4 would also be cost effective compared to discharge to POTW without sacrificing quality of treatment. On the basis of the above evaluations, Alternative 4 is the recommended alternative.

The estimated present worth cost to implement the remedy proposed in alternative 4 is $26,440,000. The cost to construct the remedy is estimated to be $16,295,000 and the estimated average annual operation and maintenance cost for 30 years is $550,000.

The elements of the proposed remedy are as follows:

1. A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program. Any uncertainties identified during the RI/FS would be resolved.

2.

A. Excavation of coal tar source areas as delineated in Figure 5 down to groundwater table. Excavated material would be consolidated under temporary enclosures, as appropriate, and as described in more detail in section 3.8 and 4.2 of the Feasibility Study Report to control, among other things, the releases of volatile emissions and odors. If coal tar source is visually observed beyond the excavation boundaries, the source would be removed to the extent feasible without dewatering the site.

B. Off-site transport and recycling and/or disposal of source area materials.

C. Installation of a protective coffer dam along the Coney Island Creek perimeter to minimize potential releases from the site during creek bank excavation and restoration efforts.

D. Use of a temporary construction enclosure along the creek bank when trenching or excavation activities may release significant volatile emissions or odors into the atmosphere.

E. Installation of a subsurface steel sheet pile barrier wall (or other barrier wall of equal or better performance) around the site to approximate depth of 25 feet to minimize the migration of NAPL from the site into the Coney Island Creek while diverting upgradient groundwater around this site to the Coney Island Creek.

F. Removal of the existing wooden bulkhead and contaminated materials between the barrier wall and the coffer dam with subsequent construction of a stabilized creek bank.

G. Installation of a NAPL collection trench along the interior of the creek barrier wall section to capture migrating NAPL.

H. Treatment of approximately 72,000 gallons daily of aqueous waste in a system designed to reduce contaminant concentrations such that treated effluent may be discharged to the Coney Island Creek. Contaminants in the water would be reduced to non-detectable levels.

I. Installation of a multi-component cover system to act as a low permeability barrier to minimize both infiltration and the potential for direct contact of workers with residual contaminants. At least two feet of cover material is necessary for the protection of human health and the environment. The site will be graded to a common elevation prior to installation of the cover system.

J. Passive venting and control of vapors which may form under the cover system. Performance evaluation of the passive system would be used to assess the need, if any, for an active system.

K. Restoration of the Coney Island Creek bank to provide a 50-foot width ecological buffer zone. Monitoring wells would be installed immediately outside of the barrier within the buffer zone to assess the long-term performance of the barrier wall.

L. Use of institutional controls (such as notifications, deed restrictions, fencing, a health and safety plan, a contingency plan and long-term monitoring after implementation of remedial actions) to ensure continued adherence to the site's health and safety plan; continued treatment of collected groundwater, maintenance of the multi-component cover system; and prohibit the use of the site for other than commercial purposes without permission from NYSDEC.

M. Since the remedy resulted in untreated hazardous waste remaining at the site, a long-term monitoring program would be instituted. Monitoring wells would be installed across the site to monitor the effectiveness of the multi-layer cover system and overall remedial plan and would be a component of the operation and maintenance plan for the site. The effectiveness of the selected remedy would be evaluated at the end of a five-year monitoring period.

The conceptual design for redevelopment, although not part of the remedy, must be evaluated for potential impacts to the remedy. The redevelopment design includes preparation of the site and installation of subsurface structures that are not part of the remedy for protection of human health and environment. Figure 3 is illustrative of the accommodation of features with the area of the remedy which can provide for a continuous impermeable layer and be integrally connected to the remedy cover system. However accomplished, redevelopment cannot adversely affect, compromise the integrity of, or disturb the site remedy.

