Prepared for:
Consolidated Edison Company of New York, Inc.
Astoria, NY





RCRA Facility Investigation Report
Con Edison, Astoria, NY

NYSDEC Permit No. 2-6301-00006/00002-0

ENSR Corporation
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Executive Summary

This report is a key milestone under the Resource Conservation and Recovery Act (RCRA) Corrective Action Program being conducted by the Consolidated Edison Company of New York, Inc. (Con Edison). Specifically, this report documents the completion of the RCRA Facility Investigation (RFI) portion of the program for the Astoria facility, located in Astoria (Queens), New York.

The RFI program was initiated in 1993 and continued through mid 2007. The overall intent of the RFI program is to characterize environmental impacts that resulted from operational activities and spills during the facility's 100-plus-year history of operation. Sequential phases of the RFI have been conducted to continually refine the nature and extent of environmental impacts.

Overview of RFI Program

In total, 41 study areas (40 individual areas and property-wide groundwater) have been designated as part of the current RFI program for the Con Edison Astoria facility (refer to Table ES-1). As defined under RCRA, the objective of an RFI is to characterize the nature, extent, direction, rate, movement, and concentration of release(s) of hazardous waste and/or hazardous constituents at various Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) at an operating facility. The RFI phase of activity is an essential part of an overall RCRA Corrective Action Program. At the Con Edison Astoria facility, the New York State Department of Environmental Conservation (NYSDEC) oversees this program. Administrative documents related to this work include a 1994 Consent Order (NYSDEC Index No. R2-1023-88-06) and the most recent RCRA Corrective Action Permit (NYSDEC Permit No. 2-6301-00006/00002-0).

The following major programs have been conducted between 1993 and 2007 to assess the 41 study areas. These studies have encompassed SWMUs, AOCs and spills within the Astoria facility.

- RCRA Facility Assessment (RFA) – Conducted between 1992 and 1994, culminating in the RFA Report (ENSR, May 1994), which is also referred to as the RFA and Sampling Visit (RFA/SV) Report.
- Phase I RFI Spills Evaluation and Investigations – Completed in 1996 as the first comprehensive phase of investigation at the Astoria facility. Results were documented in the Draft Phase I RFI Report (April 1996), which was also referred to as the *Draft Data Summary and SWMU/AOC/Spills Evaluation Report* or *Draft Data Summary Report* (DDS).
- Phase IIA RFI, North Storage Yard Investigation – Began in 1995 during the Phase I RFI to support planned capital improvements to the North Storage Yard area.
- Phase IIB RFI, Gas Turbine Facility and Former Pond Area Investigation – Conducted during 1998 and 1999 to assess light non-aqueous phase liquid (LNAPL) present in the Former Pond Area, the Gas Turbine Facility, and historic spills that occurred at the Gas Turbine Facility.
- Phase IIC RFI, Limited Investigation of Selected Parcels to Support Divestiture – Completed in 1998 and involved the investigation of new areas at the facility and certain areas proposed for divestiture by Con Edison, specifically the Gas Turbine facility, the Fuel Oil Tank Farm and the Power Generating Station.
- Eastern Parcel Area Investigation – Investigation of a 21-acre parcel known as the East Parcel to support the anticipated sale of this parcel by Con Edison. A portion of the area relates to Outfall G. The Phase I Report was submitted in March 2005, and the Phase II Report providing additional Outfall G characterization data was submitted in February 2007.
- Former Manufactured Gas Plant (MGP) AOC Investigation – Study of the former manufactured gas plant (MGP) area as a separate AOC and prioritized in the overall RCRA Corrective Action Program. The investigation of the area was completed with a draft MGP AOC Report submitted in August 2005 to the NYSDEC.

- Interim Corrective Measure (ICM), LNAPL Recovery Program – Based on the discovery of LNAPL during the Phase IIB and IIC RFI, a monitoring and recovery program was initiated in 2001 at the Purge Oil Pump House Area, Former Pond Area, and a small area immediately east of the Gas Turbine facility. The program expanded in 2004 to include the LNG facility and is currently ongoing.
- Phase IID RFI, Comprehensive Site Investigation – This phase of study was conducted to complete the RFI Program. It encompassed the entire Con Edison Astoria property, with respect to the defined AOCs, SWMUs and associated spill areas. The Phase IID field program spanned from 2005 through 2007. Minor related activities are still ongoing.

Comparison of Characterization Data to Regulatory Standards

The NYSDEC developed Remedial Program Soil Cleanup Objectives (SCOs) under the New York Code of Rules and Regulations (NYCRR). The specific citation is 6 NYCRR Subpart 375-6, effective December 14, 2006. These cleanup levels are interpreted as superseding other cleanup levels that have been developed by NYSDEC, such as the Soil Cleanup Objectives and Cleanup Levels developed under the Technical and Administrative Guidance Memorandum (TAGM) program, specifically TAGM No. 4046. The Con Edison site is an active permitted facility operating under a RCRA Part B Permit. Under that context, it is essential that NYSDEC participate in the selection of cleanup standards for the property as well as determining whether these SCOs should be applied.

The SCOs are based on the most recent chemical-specific toxicity values and exposure assumptions for a variety of scenarios. SCOs have been developed for a number of land uses, including unrestricted residential, restricted residential, commercial, and industrial, as well as for the protection of ecological resources and protection of groundwater. Under the Brownfield Cleanup Program (introduced in 6 NYCRR Subpart 375-3, with cleanup levels listed under 6 NYCRR Subpart 375-6), there are four cleanup tracks that can be used to determine the remedy at brownfields site. The tracks are briefly summarized as follows:

- *Track 1:* Unrestricted use. A cleanup under this track results in a site being cleaned up to a level that does not rely upon institutional or engineering controls; therefore, the unrestricted residential SCOs apply. These SCOs apply to soil that is at 0-15 feet in depth;
- *Track 2:* Restricted use. A cleanup under this track complies with the SCO values for restricted residential, commercial, and industrial uses, as well as for the protection of ecological resources and the protection of groundwater. Restrictions on site use and groundwater use are allowed, but institutional or engineering controls to achieve the soil SCOs are not allowed. These SCOs apply to soil that is at 0 to 15 feet in depth;
- *Track 3:* Restricted use with modified SCO values. Cleanups are the same as those under Track 2, except that the values in the SCO tables may be modified, based on site-specific data. These SCOs apply to soil that is at 0 to 15 feet in depth; and
- *Track 4:* Site-specific SCOs. SCOs may be calculated using site-specific risk calculations. The top 2 feet of soil for residential uses and top one foot of soil for non-residential uses must comply with the Track 2 tables if that soil is exposed (not covered by buildings or paving).

Because the Con Edison site is not under the Brownfield Cleanup Program, it is not necessary to designate a specific track for this site. If the cleanup was being conducted under the brownfields program, Track 2 would be the most likely approach, using the restricted-use industrial SCOs (referred to as “RSCOs”). Industrial use is generally defined as land that is intended for the primary purpose of manufacturing, production, fabrication or assembly process and ancillary services. The entire Con Edison site falls under this category, and the future land use is intended to remain the same. There is no significant ecological habitat; therefore, the ecological SCOs would not be considered as being applicable. Because the chemicals detected at this site (mainly PAHs, PCBs and lead) are primarily adsorptive and generally above the water table, the SCOs based on groundwater protection would also not apply. The applicability of groundwater protection standards are

further reduced by the fact that Con Edison does not currently use groundwater for consumption, has no plans to do so in the future, and would be amenable to a groundwater-use restriction if necessary. For these reasons, the groundwater protection standards are not applicable to the property.

Soil data collected over the course of the 14-year RFI program was compared to the RSCOs described above. The RSCO standards are used in this RFI report as a preliminary screening mechanism to better define the parameters that warrant further attention. Under that context, all soil data was compared to these standards for evaluation, despite the regulation suggesting that they apply to only the upper 15 feet of soil.

Results of RFI Program

As the RFI data was compiled and evaluated, and comparisons to RSCO standards were performed, it became apparent that one particular parameter, benzo(a)pyrene, did not appear to be associated with any of the particular study areas. It is present in soil throughout the facility and is most likely attributable to the facility-wide fill.

As the Con Edison Astoria facility was being constructed in 1903, a reported 485,000 cubic yards of soil were removed from high portions of the property and used to fill the low-lying portions in an effort to create contiguous operational areas. As operations continued over the next 100+ years, re-grading of the facility continued periodically to install footings and subsurface conduits, upgrade structures, respond to incidental spills, improve drainage and stormwater management, and enhance overall facility operations and the landscape. These activities have resulted in fill material being relatively well distributed throughout the majority of the facility. If the fill had been impacted by local operations, it could have been distributed to other areas of the facility during these re-grading events.

Some of the Astoria facility operations have resulted in cPAH generation and impacts to the nearby ground surfaces. Data collected from throughout the facility reveals that the re-grading and movement of soil and fill material have likely spread the distribution of those cPAHs. Many of the study areas that were evaluated for specific spills have exhibited little evidence of contamination from the specific spills, but do exhibit the consistent presence of low-level cPAHs. Benzo(a)pyrene, in particular, is the most common of the cPAHs detected. Its relatively low RSCO soil standard (1.1 mg/kg) is exceeded essentially throughout the facility. The other cPAHs, as well as PCBs, lead, arsenic, and some other chemicals exceed the RSCO standards in many locations, but the exceedances are not as widespread as benzo(a)pyrene. For these reasons, benzo(a)pyrene was not used to guide the designation of impacted areas.

Depths of impacted areas (i.e., soil that exceeds RSCO standards) were evaluated at a site-specific and facility-wide scale. In general, the distribution of site impacts lessens with depth. The 0-2 foot horizon reveals the majority of site impacts, while the 16-18 foot depths and greater reveal much fewer areas of impact. As also evidenced by this depth-specific view of impacted areas, the characterization of the subsurface with respect to depth delineation appears to be comprehensive. For the most part, the vertical extent of soil impacts has been defined by encountering non-impacted soil, saturation (i.e., groundwater), or bedrock. This observation is consistent with the conceptual site model (CSM) for the recorded surface spills.

Surface and near-surface soil impacts (0-2 feet) are primarily confined to the mid-section of the facility, where active operations are ongoing in and around the Pipe Yard, Cable Storage Yard and North Storage Yard areas. Few impacts were detected at the 0-2 foot horizon in the western portion of the facility where the former MGP area, CWTF and other miscellaneous areas are located. Similarly, few impacts were detected at 0-2 feet in the northeastern and eastern portions of the facility where the LNG area, Eastern Parcel, Auction Yard and other associated areas are located. There is a sharp reduction in areas that are impacted below 2 feet. For example, at the 2-4 foot depth, the majority of the North Storage Yard and several portions of the Pipe Yard and Cable Storage Yard are not impacted. The depth of impacts in those areas is primarily in the upper 0-2 feet.

As the depth of exploration increases to the 6-8 and 8-10 foot horizons, evidence of deeper impacts are evident in areas such as the former MGP area and Auction Yard (refer to Figures 5-5 and 5-6). Shallower impacts in those areas were not observed. The deepest level of comprehensive sampling was at the 16-18 foot horizon. Impacts were observed in the vicinity of the Pipe Yard. Beyond the 18-foot depth of investigation, impacts are mainly associated with the former MGP area characterization. The level of characterization at depths greater than 18 feet was targeted in suspected areas of contamination (such as the MGP area), rather than comprehensive across the entire facility.

Recommendations

In general, further action for the impacted areas depicted could consist of one or more of the following steps, as part of the RCRA Corrective Action process:

- Interim Corrective Measure (ICM) implementation to address an immediate threat (none identified);
- Exposure assessment (if desired) to evaluate whether site-specific risks are posed by the chemicals that exceed the RSCO standards;
- Corrective Measures Study (CMS) to evaluate response actions to remediate the areas that exceed RSCO standards or present potential risks; and
- No further action based on the results of the RFI program.

Table ES-1 presents recommendations for each of the RFI study areas. Based on the observations at each of the areas, it does not appear that an ICM is warranted (other than the continued gauging of LNAPL at the three areas where it's been identified). To conduct a thorough, stepwise evaluation of precisely which actions are optimal for each study area, it is recommended that a CMS be conducted. The CMS would be the next step in the RCRA Corrective Action process and would include the following 22 study areas.

- East Yard SWMU;
- Purge Oil Pump House Spill Area;
- Blue Dog Lake;
- Former Pond Area;
- Former Fire Fighting School;
- Pipe Yard SWMU Areas 1, 2, 3 and 4;
- Astoria Central Wastewater Treatment Facility SWMU (evaluation ongoing);
- Astoria East Substation Spill Area;
- Spill Nos. 89 C and E;
- Cable Storage Yard AOC;
- Triangle Area AOC;
- AOC West of Main Gate;
- Former Corporate Transportation USTs SWMU;
- Spill No. 91;
- A-11 Dock Fire Pump House AOC;
- Spill No. 70;
- Transportation Department Former Waste Oil USTs A & B SWMU;

- North Storage Yard SWMU;
- Auction Yard Areas 1, 2 and 3;
- Outfall G;
- Former MGP AOC Areas 1, 2, 3, 4 and 5; and
- Facility-wide Groundwater.

As part of the RFI evaluation, opportunities for early corrective actions or additional ICM activities were considered, based on the data as it became available. No clear "hot spots" were identified, but it did become apparent that some portions of the ground surface contain soil impacts that exceed RSCO standards. Unpaved locations in the Pipe Yard, Auction Yard, North Storage Yard and other subsets of study areas reveal surface or near-surface impacts that could pose potential risk to workers in those areas. Based on this observation, it may be beneficial to prioritize identifying an appropriate corrective action for those locations to reduce the potential impacts to industrial workers at the facility. Currently, corrective action activities are underway to address PCB impacts in shallow soil at the North Storage Yard. Activities at the North Storage Yard follow the guidelines of the Toxic Substances Control Act (TSCA).

In summary, the Con Edison facility is considered sufficiently characterized to understand the nature and extent associated of site impacts. Other than the continued ICM program for LNAPL, no further RFI characterization is planned. Any further site delineation (if necessary) would be most efficient if conducted as part of a corrective measure (e.g., pre-design sampling or post-excavation sampling). As this RFI report becomes finalized, the next step in the RCRA corrective action process will be to conduct a CMS evaluation to select specific actions for the impacted areas of the Astoria facility. Close interaction with the NYSDEC will be necessary throughout this process.

Table ES-1
Study Area Recommendations
Astoria RFI
Con Edison, Astoria, NY

Study Area	Recommendation	Chemicals Above RSCOs	General Observations and Rationale for Recommendation
East Yard SWMU	Further action to be considered	cPAHs, PCBs	The central portion of this area reveals soil impacts; PCB impacts distinguish this area from the nearby Astoria East Substation Spill Area
Purge Oil Pump House Spill Area	Further action to be considered	cPAHs	The pump house exhibits a localized area with PCB impacts; no soil impacts are present in surrounding areas; LNAPL is present in the subsurface southwest of the impacted soil area; further action is recommended for the soil and nearby LNAPL
Blue Dog Lake	Further action to be considered	SVOCs, PCBs, lead, arsenic	Primarily cPAH impacts are present in the former pond footprint; further action is recommended
Former Pond Area	Further action to be considered	PAHs, PCBs	Impacted soil was detected, with primarily cPAH and non-cPAH impacts in much of former pond footprint; LNAPL is also present northeast of the pond; further action is recommended to address the soil and LNAPL
Former 25,000 Gallon PCB Waste Oil Tanks	**No further action**	PAHs	There is no evidence of cPAH impacts being exclusively related to the former waste oil tanks; the impacts are likely attributable to Pipe Yard operations; further action is recommended as part of the Pipe Yard SWMU
Former Gas Condensate Tank	**No further action**	cPAHs	There is no evidence of cPAH impacts being exclusively related to the former gas condensate tank; impacts appear to be attributable to Pipe Yard operations; further action is recommended as part of the Pipe Yard SWMU
Former Fire Fighting School	Further action to be considered	cPAHs, PCBs	It is unclear whether impacts are directly related to former fire fighting activities; the potentially large volume of fuels discharged in the area could have resulted in the residual cPAHs and PCBs that were detected
Pipe Yard SWMU	Further action to be considered	PAHs, PCBs	Four distinct areas of soil impacts have been identified within the Pipe Yard (Areas 1, 2, 3 and 4), in addition to Blue Dog Lake and the Former Fire Fighting School; these six areas are recommended for further action individually
Pipe Yard SWMU Waste Management Practices	**No further action**	PAHs, PCBs	This area encompasses the six individual areas that should be considered for further action within the Pipe Yard (refer to Pipe Yard SWMU); no other portions of this area warrant further action
Areas Unrelated to Other Waste Management Practices	**No further action**	cPAHs	cPAH impacts in this area are not distinguishable from cPAHs further north at the AOC West of Main Gate; the area of cPAH impacts is recommended for inclusion within the AOC West of Main Gate
Astoria Central Wastewater Treatment Facility SWMU	Further action to be considered	TBD	RFI evaluation of this study area is ongoing; characterization of shallow bedrock groundwater is being considered based on the observations of seeps through the settling basin walls
Tunnel Head House AOC	**No further action**	---	No soil impacts were detected at the Tunnel Head House
Astoria East Substation Spill Area	Further action to be considered	PAHs	The majority of PAHs in excess of soil standards were cPAHs; the impacted area is relatively well defined and extends slightly into the East Yard SWMU (which is characterized by the presence of PCB impacts)
North Queens Substation Spill Area	**No further action**	---	No soil impacts were detected at the North Queens Substation
Astoria West Substation AOC	**No further action**	cPAHs	This area overlaps the MGP AOC; a specific area of cPAH impacted soil is present in the northwestern corner of the area, which is recommended for further action as part of the MGP AOC
Spill No. 69	**No further action**	cPAHs	Samples collected from this area do not show evidence of the former release; nearby locations with cPAH and PCB impacts are included within the Former Pond Area, which is recommended for further action
Spill Nos. 89 C/D/E	Further action to be considered	cPAHs	The Spill No. 89C area reveals the presence of LNAPL with no soil impacts; further action is recommended for that area to assess the impacts of LNAPL; the Spill No. 89E area reveals cPAH impacts that may extend north of the Former Pond Area; this area is also recommended for further action; no further action is warranted for Spill No. 89D
Spill No. 92	**No further action**	cPAHs	The cPAHs in this area are not reflective of the former kerosene spill; the impacts are consistent with soil conditions at the nearby Former Gas Condensate Tank; both of these areas are recommended for further action as part of the underlying Pipe Yard SWMU
Spill No. 60	**No further action**	cPAHs	cPAHs in this area are similar to the nearby detections in the northern portion of the Triangle Area; it is unclear whether they're residuals from the No. 6 fuel release; the cPAH impacts are recommended for further action as part of the Triangle Area
Coal Tar Seeps	**No further action**	---	The observations of coal tar seeps within the Pipe Yard are consistent with geologic log observations of coal slag and ash in that general portion of the Astoria facility; six areas of cPAH impacts within the Pipe Yard are recommended for further action (refer to Pipe Yard SWMU)
Cable Storage Yard AOC	Further action to be considered	PCBs	The PCB impacts are consistent with operations in that area, where incidental releases of PCB-containing oil from electronic cables could have occurred; the area impacted by PCBs is recommended for further action
Triangle Area AOC	Further action to be considered	SVOCs	The SVOCs in the central portion of the Triangle Area include cPAHs and non-cPAHs; this area is recommended for further action, incorporating nearby cPAH impacts in the vicinity of Spill No. 60
AOC West of Main Gate	Further action to be considered	cPAHs	cPAH impacts were detected in one location within this study area; similar impacts were detected south of the area at the nearby Areas Unrelated to Other Waste Management Practices; these exceedances are recommended for further action under the context of this AOC
AOC South of Transformer Shop	**No further action**	---	No soil impacts were detected at the south of the Transformer Shop
Spill No. 59	**No further action**	---	No soil impacts were detected in the Spill No. 59 area
Western Pipe Yard Area	**No further action**	cPAHs, PCBs	This area encompasses or overlaps four other study areas; the Pipe Yard SWMU Areas 1, 2 and 3, as well as the Former Fire Fighting School are recommended for further action; no other areas within the Western Pipe Yard appear to warrant additional action beyond those four areas
Former Corporate Transportation USTs SWMU	Further action to be considered	cPAHs	One location revealed soil impacts from cPAHs; no other sources of cPAHs appear to be nearby this particular area; characteristics of unsaturated soil from the depth of 6-15 feet are unclear (soil characterization extended to 6 feet); further action is recommended for this area
Building 139 Septic System SWMU	**No further action**	---	No soil impacts were detected in the vicinity of Building 139
Spill No. 91	Further action to be considered	cPAHs	Given the volume of the prior release (2,250 gallons of dielectric fluid) and the detection of cPAH impacts in the reported spill location, further action is recommended for this area
A-10 Dock Area	**No further action**	---	Further action for this study area is not anticipated; prior reports and data provided by Aracadis were reviewed and verified for completeness
A-11 Dock Fire Pump House AOC	Further action to be considered	PAHs	cPAH and non-cPAH impacts were detected along the length of this dock area; given that three reported releases of unknown fluids were recorded in this area, further action is recommended
Spill No. 70	Further action to be considered	cPAHs	The fluid released in this spill area is unknown; the cPAH detections spanned the length of the reported spill location; the pattern of cPAH impacts is not consistent with nearby MGP impacts; further action is recommended
Spill No. 73	**No further action**	cPAHs	The cPAHs detected may not necessarily be exclusively attributable to the former spill of dielectric fluid; the recorded spill was relatively large (25,000 gallons of dielectric fluid); the cPAH impacts overlap impacted soil in the Pipe Yard and will be incorporated into the Pipe Yard SWMU Area 1 for further action
Transportation Department Former Waste Oil USTs A & B SWMU	Further action to be considered	cPAHs, PCBs	cPAH and PCB impacts appear to be localized within the former location of USTs; further action is recommended
Spare Transformer Storage Yard AOC	**No further action**	cPAHs	Relatively low concentrations of benzo(a)pyrene were detected in this area; no other evidence of a potential release was identified; the presence of benzo(a)pyrene is consistent with the characteristics of fill material in many other areas within the facility; no further action is recommended specific to the Spare Transformer Storage Yard
North Storage Yard SWMU	Further action to be considered	cPAHs, PCBs, lead	PCB-equipment and operations within the area are evidenced by the presence of PCBs and other parameters indicative of routine operations and incidental releases; further action is recommended
Eastern Parcel Area	**No further action**	PAHs, arsenic	Four areas within the Eastern Parcel reveal impacts, three within the Auction Yard (refer to the Auction Yard) and one location associated with Outfall G; further action is recommended for these four specific areas; no further action appears necessary for the remainder of the Eastern Parcel
Auction Yard	Further action to be considered	PAHs	Three areas with the Auction Yard warrant further action (Auction Yard Areas 1, 2 and 3); all three areas have similarities in the pattern of cPAHs but are not contiguous across the area; further action is recommended
Outfall G	Further action to be considered	cPAHs, arsenic	Further action in the vicinity of the suspected breach in the stormwater pipeline is recommended; the presence of predominantly cPAHs at that location is indicative of impacts from the breach
Former MGP AOC	Further action to be considered	cPAHs	The MGP AOC is relatively large and underlies many other individual study areas; no contiguous widespread impacts are present in the MGP area; some impacted portions of the MGP area are recommended for further action as part of other study areas; the remaining impacted portions are grouped based on proximity; five groups of MGP-impacted areas are recommended for further action (MGP AOC Areas 1, 2, 3, 4 and 5)
Facility-wide Groundwater	Further action to be considered	TBD	RFI evaluation groundwater is ongoing