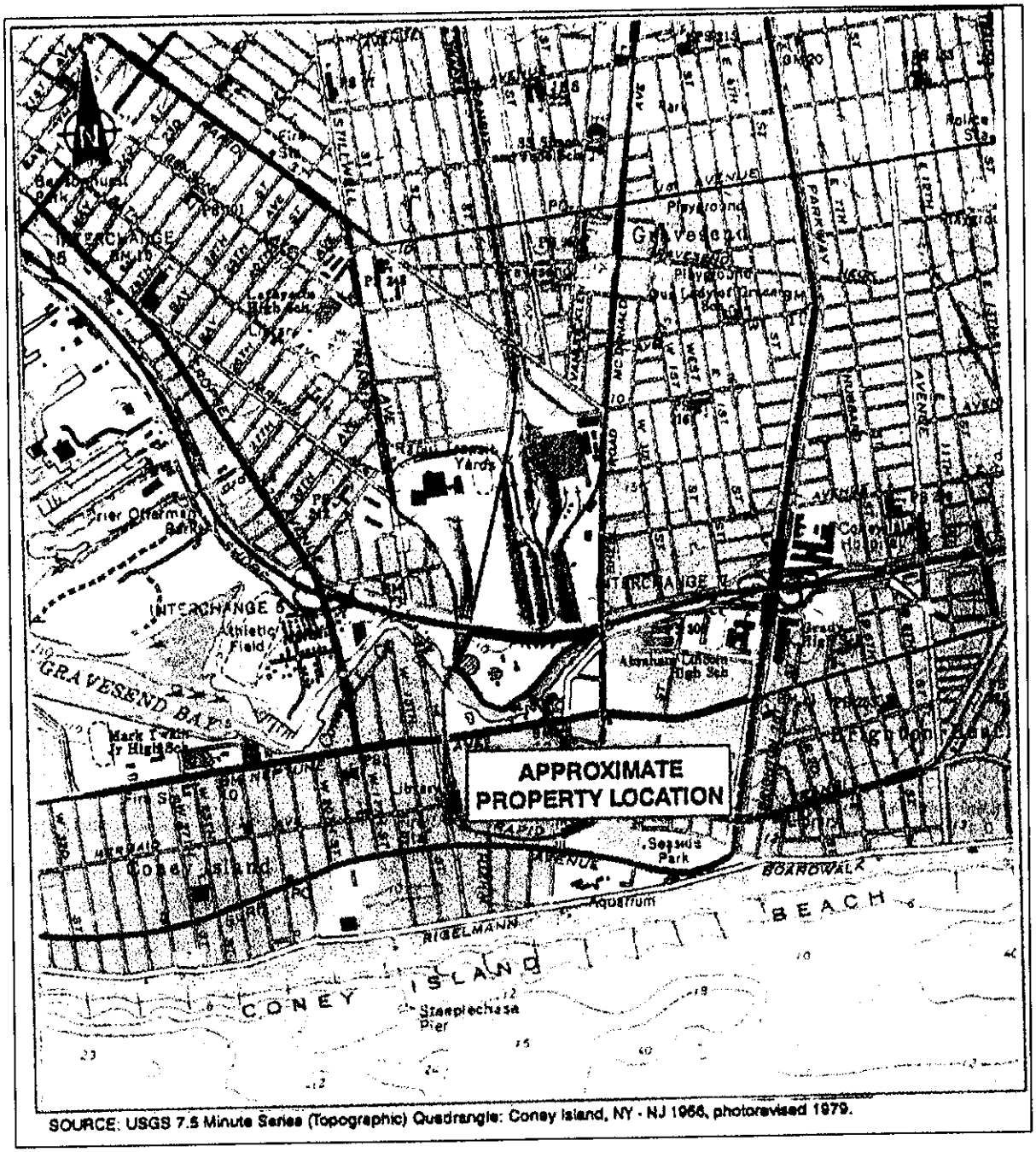
Table 1
Nature and Extent of Contamination

MEDIA	CLASS	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY of EXCEEDING SCG	SCGs (ppb)
Groundwater	Volatile Organic Compounds (VOCs)	Xylene, total	ND to 16,400	9 of 15	5
		Benzene	ND to 2,530	10 of 15	5
		Ethylbenzene	ND to 8,720	8 of 15	5
		Toluene	ND to 3,310	6 of 15	5
	PAHs	Naphthalene	ND to 21,900	8 of 15	10
		Chrysene	ND to 48J	1 of 15	0.002
MEDIA	**CLASS**	**CONTAMINANT OF CONCERN**	**CONCENTRATION RANGE (ppm)**	**FREQUENCY of EXCEEDING**	**SCGs (ppm)**
Soil	Volatile Organic Compounds (VOCs)	Acetone	ND to 71	185 of 277	0.2
		Benzene	ND to 101	95 of 277	0.06
		Toluene	ND to 450	98 of 277	1.5
		Ethylbenzene	ND to 640	149 of 277	5.5
		Xylene, total	ND to 1600	152 of 277	1.2
	cPAHs	Chrysene	ND to 1000	250 of 269	0.4
		Dibenzo(a,h)anthracene	ND to 33	40 of 270	0.014
		Indeno(1,2,3-cd)pyrene	ND to 190	218 of 270	3.2
		Benzo(b)fluoranthene	ND to 280	243 of 269	1.1
		Benzo(a)pyrene	ND to 450	249 of 270	0.061
		Benzo(a)anthracene	ND to 1100	241 of 269	0.224
		Benzo (k)fluoranthene	ND to 170	235 of 269	1.1
	Inorganics	Arsenic	ND to 135	257 of 270	7.5
		Manganese	ND to 2910	269 of 270	560[1]
		Nickel	ND to 170	244 of 251	13
		Lead	ND to 3000	267 of 270	19[1]
		Zinc	ND to 8500	171 of 270	20

Notes: (1) Background Concentration as published by Shacklette and Boerngen, USGS Paper 1270.
J = estimated value

Table 2
Remedial Alternative Costs

Remedial Alternative	Capital Cost	Annual O&M	Total Present Worth
No Action	$0	$253,000	$4,667,000
Alternative 2, Excavation of approximately 85,000 cubic yards of contaminated soils to groundwater table, NAPL treatment and discharge of treated groundwater to Coney Island Creek.	$27,508,000	$550,000	$37,653,000
Alternative 3, Excavation of approximately 85,000 cubic yards of contaminated soils to groundwater table, NAPL treatment and discharge of treated groundwater to POTW.	$27,508,000	$631,000	$39,147,000
Alternative 4, Excavation of approximately 22,000 cubic yards of coal tar source area soils, NAPL treatment and discharge of treated groundwater to Coney Island Creek.	$16,295,000	$550,000	$26,440,000
Alternative 5, Excavation of approximately 22,000 cubic yards of coal tar source area soils, NAPL treatment and discharge of treated groundwater to POTW.	$16,295,000	$631,000	$27,934,000



SOURCE: USGS 7.5 Minute Series (Topographic) Quadrangle: Coney Island, NY - NJ 1966, photorevised 1979.

SCALE 1:24,000

1 — 1/2 — 0 Mile

1000 — 0 — 1000 — 2000 — 3000 Feet

1 — 0.5 — 0 Kilometer

THIS DRAWING PRODUCED ON AUTOCAD
DO NOT REVISE IT MANUALLY

BROOKLYN UNION GAS

PROPOSED REMEDIAL ACTION PLAN (PRAP)