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List of Acronyms and Abbreviations

ACWTF	Astoria Central Wastewater Treatment Facility (refer to CWTF)
AMSL	above mean sea level
AOC	area of concern
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene and xylenes
CFS	Central Field Services
COC	chemicals of concern
COI	constituents (or chemicals) of interest
Con Edison	Consolidated Edison Company of New York, Inc.
cPAH	carcinogenic polynuclear aromatic hydrocarbon
CSM	conceptual site model
CY	cubic yard
CWTF	Astoria Central Wastewater Treatment Facility
DDS	draft data summary
ECI	Environmental Concepts, Inc.
EH&S	environmental health and safety
USEPA	United States Environmental Protection Agency
ICM	interim corrective measure
LNAPL	light non-aqueous phase liquid
LNG	liquefied natural gas
mg/L	milligrams per liter
mg/kg	milligrams per kilogram
MGP	manufactured gas plant
NYCRR	New York Codes Rules and Regulations
NYPA	New York Power Authority
NYSDEC	New York State Department of Environmental Conservation
PAH	polynuclear (or polycyclic) aromatic hydrocarbon
PCB	polychlorinated biphenyl
PID	photoionization detector
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFA/SV	RFA and Sampling Visit
RFI	RCRA Facility Investigation

RSCO	Restricted-use soil cleanup objective
SSL	soil screening level
SVOC	semi-volatile organic compound
SWMU	solid waste management unit
TAL	target analyte list
TCL	target compound list
TCLP	Toxicity Characteristic Leaching Procedure
TMW	temporary monitoring well
TPH	total petroleum hydrocarbons
TPH-DRO	total petroleum hydrocarbons – diesel range organics
TSS	total suspended solids
ug/L	micrograms per liter
USGS	United States Geological Survey
VEFR	vacuum-enhanced fluid recovery
VOC	volatile organic compound

1.0 Introduction

This report is a key milestone under the Resource Conservation and Recovery Act (RCRA) Corrective Action Program being conducted by the Consolidated Edison Company of New York, Inc. (Con Edison). Specifically, this report documents the completion of the RCRA Facility Investigation (RFI) portion of the program for the Astoria facility, located in Astoria (Queens), New York.

The RFI program was initiated in 1993 and continued through mid 2007. A photogrammetric image of the facility is shown in Figure 1-1. The overall intent of the RFI program is to characterize environmental impacts that resulted from operational activities and spills during the facility's 100-plus-year history of operation. Sequential phases of the RFI have been conducted to continually refine the nature and extent of environmental impacts.

This report presents a comprehensive evaluation of data collected throughout the 14 years of investigation, encompassing the Phase I and II portions of the RFI program. Analytical results and data interpretations from the Phase I and from early portions of the Phase II RFI programs have been presented in prior documents. To streamline the reporting process and comply with the requirements of Module III, Section B(5), *Prior Submittals* of the Permit, this document has been written such that previously-written work plans, reports, and letters written to the New York State Department of Environmental Conservation (NYSDEC) are incorporated by reference. The remainder of this report cites previously submitted documents. A list of these documents is presented in Section 6.0, References.

1.1 RCRA Permit Detail

In May of 1994, the NYSDEC issued a Permit to Operate a Hazardous Waste Management facility (NYD 980593636) under Article 27, Title 9; 6 NYCRR 373, Hazardous Waste Management, to the Con Edison Astoria, New York facility for its polychlorinated biphenyl (PCB) Waste Storage Facility. This facility is located within a portion of the North Storage Yard, which is further discussed in Section 2.0. Module III of the Permit requires Con Edison to plan and implement an environmental investigation for the Astoria facility under the RCRA Corrective Action Program. Con Edison recently renewed the Permit in March 2007.

1.2 Overview of RFI Program Chronology

In total, 41 study areas (40 individual areas and property-wide groundwater) have been designated as part of the current RFI program for the Con Edison Astoria facility. Refer to Table 2-1 for a list of these study areas. As defined under RCRA, the objective of an RFI is to characterize the nature, extent, direction, rate, movement, and concentration of release(s) of hazardous waste and/or hazardous constituents at various Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) at an operating facility. The RFI phase of activity is an essential part of an overall RCRA Corrective Action Program. At the Con Edison Astoria facility, the NYSDEC oversees this program.

In 1994, the NYSDEC issued a Consent Order (NYSDEC Index No. R2-1023-88-06) to Con Edison. The Order required Con Edison to conduct investigations and corrective actions for various spills that occurred on the property prior to 1994. Investigating the impacts from these spills was beyond the requirements of the RCRA Corrective Action Program for the defined SWMUs and AOCs. However, Con Edison and NYSDEC decided to integrate the spill response activities with the ongoing RCRA Corrective Action Program so that all environmental issues were managed under one program. Accordingly, the RFI completed for the Astoria facility encompasses SWMUs, AOCs and spills. Section 2.0 describes more specific detail relative to the individual study areas. Table 2-1 provides a list of the study areas, and Table 2-2 provides a cross-referenced lists of spills included within those study areas. A brief listing of major investigatory phases of the RFI program follows. Refer to Figure 5-13 at the end of this report for a graphical display of the various spills and their associated status.

- **RCRA Facility Assessment (RFA)** – Conducted between 1992 and 1994, culminating in the RFA Report (ENSR, May 1994), which is also referred to as the RFA and Sampling Visit (RFA/SV) Report.
- **Phase I RFI Spills Evaluation and Investigations** – Completed in 1996 as the first comprehensive phase of investigation at the Astoria facility. Results were documented in the Draft Phase I RFI Report (April 1996), which was also referred to as the *Draft Data Summary and SWMU/AOC/Spills Evaluation Report* or *Draft Data Summary Report* (DDS).
- **Phase IIA RFI, North Storage Yard Investigation** – Began in 1995 during the Phase I RFI to support planned capital improvements to the North Storage Yard area.
- **Phase IIB RFI, Gas Turbine Facility and Former Pond Area Investigation** – Conducted during 1998 and 1999 to assess light non-aqueous phase liquid (LNAPL) present in the Former Pond Area, the Gas Turbine Facility, and historic spills that occurred at the Gas Turbine Facility.
- **Phase IIC RFI, Limited Investigation of Selected Parcels to Support Divestiture** – Completed in 1998 and involved the investigation of new areas at the facility and certain areas proposed for divestiture by Con Edison, specifically the Gas Turbine facility, the Fuel Oil Tank Farm and the Power Generating Station.
- **Eastern Parcel Area Investigation** – Investigation of a 21-acre parcel known as the East Parcel to support the anticipated sale of this parcel by Con Edison. A portion of the area relates to Outfall G. The Phase I Report was submitted in March 2005, and the Phase II Report providing additional Outfall G characterization data was submitted in February 2007.
- **Former Manufactured Gas Plant (MGP) AOC Investigation** – Study of the former manufactured gas plant (MGP) area as a separate AOC and prioritized in the overall RCRA Corrective Action Program. The investigation of the area was completed with a draft MGP AOC Report submitted in August 2005 to the NYSDEC.
- **Interim Corrective Measure (ICM), LNAPL Recovery Program** – Based on the discovery of LNAPL during the Phase IIB and IIC RFI, a monitoring and recovery program was initiated in 2001 at the Purge Oil Pump House Area, Former Pond Area, and a small area immediately east of the Gas Turbine facility. The program expanded in 2004 to include the LNG facility and is currently ongoing.
- **Phase IID RFI, Comprehensive Site Investigation** – This phase of study was conducted to complete the RFI Program. It encompassed the entire Con Edison Astoria property, with respect to the defined AOCs, SWMUs and associated spill areas. The Phase IID field program spanned from 2005 through 2007. Minor related activities are still ongoing. The results of this and the prior programs are presented in Section 4.0.

1.3 Areas Excluded from RFI Program

Over the course of its operating history, Con Edison has transferred (divested) portions of its original property to others. The current Con Edison Astoria facility boundaries and adjacent properties that were formerly Con Edison property (i.e., pre-divestiture 1999) are depicted in Figure 1-2. Figure 1-3 shows the designated operational areas within the facility. The majority of historic spills that occurred during Con Edison's operations remain part of Con Edison's current property. Refer to Table 2-2 for a list of spills encompassed in this RFI program, and the study areas that they're associated with. Beyond the current property boundaries are historic spill locations that are now on adjacent properties because of Con Edison's divestitures. Refer to Table 2-3 for a list of spills that are no longer on Con Edison's Astoria property. Therefore, this RFI Report pertains to SWMUs, AOCs and spills that are within the current Con Edison Astoria property. Refer to other documents for information related to spills beyond the current property boundaries. A brief summary of these divestitures follows as they pertain to the assessment of operational impacts.

In 1999, Con Edison sold three parcels of land at the Astoria facility as part of divestiture proceedings. As part of the sale of these parcels, all current and future environmental liabilities became the complete responsibility

of the respective new owners. Two of these parcels, the Astoria Fuel Oil Tank Farm (approximately 12.5 acres) and the Astoria Generating Station (approximately 19.3 acres), were purchased by Orion Power New York (currently owned by US Power Gen), and the third parcel, the Astoria Gas Turbine Facility (approximately 15.1 acres), was bought by NRG Energy, Inc. The remaining 224 acres of the facility were retained by Con Edison.

Some of the conclusions and recommendations presented within the prior RFI reports (e.g., Phase I, IIA, IIB, and IIC) addressed issues associated with the properties that were transferred by Con Edison during divestiture. Since the environmental liabilities were transferred along with these divested properties, only the areas retained by Con Edison are discussed within this RFI Report. Spills recorded on those divested properties (refer to Table 2-3) are no longer included in Con Edison's Corrective Action Program.

1.4 Purpose and Objectives of the Phase IID RFI

During 2001, the NYSDEC provided written comments following their review of three RFI reports (i.e., Phase I, Phase IIB, and Phase IIC) in three separate letters dated May 30, June 29, and July 17, 2001, respectively. Con Edison subsequently issued written responses to the NYSDEC's comments in a comprehensive response package dated March 15, 2002. Following their review of Con Edison's response package, the NYSDEC issued a letter to Con Edison, dated May 10, 2002, indicating that the responses were found to be acceptable.

In addition, the NYSDEC issued a memorandum, dated February 13, 2002, outlining their strategy for the future of the Astoria Corrective Action Program and, specifically, the remainder of the RFI. The memorandum listed the issues identified during previous phases of the RFI that needed to be addressed during this phase of the RFI, Phase IID. Following receipt of the new NYSDEC site strategy, the respective conclusions and recommendations sections found within each of the three RFI reports (i.e., Phase I, IIB and IIC) were revised to incorporate the general approach of the new site strategy as well as to address only those SWMUs/ AOCs/Spills still retained by Con Edison following divestiture. The respective revised conclusions and recommendations sections from each of those three reports were submitted under separate cover to the NYSDEC on April 5, 2002. In addition, the Con Edison team reviewed both the new NYSDEC site strategy and revised the conclusions and recommendations sections of the Phase I, IIB and IIC RFI Reports and cross-referenced them with all other RFI documentation in an effort to identify any other outstanding issues that needed to be addressed during the Phase IID RFI. Following this review, a single table was created, entitled "Table 1, Proposed Phase IID RFI Sampling Plan Table." This table was used as the basis for a comprehensive discussion held between the NYSDEC and the Con Edison team on April 22 and 23, 2002 (referred to as the Site Strategy meeting) regarding the upcoming Phase IID RFI. The purpose of the meeting was to evaluate past findings for each SWMU/AOC/Spill retained by Con Edison following the divestiture, and to discuss a conceptual scope of work in an effort to streamline the Phase IID RFI work plan preparation, review, comment and approval process. Based on the outcome of that meeting, Table 1 in the final work plan (ENSR, 2002) was revised to incorporate the NYSDEC's comments presented during the meeting, and to provide the technical basis for the Phase IID RFI.

1.4.1 Historic Preliminary Comparison to Standards

During November of 2000, the NYSDEC issued preliminary concentration guidelines for soil at the North Storage Yard following their review of the North Storage Yard RFI Report. These guidelines included total values for three chemicals of concern (COC) groups: polychlorinated biphenyls (PCBs), carcinogenic polynuclear aromatic hydrocarbons (cPAHs), and lead. These guidelines were used during execution of the ICM program at the North Storage, and were used to help guide the development of the sampling plan and sequential characterization of other study areas during the Phase II RFI. The brief review of the history and details relative to these North Storage Yard guidance concentrations is provided in the paragraphs that follow.

A draft site-specific risk assessment for the North Storage Yard was submitted to the NYSDEC on June 10, 1996 as part of the Draft North Storage Yard RFI Report (ENSR, 1996). This risk assessment evaluated a current and future on-site industrial worker exposure scenario. An update to the draft risk assessment was

provided to the NYSDEC in a letter on March 27, 1998 (ENSR, 1998) to incorporate revisions due to changes in NYSDEC guidance. Following the NYSDEC's review of the Draft North Storage Yard RFI Report, they presented their comments on the report in a letter dated November 2, 2000. In summary, the NYSDEC did not agree with the recommendation of no further action due to the presence of hazardous constituents in the soil. The NYSDEC cited that elevated concentrations of PCBs (maximum of 126 ppm), cPAHs (elevated levels, no concentration cited) and lead (maximum of 5,820 ppm) were detected in the surface and subsurface soils at the North Storage Yard. To protect human health and the environment, they issued recommended soil cleanup levels for PCBs (25 ppm), cPAHs (10 ppm), and lead [900 ppm, provided the Toxicity Characteristic Leaching Procedure (TCLP) limit is not exceeded], in addition to implementing appropriate institutional and engineering controls.

Subsequently, the North Storage Yard risk assessment was expanded to evaluate scenarios discussed with the NYSDEC at a meeting on January 18, 2001 and to evaluate potential risks associated with using the NYSDEC recommended concentration guidelines to direct remediation at the North Storage Yard. This same information was reiterated in the North Storage Yard RFI: Response to NYSDEC Comments document (ENSR, May 2001). As referenced in Section 3.0 of that document, potential risks posed by site contaminants were evaluated for the current/future on-site worker (e.g., spill response worker and daily on-site worker), for a future remediation worker, and for a future nearby resident during remediation activities. The results of the risk characterization concluded that the concentrations of COCs in the North Storage Yard presented potential risks to the current/future on-site worker. Based on that conclusion, remediation activities have been initiated for the North Storage Yard and are currently ongoing.

1.4.2 Site Strategy Meeting with NYSDEC

In a letter dated February 13, 2002, the NYSDEC presented their view for the future corrective action strategy for the Astoria facility. This strategy included the following four main facets:

- Installing a network of site perimeter monitoring wells around the facility and along the downgradient property boundaries;
- Sampling requirements for certain SWMUs/AOCs/Spills to be investigated during Phase IID;
- A reference to what the major COCs are at the Astoria facility, including PCBs, total BTEX, total cPAHs, total non-cPAHs and lead; and
- The use of appropriate institutional and engineering controls.

No cleanup levels were referenced for any of these COCs in the letter. The NYSDEC also stated within the February 13, 2002 letter that hot spots would be evaluated on a case-by-case basis through consultation with their Central Office and possibly the New York State Department of Health.

In preparation for the April 2002 Site Strategy meeting with the NYSDEC, the Con Edison team evaluated each of the topics referenced in the NYSDEC's February 13, 2002 letter. The evaluation produced a Draft Proposed Phase IID Sampling Plan table that summarized the proposed Phase IID RFI sampling activities for each SWMU/AOC/Spill. Existing data were evaluated against the NYSDEC's recommended concentration guidelines for the North Storage Yard [PCBs (25 milligrams per kilogram {mg/kg}); total cPAHs (10 mg/kg) and total lead (900 mg/kg), provided the TCLP limit is not exceeded] to determine if the nature and extent of contamination had been defined or if there was adequate information to proceed to corrective action (i.e., paving, capping, soil excavation). Areas of significantly higher contamination were considered to be sampling locations with concentrations 10 times greater than the recommended NYSDEC value. During the Site Strategy meeting, each SWMU/AOC/Spill was discussed in detail to understand previous findings, data interpretations and proposed Phase IID RFI sampling. In addition, several new issues were added to the RFI since the previous Phase IIC RFI was completed. These new issues included impacted soil from past spills at substation pump houses, outstanding UST closure activities at three areas, the former MGP area, and the septic system at Building 139. As discussed in Section 1.4, this table was revised to incorporate the changes

agreed upon by all parties during the meeting and is presented as Table 2-2 in the Phase IID RFI Work Plan. Moreover, the information presented in Section 2.2 of the Phase IID RFI Work Plan summarized the results of the data evaluations for each SWMU/AOC/Spill. The locations of the areas investigated during the Phase IID RFI are depicted in Figures 1-4 and 1-5.

1.4.3 Culmination of Final Phase IID RFI Work Plan Objectives

The objectives of the Phase IID RFI were to:

1) Address data gaps identified at certain SWMUs or AOCs which were investigated previously under the Phase I, Phase IIB, and/or Phase IIC RFI programs;
2) Assess potential impacts to soil and groundwater from specific past spills (i.e., Appendix B spills from the 1994 Consent Order) not previously investigated;
3) Conduct an initial assessment of soil and groundwater quality in the area of the former MGP operations and other newly identified AOCs; and
4) Assess groundwater quality at certain SWMUs/AOCs/Spills within the facility and also along the general perimeter of the facility and downgradient property boundaries.

To verify that all spills retained by Con Edison following the 1999 divestiture have been properly assessed during the RFI, Table 2-1: Summary of Spill Evaluations, from the revised Phase I RFI Report was re-evaluated to determine that the 14 spills referenced herein were the only spills that remain open. All spills retained by Con Edison following the 1999 divestiture and their status were summarized in Table 2-1 of the Phase IID RFI work plan.

1.5 Report Organization

The following summary generally describes the contents of this report relative to what has been presented in prior reports:

- Facility description and investigative history – Presented in prior reports up through the Phase IIC RFI program (April 2002) and the former MGP AOC RFI program (August 2005); updated in Section 2.0 of this report to encompass the recent Phase IID RFI program;
- Environmental setting, site geology, hydrogeology and associated detail – Presented in prior reports at a local scale, primarily focusing on specific study areas and portions of the Astoria facility; updated and expanded at a property-wide scale in Section 3.0 of this report;
- Specific study area characterization results – Presented in specific reports targeting particular study areas and portions of the Astoria facility; all prior characterization results are compiled, presented and interpreted on a site-by-site basis within Section 4.0 of this report; and
- Conceptual Site Model (CSM) – An overall CSM for the facility has not previously been compiled during prior phases of investigation and reporting; the CSM for the Astoria facility is based on the site-specific data collected during the 14-year RFI history; observations and graphics at a facility-wide scale are presented in Section 5.0 of this report.

2.0 Facility Description and Investigation History

The Astoria facility is Con Edison's main warehousing and power distribution center. Encompassing approximately 224 acres along the East River, it is the largest contiguous privately-held parcel of property in the New York metropolitan area. The following subsections provide some general descriptive and historical information relative to overall facility and operations. Topographic and geologic detail is provided in Section 3.0.

2.1 Facility Description

Con Edison's Astoria facility is situated in the northwest portion of Queens County in Astoria, New York. In 1999, Con Edison divested three main areas of its facility, including the Power Generating Station and Fuel Oil Tank Farm, to Orion Power New York (currently owned by US Power Gen) and the Astoria Gas Turbine facility to NRG Energy, Inc. Refer to Figure 1-2 (Section 1.0) for the locations of these adjacent properties.

The facility is zoned as a manufacturing area and is surrounded by developed industrial and residential areas. The site is bordered to the west and north by the East River and to the east by Luyster Creek (also known as Steinway Creek). To the south, 20th Avenue borders the facility. The site has been owned by Con Edison or its predecessor companies since the late 1890s. From the early 1900s through 1999, the facility has been operated in some form as a power- or gas-generating facility. Following the divestiture in 1999, Con Edison operations focus on the transmission and delivery of electricity to its customers. The adjacent New York Power Authority (NYPA) complex to the north is owned and operated by NYPA, but the environmental responsibility for past practices under the Corrective Action program is maintained by Con Edison. Portions of the NYPA property were included in the RFI program with results reported in this RFI report.