FORMER BROOKLYN BOROUGH GAS WORKS SITE

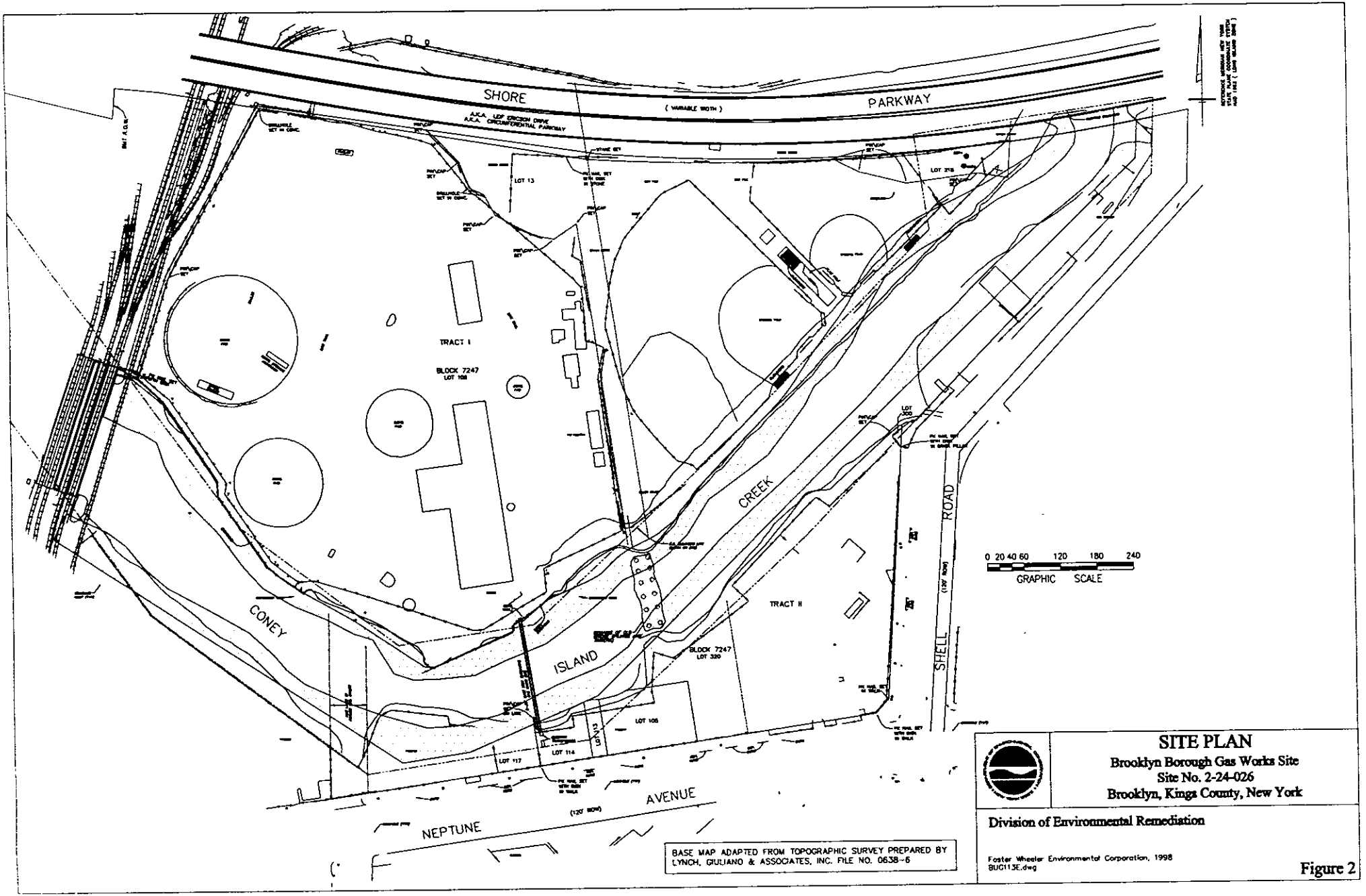
FIGURE 1

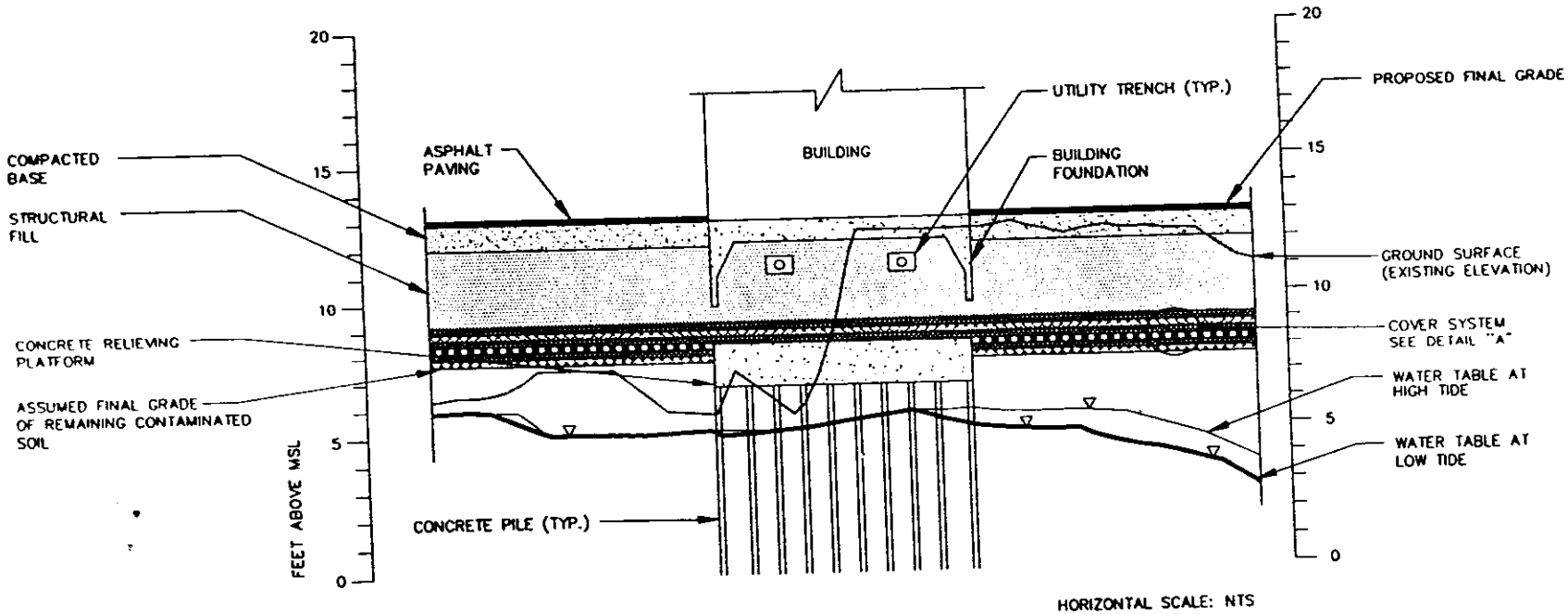
REGIONAL LOCATION MAP

FOSTER WHEELER ENVIRONMENTAL CORPORATION
LIVINGSTON, NEW JERSEY

CAD FILE NAME: BUG113A.DWG DATE: 1/13/2000
PLOT SCALE: 1=1 TIME: 2:00 PM

FWA3R12.DWG

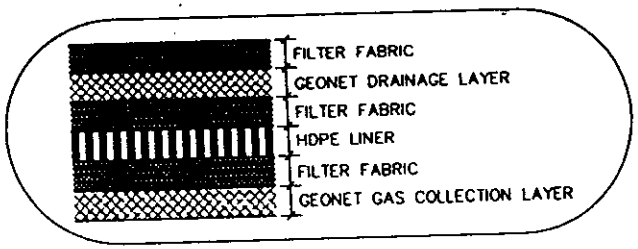

SHORE PARKWAY
(VARIABLE WIDTH)
A.K.A. LEIF ERICSON DRIVE
A.K.A. CIRCUMFERENTIAL PARKWAY
TRACT I
BLOCK 7247
LOT 108
TRACT II
BLOCK 7247
LOT 320
CONEY ISLAND CREEK
SHELL ROAD
(100' ROW)
NEPTUNE AVENUE
(120' ROW)
LOT 13
LOT 100
LOT 105
LOT 114
LOT 117
0 20 40 60 120 180 240
GRAPHIC SCALE
BASE MAP ADAPTED FROM TOPOGRAPHIC SURVEY PREPARED BY LYNCH, GIULIANO & ASSOCIATES, INC. FILE NO. 0638-6
SITE PLAN
Brooklyn Borough Gas Works Site
Site No. 2-24-026
Brooklyn, Kings County, New York
Division of Environmental Remediation
Foster Wheeler Environmental Corporation, 1998
BUG113E.dwg
Figure 2



LEGEND:

- CONCRETE
- COMPACTED BASE
- STRUCTURAL FILL
- EXISTING GRADE
- WATER TABLE ELEVATION
- ASPHALT PAVING
- GEOTEXTILE
- GEONET
- GEOMEMBRANE

DETAIL "A"



SUBSURFACE STRUCTURE NOT REQUIRED AS PART OF THE REMEDY FOR PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

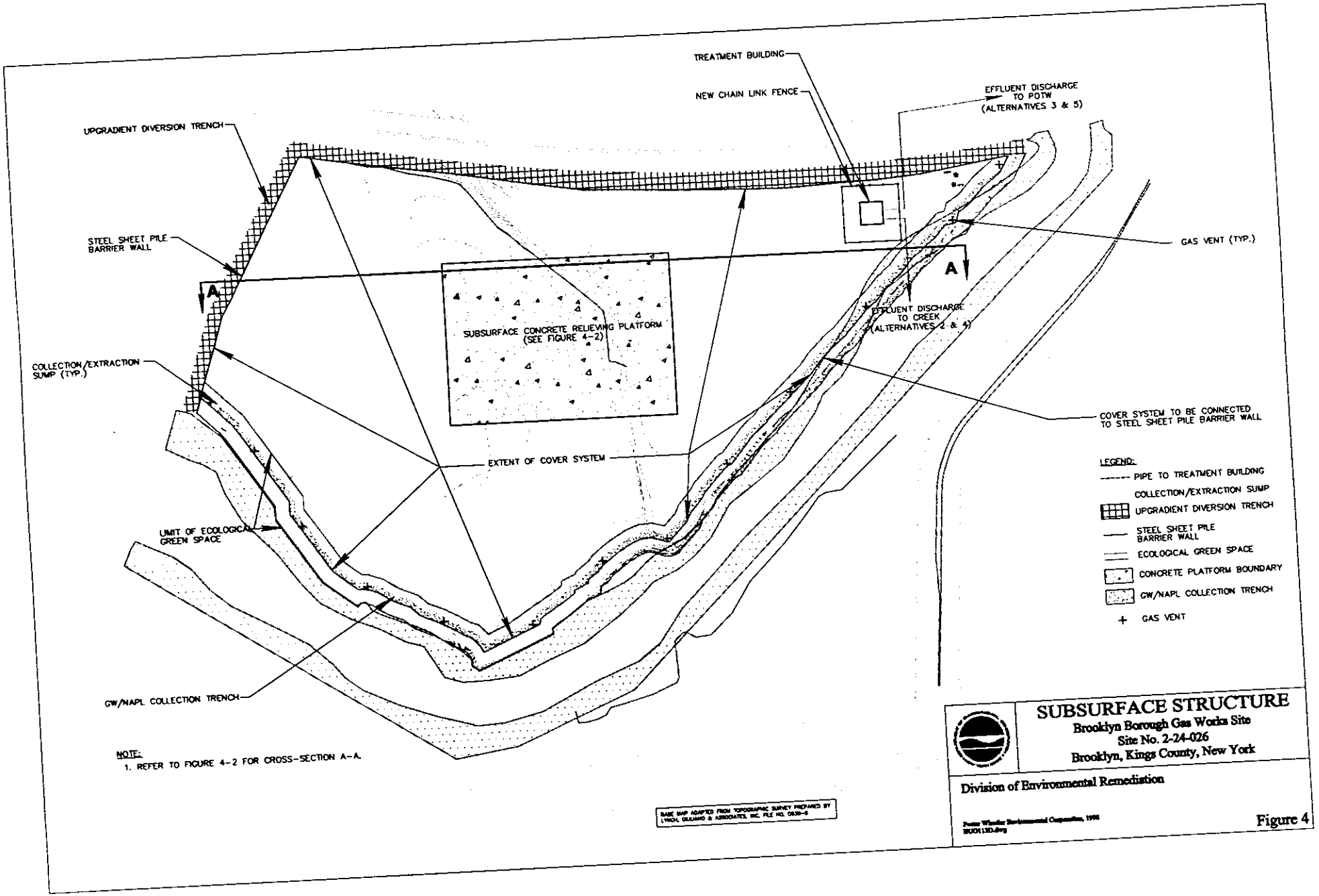
COVER SYSTEM

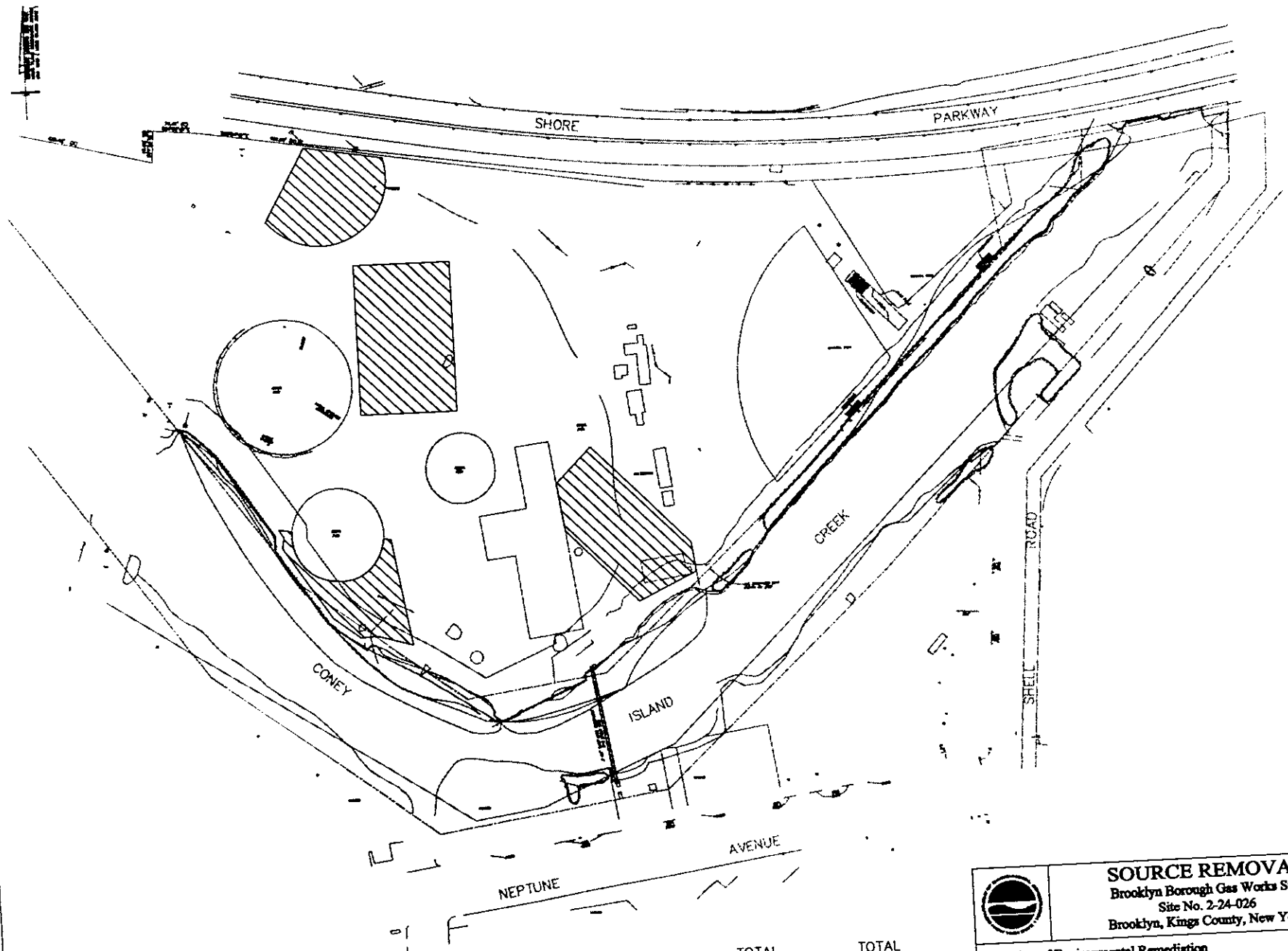
Brooklyn Borough Gas Works Site
Site ID No. 2-24-026
Brooklyn, Kings County, New York

Division of Environmental Remediation

Map Source: Foster Wheeler Environmental Corporation, 1998
BUG113C.dwg

Figure 3


TREATMENT BUILDING
NEW CHAIN LINK FENCE
EFFLUENT DISCHARGE TO POTW (ALTERNATIVES 3 & 5)
UPGRADIENT DIVERSION TRENCH
STEEL SHEET PILE BARRIER WALL
GAS VENT (TYP.)
A
A
SUBSURFACE CONCRETE RELIEVING PLATFORM (SEE FIGURE 4-2)
EFFLUENT DISCHARGE TO CREEK (ALTERNATIVES 2 & 4)
COLLECTION/EXTRACTION SUMP (TYP.)
COVER SYSTEM TO BE CONNECTED TO STEEL SHEET PILE BARRIER WALL
EXTENT OF COVER SYSTEM
LIMIT OF ECOLOGICAL GREEN SPACE
GW/NAPL COLLECTION TRENCH
LEGEND:
PIPE TO TREATMENT BUILDING
COLLECTION/EXTRACTION SUMP
UPGRADIENT DIVERSION TRENCH
STEEL SHEET PILE BARRIER WALL
ECOLOGICAL GREEN SPACE
CONCRETE PLATFORM BOUNDARY
GW/NAPL COLLECTION TRENCH
GAS VENT
NOTE:
1. REFER TO FIGURE 4-2 FOR CROSS-SECTION A-A.
BASE MAP ADAPTED FROM TOPOGRAPHIC SURVEY PREPARED BY LYNCH, GIULIANO & ASSOCIATES, INC. FILE NO. 0838-8
SUBSURFACE STRUCTURE
Brooklyn Borough Gas Works Site
Site No. 2-24-026
Brooklyn, Kings County, New York
Division of Environmental Remediation
Figure 4



SOURCE REMOVAL

Brooklyn Borough Gas Works Site
Site No. 2-24-026
Brooklyn, Kings County, New York

Division of Environmental Remediation

Foster Wheeler Environmental Corporation, 1998
BUG113B.dwg

Figure 5