2.2 Site Operations History

The information in this section discusses the operational history of the Astoria facility from the late 1890s to present day. Two key aspects of the facility's operational history are particularly important to the RCRA Corrective Action Program: Manufactured Gas Plant (MGP) operations and the associated waste management practices. These operations are described in the following subsections.

2.2.1 MGP Operations History

Before construction of the former MGP began, extensive grading was conducted in June of 1903 to address the great irregularities in the natural grade of the property. Grading involved the removal of approximately 485,000 cubic yards of earth from the high ridges on the property and the re-application of the excavated soil onto the low-lying portions of the property. MGP operations began between 1906 and 1907, during which time the Astoria facility was owned and operated as an oven gas plant by the Astoria Light, Heat and Power Company. The Astoria Light, Heat and Power Company, a subsidiary of the Consolidated Gas Company of N.Y., operated the facility from 1906 to 1937. During the 1920s, the property was considered the world's largest gas manufacturing plant, producing up to 86 million cubic feet of gas per day. During this time, the Consolidated Gas Company of N.Y. assumed control of MGP operations and ownership. At the time of the acquisition by the Con Edison Company of New York in 1936, MGP operations were subsequently enlarged and modified to include water gas, producer gas, and LP-Air process capabilities. In addition to the 30 years during which Astoria Light, Heat and Power Company operated the MGP, the Con Edison Company of New York operated the coal gasification plant at the site for approximately 25 years, ending in the early 1960s. Records indicate that the Astoria MGP utilized a variety of gas manufacturing processes over the years; however, detailed information on these manufactured gas operations is very limited.

MGP operations were centered in the present location of the Central Field Services (CFS) Warehouse (Building #136) and extended northeastward towards the current Gas Turbine facility, northwestward towards

the Power Generating Station and the NYPA's Polletti Electric Generating Station, and southward to the current CWTF settling tanks (the former gas holder foundations). The MGP facility, during the years of operation (1906-1961), consisted of inclined and horizontal retort houses, a primary gas generator house, and associated structures. These associated structures included light oil scrubbing facilities, compressor buildings, purifiers, and associated tar management facilities. The majority of the former MGP structures (the retort houses, boiler house, extractor houses, and exhauster houses) were concentrated within the footprint of the area currently occupied by the Astoria West Substation, the extensive CFS Warehouse (Building #136), and outdoor storage and parking areas.

In addition to the typical MGP structures, various portions of the site were utilized for the processing and storage of by-products and process material associated with MGP operations. By-products included coal, coke, ash, slag, oxide, ammonia, liquors, tars, and light oil. Tar processing equipment, including two 400,000-gallon storage tanks, separators, pumps, and piping were located in the present location of the northwest corner of the Pipe Yard. Various purifier houses, scrubbers, condensers, sampling houses, and associated structures were also located on the property. Facility records and personnel have indicated that on-site materials, primarily coal, were transported via a series of narrow-gauge railroad track systems and conveyors from the area of coal storage that was reportedly directly north of where the MGP operations were located. As referenced in the Description of Current Conditions Report (ENSR, July 1994), agreements dating back to 1936 have been recorded indicating the extensive off-site sale of MGP waste residuals (e.g., light oil, coal tar, heavy water, gas tar, etc.).

2.2.2 Site Waste Storage and Disposal History

At times during the facility's operations, coal tar seeps have been observed emanating from the ground surface in the Pipe Yard during summer months. According to facility personnel, the seeps are typically one foot in diameter when discovered at the ground surface. It has been suggested that the seeps are the result of waste disposal practices associated with the former MGP operations. As referenced above in Section 2.2.1, information contained within the Description of Current Conditions Report indicates that most of the wastes associated with the MGP operations were sold and removed off-site rather than disposed of on-site.

Blue Dog Lake formerly extended further north than its present boundaries and has been referred to as the "tar pond" in several of the older historic facility drawings. Employee interviews also revealed that the lake was dredged and that the dredged material was used to fill the northern edge of the lake. Employee interviews also indicated that Blue Dog Lake was utilized as a waste disposal area. The wastes disposed of in the lake were unidentified based on the research conducted.

2.3 Previous Investigations

The following sections briefly summarize the previously-completed phases of the RFI at Astoria, including a list of each area addressed during each phase. Each area is discussed in greater detail in Section 4.0.

2.3.1 RCRA Facility Assessment (RFA)

The RFA program was conducted between 1992 and 1994, culminating in the RFA Report (ENSR, May 1994), which is also referred to as the RFA and Sampling Visit (RFA/SV) Report. The report described the general background of the Astoria facility (e.g., physical setting, site operations, waste generation and management, spill history, etc.) and the results of sampling conducted at four areas.

The findings presented in the RFA Report recommended no further action for the Purge Oil Tanks SWMU. However, supplemental soil sampling was recommended for the East Yard SWMU, the Chemistry Lab Waste Oil UST, and Transportation Department Former Waste Oil USTs A and B. This sampling was conducted during the Phase I RFI, as discussed in detail on Section 2.0.

2.3.2 Phase I RFI Spills Evaluation and Investigations

In 1996, the first phase of the RFI was completed with the submittal of a Draft Phase I RFI Report (April 1996), which was also referred to as the *Draft Data Summary and SWMU/AOC/Spills Evaluation Report* or *Draft Data Summary Report* (DDS). This investigation was much larger in scope than the RFA and included the sampling and analysis of the three RFA areas; potential source area investigations including identified RCRA units and documented spills of petroleum; and a hydrogeologic investigation of the facility. The Phase I RFI contained a more complete presentation of the data collected, presented an evaluation of spills at the Astoria facility that warranted further investigation, and identified other areas that warranted investigation that were not specified in the Permit. The document was revised in 1998 following updated toxicological values issued by USEPA in the risk assessment screening process and titled *Revised Draft Data Summary and SWMU/AOC/Spills Evaluation Report* (June 1998). Following the Phase I RFI, four subsequent phases of study (Phase IIA through IID) were performed at the facility, as discussed in this subsection. Highlights of the spill history are provided below.

In a letter dated December 13, 1996, the NYSDEC commented on the conclusions reached for each spill discussed in this report. The NYSDEC also identified 15 additional spills (reference numbers 84 through 98) requiring investigation and potential remediation. In their December 13, 1996 letter, the NYSDEC agreed with Con Edison's determination of no further action for 51 of the original 83 spills. Con Edison responded to the NYSDEC's comments on the remaining 32 original spills in a letter report dated February 10, 1997 (ENSR Document Number 1869-003-100). In addition, in letters dated February 27 and March 21, 1997, Con Edison provided background information on the 15 additional spills (Nos. 84 through 98) as well as supplemental information on two other spills (Nos. 10 and 40). As a result of the various evaluations, comments and responses, the NYSDEC has agreed to the integration the investigations for 33 past spills into the on-going RCRA Corrective Action Program for the Astoria facility. Of these, 14 spills (6A, 10, 12, 38, 41, 46C, 60, 69, 73, 74, 86, 89 C/D/E, 91 and 92) were evaluated as part of this Phase IID RFI program. Figure 5-13 in Section 5 of this report highlights the locations of these 14 spills, along with depictions of the other recorded spills within the Astoria property.

2.3.3 Phase IIA RFI, North Storage Yard Investigation

There is a long regulatory history for the North Storage Yard that began in 1995 with the Phase I RFI and is currently in the process of obtaining approval from NYSDEC and USEPA to conduct remedial actions so that certain capital improvements can be done.

The Phase IIA RFI was completed in 1996 and consisted exclusively of investigating soil and groundwater quality at the North Storage Yard SWMU. The investigation of the North Storage Yard was expedited because of Con Edison’s plans to improve the yard. This report focused on the sampling context, rationale, procedures and results. Based on the findings, which included a human health risk assessment, no remedial actions were recommended for the yard (ENSR, June 1996). The NYSDEC issued written comments following review of the report in a letter dated November 2, 2000. In the letter, the NYSDEC did not agree with the no further action recommendation and provided Con Edison with recommended cleanup values for three COCs (total cPAHs – 10 ppm, total PCBs - 25 ppm, and total lead - 900 ppm).

In response to NYSDEC’s letter, Con Edison prepared a comprehensive report (ENSR, May 2001), which included a proposed conceptual plan for the remediation and maintenance of the yard. In an effort to move forward with the proposed plan, Con Edison has had several meetings with NYSDEC and USEPA, presenting their proposed remedial actions (ENSR, May 2003 and July 2003) to address the impacted soil at the yard. Currently, Con Edison is preparing a Human Health Risk Assessment, which will serve as the basis for a revised ICM proposal.

2.3.4 Phase IIB RFI, Gas Turbine Facility and Former Pond Area Investigation

Phase IIB of the RFI was conducted during 1997 and 1998 to assess light non-aqueous phase liquid (LNAPL) present in the Former Pond Area, the Gas Turbine Facility, and historic spills that occurred at the Gas Turbine Facility. The Gas Turbine Facility was divested to NRG Energy in 1999 and is no longer Con Edison property. Based on the outcome of Phase IIB, no further delineation of those areas was recommended. However, a supplemental field investigation was performed in 1998 to evaluate the consistent occurrence of LNAPL in monitoring wells at the Former Pond Area so that an Interim Corrective Measure (ICM) could be implemented to recover the LNAPL. The findings and recommendations from this study were presented in the ICM Evaluation Report (ENSR, April 1999) and the ICM Final Recommendations Report (Con Edison, January 2001). The details of the ICM LNAPL recovery program are discussed in Section 2.3.8.

2.3.5 Phase IIC RFI

The Phase IIC RFI investigated new areas of the facility and also investigated certain areas that were proposed for divestiture by Con Edison, specifically the Gas Turbine facility, the Fuel Oil Tank Farm, and the Power Generating Station. The following areas were investigated during the Phase IIC RFI:

- Purge Oil Pump House Spill Area;
- Astoria Central Wastewater Treatment Facility (CWTF) SWMU;
- Tunnel Head House;
- A-11 Dock Spill Investigation Area;
- Spill No. 70; and
- Facility-wide Groundwater.

Two other areas, the Fuel Oil Tank Farm and Generating Station Transformers, were also included in the investigation but were divested by Con Edison in 1999 to Orion Power New York. The report recommended additional field assessment, consideration of additional monitoring wells, and the installation of sentinel wells to assess groundwater migration. Further detail on the Phase IIC program is provided in the paragraphs below.

The Phase IIC RFI Report was submitted to the NYSDEC during August of 1998 (ENSR, August 1998). Due to the expedited nature of the Phase IIC program (i.e., pending divestiture activities at the time), not all analytical data was received and evaluated before the report was issued to the NYSDEC. Therefore, an addendum containing the remaining analytical data was submitted to the NYSDEC on November 6, 2000. The NYSDEC issued written comments on the Phase IIC RFI Report and addendum letter in a letter dated July 17, 2001. The NYSDEC stated that they agreed with the general recommendations made in the report, with only some minor changes, and asked for revised recommendations based on any additional investigations that had been conducted subsequent to the submittal of the Phase IIC RFI Report. Con Edison submitted revised recommendations on April 5, 2002. These recommendations excluded the following areas for which Con Edison no longer retains responsibility: the Generating Station Transformer Spill Investigation Area; the area around the Southwest Storm Sewer (although this sewer pipe itself is still owned by Con Edison); the Site Perimeter Small Diameter Monitoring Well – F02; the Fuel Oil Tank Farm Spill Investigation Area; and the AOC South of the Fuel Oil Tank Farm.

Based on the Phase IIC RFI results and conclusions, additional field investigations were required to determine the northern extent of LNAPL at the Purge Oil Pump House, to fill data gaps that exist in the evaluation of potential near-surface releases at the CWTF, and to complete the Tunnel Head House AOC investigation. In addition, the following recommendations for management of the temporary monitoring wells (TMWs) were made, based on the water level and LNAPL gauging activities conducted during Phase IIC RFI:

- Removal of numerous TMWs based on the absence of LNAPL;
- Maintaining several TMWs to provide additional data, if necessary, during future ICM and/or RFI activities; and
- Continuation of ICMs at the Purge Oil Pump House area to remove LNAPL.

2.3.6 Eastern Parcel RFI

The Eastern Parcel was investigated separately from the rest of the site-wide RFI due to the anticipated sale of this parcel. There were three phases to the Eastern Parcel RFI conducted between 1999 and 2006: Phase I, Phase II, and the Outfall G investigation. The Phase I findings were presented in the Data Summary Report for the Eastern Parcel RFI (ENSR, November 1999) and submitted to the NYSDEC during November of 1999. The NYSDEC provided their written comments to that report in a letter to Con Edison dated January 11, 2000. In response to the NYSDEC's comments requesting additional sampling, a Phase II RFI work plan for the Eastern Parcel was prepared and submitted to the NYSDEC during February of 2002 to address seven issues:

- Determine the source and extent of 1,1-dichloroethane detected in the groundwater at monitoring well F09B;
- Evaluate the extent of volatile organic compound (VOC)-impacted soil southwest of the Eastern Parcel;
- Evaluate potential groundwater impacts from the impacted soil in the area of boring Y39;
- Locate the terminus of Outfall G;
- Assess the significance of semi-volatile organic compounds (SVOCs) in groundwater detected in site perimeter small diameter monitoring wells (F10, F11 and F12) during Phase I RFI activities and VOCs and PCBs detected in the groundwater at F11;
- Investigate the source and extent of tetrachloroethylene (PCE) detected in well F42D; and
- Conduct a hydrogeologic evaluation of the eastern portion of the Astoria facility to ascertain the flow characteristics of groundwater in the shallow and deep overburden hydrogeologic units (refer to Section 3.4, Site Hydrogeology).

The NYSDEC issued written comments on the Phase II work plan in their letter dated March 25, 2002. Subsequently, Con Edison submitted a response to comments package to the NYSDEC on June 21, 2002, and received approval from the NYSDEC by letter, dated August 13, 2002, to proceed with the implementation of the Phase II work plan. Supplemental and related work plans include the Outfall G work plans and execution (ENSR, March 2005 and February 2007), as well as the Central Wastewater Treatment Facility (CWTF) work plan and execution program (ENSR, June 2007). The details and findings of the cumulative RFI investigations for the broader Eastern Parcel area are presented in Section 4.37, with specific details on the Outfall G investigations presented in Section 4.39.

2.3.7 Former Manufactured Gas Plant (MGP) AOC Investigation

During the Site Strategy meeting with the NYSDEC in April 2002, the general approach for investigating the environmental conditions within the former MGP area was discussed. Based on these discussions, the NYSDEC and Con Edison concurred that the former MGP area should be studied as a separate AOC and prioritized in the overall RCRA Corrective Action Program. Accordingly, the investigation of that area was completed and a draft MGP AOC Report (August 2005) was submitted. It is Con Edison's understanding that NYSDEC will review the draft report once the RFI is completed for the remainder of the Astoria facility. This RFI report constitutes that milestone and should initiate the review of the associated MGP report. It is important to note that detailed investigative results, findings, conclusions and recommendations presented in the MGP report are not repeated herein. However, the analytical data and geologic information obtained during the MGP investigation is incorporated within the overall database of information available to assess the

facility-wide conditions. Tables, figures and discussions within this RFI report include all data collected and compiled to-date.

2.3.8 ICM, LNAPL Recovery Program

During Phase IIB and IIC RFI investigations, areas of LNAPL were identified at the Purge Oil Pump House Area, the Former Pond Area, and a small area immediately east of the Gas Turbine facility. Subsequently, these areas became the focus of a study to assess the need for implementing ICMs for the recovery of the LNAPL. The findings of this study were presented in the *Interim Corrective Measure (ICM) Evaluations Report* (ENSR, April 1999, revised August 1999) {formerly referred to as Interim Remedial Measures}. During October and December of 2000, additional ICM evaluations were performed and final ICM recommendations were submitted to the NYSDEC in January of 2001. These ICM recommendations were approved by the NYSDEC and implemented in April of 2001 for the recovery of LNAPL from monitoring wells in these areas, using Soakease^{TM} absorbent bailers.

Originally, 11 wells were included in the ICM program. These included four wells in the Former Pond area (A11, A17, A22 and F17), six wells in the Purge Oil Pump House (POPH) area (K46, K55, K56, K101, K103 and K108), and one well (A25) immediately east of the Gas Turbine facility. During 2005, one well (F38, LNG facility) was added to the ICM program, due to the discovery of LNAPL in that well. During 2006, three wells (A11, A25, and F17) were removed from the ICM program following NYSDEC's approval. Currently, there are nine wells in the ICM program, including two wells in the Former Pond area (A17 and A22B [replacement for A22]), six wells in the POPH area (K46, K55, K56, K101, K103 and K108), and one well within the LNG facility area (F38).

At the start of the program, field inspections were conducted on a weekly basis to measure LNAPL in each well with an oil\water interface probe and to replace the spent absorbent socks with new ones. Shortly after implementation of the Soakease^{TM} absorbent bailers, the ICM efforts were supplemented with manual bailing, as needed, for ICM wells that exhibited LNAPL thicknesses of 0.5 feet or greater. During 2003, field inspections were changed to monthly visits, following approval from the NYSDEC. Throughout the program, Con Edison has also been actively recovering LNAPL from these wells on a quarterly basis, using the vacuum enhanced fluid recovery (VEFR) method. Table 2-5 presents a summary of LNAPL measurement data collected during the on-going ICM program. Con Edison has been providing the NYSDEC with ICM status updates on a quarterly basis since May of 2001.

To better understand the LNAPL distribution, approximately 8 years of LNAPL data were analyzed at 10 site wells to identify trends in LNAPL thickness and whether there are any relationships between LNAPL thickness and groundwater levels. LNAPL fluid level data was reviewed at monitoring wells A17, A22, A22B, F38, K101, K103, K108, K46, K55 and K56. LNAPL data were not reviewed where LNAPL recovery is already taking place. Observations are provided below.

Appendix I includes graphs of fluid levels in these wells between January 2000 and June 2007. Of the above wells, only monitoring wells A22, A22B and F38 had an average LNAPL thickness value of greater than 2 inches. However, at monitoring well K103, LNAPL thickness measurements have typically been above two inches since September 2006. These higher thickness measurements are not considered a trend, because they have occurred during times of low water table conditions, which have correlated to higher LNAPL thickness measurements in the past. The LNAPL trends will continue to be updated as the ICM LNAPL gauging program progresses.

Appendix I also provides graphs comparing water levels and LNAPL thickness, which were correlated at monitoring wells K55, F38 and A22. This correlation between higher LNAPL thickness and lower water levels suggests that LNAPL is trapped below the water table at residual saturation and is temporarily mobilized after the water level falls. Because as potentiometric surface declines, LNAPL will drain slower than water, due to lower density and higher viscosities, LNAPL previously below the water table ends up above the water table

and appears in the well. In such cases, the appearance of LNAPL is not indicative of mobile LNAPL. Rather, it is indicative of residual (i.e., immobile) separate-phase soil contamination.

In summary, the thickness and sporadic appearance of LNAPL in these wells suggests that LNAPL is not likely to be recoverable in significant volumes. The fine sands and silty sands that predominate at these wells produce capillary forces that push immobile LNAPL into adjacent wells. However, recovery of LNAPL in such cases is typically low, resulting in little recovery beyond that present in the well and sand pack.

2.3.9 Phase IID RFI, Comprehensive Site Investigation to Complete the RFI Program

The Phase IID RFI program (this report) encompassed the entire Con Edison Astoria property with respect to the defined AOCs, SWMUs and associated spill areas. In total, 41 separate study areas were assessed as part of the Phase IID program. Refer to Table 2-1 for a list of these study areas, and to Table 2-2 for a cross-referenced list of spills that were included as part of the investigation for these study areas. Refer to Figures 1-4 and 1-5 (Section 1.0) for the locations of these study areas. Further detail on a site-specific basis is presented in Section 4.0. Cumulative findings at a facility-wide scale are presented in Section 5.0.

3.0 Environmental Setting

This section establishes the basic framework relative to the site setting. This is essential in understanding the potential migration characteristics of impacted soil and groundwater, as well as the potential environmental receptors associated with those impacts.

3.1 Site Topography and Surface Cover

The site is situated in the northwestern part of Queens County, which is characterized by low rolling hills overlooking and extending into the East River between various salt-water bays. The largest of these bays, Flushing Bay, is located approximately two miles east of the Astoria facility. A relatively narrow ridge, ranging in elevation from 160 to 260 feet above mean sea level (AMSL), trends about east-northeast in the central part of Queens County. This ridge, located approximately six miles southeast of the Astoria facility, is part of the Harbor Hill Terminal Moraine, which marks the furthest advance of the Wisconsin Glaciation in this area. A plain slopes gently southward from the ridge to the Atlantic Ocean. A large flat-bottomed valley, Flushing Meadow, extends northward from this ridge to Flushing Bay on the East River. Figure 3-1 presents the site locus map, with the facility location depicted within the published United States Geological Survey (USGS) topographic map. Figures 3-2 through 3-5 relate to cross-sectional interpretations of the subsurface (discussed in Section 3.3) and Figure 3-6 shows the different surface cover materials currently in place at the facility, which are predominantly comprised of asphalt, gravel and grass (landscaped areas).

The Astoria facility lies in a relatively flat area abutting the East River to the northwest. According to United States Geological Survey (USGS) maps and historic facility drawings, the north-northwestern portion of the Astoria facility is primarily fill material, which typically consists of construction and demolition debris mixed with sand, gravel, rock, coal ash, slag, and cinders. The fill has been used historically in this region to extend and reinforce shorelines and to eliminate swampy areas. The overall elevation of the site and the surrounding properties slopes from south to north at approximately 35 feet AMSL along 20th Avenue to approximately 8 feet AMSL along the East River.

3.2 Surface Water Hydrology

Although local surface waters are classified as suitable for recreational boating and fishing, few recreational activities occur on the East River and other New York City area waters because of the highly industrial nature of the area. Water depths of the East River in the immediate area of the shorelines range from 8 feet to 68 feet. The average depth of water in Luyster Creek to the east-northeast is approximately 11 feet. According to the NYSDEC, surface water classification for the East River is “Class 1," which is described as saline surface waters, best suited for secondary contact recreation and fishing and shall be suitable for fish propagation and survival. Luyster Creek (formerly known as Steinway Creek) is classified as class "SD," which is described as saline surface waters, best used for fishing and can be suitable for fish survival.

Due to the highly developed nature of the site, a substantial portion of the precipitation runs off paved surfaces to sewers and is discharged to the East River through the site's storm sewer systems. Although much of the subject property is paved, a large volume of precipitation penetrates the ground surface in unpaved areas and percolates downward to the water table. A small area on the west side of Luyster Creek is indicated as a marsh on the USGS topographic map of the area. It is unclear how much precipitation enters Luyster Creek directly as runoff from the surrounding areas.

3.3 Site Geology

The geology of the area can be discussed as two major units: overburden and bedrock. The following subsections describe general observations recorded during investigative activities. Relevant literature information was reviewed and added to this discussion and interpretations, as appropriate.

3.3.1 Overburden Geology

Geologic cross-sections were developed, based on geologic logs from boring advanced throughout the RFI investigations. Six cross-sections were developed along the cross-sectional lines shown on Figure 3-2, and are presented in Figures 3-3 through 3-5. The lithology was grouped into four types: fill, clay, silty sand, and sand. Fill is present over a large portion of the facility in general, from land surface to a depth of approximately 10 to 20 feet bgs. Underlying the fill is a discontinuous clay layer. Below the clay is silty sand and sand, respectively. The depth to bedrock is typically 50 feet or less, although work performed by others at Castle Oil to the east of Luyster Creek indicates that bedrock exists on those properties at approximately 65 feet bgs. The varying sand, silty sand, and clay layers are typical of coastal lithology.

Three of the cross-sections include representation of Luyster Creek. Depths of Luyster Creek were based on bathymetry data provided by Con Edison and performed by Aqua Firma Surveys soundings on May 27, 1997. The creek is a dominant feature; the northern portion of the creek has been dredged to approximately 35 feet to allow for tanker access, while the southern portion is shallower (less than 10 feet). Based on interpretation of boring logs and bathymetry data, it is believed that Luyster Creek intersects the fill layer. In northern portions of Luyster Creek, the creek likely intersects the deeper clay and/or silty sand units.

According to USGS geologic maps, the northern portion of the Astoria facility lies on fill materials, while the central portion of the subject property is situated on glacial till (ground moraine). The boundary between these surficial materials is generally reflected in the site topography, with the higher site elevations corresponding to areas overlying glacial till. The fill materials in the northern portions of the site overlie shore and salt marsh deposits (organic silt, peat, and clay), since fill materials were generally used in this area to extend and reinforce shorelines and to eliminate swampy areas.

3.3.2 Bedrock Geology

The bedrock underlying the majority of the Astoria facility and surrounding properties are mapped as Member A of the Fordham Gneiss. This Middle Proterozoic-age rock unit is described as a pinkish-white to salmon-red and medium-gray banded muscovite-biotite-plagioclase-microcline-quartz gneiss. An outcrop of this bedrock unit is present between the Hell's Gate and Triborough bridges on the east bank of the East River. This unit is considered to be a metamorphic aureole (a thermally altered zone) around the intrusive Yonkers Gneiss. Bedrock underlying the eastern portion of the site (including the area near the liquefied natural gas (LNG) storage tank) is mapped as the Hartland formation, which consists of mica-quartz schists, granite, and amphibolite interlayered with pegmatite, amphibolite, and coarse granoblastic-textured amphibolite gneiss. According to previous investigations, boring logs for the Astoria facility and vicinity indicate that the depth to bedrock ranges from approximately 35 feet to 70 feet below ground surface (bgs).

The two bedrock units underlying the Astoria facility and surrounding properties are separated by Cameron's Line, which runs along 31st Street and past the northwest side of the LNG Storage Tank before veering eastward towards Riker's Island. Cameron's Line is a major regional northeast-striking fault with an eastward-dipping surface. Evidence of thrusting exists along Cameron's Line, with younger allochthonous rock units on the east side thrust westward over older autochthonous rock units. This thrusting is thought to have occurred during the early phase of the Taconian deformation during the Ordovician Period. Similar periods of deformation have also resulted in the creation of northeast-trending asymmetric folds. The Astoria facility is also located on the axis of an antiform fold.

3.4 Site Hydrogeology

Only the southern portion of the site is underlain by one of the aquifers in the Brooklyn/Queens Aquifer System. The Upper Glacial Aquifer in this location consists of glacial till (ground moraine). The unconsolidated sediments and glacial till aquifer underlying the facility are relatively thin (approximately 35 to 45 feet thick) and rest directly upon the bedrock surface. According to the NYSDEC, the groundwater

classification for the Astoria area in the vicinity of Queens County is class "GA" for “fresh groundwater,” and is part of the Brooklyn/Queens sole-source aquifer.

Based on the subsurface investigations conducted at the Astoria facility, groundwater is generally encountered at depths between 3-to-15-feet bgs. The general direction of groundwater flow follows the site topography, from the south central portion of the site towards the East River (north and northwest) and towards Luyster Creek (northeast). Groundwater elevations in on-site monitoring wells suggest a groundwater divide is present in the eastern portion of the facility that was investigated as part of the Eastern Parcel RFI Phase II. Based on results from previous phases of the RFI, it has been determined that the East River has a tidal influence on the site for approximately 250 feet inland. The difference between mean high water and mean low water in the East River is approximately 6 feet.

During the Eastern Parcel Phase II RFI, a hydrogeological investigation was conducted to characterize groundwater flow conditions in the overburden in the eastern portion of the facility for use in development of defensible soil and groundwater screening levels for constituents of interest (COIs) in the area. During previous RFI investigations, a groundwater divide had been identified at the Astoria facility. On the western side of the groundwater divide, sufficient information was available to characterize groundwater flow as toward the East River and to identify the East River as the receptor location (i.e., the off-site destination of groundwater). The hydrogeological investigation described below was completed to characterize groundwater flow and identify receptor locations on the eastern side of the groundwater divide, where sufficient information was previously unavailable.

In summary, the results of that study concluded:

- Groundwater in the Eastern Parcel flows toward and eventually discharges to Luyster Creek;
- Groundwater levels in both shallow and deep overburden wells are tidally influenced to a distance of up to approximately 575 feet inland. Average groundwater elevations were higher than the water level in Luyster Creek; which is consistent with groundwater discharging to Luyster Creek;
- Water levels in the deep overburden were generally higher than water levels in the overlying shallow overburden, indicating an upward vertical gradient consistent with groundwater discharging to Luyster Creek;
- Groundwater elevations in individual wells, even those not tidally influenced, were observed to vary up to more than one foot, which are likely due to precipitations and/or seasonal variations;
- After a heavy precipitation event like that experienced on September 8, 2004, where 3.85 inches of rain fell, shallow groundwater levels can rise by a foot or more. Deep water levels were not impacted, except well F19D;
- Based on interpretation of boring logs and bathymetry data, Luyster Creek intersects the fill layer. In southern portions of Luyster Creek, the creek is shallower (approximately 10 feet or less) and intersects the fill layer. In northern portions of Luyster Creek, the creek is very deep (approximately 35 feet) and likely intersects deeper clay and silty-sand layers as well as the overlying fill layer;
- The hydraulic conductivity of the fill layer is much greater (generally 10 ft/day to 50 ft/day) than the underlying silty sand (less than 1 ft/day to 2.5 ft/day) and presumably the clay layer (no wells were screened or tested within the clay layer). Therefore, both the silty sand and clay layers act as confining units and likely inhibit the downward movement of COCs from shallow groundwater to deeper groundwater. Furthermore, an upward vertical gradient was observed between the shallow and deep zones, which would also impede the potential downward vertical migration of COCs.

In support of this RFI report, a synoptic round of water level measurements was collected in July 2007. The results are presented in Figure 4.41-1 in Section 4.0 as a ground surface elevation map. As shown, groundwater in the overburden flows in two directions at the facility. In the eastern portion, groundwater flows

east-northeasterly toward Luyster Creek, while in the western portion there is a northwesterly flow toward the East River. This is consistent with historic groundwater flow directions. Refer to Section 4.41 for a more detailed discussion of groundwater flow and characterization results.

3.5 Local Groundwater Use

Historically, groundwater supply systems were developed for the Queens and Kings Counties in the 1880s. By 1947, however, severe salt-water encroachment had occurred in many of these areas due to excessive groundwater pumping. By this time, the public groundwater supply in Kings County (Brooklyn) had been replaced by the New York City municipal water supply, which is derived primarily from surface water reservoirs in upstate New York. By 1974, only one water supply company (the Jamaica Water Supply Company) continued to pump groundwater in Queens County. According to the 1996 New York City Drinking Water Supply and Quality Statement, on May 30, 1996, New York City assumed ownership and operation of the groundwater supply and distribution system in southeastern Queens, formerly operated by the Jamaica Water Supply Company. The New York Department of Environmental Protection (NYDEP) reports that 13 wells from the former Jamaica Water Supply Company network are currently pumping in Queens County. As of July 2002, the pumping rate was 16.4 MGD. These wells are more than two miles from the site.

Groundwater in the vicinity of the Astoria facility is not used for drinking water purposes. Residents of the area are connected to the New York City public water supply system.

3.6 Potential Receptors

Potential receptors have been identified within the immediate area of the Astoria facility and are briefly summarized below. All information is based on previous assessment and reports. This RFI document focuses on the nature and distribution of site conditions, without additional analysis of potential receptors or impacts.

Site Workers – On-site Con Edison workers are potential receptors to contaminants found in the site media. In addition, people using the athletic fields on the southeastern abutting property (currently leased to the Federation of Italian-American Organizations of Queens and the Immaculate Conception Youth Organization) are potential receptors. These fields consist of approximately 384,000 square feet of land and are located east of the Main Gate entrance to the site.

Potential Downgradient Receptors – The nearby community includes workers at the NRG Energy property (Astoria Gas Turbine facility), US Power Gen (Astoria Generating Station and the Fuel Oil Tank Farm), and the New York Power Authority (NYPA) property. For ease of reference when viewing prior reports, note that US Power Gen was formally Reliant Energy. Based on conversations with the NYSDEC during the April 2002 Site Strategy meeting, it was suggested that workers at these properties downgradient of the Con Edison facility should be considered potential users of the groundwater. However, no one on these properties uses the groundwater for drinking or industrial purposes. Therefore, potential exposure to groundwater at these downgradient locations is limited to the worker who may occasionally be exposed to groundwater during subsurface maintenance activities.

Luyster Creek – Luyster Creek is a drainage channel that borders the southeastern edge to the ConEdison property. Surface water runoff from the southeastern portions of the facility flows into that creek, which eventually discharges into the East River northeast of the property.

East River – The site is bordered to the west, north, and northeast by the East River. Although local surface waters are classified as suitable for recreational boating and fishing, few recreational activities occur on the East River and other New York City area waters because of the highly industrialized nature of the area. A total of 51 fish species have been identified in the East River in the vicinity of the site. Two types of benthic habitat exist near the site; approximately 47 species were taken during a study conducted by Metcalf & Eddy (1982) as described in the Phase I RFI Report. The Metcalf & Eddy Study found 46 phytoplankton and zooplankton species as well as 62 periphyton organisms near the site. Three fish species are taken by recreational

fisherman from the East River near Astoria. Several commercially-important shellfish resources exist in the East River in the region of the site. However, these are not harvested for human consumption, due to regulation that prohibits commercial harvesting of shellfish from certain areas.

As part of the Phase I RFI, a risk assessment on groundwater was performed. Site-specific groundwater screening levels for groundwater flowing to the East River were also developed in accordance with the methodologies of the USEPA Soil Screening Guidance. In all cases where groundwater flows to the East River, dissolved-phase constituent groundwater concentrations were below groundwater site-specific soil screening levels (SSLs), indicating that the constituents present in groundwater did not pose an unacceptable risk at the receptor location.

4.0 Site-Specific Characterization of Individual Study Areas

This section provides the site-specific characterization of 41 individual AOCs, SWMUs, and spills (generally referred to as "study areas" for simplicity). Refer to Table 2-1 for a comprehensive listing. As introduced in Section 2.0, the RFA/RFI program has been ongoing for approximately 14 years. The investigatory programs have been sequential to continually improve the level of characterization for each of the study areas. Investigations leading up to the Phase IID RFI program have been captured and documented in prior reports (refer to Section 2.0, Facility Description and Investigation History, and list of references in Section 6.0). Because the Phase IID RFI results have not yet been documented, this section provides more detail relative to that particular program. Despite the increased detail presented for the Phase IID RFI program, equal weight is given to all available investigatory data used to view the overall characteristics of each particular study area.

For reference, copies of geologic and well construction logs from the entire 14-year RFI program are provided in Appendices A and B, respectively. Other field records (e.g., chain-of-custody documentation, groundwater sample collection records, etc.) are provided only for the Phase IID program, as other prior reports archive similar field records for the prior investigatory programs.

The Phase IID RFI characterization was consistent with the work plan for that phase of activity (ENSR, 2002) and discussions with the NYSDEC relative to program execution. As appropriate, each study area discussion includes an evaluation of data collected relative to the work plan. The Phase IID program spanned approximately five years (2002 through 2007) and was sequential to optimize the data-collection efforts and complete the characterization of each designated study area.

With over 200,000 data records estimated, a streamlined approach is used herein to present the characterization information. For each study area, there are figures that display the total VOCs, SVOCs, PCBs, and lead detected in soil, which have been the parameter groups historically associated with the Astoria property. These figures assist in quickly viewing which portions of the study areas are most impacted. For parameter-specific figures, a pre-screening of data against Restricted Industrial Soil Cleanup Objectives (RSCOs) was performed as an initial point of reference. These standards have not been designated for use at the Astoria facility, but they do provide a reasonable set of comparative values to focus the evaluation of each study area. For reference, these standards are provided in NYSDEC regulations effective December 14, 2006, under 6 NYCRR Part 375-6, Table 375-6.8(b). Refer to Section 5.2 for a more detailed discussion of the RSCO standards and the rationale for recommending the restricted industrial set of standards for the Astoria facility. It should be noted that the NYSDEC regulations stipulate a comparison soil depth of 0-15 feet. However, because the pre-screening process presented in this section is only intended to identify those parameters that warrant further attention, all soil data (regardless of depth) is included for comparison.

Table 2-7 provides a list of those parameters that exceed these standards in 10 or more soil sampling locations, which consists of cPAHs, PCBs and metals. Table 2-7 provides a list of other parameters of note that exceed these standards in less than 10 locations, which consist of VOCs, non-cPAHs and metals. SVOCs (other than PAHs) do not exceed these standards. In addition to these target parameters, some of the areas included an asbestos evaluation and hazardous waste identification. That analysis was intended to be archived for future use in the event that the RFI/CMS process would include soil excavation and waste management (i.e., transportation and disposal). The information is not used to characterize the soil or groundwater conditions associated with the specific study areas.

This remainder of this section is organized by study area. Soil is the primary focus of the first 40 study areas presented. Groundwater is viewed on a facility-wide basis, presented as the 41st study area in this section. Tables and figures associated with each study area are sequenced in parallel with the text to facilitate the presentation. For example, characterization of the East Yard SWMU is presented in Section 4.1, with a

supporting series of tables labeled as "Table 4.1-1, 4.1-2, 4.1-3, etc." and figures labeled as Figure 4.1-1, 4.1-2, 4.1-3, etc."

4.1 East Yard SWMU

The East Yard SWMU is located in the south-central portion of the facility north of the Transformer Shop (Bldg. #82). It was initially investigated in 1994 to assess site conditions due to former waste management activities. Periodic monitoring well gauging continued from 1993 through the present. Additional site characterization activities were completed as part of the Phase IID RFI program in 2007.

4.1.1 Site Description

The East Yard is used for storage of construction materials such as miscellaneous electronics parts, transformers and cables, as well as various wastes (discussed below). The yard occupies an open area approximately 400 x 600 feet and is covered with asphalt, concrete, and gravel (refer to Figure 4.1-1). Surficial soils encountered during drilling consisted primarily of fine-to-medium sand, with lesser quantities of gravel, cinder, and clinker, coal and coal ash. Groundwater is generally present at a depth of approximately 7 feet and flows northwesterly towards the East River.

Historical information concerning waste management activities within the East Yard is available for the period after 1960, although it was operational prior to that date. The East Yard has been used to store a variety of solid wastes, some of which contained PCBs. There have been no recorded spills within the East Yard.

Hazardous waste storage consists of 90-day storage of solid and liquid wastes (frequently classified as hazardous waste based on the presence of PCBs), as well as lead, benzene and cadmium. The East Yard is also used for the storage of non-hazardous waste oil (e.g., motor oil and hydraulic oil), paints, and asbestos waste. Other materials stored or temporarily staged at the East Yard include new transformers, old and reconditioned distribution transformers, pole-type transformers, bushings, and other miscellaneous electronics parts and cables.

4.1.2 Site Geology and Subsurface Observations

Through observations during the RFI investigations, this area mostly consists of sand, trace amounts of small gravel, silt, coal ash and coal slag. Silt was generally present at deeper horizons (7 feet) with traces throughout the boreholes in the area. Coal ash and slag was recorded in most areas of the East Yard study area. At a depth of 2-3 feet, cinder was apparent at sample location E03. Also at E03, a petroleum odor was detected and the headspace readings for total organic vapors were relatively high, starting at 198 ppm towards the surface, 605 ppm 2 inches below that point, 558 ppm 6 inches just below that, and 448 ppm of organic vapors at a depth of 2.5 feet. The geologic logs from Appendix A provide observational and quantitative information regarding this site.

4.1.3 Summary of Previous Investigations

The East Yard was first investigated during the RCRA Facility Assessment (RFA) in 1994. The investigation was focused on the presence of potential site impacts that may have resulted from decades of site operation. The 1994 investigation included an extensive soil sampling program. A total of 30 soil samples were collected from various locations at various depths and were analyzed for VOCs, SVOCs, PCBs, lead, chromium, and mercury. In addition, a 21-point PCB screening program was executed for shallow and near-surface soil, using immunoassay field screening kits.

Results of the 1994 investigation were interpreted to reveal relatively low concentrations of VOCs, SVOCs and metals, but relatively high concentrations of PCBs (quantified in the subsections below). The NYSDEC had previously issued concentration guidelines in 2000 specific to the North Storage Yard, which is adjacent to the East Yard (refer to discussion in Section 3.36). Those guidelines were used during the East Yard site

investigations as a general guideline to sequentially characterize the area. For reference, the North Storage Yard guidance concentrations were established for three parameter groups: cPAHs (10 mg/kg), PCBs (25 mg/kg) and lead (10 mg/kg total lead; 900 mg/kg, provided the TCLP limit is not exceeded).

Total cPAHs did exceed the North Storage Yard concentration guideline and were generally consistent with cPAH concentrations found across the Astoria facility. This finding indicated that the presence of cPAHs was likely the result of historic site-wide industrial filling activities rather than the result of site-specific operational impacts. The concentration of PCBs exceeded the North Storage Yard guidance concentrations, exhibiting the highest concentration of between 1,000 and 2,500 mg/kg in soil collected from 0-3 feet at locations E05 and E15.

During the 2002 site strategy meeting with the NYSDEC, it was determined that additional soil sampling was necessary to further characterize the level and extent of PCB impacts. Con Edison and the NYSDEC considered whether further groundwater characterization was necessary, based on the historic (1996) measurement of 0.02 feet of LNAPL in monitoring well N02. Because the measurement was not repeated in subsequent gauging events, minimal action was determined to be necessary. The decision was to further characterize groundwater downgradient of that location.

4.1.4 Phase IID Investigation

Based on the findings of the 1994 Phase I RFI, subsequent LNAPL gauging, and the 2002 site strategy meeting, the following objectives were established for the Phase IID RFI program:

- Characterize PCB impacts in soil, specifically in the vicinity of prior sampling locations E05 (in the south-central portion of the yard) and E15 (in the northeastern portion of the yard); and
- Evaluate groundwater quality downgradient of monitoring well N02 (near the northeastern corner of the adjacent North Storage Yard).

To achieve these objectives, four soil borings were advanced in the vicinity of prior location E05, and five soil borings were advanced in the vicinity of E15 (refer to Figure 4.1-1). In addition, two soil borings, E05A and E15A, were installed immediately adjacent to E05 and E15, respectively, to assess the reproducibility of the previous concentrations of PCBs detected in soils from these locations. The depth of soil samples extended to approximately 6-7 feet. Soil samples were collected for analysis from surficial soils (approximately 1-2 feet) and near the maximum extent of boring (approximately 5-6 feet) in all 11 Phase IID RFI locations. Following sample collection, each boring was backfilled with clean sand and restored at the surface with the material that matched the adjacent surface (i.e., gravel, concrete or asphalt).

Soil samples from the 11 borings were analyzed for PCBs. Additionally, the soil samples from three of the five soil borings (E29, E31 and E34) advanced adjacent to E05 in the southern portion of the yard were also analyzed for VOCs and PAHs, and soil from one of these borings (E29) was analyzed for TPH fingerprint analysis. To evaluate groundwater quality downgradient of well N02, groundwater samples were collected from well N08, located in the northeast corner of the North Storage Yard, for analysis of PCBs, VOCs and SVOCs.

4.1.5 Cumulative Site Characterization Findings

Based on the prior investigations, supplemented by the recently-completed Phase IID RFI program, the East Yard has been sufficiently characterized to understand the general nature and distribution of impacts from prior and ongoing operations. The series of Tables 4.1 and Figures 4.1 present the comprehensive database of information compiled for the East Yard with specific observations presented as follows.

Review of the boring logs from the East Yard borings indicate that soils consist primarily of fill material. The presence of coal ash was noted in two borings adjacent to E05 (E25 and E27) and four borings adjacent to E15 (E29, E30, E31 and E32).

An overview of soil analytical data is presented in Table 4.1-1. As shown on the pie chart symbol on Figures 4.1, most parameter groups analyzed in East Yard soil were detected to some extent. The general levels of detected concentrations are shown in the subsequent portion of Figures 4.1. Soil samples collected from the vicinity of boring E15 reveal total VOCs < 1 mg/kg, total SVOCs from 10-100 mg/kg (borings E31 and E34) and from 100-1,000 mg/kg (boring E29), and PCBs from <1 mg/kg to 10-100 mg/kg (boring E30).

Specific parameters detected in the soil samples were compared to NYSDEC's RCSO standards. Based on this comparison, only five cPAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3,-cd)pyrene) and total PCBs exceeded their respective standards. As shown on the depth-specific set of Figures 4.1, the highest concentrations of cPAHs and PCBs are in the shallowest soil samples, collected from depths of less than 6 feet. The highest detection of PCBs was in E05 from 5-6 feet at a concentration in the vicinity of 2,000 mg/kg.

Further action is recommended for this area, based on the PCB impacts to soil in the central portion of the study area. The PCB impacts distinguish this area from the nearby Astoria East Substation Spill Area, which is attributed to impacts from cPAHs.

4.2 Purge Oil Pump House Spill Investigation Area

The Purge Oil Pump House is located in the far northwestern portion of the Astoria property and extends northward to areas adjacent to the East River. The Pump House was initially investigated in 1994 to assess site conditions in the vicinity of the purge oil tanks. Additional characterization of the Pump House area was conducted as part of the Phase IIC RFI in 1997 and 1998, and additional site characterization activities were completed as part of the Phase IID RFI program in 2006.

4.2.1 Site Description

The former Pump House was historically used for underground storage of various waste oils generated at the Astoria property. The AOC consists of an area of approximately 425 x 500 feet, primarily paved in asphalt and surrounded by gravel. Surficial soils encountered during drilling consisted of fine sand and silt, with some gravel, coal ash, and wood fragments (fill). Groundwater is generally present at a depth of 7 feet and flows north towards the East River.

Three separate spill incidents were recorded at the former Pump House. An unknown (unrecorded) quantity of unspecified oil (most likely purge oil) was released on May 5, 1987 (Spill No. 46C). Purge oil was released on May 23, 1989 (Spill No. 41) and again on March 29, 1990 (Spill No. 38). The specific quantities of those two releases were also not known (not recorded).

The former purge oil tanks included two steel 25,000-gallon USTs, installed in the mid-1930s and excavated and removed during March of 1998. The purge oil USTs were located in the southwestern portion of the AOC, immediately north of the Pump House. Historically, the two tanks managed approximately 200,000 gallons of waste oil per year. This waste oil included a mixture of No. 2 fuel oil, kerosene, waste lubricating oil (from power plants), non-PCB transformer oil, and relatively small amounts of waste dielectric fluid (from electric cables). The tanks were cylindrical, steel-riveted, and encased in concrete.

During tank removal activities in 1998, an oily sheen was observed on the groundwater, collecting in one of the tank excavations. This observation was reported to the NYSDEC (Spill No. 41), and the Pump House was identified as a SWMU requiring additional RFI activities.

4.2.2 Site Geology and Subsurface Observations

The area in the vicinity of the Purge Oil Pump House exhibits a general sediment-type composition that includes silt, sand, trace amounts of gravel, coal ash and coal slag. The coal ash and slag was present at all depths in almost all of the boring locations. A strong "MGP-type" odor was reportedly present in many areas at various depths. The odor started to appear at a depth of approximately 5 feet at sample locations F55, F56, Y133 and Y18. Location Y18 showed headspace readings ranging from 69.5 to 223.3 ppm of organic vapors. As the drilling approached 7 feet, the odor continued at Y133, and was encountered in additional locations at that depth, including sample locations Y56, Y16, Y17, Y21, Y22, Y23, Y318, Y319 and Y55. As the depth of drilling progressed, a variety of sample locations exhibited increasing headspace readings as well. Specifically, sample location F56 exhibited a headspace reading of 613 ppm at 8 feet, sample location F17 exhibited a reading of 338 ppm at 10 feet, and sample location F17 exhibited a reading of 693 ppm at 11 feet. At sample location Y21, the headspace reading decreased with depth, from 510 ppm at 11 feet down to 217 ppm at 12 feet. Sample location Y55 exhibited headspace readings as well, from a depth of approximately 13 feet below surface, where it reached 230 ppm, through the bottom of the borehole. For more detail on specific results and measurements in this area, refer to Appendix A, which contains the geologic logs.

4.2.3 Summary of Previous Investigations

During the Phase IIC RFI program, potential impacts to soil and groundwater were investigated in the areas of three prior spills and the former location of the purge oil tanks. In addition, LNAPL was observed floating on water within a feeder vault just east of the former Pump House. The possible sources of the LNAPL in and around the feeder vault were also investigated during the Phase IIC RFI.

Temporary groundwater monitoring and gauging wells (K-series wells) were installed during the Phase IIC RFI to assess the extent of LNAPL in the vicinity of the spills and the feeder vault. Soil samples were also collected from several of these well locations for analysis of VOCs, SVOCs, PCBs, and TPH-fingerprinting. Additionally, two permanent monitoring wells (F06B and F32) were installed approximately 250-350 feet north-northeast of the Pump House to assess downgradient groundwater quality.

Following completion of the Phase IIC RFI, it was concluded that the soil had been impacted and that LNAPL was present in each of the three spill AOC areas. During April 2001, Con Edison implemented an ICM program to monitor and remove LNAPL at applicable temporary well locations including K46, K55, K56, K101, K103, and K108 located in the immediate vicinity of the Pump House; no such activates were conducted on the westerly-adjacent NYPA property. The ICM program is currently ongoing.

4.2.4 Phase IID Investigation

Based on the data evaluation completed at the Site Strategy meeting in April 2002, the following objectives of the Pump House Phase IID characterization were established:

- Evaluate the extent of cPAHs in soil at temporary well locations K53 and K55 (northeast and north of the Pump House, respectively);
- Assess groundwater quality downgradient (off-site) of the Pump House; and
- Determine the extent of LNAPL north of K107 (east of the Pump House).

To evaluate the extent of elevated concentrations of cPAHs in soil detected previously at RFI Phase IIC sampling locations K53 and K55, three soil borings (Y151 through Y153) were advanced, as shown in Figure 4.2-2, to the water table. Surface soil (0-2 feet) and shallow subsurface soil (1-2 feet above the water table) samples were collected for laboratory analysis of PAHs.

Monitoring well F86 was installed downgradient of the Pump House, on the adjacent NYPA property, and groundwater samples were collected for laboratory analysis of the full suite of analyses – VOCs, SVOCs, PCBs, and Appendix IX metals.

4.2.5 Cumulative Site Characterization Findings

Based on the prior investigations supplemented by the recently-completed Phase IID RFI program, the Pump House has been sufficiently characterized to understand the general nature and distribution of impacts from prior operations. The series of Tables 4.2 and Figures 4.2 present the comprehensive database of information compiled for this area.

A review of the boring logs from the Pump House area indicates that the soils consist primarily of fill material, including coal slag, coal ash, and bricks. An overview of soil analytical data is presented in Table 4.1-1. As shown on the pie chart symbol on Figures 4.1, most parameter groups analyzed in soil were detected to some extent. The general levels of detected concentrations are shown in the subsequent portion of Figures 4.2. Soil samples collected from the vicinity of borings K53 and K55 reveal total VOCs < 1 mg/kg, total SVOCs from 10-100 mg/kg (borings E31 and E34) and from 100-1,000 mg/kg (boring E29), and PCBs from <1 mg/Kg to 10-100 mg/Kg (boring E30).

LNAPL was observed in the area of the Pump House and is periodically gauged as part of the ongoing ICM program at the Astoria facility. Refer to Section 4.41 for an evaluation of facility-wide groundwater.

The Pump House exhibits a localized area with PCB impacts; no soil impacts are present in surrounding areas. LNAPL is present in the subsurface southwest of the impacted soil area. Further action is recommended for the soil and nearby LNAPL.

4.3 Blue Dog Lake

Blue Dog Lake is a small pond (approximately 150 feet x 150 feet) located in the southern portion of the Pipe Yard (refer to Figure 4.3-1, Blue Dog Lake site plan). It was initially investigated as part of the Phase I in 1999 to assess site conditions due to former liquid waste discharge and collection in the pond. Additional characterization of this area was conducted as part of the Phase IID RFI program, including the collection of soil, sediment, surface water and groundwater samples.

4.3.1 Site Description

Blue Dog Lake is located in the southern portion of the Pipe Yard (refer to Figure 4.3-1). Based on a review of historical maps and aerial photographs, Blue Dog Lake appears to have formerly extended further north than its present boundary. Facility employees report that the former northern portion of the pond was filled with dredged material from the other portions of the pond. The figures presented in this report present both the current and historic pond boundary. Samples encompassed both areas.

A 1961 insurance map indicates a concrete pad as the “Flush Truck Cleaning Area” on the south side of the lake. This property use was confirmed during employee interviews, which indicated that Blue Dog Lake received waste from "flush trucks," and that “flush trucks” were vehicles dedicated to flushing various manholes and confined spaces in the Con Edison system to allow maintenance and repair activity. Employees also reported that a storm drain formerly discharged into the pond from the East Yard, and that large concrete and/or steel vaults, formerly located in the Pipe Yard immediately north of the pond, were used to accumulate waste oils prior to removal off-site by a vendor.

4.3.2 Site Geology and Subsurface Observations

The Blue Dog Lake area is comprised of sand, silt and clay. At sample location Y154, there was a presence of coal tar “globules” from 2-4 feet in depth, accompanied with an elevated headspace reading of 188 ppm of

organic vapors and a “naphthalene-type” odor. Also, sample location Y155 had a slight odor as well as a reported petroleum sheen in the first 2 feet of the boring. This observation was followed by evidence of tar and petroleum staining at 4 feet, along with a headspace reading of 138.5 ppm of organic vapors. Refer to the geologic logs provided in Appendix A for a full description of observations and measurements.

4.3.3 Summary of Previous Investigations

As shown in Figure 4.3-2, samples were collected in the 1994/1995 timeframe from the current location of the pond. In the 2005/2006 timeframe, the extent of characterization was expanded to encompass a broader area and to complete the characterization of the historic location of the pond.

Initially, soil samples were collected as part of the Phase I RFI program from the immediate vicinity of Blue Dog Lake. A total of 14 soil and sediment samples were analyzed for VOCs, SVOCs (including cPAHs and non-cPAHs) and PCBs. Based on the Phase I data (primarily the detection of cPAHs and PCBs), the extent of characterization was expanded vertically and horizontally beyond the pond itself.

This particular study area was specifically discussed with the NYSDEC during the April 2002 site strategy meeting previously referred to. Total cPAH concentrations in soil exceeded the NYSDEC recommended comparison value of 10 mg/kg being applied as a point of reference at that time --- specifically, soil samples collected from locations Y04 and Y05 (along the northwestern and southern margins of the pond) and F26 (along the northern perimeter of the pond). PCBs did not exceed the 25 mg/kg comparison value being applied at that time. VOCs were detected, but were not considered to be an issue of high significance at the site. During the site strategy meeting, it was determined that additional sampling was necessary to delineate PAHs, as well as continued analysis of VOCs and PCBs to verify site conditions.

4.3.4 Phase IID Investigation

Based on the findings of previous investigations and the site strategy meeting referenced above, the following six objectives were identified for the Phase IID RFI program.

- Assess the vertical extent of PCBs in soil at former Phase I sampling locations Y03 and Y04;
- Assess the extent of BTEX- and cPAH-impacted soil north of former Phase I RFI sampling location F26;
- Visually define the presence/absence of sludge outside the current boundary of the pond;
- Evaluate potential ecological issues posed by the sediments within the pond, including an evaluation of sediment and surface water quality;
- Calculate the localized groundwater flow direction in the vicinity of the pond; and
- Assess general groundwater quality in the vicinity of the pond.

To address the first objective above, soil borings Y30 and Y31 were advanced immediately adjacent to Y03 and Y04. Four soil samples were collected from the vicinity of location Y30, and four soil samples were collected from the vicinity of location Y31. The samples were analyzed for PCBs.

To further evaluate BTEX and cPAH soil conditions in the area of former Phase I RFI sampling location F26 (north side of the lake, and former concrete and/or steel vault location), three soil borings (Y32, Y33, and Y34) were installed, and soil samples were collected and analyzed for BTEX, PAHs and PCBs.

The presence/absence of sludge was visually defined outside the current boundary of the pond. To assess the potential for soil impacted by sludge (specifically PAHs and PCBs), two deep borings/permanent monitoring wells (F52 and F53) were installed outside the observed sludge covered areas (refer to Figure 4.3-1).

To further evaluate the extent of possible buried sludge, eleven additional soil borings (Y30 through Y40) were installed, as shown on the set of Figures 4.3. Drilling and exploration continued to the saturated zone to visually determine the presence/absence of buried sludge. If sludge was observed in the initial boring, "step-out" (more distant) borings were completed until no further visual evidence of sludge was observed. Potential impacts to groundwater quality were assessed, based upon the analytical data (i.e., VOCs, SVOCs, and PCBs).

Potential ecological impacts were assessed by collecting sediment and surface water samples directly from the current pond. Two sediment locations (Y154 and Y155) were sampled using a sediment coring device (Vibracore™). Sediment samples were collected up to 5 feet deep at both locations and analyzed for VOCs, SVOCs, PCBs and metals. Two surface water samples (SW-1 and SW-2) were collected from opposite ends of the pond and analyzed for VOCs, SVOCs, PCBs and metals, as well as physical parameters, if needed for subsequent ecological evaluation, including pH and total suspended solids (TSS). A wetland scientist/ecologist also toured the pond and surrounding area to evaluate the presence of ecological receptors in relation to potentially ecological issues.

4.3.5 Cumulative Site Characterization Findings

Based on the prior investigations supplemented by the recently-completed Phase IID RFI program, Blue Dog Lake has been sufficiently characterized to understand the general nature and distribution of impacts from prior and ongoing operations. The series of Tables 4.3 and Figures 4.3 present the comprehensive database of information compiled for the site. A discussion of specific observations follows.

As shown on Figure 4.3-5, total VOCs in soil ranges were detected in the 100-1,000 mg/kg range in location F26 on the northern edge of the current pond location, as well as at borings Y33 and Y312, further away from the pond and closer to the Cable Storage and Pipe Yard operational areas. All other areas sampled revealed lower concentrations of total VOCs at values less than 100 mg/kg. As shown in Figure 4.3-10, total VOCs in sediment and surface water were well characterized. The highest concentrations of VOCs in sediment were in the central (deepest) area of the pond, at ranges approaching 1,000-3,000 mg/kg. VOC concentrations dissipated from there outward to the edges of the pond. Relatively low concentrations of VOCs were detected in surface water, with total VOC values in the 1-10 ug/kg range in both samples. None of the individual VOC parameters exceeded their respective RSCO standard in any of the matrices analyzed (refer to Table 4.3-1).

Total SVOCs (including cPAHs and non-cPAHs) were detected, ranging from 10 to 10,000 mg/kg (refer to Figure 4.3-6). The majority of SVOCs were detected in boring Y312, which is far south of the pond and within the Cable Storage Yard operational area. As shown in Figure 4.3-11, the maximum total SVOCs in sediment were in the 10,000-40,000 mg/kg range, with surface water concentrations in the 1,000-5,000 ug/L range. As shown in Table 4.3-1, many of the individual SVOC parameters exceeded their respective RSCO standards. Individual cPAH exceedances included all seven cPAH parameters analyzed, with maximum values in sediment sampling location boring Y154 at a depth of 2-4 feet. The highest detected cPAH was chrysene, at a concentration of 850 mg/kg. Non-cPAH parameters exceeded their respective RSCO standards as well. Similarly, Y154 sediment at 2-4 feet yielded the highest non-cPAH concentration, with naphthalene being the highest individual parameter at 13,000 mg/kg. One SVOC other than the PAHs was detected above its respective RSCO standard. The aromatic compound 1,4-dichlorobenzene (570 mg/kg) in sediment collected from Y154 at 2-4 feet exceeded the RSCO standard of 250 mg/kg.

PCBs were most prevalent in the immediate vicinity of the pond, particularly at the northern edge, as shown in Figure 4.3-7. Total PCB concentrations were in the vicinity of 100-500 mg/kg in some locations. As shown in Table 4.3-1, the highest concentration of PCBs was detected in boring Y154 sediment from 0-2 feet deep, at an estimated concentration of 500 mg/kg.

Of the metals analyzed, arsenic and lead exceeded their respective RSCO standards. Arsenic was detected at a maximum concentration of 17.6 mg/kg in sediment collected from 2-4 feet deep at boring Y154. Lead was detected at its maximum of 9,860 mg/kg in sediment collected from boring Y155 at a depth of 2-4 feet.

Based on these results, the characteristics of Blue Dog Lake are fairly well understood. There appears to be elevated levels of cPAHs, non-cPAHs, other SVOCs, PCBs, arsenic and lead in sediment and soil within the study area. In summary, the cPAHs are the primary constituents of concern. Further action is recommended.

4.4 Former Pond Area

The Former Pond Area encompasses Spill No. 69 (categorized as a separate study area) and the approximate location of a former retention pond in the north-central portion of the facility. Some of the coal tar seeps (also captured as a separate study area) transect the southwestern portion of the Former Pond Area.

4.4.1 Site Description

The Former Pond Area is just north of the Pipe Yard. It is in an open, grassy field (refer to Figure 4-4.1). Geophysical data obtained during the Phase I RFI indicated that the estimated size of the Former Pond was approximately 75 x 250 feet. Based on historical photographs, the original elevation of the pond was approximately 15 feet below its current level. Site development, the filling of low-lying areas, and erosion all contributed to the increase in site elevation. No spills have been recorded in the area.

4.4.2 Site Geology and Subsurface Observations

The area in the vicinity of the Former Pond exhibits a general composition of brown-to-black sand, silt and traces gravel, with coal ash and slag present in certain areas. Generally, the larger pieces of gravel were observed deeper in the boring locations. In certain areas, coal slag and tar were present in areas down to 10 feet below the surface. Many areas reported an “MGP-type” odor below a depth of 4 feet. Most areas that did exhibit an odor had reports of that odor being continuous throughout the borehole. The areas where odors were most prevalent include sample locations F55, Y133, Y18, Y17, Y21 and Y55. Many areas had elevated headspace readings of organic vapors as well. Sample location F55 had headspace readings ranging from 125-564 ppm. Location F17 also showed high headspace readings throughout its boring past 10 feet, ranging from 158-693 ppm. Other locations that showed high headspace readings throughout their respective boreholes were sample locations Y18, Y55 and Y21. For a full description concerning the Former Pond study area refer to Appendix A, which provides the geologic records.

4.4.3 Previous Investigations

During the Phase I RFI, eight borings (Y16 through Y23) and one monitoring well (F17) were advanced within and immediately surrounding the estimated location of the Former Pond. Soil samples were collected from these locations at various depths above and below the water table and analyzed for VOCs, SVOCs and PCBs. Based on the Phase I RFI findings, no further action was necessary relative to characterizing VOCs and SVOCs in soil. However, there was evidence of PCB impacts in the vicinity of sampling location Y22 (refer to Figure 4.4-2), thereby necessitating follow-up sampling as part of the Phase IIB RFI program.

During the Phase IIB RFI, 16 temporary wells were installed in and around the Former Pond to investigate PCBs. During the investigation, LNAPL was detected in some of the temporary wells during June 1997. In response, samples of the LNAPL were collected from wells A17 and A22 for analysis of PCBs and TPH-fingerprinting. The sample results indicated that the LNAPL at location A17 was similar to No. 2 fuel oil, with a PCB concentration of 120 milligrams per liter (mg/L), while the LNAPL at location A22 was similar to No. 6 fuel oil, with a PCB concentration of 21 mg/L. An ICM was implemented during 2001 to periodically monitor and recover the LNAPL in three wells (A17, A22, and F17) for the Former Pond Area.

Further evaluation was conducted and discussed during the 2002 NYSDEC strategy session. Total cPAHs exceeded the NYSDEC-recommended level of 10 mg/kg (which was considered applicable at that time) at seven locations (F17, Y16, Y17, Y18, Y21, Y22, and Y23). Elevated concentrations of BTEX (greater than 100 mg/kg) were detected at four locations (F17, Y17, Y21, and Y22). PCBs exceeded the recommended level of 25 mg/kg (also considered applicable at that time) at four locations (F17, Y18, Y22, and Y23). Additional review of the data revealed that some of this data was from below the water table during the time of sample collection. PCBs in the western, southern and northern areas were considered delineated, but PCB characterization of the eastern area was unclear. The depth of soil characterization for PCBs and the other parameters (primarily VOCs and cPAHs) was considered to be adequate, based on the samples extending into the water table. However, groundwater characterization was necessary.

4.4.4 Phase IID Investigation

During the April 2002 site strategy meeting with the NYSDEC, it was determined that the issue of elevated contaminant concentrations beneath the water table at the Former Pond should be assessed through the completion of an assessment of the groundwater quality downgradient of the Former Pond. In addition, the eastern extent of PCB impacts (specifically, soil conditions east of location Y23) would need to be better delineated. It was also agreed that LNAPL delineation was adequate during the Phase IIB RFI; no further LNAPL sampling or analysis was required. Because sludge remained in the pond at that time and could have been a potential source of contamination, it was agreed that the sludge would be delineated as well. In summary, the stated objectives for the Phase IID RFI at the Former Pond Area were to:

- Assess groundwater quality downgradient of the Former Pond;
- Delineate the eastern extent of PCBs in soil beyond Y23; and
- Characterize the pond sludge.

4.4.5 Cumulative Site Characterization Findings

As shown in Figure 4.4-2, samples within the footprint of the pond and its immediate vicinity were collected as part of the earlier investigation phases in the 1994-1996 timeframe. Samples extending further to the north and east were collected during the Phase IID program in the 2004-2006 timeframe. Parameters analyzed in soil included the targeted PCBs and cPAHs, as well as VOCs, other SVOCs and metals. Refer to Figures 4.4-3 and -4 for parameters analyzed and detected in soil at the Former Pond Area.

VOCs were reported, primarily in samples collected from directly within the Former Pond. Figure 4.4-5 shows sample location F17 with a total VOC range in the vicinity of 100-1,000 mg/kg. Other locations in the area revealed much lower total VOC concentrations in the 1-100 mg/kg range. None of the VOCs exceeded their respective RSCO standards.

The distribution of total SVOCs (refer to Figure 4.4-6) was generally in the 100 mg/kg range, with the highest total concentration at sample location F17. Most of the individual cPAHs analyzed in the Former Pond Area exceed their respective RSCO soil standard. Samples collected in and adjacent to the pond appear to have the maximum concentrations of the cPAHs that exceed RSCO standards, such as sample locations Y21 (140 mg/kg benzo(k)fluoranthene), Y22 (1.7 mg/kg dibenz(a,h)anthracene) and Y23 (47 mg/kg benzo(a)anthracene). One non-cPAH (naphthalene) exceeded its RSCO standard, with 1,200 mg/kg detected at sample location Y17. No other SVOCs exceeded their respective RSCO standards in soil.

PCBs in soil exceeded their RSCO standards as well. Coincidentally, the RSCO standard for total PCBs is 25 mg/kg, which is the same as the preliminary concentration guideline identified for the North Storage Yard remediation program in 2000. The maximum detected values were directly in the Former Pond Area. Location Y23 exhibited the maximum PCB concentration in site soil, with a reported concentration of 32 mg/kg at a depth of 15-17 feet.

LNAPL was observed in the vicinity of the pond area and is periodically gauged as part of the ongoing ICM program at the Astoria facility. Refer to Section 4.41 for an evaluation of facility-wide groundwater.

Based on the residual PCBs and PAHs within the Former Pond Area, combined with the presence of LNAPL northeast of the pond, further action is warranted. Grouping the Former Pond Area with the overlapping Spill No. 69 area was considered. However, although some similarities exist between the Former Pond and Spill No. 69 datasets, they are different enough to keep separated for follow-up evaluation. The depth of soil impacts at the pond area is greater than the Spill No. 69 area. Additionally, there are more parameters that exceed RSCO standards, and their concentrations are higher at the pond area.

4.5 Former 25,000 Gallon PCB Waste Oil Tanks

The former 25,000-Gallon PCB Waste Oil Tanks were located in the central portion of the Astoria facility within the Pipe Yard north-northwest of Blue Dog Lake. These tanks were removed at some time prior to 1986, and no information regarding confirmatory tank closure sampling activities was available from facility personnel. Initial characterization of the former 25,000-gallon PCB Waste Oil Tank Area was conducted as part of the Phase I RFI in 1995, and additional site characterization activities including soil and groundwater sampling were completed as part of the Phase IID RFI program in 2005 and 2006.

4.5.1 Site Description

Historical information pertaining to the former 25,000-Gallon PCB Waste Oil Tanks is limited. According to the RFI Preliminary Review/Visual Site Inspection (PR/VSI) Report, these two underground storage tanks were cylindrical steel tanks, each with a capacity of 25,000 gallons. These tanks are considered one of the several subunits of the Pipe Yard SWMU, and were situated north-northwest of Blue Dog Lake underneath at-grade mounts (refer to Figure 4.5-1). The ground cover in this area is predominantly asphalt pavement. The USTs were used to store oil-containing PCBs at concentrations ranging from 50 mg/kg to 500 mg/kg. According to facility records, these tanks were formerly utilized at Con Edison's Hellgate facility to store similar oil. Facility personnel reported that these tanks were removed at some time prior to 1986, and the personnel interviewed were not aware of any confirmatory tank closure sampling activities. The facility's 1980 Spill Prevention and Countermeasures Control (SPCC) Plan indicated the existence of these tanks. However, the 1981 SPCC Plan did not indicate the existence of these tanks, suggesting the tanks may have been removed during that time interval.

4.5.2 Site Geology and Subsurface Observations

This area mostly consists of sandy material, gravel with clay appearing at deeper depths, and some cinder and coal slag deposits in certain areas. The areas that were found to have coal slag and coal tar present were at sampling locations F57, Y58, Y59 and Y97. The areas that contained cinders were locations Y11 and Y12. Some areas also had elevated headspace readings. Sample location F57 showed readings of 488 ppm at a depth of 2 feet, and 233 ppm at a depth of 4 feet. Location Y12 exhibited an organic vapor reading of 203 ppm at 9 feet. Location Y58 also showed high headspace readings from 8-10 feet, with a measurement of 311 ppm. The highest reading recorded in this area was at sample location Y13 at a depth of 2 feet, where the headspace reading registered 1,882 ppm. Areas that were reported to exhibit a strong MGP-type odor were at sample location F57 from 6-15 feet, location Y58 from 8-10 feet and location Y12 at 9 feet. Appendix A is available to refer to the geological logs for this site.

4.5.3 Previous Investigations

As part of the Phase I RFI, five surface and six subsurface soil samples were analyzed for PCBs, SVOCs, and VOCs. Based on the analytical data, there is no evidence of a possible release of PCBs in this unit, nor do PCB concentrations exceed the NYSDEC recommended PCB level of 25 mg/kg. The extent of SVOC-impacted soil was not well defined to the east of boring Y11 and west of boring Y13. Based on the high concentrations of total VOCs in soil at Y13, there is evidence of a significant release of VOCs in the vicinity of

that location. In addition, the lateral and vertical extent of the VOC-impacted soil is not well defined. Finally, a Phase I RFI groundwater sample collected from well F25, which is located between the former locations of the 25,000 gallon PCB waste oil tanks, reported total VOCs at low concentrations.

4.5.4 Phase IID Investigation

Based on the data evaluation performed during April of 2002, concentrations of cPAHs exceeded the NYSDEC guidance concentration of 10 mg/kg at each of the five locations (F25, Y10, Y11, Y12 and Y13). Three of these locations (F25, Y11 and Y13) yielded elevated levels of cPAHs at concentrations greater than 10 times the NYSDEC level. The elevated concentrations of cPAHs from F25 (16-18 feet) were detected in samples collected from below the water table. PCBs were below the prior North Storage Yard concentration guideline of 25 mg/kg at all five of the same locations. Elevated BTEX concentrations were present at location Y13 (6-8 feet) at 680 mg/kg. During the April 2002 site strategy meeting, it was agreed that sufficient data existed to proceed to a corrective action evaluation for the VOCs at sample location Y13, and for the SVOCs at locations Y10, Y11, Y12, Y13, and F25. However, to support the corrective action evaluation, it was determined that additional soil sampling was needed to complete the delineation of VOCs and PAHs in soil and to assess potential VOC and SVOC impacts to groundwater.

Therefore, the four objectives of the Phase IID RFI for the former 25,000-Gallon PCB Waste Oil Tanks were to:

- Determine the lateral and vertical extent of VOCs to the east of location Y13;
- Determine the lateral and vertical extent of PAH soil contamination west of location Y11 and east of location Y13;
- Assess potential SVOC impacts to groundwater as a result of SVOC soil contamination associated with F25, Y10, and Y12; and
- Assess potential VOC impacts to groundwater as a result of VOC soil contamination associated with F25.

To meet the soil objectives, two soil borings were completed at locations Y58 and Y59. Soil samples from location Y58 were collected at depths ranging from 0-2 feet to 7-9 feet and were analyzed for VOCs, cPAHs, non-cPAHs, and PCBs. Soil sample from location Y59 were collected at depths ranging from 0-2 feet to 6-8 feet and were analyzed for VOCs, SVOCs including cPAHs and non-cPAHs, and PCBs.

To assess VOC contamination in groundwater and to assess the potential for soil impacted by SVOCs at F25, Y10, and Y12, one permanent monitoring well at location F57 was installed. Soil samples were collected at depths of 0-2 feet and 6-8 feet and analyzed for VOCs, SVOCs, including cPAHs and non-cPAHs, PCBs, and petroleum. Groundwater samples were collected from F57, and existing well F25 was redeveloped and re-sampled for VOC and SVOC analysis.

4.5.5 Cumulative Site Characterization Findings

The full set of analytical data collected for the Former 25,000-Gallon PCB Waste Oil Tanks is presented in Table 4.5-1. A summary of the parameters that exceed RSCO standards in soil is presented as Table 4.5-2. As shown in Figure 4.5-5, VOCs were virtually non-detected throughout the area. The two exceptions were wells F57 and F58. Total VOCs were detected in the 100 mg/kg range in soil collected from those locations, but no individual VOC exceeded its respective RSCO standard.

SVOCs were detected throughout subsurface soil in the area. As shown in Figure 4.5-6, SVOC concentrations were lower (100-1,000 mg/kg) closer to the tanks and higher to the north (1,000-10,000 mg/kg) and to the south (10,000-100,000 mg/kg). As shown in Table 4.5-2, cPAHs exceeded their respective RSCO standards to varying degrees in all samples, with all seven cPAHs exceeding standards in soil samples collected from borings Y11, Y13, and Y58. Non-cPAHs were detected in excess of standards in samples from

only three locations Y11 from 2-4 feet (phenanthrene only), Y13 from 6-8 feet (fluoranthene, phenanthrene, and pyrene), and Y58 at 7-9 feet (all non-cPAHs).

PCBs were detected in nine samples, including two sample duplicates, with a maximum concentration of 15.6 mg/kg reported in sample F57AS (0-2 feet). All concentrations were below the RSCO standard of 25 mg/kg.

Refer to Section 4.41 for an evaluation of facility-wide groundwater.

There is no evidence of cPAH impacts being exclusively related to the Former Waste Oil Tanks and are presumably attributed to general Pipe Yard operations. Further action is recommended as part of the Pipe Yard SWMU; but no further action is required for the waste oil tanks themselves.

4.6 Former Gas Condensate Tank

The former Gas Condensate Tank is located along the north-central boundary of the Pipe Yard. The following subsections provide site information and investigatory detail.

4.6.1 Site Description

The former tank area is one of the several subunits of the Pipe Yard SWMU (refer to Figure 4-6.1). According to the PR/VSI Report, the former Gas Condensate Tank was a mounded 21,800-gallon steel tank located south-southeast of Gas Turbine #3 located in the Gas Turbine facility (currently owned by NRG Energy); the former Gas Condensate Tank subunit is on property still owned by Con Edison. The Astoria facility's 1981 SPCC plan suggested the tank might have had a 12,000-gallon capacity. Start-up and closure dates for the former tank are not available.

4.6.2 Site Geology and Subsurface Observations

The former Condensate Tank study area is comprised of mostly sand and gravel based on the borings drilled in that area. Cinders and ash were present in some locations, and silt was recorded at deeper depths towards the water table. Cinders and ash were observed at locations Y26 and Y27 at a depth of 6 feet, which was the end of the boring for both of those locations. Sample location K119 showed coal slag at 5 feet, accompanied by a reportedly “strong” MGP-type odor. The only elevated headspace reading in the area was detected at location Y27 at a depth of 5 feet, where the measurement of organic vapors was a relatively high reading of 1,530 ppm. For more details regarding the Former Gas Condensate Tank study area, refer to Appendix A for the geologic boring logs.

4.6.3 Previous Investigations

During the Phase I RFI, four surface and three subsurface soil samples were collected from four locations (F16, Y25, Y26 and Y27) at various depths in the vicinity of the former Gas Condensate Tank and analyzed for VOCs, SVOCs, and PCBs. Based on the analytical data, there was no evidence of a release of VOCs or PCBs at this subunit; however, cPAHs were detected in the soil samples at total concentrations in the range of 10-20 mg/kg. In addition, LNAPL was encountered at the water table (approximately 5 feet) during the drilling of boring location Y27.

4.6.4 Phase IID Investigation

During the site strategy meeting with the NYSDEC in April 2002, it was decided that groundwater quality would need to be assessed to evaluate potential impacts from cPAHs and to determine whether LNAPL was present at location Y27. Therefore, the two objectives of the Phase IID RFI for the former Gas Condensate Tank are to:

- Assess potential PAH impacts to groundwater; and
- Determine if LNAPL is present at Y27.

To meet these two objectives, permanent monitoring well F58 was installed downgradient of this area using the vacuum excavation method above the water table, and subsequently completing the boring below the water table, using a conventional hollow stem auger drill rig. A groundwater sample was collected from F58, using the low-flow method and analyzed for PAHs. The data from F58 was also used as part of the Site Perimeter Groundwater Monitoring Well Network (refer to Section 4.41) data evaluation.

To evaluate the presence/absence of LNAPL at Y27, one permanent monitoring well (F16B) was installed as part of the previous Eastern Parcel RFI Phase II program in 2004. This well was also gauged for LNAPL with an oil/water interface probe during Phase IID. No LNAPL has been detected in wells F16B or F58 during any of the well-gauging events.

4.6.5 Cumulative Site Characterization Findings

There is no evidence of cPAH impacts exclusively related to the Former Gas Condensate Tank. The impacts appear to be more attributable to general Pipe Yard operations. Further action is recommended as part of the Pipe Yard SWMU, but no further action is required for the gas condensate tank itself. Refer to Section 4.41 for an evaluation of facility-wide groundwater.

4.7 Former Fire Fighting School

The former Fire Fighting School is another subunit of the Pipe Yard SWMU, immediately west of Blue Dog Lake (refer to Figure 4.7-1). It is also the southernmost portion of the Western Pipe Yard Area (refer to Section 4.26).

4.7.1 Site Description

Con Edison employees have stated that fire training activities consisted of pouring oil into vaults or onto the ground, igniting the oil, and then extinguishing it. No unintentional spills have been recorded in the area. The surface of the area is primarily asphalt.

4.7.2 Site Geology and Subsurface Observations

The former Fire Fighting School area is composed primarily of silt and sand. Every boring showed signs of coal slag or ash, yet headspace readings were all relatively low compared to other study areas, in the vicinity of single digits or non-detectable readings. Sample location Y02 contained cinders at 2 feet, but there were no other notable findings in the area. The geologic logs in Appendix A provide observational and quantitative information regarding this site.

4.7.3 Previous Investigations

As shown in Figure 4.7-2, one boring (Y02) was collected during the Phase I RFI program in 1995. This included one surface and one subsurface soil sample that were both analyzed for VOCs, SVOCs and PCBs. Based on the analytical results, there was no evidence of residual VOCs or PCBs. When concentrations were compared to site-specific screening levels (SSLs) used at that time, two SVOCs [benzo(a)pyrene and dibenzo(a,h)anthracene] exceeded their respective site-specific SSLs. Accordingly, the area was included for subsequent RFI assessment, which was completed as part of the Phase IID program in the 2005/2006 timeframe.

4.7.4 Phase IID Investigation

Prior to executing the Phase IID program, this area was discussed with the NYSDEC during the April 2002 site strategy meeting. An updated comparison was performed using the North Storage Yard guidance

concentrations in lieu of the prior comparison to SSLs. Based on the evaluation, total cPAHs exceeded the prior concentration guideline of 25 mg/kg. This was consistent with the two cPAH parameters exceeding SSLs, using the prior comparison. As such, it was decided that further evaluation of cPAHs in soil and an assessment of groundwater was warranted to complete the characterization phase of study in this area. Data was collected as part of the Phase IID program.

4.7.5 Cumulative Site Characterization Findings

In compiling the 1995 and 2005/2006 soil data, none of the VOC parameters were detected (refer to Figure 4.7-5).

Total SVOCs (including both cPAH and non-cPAH compounds) were detected in the 1-100 mg/kg range, as shown in Figure 4.7-6. Table 4.7-1 reveals that benzo(a)pyrene is the only parameter that exceeds its respective RSCO standard. This was consistent with the prior detection of benzo(a)pyrene above the prior comparisons to SSLs and North Storage Yard guidance concentrations. The other cPAH [dibenz(a,h)anthracene] was not in excess of the RSCO standard. The benzo(a)pyrene detection was in the 2-7 mg/kg range in most of the soil samples analyzed, which is above the 1.1 mg/kg RSCO standard for that parameter.

PCBs were detected at relatively low concentrations (1-10 mg/kg) in most soil locations assessed (refer to Figure 4.7-7). One location (F52 at a depth of 2-4 feet) revealed an estimated concentration of 34 mg/kg total PCBs, which is above the RSCO standard of 25 mg/kg.

Based on the history of site use (discharging fuel onto the ground for fire suppression training) and the detection of fuel-related parameters in soil, further action for this area is recommended. The COPCs can be limited to benzo(a)pyrene and PCBs, as the only two parameters in excess of RSCO standards.

It is unclear whether impacts are directly related to former fire fighting activities. No LNAPL or residual petroleum-related VOCs (commonly associated with former fire fighting activities) were detected. The potentially large volume of fuels discharged in the area could have resulted in the residual cPAHs and PCBs that were detected. Further action is recommended, primarily to address the remaining cPAHs and PCBs in soil.

4.8 Pipe Yard SWMU

The Pipe Yard is one of the largest study areas within the Astoria facility because it occupies the largest area at the facility, approximately 1,750 feet by 650 feet. The Pipe Yard serves as a central storage area for plumbing, mechanical, building and construction materials used throughout the Con Edison system. It overlaps many other study areas, including Blue Dog Lake, the Western Pipe Yard Area, Former 25,000 Gallon PCB Waste Oil Tanks, Coal Tar Seeps, Former Fire Fighting School, Former MGP AOC, Former Gas Condensate Tank, Building 139 Septic System SWMU, Spill No. 73 and Spill No. 92. Each of these areas is presented individually in other subsections for completeness in presenting the site history and prior investigation detail. The overall program and general findings for the Pipe Yard region is provided in the subsections below.

4.8.1 Site Description

The Pipe Yard is located in the central portion of the Astoria facility, with a gravel surface on the southeastern half of the area and asphalt paving on the northwestern half. Refer to Figure 4.8-1 for site detail. As depicted in Figure 4.8-1, coal tar seeps (discussed further in Section 4.20 as its own study area) have been observed in several locations within the Pipe Yard.

4.8.2 Site Geology and Subsurface Observations

The Pipe Yard study area is a large section of the property, comprised of relatively consistent sand and gravel, with some silt noted in selected locations. There were many areas in which "odors" were reported at several different depths. Coal ash and coal slag were also reported to be present in some of the subsurface areas. Areas that showed both a high headspace reading and evidence of coal ash and slag were in the proximity of Blue Dog Lake and near the Former 25,000-Gallon PCB Waste Oil Tanks, and in the east and northeast portions of the study area. Northeast of Blue Dog Lake was the area that exhibited the highest headspace readings, in excess of 9,999 ppm (the maximum digital measurement on the organic vapor meter). Other geologic logs show recorded headspace readings in the thousands in the Blue Dog Lake area. Those areas where coal ash and tar were present in the absence of elevated headspace readings appear to be in the northwestern portion of the Pipe Yard. Refer to the geologic logs provided in Appendix A for a full description of observations and measurements in this area.

4.8.3 Previous Investigations

Prior investigation of the Pipe Yard under the RFI program was initiated in 1994/995. Subsequent phases of study expanded the investigation dataset primarily by collecting additional data in-between sampling locations, i.e., the expansion of the investigation over the past decade was designed to increase the sample density within the Pipe Yard to better characterize site conditions. Figure 4.8-2 presents the progression of investigation programs in the Pipe Yard area.

Parameters analyzed included all the major contaminant groups assessed during the RFI program, including VOCs, SVOCs, PCBs and metals. As shown in Figures 4.8-3 and 4, the majority of parameter groups analyzed in soil were present and detected in soil. Table 4.8-1 contains all of the available soil data compiled for the Pipe Yard area, sorted by the year of investigation and sample location. In general, cPAHs and PCBs were detected during the earlier sampling events at concentrations that exceeded the preliminary North Storage Yard guidance concentrations used at the time. The detections of those parameter groups are what dictated the subsequent sampling and analysis phases of study throughout the RFI program. Specific locations of detected compounds and associated concentrations are described in subsequent subsections.

4.8.4 Phase IID Investigation

The Phase IID investigation was conducted in the 2005/2006 timeframe and was primarily designed to complete data gaps in understanding the nature and extent of cPAH and PCB conditions in the Pipe Yard study area. An expanded parameter list of chemicals analyzed was created to ensure completeness of the RFI program. The results of the RFI program leading up to and including the recent Phase IID investigation are presented in Section 4.8.4.

4.8.5 Cumulative Site Characterization Findings

The 4-8 series of figures presents the ranges of parameter group concentrations detected in soil. As shown in Figure 4.8-5, VOCs were not dominant at the Pipe Yard. The majority of total VOC concentrations were either non-detect or in the 1-10 mg/kg range. As shown in Table 4.8-2, none of the individual VOC compounds exceeded their respective RSCO standard. Thus, VOCs are not considered to be of concern at the Pipe Yard, which includes all of the other study areas that overlap the area (refer to the introductory discussion for this section).

SVOCs were detected throughout the Pipe Yard, as expected. The concentration ranges, as shown in Figure 4.8-6, vary from the 10 mg/kg level up to the 100,000 mg/kg level (sample location Y58). In comparing individual parameters to the RSCO standards, only the PAHs included within the SVOC parameter list exceeded their respective standards. Table 4.8-2 presents the results of those samples in exceedance. The highest concentrations were detected in locations such as Y13 (e.g., benzo(a)anthracene at 760 mg/kg) and

Y58 (e.g., benzo(b)fluoranthene at 2,100 mg/kg) and K120 (e.g., chrysene at 350 mg/kg). The soil characterization extended 28 feet below the surface. The maximum depth of soil in exceedance was at 9 feet.

PCBs were not detected in many sampling locations. As shown in Figure 4.8-7, the areas with PCB detections were primarily in the southwestern and eastern portions of the Pipe Yard. As shown in Table 4.8-2, exceedances of RSCO standards for PCBs were present in those areas as well, specifically at M38 (134 mg/kg), Y137 (72 mg/kg) and Y139 (68 mg/kg).

Of the metals analyzed, lead was the primary concern, based on the equipment and materials maneuvered and stored within the northwestern portion of the Pipe Yard area. Lead was detected in all locations analyzed, with the highest concentration at location MGP-18 (1,110 mg/kg). However, when compared to the RSCO standard of 3,900 mg/kg, none of the lead detections were in exceedance. Arsenic (not a chemical considered to be attributable to Pipe Yard operations) was detected in one location (MGP-19) at a concentration at the18-19 mg/kg level, at a depth of approximately 5 feet. This detection is in the far northwestern edge of the Pipe Yard, overlapping the former MGP AOC area.

In summary, four distinct areas of soil impacts have been identified within the Pipe Yard (Areas 1, 2, 3 and 4), which are described and shown in Section 5.0 at a facility-wide scale. In addition, the former Fire Fighting School and Blue Dog Lake are located within the Pipe Yard and reveal evidence of soil impacts in excess of RSCO standards (refer to Sections 4.3 and 4.7, respectively). Accordingly, these six areas are recommended for further action, individually, to address these residual impacts.

4.9 Pipe Yard SWMU Waste Management Practices

By grouping the sampling data for the Pipe Yard (refer to Section 4.8), the only additional samples reportedly associated with Pipe Yard operations are actually in the LNG tank area at locations F09, F47 and F48. These three locations are well beyond the boundaries of the Pipe Yard, at the eastern edge of the Astoria property just east of the Eastern Parcel. Refer to Figure 4.9-1. One of these locations (F09) contains a parameter in excess of RSCO standards. Benzo(a)pyrene was detected at an estimated 2.6 mg/kg, compared to the RSCO standard of 1.1 mg/kg for that compound. No other chemicals in that area were detected in excess of RSCO standards.

The remaining information for this study area overlays the information available for the Pipe Yard SWMU (Section 4.8). Based on the investigation conducted, there is little justification to support tracking this particular SWMU separately from the main Pipe Yard SWMU. Thus, no further action is recommended for this particular study area. Refer to Section 4.8 for recommendations related to the Pipe Yard SWMU.

4.10 Areas Unrelated to Other Waste Management Practices

Several areas within the facility have been designated as “areas associated with other waste management practices” over the course of the RFI program. Labels include Areas 1 and 2, A and B, and other nomenclature. In general, there are two primary areas that were identified as warranting RFI study – one area (Area 1 or Area A) adjacent to the main gate at the southwestern entrance to the facility, and the other area (Area 2 or Area B) at the northeastern edge of the facility north of the Spare Transformer Yard. The second area (Area B) is combined with the Spare Transformer Yard study area, based on similar site conditions and proximity to that area. Only the first area (Area A) is being considered a separate area for the purposes of RFI study and reporting. Refer to Figures 1-3, 1-4 and 1-5 for the locations of these areas and Figure 4.10-1 for the vicinity of Area A in particular (hereafter referred to without the “Area A” designation).

4.10.1 Site Description

The specific location of interest for this study area is located at the southern tip of the property, adjacent to the Main Gate (refer to Figure 4.10-1). The surface cover is primarily landscape (soil and vegetation). It is unclear

how this area became impacted, but previous studies have revealed site impacts that warranted further characterization.

4.10.2 Site Geology and Subsurface Observations

This particular study area spans many portions of the Astoria facility; it is not a contiguous parcel like the other study areas evaluated in the RFI program. Overall, the subsurface in each of the locations assessed as part of this study area consist of sand and gravel material, with some silt in certain areas. Sample location Y78 was the only location in which coal slag and ash were reported. The coal-impacted soil was reported at a depth of 6-8 feet at that location. There were three locations assessed that exhibited relatively high headspace readings. Sample location MGP23 revealed a reading of 840 ppm at a depth of 5-10 feet, location MGP22 had a reading of 205 ppm at a depth of 5 feet, and location F14 had a reading of 240 ppm at a depth of 6 feet. The boring logs for this broad study area are compiled in Appendix A for reference.

4.10.3 Previous Investigations

The investigation of this area began in 1995 as part of the Phase I RFI program. It was expanded as part of the Phase IID RFI program during the 2005 timeframe. Prior investigatory data revealed the presence of cPAHs in soil, specifically benzo(a)pyrene and dibenz(a,h)anthracene, in location F20 at a depth of 6-8 feet.

4.10.4 Phase IID Investigation

The Phase IID RFI program included the collection soil samples from three additional locations. Samples were analyzed primarily for PAHs. Analytical results from this area are presented in Tables 4.10-1 and 2. Parameter groups analyzed and detected are graphically depicted in Figures 4.10-3 and 4, respectively.

4.10.5 Cumulative Site Characterization Findings

As shown in Figure 4.10-2, sample collection was performed in 1995 and 2005. The ranges of parameters detected are shown in Figures 4.10-5 through 8. VOCs were not detected above RSCO standards. Similarly, SVOCs (other than cPAHs), PCBs and metals were not detected in excess of RSCO standards. Only cPAHs exceeded their respective standards at this site. Benzo(a)pyrene and dibenz(a,h)anthracene exceeded their RSCO standards at location F20 and Y78. Refer to Section 4.41 for an evaluation of facility-wide groundwater.

The cPAH impacts in this area are not distinguishable from cPAHs further north at the AOC West of Main Gate (specifically sampling location Y328). Thus, the area of cPAH impacts at this study area is recommended for inclusion within the AOC West of Main Gate for consideration of further action. No further action for this area as a separate area of investigation is warranted.

4.11 Astoria Central Wastewater Treatment Facility SWMU

The Astoria Central Wastewater Treatment Facility (CWTF) has been designated as a SWMU by the NYSDEC. The SWMU area is rectangular in shape and includes the two former wastewater settling tanks and surrounding landscaped area.

4.11.1 Site Description

The CWTF is located north of 20th Avenue, directly west of the Astoria Transformer Shop (refer to Figure 4-10.1). This facility includes a wastewater treatment building, a neutralization chamber situated within the wastewater treatment building, and two large settling tanks that were originally used as the gas holder foundations during the former MGP operations. The standing water and sediment within both tanks were removed by Con Edison during 2005/2006 under the direction of NYSDEC.

4.11.2 Site Geology and Subsurface Observations

This area consists of sand and gravel, with a mixture of sand and silt at deeper horizons. One sampling location, MGP27, exhibited coal and brick fragments from 0-2 feet. Two areas reported high headspace readings. Sample location W03 showed a reading of 130 ppm at a depth of 9 feet, and location W10A contained readings up to 1,668 ppm at a depth of 14 feet. The headspace measurements in location W10A in particular declined at a depth of 18 feet, but then increased again at 24 feet. The geologic logs in Appendix A provide observational and quantitative information regarding this site.

4.11.3 Previous Investigations

During the Phase I RFI, soil samples were collected from seven locations at the CWTF and analyzed for PCBs, SVOCs, and/or VOCs. All soil samples contained VOCs at levels ranging from non-detect to 0.039 mg/kg, except for one deep sample at W03 (14-16 feet), which yielded a total BTEX concentration of 11 mg/kg. Based on these results, additional soil sampling was warranted in the vicinity of W03 (southeastern portion of the CWTF) to assess the extent of VOCs in soil. In addition, moderate ppb concentrations of benzene, toluene, ethylbenzene, and xylenes were detected in groundwater samples collected from well W03; and PCBs (Aroclor 1260) were detected in wells F13 and W06. These contaminant levels may have been attributable to the turbidity typically found at greater levels in small diameter wells (i.e., 1-inch wells) rather than in samples collected from conventional 2-inch wells. Nevertheless, the Phase I RFI findings concluded that additional assessment of the mobile BTEX and Aroclor 1260 constituents in groundwater was warranted in these areas.

These recommendations for further assessment were addressed during the subsequent Phase IIC RFI. The Phase IIC RFI results indicated limited VOCs in soil at the water table at well W03B, which virtually had no impact on groundwater (i.e., less than 1 ppb xylenes). Therefore, no further action was recommended for the issue of VOCs in soil at W03B. During the Phase IIC RFI activities, F33 was installed as a 2-inch well in the vicinity of both wells W06 and F13 to determine if turbidity had influenced the Phase I RFI sample results. Well F33 was sampled for PCBs, and no PCBs were detected. As referenced in the conclusions and recommendations section of the Phase IIC RFI Report, it was recommended that confirmatory soil samples be collected adjacent to W08 to confirm the absence/presence of certain chlorinated VOCs. In addition, during the Phase IIC RFI program, the NYSDEC requested that a deep (1-to 2-feet above the water table) soil sample be collected adjacent to location W10 to assess the presence of oily soil detected during Phase IIC. These two recommendations were completed during the Phase IID RFI, as discussed below.

4.11.4 Phase IID Investigation

The Phase IID RFI objectives for the CWTF were to:

- Characterize the chlorinated VOCs in soil at boring W08 to determine if they are present or are the result of cross-contamination that occurred during previous Phase IIC sampling; and
- Assess the significance of oily soil at boring W10 that was detected during previous Phase IIC RFI sampling activities.

To determine if VOCs are present at boring W08, boring W08A was advanced, Shallow (0-2 feet), intermediate (6-8 feet), and deep (approximately 12-14 feet) soil samples were collected from the vadose zone and analyzed for chlorinated VOCs. In addition, boring W10A was advanced adjacent to boring W10 to collect one deep vadose zone soil sample from approximately 13-15 feet for TPH-fingerprint analysis.

4.11.5 Cumulative Site Characterization Findings

Analytical data compiled for the CWTF is presented in Tables 4.11-1 and -2. As shown in Figure 4.11-2, the investigation of this area began in the 1994/1995 timeframe and continued through the 2005/2006 timeframe. Parameter groups analyzed and detected are shown in Figures 4.11-3 and -4, respectively.

The ranges of total VOCs (Figure 4.11-5) are generally at the 1-10 mg/kg level. Total SVOCs (excluding cPAHs) are in the 1-100 mg/kg range (Figure 4.11-6), and PCBs (Figure 4.11-7) were detected in the 1-10 mg/kg range. None of the VOCs, SVOCs (other than cPAHs), or PCBs were in excess of their respective RSCO standards. Similarly, none of the metals (including lead shown in Figure 4.11-8) were in excess of the metals RSCO standards. Only benzo(a)pyrene exceeded its respective soil standards at the CWTF. The exceedances were in the northwestern portion of the area, closer to the former MGP area operations.

Groundwater, on a facility-wide basis, is presented in Section 4-41 of this report. An expanded assessment of groundwater quality in the immediate vicinity of the CWTF has been of recent interest. There are two settling basins at the CWTF, each nearly 50 feet deep. They both penetrate the top of competent bedrock (assumed to be approximately 30 feet below ground surface). Water was observed infiltrating these two settling basins through cracks in the cement walls during a recent sludge removal event conducted by Brown and Caldwell. The cracks were reportedly near the bottom of the basins, which indicates that they could have been connected to groundwater fractures within the competent bedrock. Although groundwater collected to date does not indicate impacts from the basins, the groundwater samples were collected from shallow overburden strata.

Based on the Brown and Caldwell observation, an expanded assessment of groundwater quality in the bedrock formation has been proposed to the NYSDEC (Con Edison letter proposal, June 26, 2007). The proposed assessment is to install three new overburden/bedrock groundwater monitoring well pairs (overburden wells F109, F110 and F111; and bedrock wells F109BR, F110BR and F111BR). This work is ongoing and will be recorded and presented in a separate report.

4.12 Tunnel Head House AOC

A localized area of BTEX-impacted soil was discovered during the Phase I RFI on the south side of the Tunnel Head House. Subsurface investigations were conducted during RFI Phases I, IIC and IID to delineate the extent of impacted soil and to assess potential impacts to the groundwater.

4.12.1 Site Description

The Tunnel Head House is the entrance to a service tunnel that runs under the East River to the Bronx, and is located at the southwestern corner of the site (refer to Figure 4-12.1). Two historic spills were recorded at the Tunnel Head House on February 5, 1990. Spill Nos. 37 and 75 were separate releases of dielectric fluid on that date, each consisting of approximated 1,000 gallons.

4.12.2 Site Geology and Subsurface Observations

The area in the vicinity of the Tunnel Head House is comprised primarily of sand, with trace amounts of silt and gravel. The area did not have any coal slag or ash present, but there were two areas that had elevated headspace levels. Location F01 was reported to exhibit 279 ppm of organic vapors at a depth of 9 feet, and location H03 revealed 5,207 ppm at a depth of 7 feet. There were no other prominent observations in the area. The geologic logs in Appendix A offer additional observational and quantitative information regarding this site.

4.12.3 Previous Investigations

During the Phase I RFI, 10 soil samples were collected from locations F01 and H01 through H04 and analyzed for VOCs, SVOCs, and PCBs. Based on those analytical results, SVOCs and PCBs did not require further investigation. However, additional sampling was warranted to assess the extent of BTEX-impacted soil in the vicinity of boring H03.

During the Phase IIC RFI, six soil samples were collected from three soil borings (E33, F35 and F36) for BTEX analysis. BTEX concentrations were only detected at boring E33, with concentrations increasing with depth up

to 8 feet. Xylenes were reported in the near-surface soil (estimated at 0.007 mg/kg) and increased in the subsurface sample from 6-8 feet (xylenes estimated at 82 mg/kg and ethylbenzene at 3.80 mg/kg).

4.12.4 Phase IID Investigation

The three Phase IID objectives for the Tunnel Head House were to:

- Delineate the vertical and lateral extent of BTEX-impacted soil in the vicinity of H03;
- Determine the localized groundwater flow direction; and
- Assess potential BTEX impacts to groundwater.

To meet these objectives, borings Y70 and Y71 were advanced to delineate BTEX impacts to soil near Phase I RFI boring H03, as shown in Figure 4.12-2. Two soil samples were collected from each boring for BTEX analysis. Con Edison also evaluated the localized groundwater flow direction and groundwater quality as part of the Site Perimeter Groundwater Monitoring Well Network evaluation activities. The groundwater sample results obtained from well F66 (part of the Site Perimeter Groundwater Monitoring Well Network) were used to evaluate potential BTEX impacts to groundwater.

4.12.5 Cumulative Site Characterization Findings

Based on the recorded spill type (dielectric fluid), it is unlikely that the cPAH detections are related to that spill. Dielectric fluids can be aromatic hydrocarbons (specifically, alkylated benzenes such as diethyl benzene and dibenzyl toluene). They can also consist of fluorocarbons, silicate esters or other silicones. None of these fluids contain cPAHs. However, it is possible that if the dielectric fluid released was an aliphatic hydrocarbon (such as mineral oil), it could have contained small amounts of cPAH impurities. Thus, it may be possible that the cPAHs are related to the spill, but it is more likely that compounds are associated with the facility-wide fill material used during property development and detected throughout the Astoria facility. Because the contribution of cPAHs is unlikely due to the dielectric fluids, and the soil concentrations were below RSCO standards, no further action is recommended for this area.

The groundwater analytical results from well F66 are discussed on a facility-wide basis in Section 4.41.

4.13 Astoria East Substation Spill Area

The operational history of the Astoria East Substation Spill Area includes four separate spill events. As shown in Table 2-2, spills recorded in this area include Spill Nos. 12, 25, 74 and 86. All of the spills related to releases of dielectric fluid, as part of operational activities. In addition, two other observations of potentially-impacted soil were recorded in this area and were identified for response actions and further investigations (a potential fuel release from a former diesel UST and a potential PCB release from Feeder #34126).

4.13.1 Site Description

The Astoria East Substation is located in the southwestern-central portion of the Astoria facility. It consists of several power feeders, overhead power lines, and associated electronic equipment. The spill area is immediately northeast of the North Queens Substation, which is covered under another study area (refer to Section 4.14). The area is primarily gravel-covered and fairly large at approximately 700 x 400 feet in area.

4.13.2 Site Geology and Subsurface Observations

The Astoria East Substation Spill area is comprised of sand and trace amounts of gravel at all depths, with coal slag and ash present in some areas. The areas that contain coal slag and ash were location K135 (present from 1-6 feet), K136 (at 1-4 feet), Y38 (at 1-4 feet), Y122 (at 2 feet), K134 (at 3 feet), Y123 (at 5 feet) and Y83 (at 1 foot). An MGP-type odor was present at some locations. Sample location F60 contained an MGP-type odor from 5-10 feet, while sample locations K135 and Y123 had an odor at 5-foot horizon. Location

F60 also had two elevated headspace readings of 165 ppm at 9 feet, and 118 ppm at 13 feet. Refer to the geologic logs provided in Appendix A for a full description of observations and measurements.

4.13.3 Previous Investigations

Multiple investigations were performed as each of the spills in this area occurred. In general, the responses were quick and immediate, encompassing the removal of released fluids and visibly impacted soil in accordance with Con Edison processes and procedures. Beyond the spill responses, an overall characterization of the area was conducted in the 2005/2006 timeframe as part of the Phase II RFI program. Specific details of the individual spill response activities follow.

Spill No. 12

Spill No. 12 occurred on August 12, 1993, when approximately 4,220 gallons of dielectric fluid were released from Feeder No. 34125M. According to available Con Edison records, much of the impacted material was removed; however, some of the impacted areas were inaccessible due to overhead power lines and other structures and equipment. Rather than jeopardize the integrity of sensitive electronic structures and place excavation workers at risk due to the close proximity of the power lines, further investigation was postponed to the RFI program.

Spill No. 25

On June 30, 1994, a relatively isolated 30-gallon release of dielectric fluid was recorded in the substation area. Immediate responses included the removal of visibly impacted oil-impacted soil. No other actions were conducted. This spill was addressed outside the context of the RFI characterization program. No further action is necessary for this spill.

Spill No. 74

Spill No. 74 occurred on January 21, 1989, when approximately 5,000 gallons of dielectric fluid were released from a broken pipe at the Astoria East Substation. Three test pits were advanced by Con Edison in an effort to locate and repair the broken pipe. The pipe was located and subsequently repaired, and impacted soil was removed from the immediate area where the break was discovered. No further excavation was possible due to above-ground and below-ground structures in the area. An investigation was recommended as part of the RFI program to complete an assessment of the area.

Spill No. 86

A recorded 1,600 gallons of dielectric fluid were released on June 27, 1995 at the substation. Similar to the other releases in this area and in accordance with Con Edison processes and procedures, Con Edison workers removed visibly impacted soil at the spill site and replaced the excavated material with clean backfill. Subsequent characterization of the area beyond the excavation was included as part of the RFI characterization program.

PCBs in Soil - Feeder #34126

On May 12, 1999, while Con Edison was conducting improvements to Feeder #34126 in the Astoria East Substation, PCB-impacted soil (Aroclor 1260 at 130 mg/kg) was detected in an excavation. However, no oil or apparent oil contamination was reported by Con Edison personnel. The NYSDEC was notified on the same day of this finding. The excavated trenches were backfilled with clean soil after completing the feeder improvement project. Additional investigations were deemed necessary to further assess potential impacts associated with the PCB release into soil.

4.13.4 Phase IID Investigation

The Phase IID investigation is discussed separately for the spills related to this site.

Spill No. 12

Three locations were proposed for installation around Spill No. 12. However, the two proposed borings, Y146 and Y147, were not installed due to safety hazards with nearby high-voltage under-ground and above-ground utilities. Permanent monitoring well F60 was installed downgradient of Spill No. 12, just beyond the security fence of the Astoria East Substation, as depicted in Figure 4.13-2. A black tar-like material was present at location F60 from approximately 4-10 feet, with a maximum soil headspace reading of 165 ppm in the 8-10 foot sample (groundwater interface). Soil samples were collected from location F60 at 0-2 feet and 8-10 feet for analysis of BTEX, PCBs and TPH-DRO. Trace levels of PCBs, benzene, toluene, and xylenes were reported in the samples well below their respective RSCO standards. TPH was reported in both samples, at 1,300 mg/kg (0-2 feet) and 150,000 mg/kg (8-10 feet). The elevated TPH concentration is consistent with the tar-like material observed at that interval.

Spill No. 74

Three locations (Y212, Y213 and F51) were installed to assess subsurface conditions around former Spill No. 74. Location F51 was completed previously as a permanent monitoring well during the Eastern Parcel Phase II RFI. Soil samples were collected from borings Y212 and Y213 from depths up to 8 feet (groundwater table) for analysis of BTEX, PCBs, and TPH-DRO. Trace levels of benzene, toluene, and xylenes were reported in the samples, well below their respective RSCO standards. PCBs were detected at a maximum of 6.7 mg/kg (Y212, 0-2 feet), well below the RSCO standard of 25 mg/kg. TPH was reported in all samples ranging from 330 mg/kg (Y213, 6-8 feet) to 11,000 mg/kg (Y212, 0-2 feet).

PCBs in Soil - Feeder #34126

Three soil borings (Y209 – Y211) were advanced around the feeder to assess PCBs in soil. The borings were advanced to a depth of 6 feet each. Soil samples were collected from each boring at 0-2 feet and 5-6 feet and analyzed for VOCs. PCBs were detected up to a maximum of 3.2 mg/kg (Y209, 0-2 feet).

4.13.5 Cumulative Site Characterization Findings

At least 17 sampling locations were used to characterize the Astoria East Substation area. Several other sampling results are available, as part of assessing other study areas nearby (refer to the series of Figures 4.13). Post-response soil samples were collected primarily during the 2005/2006 timeframe. The array of sampling locations and depths encompassed historic spill areas 12 and 74, as well as the two historic impacted soil areas (diesel fuel and PCB release). Samples were analyzed for a wide range of parameters, beyond the specific chemicals associated with each of the individual releases including VOCs (including BTEX), SVOCs (including cPAHs and non-cPAHs), PCBs and metals (including lead and nickel).

Total VOCs (as shown in Figure 4.13-5) were relatively low or non-detect, primarily less than one mg/kg. The only area with VOCs in excess of that range was location Y218, where total VOC concentrations were in the 10-100 mg/kg range and all individual VOCs were below their respective RSCO standards (refer to Table 4.13-1).

Total SVOCs were detected in the 10,000 mg/kg range in many soil locations in the western portion of the substation (refer to Figure 4.13-6). Upon review of Table 4.13-1, the SVOCs that exceed RSCO standards consist of PAHs. The maximum cPAH concentrations are in locations K135, K216, K217 and K218, which consist of chrysene, benzo(a)pyrene, and the other cPAHs. The depths of these maximum detections span the length of the borehole sampled, which extends to a depth of 8 feet. Non-cPAH detected include pyrene and phenanthrene, at concentrations in excess of RSCO standards in soil collected from Y217 (6-7 feet).

PCBs were detected at relatively low concentrations at the substation and did not exceed the total PCB RSCO standard of 25 mg/kg in any of the samples. Similarly, metals (including lead and nickel) were detected but did not exceed their respective RSCO standards.

In summary, the soil underlying the Astoria East Substation is impacted with PAHs (both cPAHs and non-cPAHs) at depths extending throughout the subsurface assessed (up to 8 feet). Further action is recommended to better define the extent of PAH impacts, and to understand whether this is an isolated area of higher and deeper impacts, or whether it can be considered part of the facility-wide distribution of PAHs in the fill material. This is discussed on a facility-wide basis in Section 5.0.

4.14 North Queens Substation Spill Area

The North Queens Substation Spill Area relates to a localized portion of the facility, immediately adjacent to the Astoria East Substation (refer to Section 4.13). A small release of transformer oil (less than 10 gallons) occurred on June 26, 1985 (Spill No. 51). The immediate site response consisted of oil recovery and soil removal in the vicinity of the release. The transformer oil was non-PCB oil (based on the date of use and operational records). Only BTEX compounds were considered to be a potential contaminant for this particular spill. The surface of this area is asphalt pavement.

4.14.1 Site Description

During 1996, a pre-closure site assessment (non-RFI related) was performed by ECI in the immediate vicinity of a former 1,080-gallon diesel UST to determine if a release of diesel fuel had occurred and impacted nearby soil and groundwater. The UST was located on the east side of an emergency generator and north side of the North Queens Substation building (refer to Figure 4.14-1). The UST was installed in 1980 and removed from the ground in 1998. Four soil borings (SB-1 through SB-4) were advanced by ECI in the immediate vicinity of the UST to depths ranging from 17 feet to 21 feet. One boring (SB-1) was completed as a monitoring well (MW-1). Soil samples were collected at 5-foot intervals or less. Headspace measurements during the activities ranged from non-detect to 1.4 mg/kg. Four of the 13 soil samples were submitted for laboratory analysis of VOCs, SVOCs, PCBs and TCLP lead. A groundwater sample was collected from MW-1 for laboratory analysis of VOCs, SVOCs, PCBs and metals.

ECI stated in their report that none of the VOC soil samples had concentrations exceeding the Alternative Guidance Values (NYSDEC, STARS Memo #1, applicable at that time). PCBs were detected in one sample only, at 0.30 mg/kg, which was below the NYSDEC's TAGM 4046 values. SVOCs were detected in eight of 13 soil samples at concentrations exceeding the NYSDEC's Alternative Guidance Values. Low levels of TCLP lead were detected in each of the four soil samples at a maximum concentration of 0.023 mg/L. There were no detectable concentrations of VOCs, SVOCs or PCBs in the groundwater sample collected from MW-1 (ECI, 1997). However, two metals (lead and nickel) were reportedly detected at concentrations exceeding applicable NYSDEC TOGS water quality standards.

These historic ECI findings were discussed with the NYSDEC as part of the April 2002 site strategy meeting. An agreement was made that supplemental RFI characterization would include additional analysis of BTEX and PAHs potentially resulting from the diesel fuel release.

4.14.2 Site Geology and Subsurface Observations

The North Queens Substation Spill area is composed of brown sand and gravel, with less gravel as the drilling depth increased. The only outlier was the area of location Y83; below the asphalt between 1-2 feet, black coal ash and slag were present, followed by brown silt and sand to a depth of 4 feet. Organic vapor measurements were generally not present or low (i.e., single digit readings). The geologic logs in Appendix A provide observational and quantitative information regarding this site.

4.14.3 Previous Investigations

No previous investigations were performed for this localized spill. The soil was characterized as part of the Phase IID investigation in the 2005/2006 timeframe.

4.14.4 Phase IID Investigation

Four soil samples were collected and analyzed for BTEX from three separate locations, as depicted in Figure 4.14-2. The samples results are presented in Table 4.14-1.

4.14.5 Cumulative Site Characterization Findings

Two gasoline-related aliphatic compounds, benzene and toluene, were detected in soil. One sample (Y82) revealed the presence of benzene at a depth of 7 feet, at a concentration of 0.19 ug/kg. Another sample (the duplicate sample collected from Y82 at the same depth of 7 feet) revealed the presence of benzene at 0.77 ug/L and toluene at 0.39 ug/L. These detections are orders of magnitude below the RSCO soil standards of 89 mg/kg (89,000 ug/L) for benzene and 1,000 mg/kg (1,000,000 ug/kg) for toluene.

For completeness in reporting, these results are shown graphically in the set of figures shown as Figure 4.14. Based on the lack of soil impacts at this site, no further action is recommended for the North Queens Substation Spill Area.

4.15 Astoria West Substation AOC

The Astoria West Substation is situated on the northwestern edge of the Astoria facility, adjacent to the NYPA property. The area has a gravel surface and is within the footprint of the large historic MGP facility (refer to Section 4.40).

4.15.1 Site Description

Documented releases and potential releases were investigated during the RFI program, encompassing the Astoria West Substation and a small area of the adjacent NYPA property. The releases included two off-site spills (Spill No. 6A and Spill No.10), both of which occurred on NYPA property (refer to Table 2-3 for a list of non-AOC spills). Other potential impacts that were assessed included potential releases in the vicinity of a former diesel UST, and suspected operational impacts at three Pump Houses in the substation (Pump House Nos. 7, 8, and 9). The two spills consisted of dielectric fluid. Spill No. 6A (4,000 gallons) was recorded on May 5, 1992, and Spill No. 10 (8,000 gallons) occurred on March 13, 1993.

4.15.2 Site Geology and Subsurface Observations

The subsurface in the area of the Astoria West Substation study area consisted of sand, silt and trace amounts of gravel. The only area where coal ash was reported was location F62 (1-5 feet), where coke fragments were also noted on the geologic log. At sampling locations F70, MGP36, MGP37, MGP38 and MGP39, a concrete slab was recorded at an average depth of 4 feet. Refer to Appendix A in the geologic logs for more information concerning the Astoria West Substation study area.

4.15.3 Previous Investigations

Prior to the RFI program, areas within this study area were investigated as part of the response to each release at the time they occurred. Details of the releases and responses are described below. The Phase IID subsection describes the follow-up assessment conducted under the Phase IID RFI characterization event.

Spill Nos. 6A and 10

As mentioned, Spill No. 6A occurred on May 5, 1992, when approximately 4,000 gallons of dielectric fluid spilled as a result of a leak from Feeder No. 24051. According to Con Edison records, dielectric fluid entered a nearby catch basin and was being released to the East River via the storm sewer system that discharges though the NYPA property. The leak was repaired and booms were deployed to contain product discharged into the river. A contractor removed the affected soils and vacuumed approximately 4,000 gallons of LNAPL from the site. Test pits were completed to evaluate groundwater in the area of the spill.

Spill No. 10 occurred on March 13, 1993, when approximately 8,000 gallons of dielectric fluid were released due to a leaking pipe, approximately 200 feet from the NYPA guard shack. The leak was "clamped" on March 15, 1993. Approximately 18,000 gallons of dielectric fluid and water were recovered. In addition, 180 cubic yards of impacted soil were excavated from the area of the spill.

Former Diesel UST Area

As part of Con Edison's UST management program, one 1,080-gallon fuel oil UST was removed previously outside the context of the RFI program. The response activities included removal and disposal of petroleum-impacted soil within a reported 3- to 6-foot perimeter around the tank, and backfilling the tank and surrounding excavation with clean fill. Discolored soil was reported at a depth of 3 feet.

Potential Impacts at Pump House Nos. 7, 8, and 9

Based on anecdotal information, the high level of activity associated with the three pump houses raised concern that historic incidental releases of petroleum could have occurred. Accordingly, soil and groundwater sampling under the Phase IID program included sampling locations within the Pump House area.

4.15.4 Phase IID Investigation

The Astoria West Substation was investigated as part of the former MGP AOC investigation and as part of the overall Phase IID program. Specific objectives for the substation area included an assessment of soil and groundwater in the vicinity of the two historic spills (Spill Nos. 6A and 10), as well as an assessment of the general conditions in the vicinity of the former diesel UST, pump houses, and other operational areas. For completeness, sample analysis consisted of VOCs, SVOCs (including both cPAHs and non-cPAHs), PCBs and metals. The results are presented in Table 4.15-1 and displayed in the series of 4.15 figures. A discussion of the results follows.

4.15.5 Cumulative Site Characterization Findings

As shown in Figure 4.15-2, all of the soil data compiled for the Astoria West Substation was collected in the 2005/2006 timeframe as part of the MGP assessment portion of the Phase IID field program. Figures 4.15-3 and -4 display the comprehensive list of parameter groups analyzed and detected in site soil, including VOCs, SVOCs, PCBs and metals.

VOCs were not detected in any of the soil samples collected from the substation area, as shown in Figure 4.15-5. This is a consistent finding for the majority of sites situated on gravel surfaces at the facility.

Total SVOCs were reported at concentrations ranging from non-detect to the 1,000 mg/kg range (refer to Figure 4.15-6). A review of Tables 4.15-1 and -2 reveal that cPAHs exceed their respective RSCO standards. None of the non-cPAHs or other SVOCs exceeds RSCO standards. Specific cPAHs that exceed soil standards at the substation are in the 3-7 foot depth horizons primarily in location F63, which include benzo(a)anthracene (71 mg/kg), benzo(a)pyrene (7 mg/kg), benzo(b)fluoranthene (50 mg/kg), dibenz(a,h)anthracene (9.7 mg/kg) and indeno(1,2,3-cd)pyrene.

No PCBs or trace metals exceeded their respective RSCO standards at the substation study area.

Overall, the Astoria West Substation appears to be fairly well characterized. The exceedance of cPAH standards is consistent with the conditions in that portion of the facility, within the MGP operational area. There is no evidence of residual impacts from the reported spills at the substation. Because further action is recommended for this northwestern corner of the MGP area (refer to Section 4.40), no further action is recommended specifically to address spills or other non-MGP impacts at the Astoria West Substation.

4.16 Spill No. 69

Spill No. 69 is located in the eastern-central portion of the facility west of the Former Pond Area and south of the Gas Turbine Facility (NRG Energy). This study area consists of soil potentially impacted by a fuel oil spill which occurred in 1977. Site characterization activities were completed as part of the Phase IID investigation in 2005.

4.16.1 Site Description

Spill No. 69 occurred under the bridge, to the west of the Former Pond on January 26, 1977. The spill, an estimated 80,000 gallons of fuel, was the result of a ruptured fuel oil line at a flanged connection. The oil that was spilled onto the ground was retained in a culvert and immediately picked up by a contractor-supplied vacuum truck. Refer to the Figure 4.16 series for Spill No. 69 figures. The surface of the area is primarily gravel, covered with some vegetation.

4.16.2 Site Geology and Subsurface Observations

This area consisted of silt, coal ash and slag. Fine silt was noted in the first 2 feet of the subsurface, followed by coal ash and coal slag to a depth of 4 feet at location Y85 and to a depth of 3 feet at location Y86. No headspace detections were recorded for the two boring areas on the site, but there was a “strong” odor reported in the 2-3 foot interval at location Y86. For more detailed records, refer to Appendix A for measurements and descriptions for each boring sample.

4.16.3 Previous Investigations

During the Phase IIB RFI, temporary monitoring wells were installed in the Former Pond Area to delineate the extent of LNAPL identified during previous phases of the RFI. Two of the wells (A11 and A22) were installed in the general vicinity of Spill No. 69. LNAPL was not detected at well A11, but was present at well A22. From September 1997 to January 1998, measurements taken from well A22 indicate that LNAPL thicknesses ranged between 0.01 feet to 1.2 feet for various sampling events. Samples of LNAPL were collected from well A22 for laboratory analysis of PCBs. The results indicated that the LNAPL sample from A22 was similar to No. 6 fuel oil, with traces of PCBs.

4.16.4 Phase IID Investigation

The Phase IID objective for Spill No. 69 was to characterize the nature and extent of soil potentially impacted by the spill.

To achieve this objective, two soil borings (Y85 and Y86) were installed, as shown in the Figure 4.16 series. Soil samples were collected for analysis from surficial soils (0-2 feet) and near the maximum extent of the boring (2-3 feet). Following sample collection, each boring was backfilled with clean sand and finished at the surface with the material that matched the adjacent surface (i.e., gravel, concrete, or asphalt). Although the spill was predominately fuel-related, soil samples from both borings were analyzed for a relatively comprehensive parameter list consisting of VOCs, SVOCs, cPAHs, non-cPAHs and PCBs.

4.16.5 Cumulative Site Characterization Findings

Based on the prior Phase IIB RFI investigation and the recently-completed Phase IID RFI program, Spill No. 69 has been sufficiently characterized in regards to the general nature and distribution of soil impacts from the specific spill. The series of Tables 4.16 and Figures 4.16 present the comprehensive database of information compiled for Spill No. 69. A discussion of specific observations follows.

Review of boring logs from Spill No. 69 borings indicate that the soils consist primarily of brown sandy silt containing gravel, fill, and organic material. The presence of coal ash and slag was noted in both of the borings near the maximum extent of the boring (2-4 feet).

An overview of the soil data is presented in the Table 4.16 series. As shown on the pie chart symbol on Figures 4.16, each of the parameter groups analyzed in Spill No. 69 soil samples, with the exception of SVOCs, was detected to some extent. The general levels of detected concentrations are shown in the subsequent Figures 4.16. Total VOCs were detected in soil samples, from both borings, at levels between 1-10 mg/kg. Total cPAHs range from 1-10 mg/kg (Y85) and from 10-100 mg/kg (Y86), and total non-cPAHs range from 10-100 mg/kg in soil samples from both borings. PCBs range from 1-10 mg/kg in soil samples collected from both borings.

Specific parameters detected were compared to RSCO standards. Based on this comparison, only some cPAHs exceeded their respective standards, and only in one sampling location. None of the non-cPAHs or other SVOCs exceeded standards, and none of the VOCs or PCBs exceeded standards. Three out of the seven cPAHs analyzed exceeded their respective standards in soil boring Y86 at a depth of 0-2 feet. Benzo(b)fluoranthene at a level of approximately 13 mg/kg exceeded its standard of 11 mg/kg, benzo(a)pyrene at a level of approximately 15 mg/kg exceeded its standard of 1.1 mg/kg, and benzo(a)anthracene at a level of approximately 14 mg/kg exceeded its standard of 11 mg/kg. As shown in the depth-specific Figures 4.16-8 through 14, the highest concentrations of cPAHs are in the shallowest soil samples collected from depths of less than 2 feet. The highest detection of a cPAH was at location Y86, at a concentration of 15 mg/kg of benzo(a)pyrene and at a depth of 0-2 feet.

Based on the shallow nature of the sole location of concern and the presence of coal ash and slag in the soil matrix, it is not likely that the cPAH detection is exclusively related to Spill No. 69. Data indicates that Spill No. 69 is sufficiently characterized; no further action is recommended in response to the spill. However, the cPAH exceedance in soil nearby the Former Pond Area is indicative of low levels of cPAHs impacts in that area. Further action for the Former Pond Area is recommended to encompass this cPAH issue (refer to Section 4.4); no further action is warranted for this particular spill.

4.17 Spill No. 89 C/D/E

Spill No. 89 C/D/E is located in the eastern-central portion of the facility adjacent to the Gas Turbine Facility (NRG Energy) to the northwest and Spill No. 69 to the southwest. The initial release occurred during October 1995. No specific information on the exact fuel type is available. Site characterization activities were completed as part of the Phase IIB and Phase IID RFI investigations in 1998, 2005 and 2006.

4.17.1 Spill Description

The area is covered primarily by gravel. Spill Nos. 89 C, D and E occurred on October 10, 1995 during the excavation of test pits near the gas meters in the Astoria LNG area (refer to Figure 4.17-1). According to the Con Edison spill summary, approximately 50 gallons of an unknown oil seeped into each of the three test pit excavations, totaling approximately 150 gallons. After a sheen appeared on the groundwater in the first test pit, a water sample was collected for PCB analysis and was reported to contain 19 mg/L of PCBs. A water sample collected from the second test pit reportedly contained 62 mg/L of PCBs.

4.17.2 Site Geology and Subsurface Observations

Spill No. 89 C/D/E has a subsurface of mostly sand, silt and trace amounts of gravel. Coal ash and coal slag were recorded in some areas. Coal ash and slag are present at locations Y74 and F56. Sampling location Y74 was NAPL-saturated throughout the boring and contained an MGP-type odor, while location F56 began to have a MGP-type odor at a depth of 6 feet and continued to the end of the boring to a depth of 14 feet. The only significant headspace reading was 613 ppm of organic vapors at 8 feet at location F56. Refer to the geologic logs provided in Appendix A for a full description of observations and measurements.

4.17.3 Previous Investigations

Impacts from this spill were initially investigated during the RFI Phase IIB, which included the installation of four temporary monitoring wells (A13, A14, A15 and A25) in a low-lying area to determine if LNAPL was present. During 1998, LNAPL was detected in well A25 only. TPH as No. 2 fuel oil (32,000 mg/kg) was reported in a soil sample collected from A25 at a depth of one foot. This well was included as part of the ongoing ICM program between 2001 and March 2006 to monitor and recover LNAPL, but was removed from the program after receiving written approval from the NYSDEC in their letter dated April 13, 2006.

4.17.4 Phase IID Investigation

The objective of the Phase IID RFI for Spill No. 89C/D/E was to evaluate potential soil and groundwater impacts from the historic spill. To meet this objective, four soil borings (F56, F73, Y74 and Y75) were installed, as shown in the Figure 4.17 series. Two soil samples were collected from each boring at 0-2 feet and 1 to 2 feet above the water table and analyzed for VOCs, SVOCs, PCBs and TPH-fingerprint. These results are presented in Table 4.17-1. During drilling activities, oil-saturated soil was encountered at the groundwater interface (approximately 2-3 feet) in borings Y74 and Y75. Groundwater samples were collected from wells F23, F56 and F73, as part of the property-wide groundwater assessment (refer to Section 4.41), to assess local groundwater quality at Spill No. 89.

4.17.5 Cumulative Site Characterization Findings

As shown in Table 4.17-1 and the series of Figures 4.17, all soil parameters were below the respective RSCOs, with the exception of one cPAH, benzo(a)pyrene. In the near surface soil sample collected from location F23, benzo(a)pyrene was detected slightly above the RSCO at 1.3 mg/kg.

The Spill No. 89C area revealed the presence of LNAPL at one time, but it is no longer present. Soil impacts were minimal, with only benzo(a)pyrene exceedances. Further action is recommended for the Spill No. 89C area to assess whether the prior LNAPL issue has been resolved. The Spill No. 89E area reveals cPAH impacts beyond the presence of benzo(a)pyrene that may extend north of the Former Pond Area, based on nearby soil data; this area is also recommended for further action to consider whether corrective action is necessary. Based on the lack of cPAH impacts and absence of LNAPL in the Spill No. 89D area, no further action is warranted for that particular area. Only the Spill No. 89C and 89E areas are recommended for further action beyond this RFI program.

4.18 Spill No. 92

Spill No. 92 is located in the northern section of the Pipe Yard near the Gas Turbine Facility. The release occurred in March 1996. After the initial response, no other action was implemented. Site characterization activities were completed as part of the Phase IID RFI investigations in 2005.

4.18.1 Site Description

Spill No. 92 is located in the Pipe Yard where the groundcover is predominantly gravel. Spill No. 92 was identified on March 19, 1996 in the Gas Turbine Facility (refer to Figure 4.18-1). During regular inspections by Con Edison, an operator found kerosene coming out of the Building 3 Generating Room. According to the

Con Edison spill summary, approximately 1,000 gallons of kerosene were released, due to a faulty solenoid valve, and entered a drain in the parking lot, which ultimately discharged into a drainage area located in the Pipe Yard to the south. Absorbents were used to contain the kerosene. A contractor recovered the spilled kerosene and removed contaminated debris and soil, and properly disposed of the impacted materials. The solenoid valve was subsequently replaced.

4.18.2 Site Geology and Subsurface Observations

The subsurface of the Spill No. 92 study area is composed of sand just below the surface, followed by mostly black coal ash fill and gravel. Coal slag is present in increasing depths. At depths below 5 feet, a petroleum odor was present, and petroleum sheen was noted below 7 feet at both locations K120 and K121. Headspace readings of organic vapors were generally modest compared to the other study areas assessed, with a concentration of 64 ppm at location K120 at a depth of 7-9 feet. For a full description of subsurface observations at the Spill No. 92 site, refer to Appendix A, which provides the geologic records.

4.18.3 Previous Investigations

After the initial spill response (spill containment and removal of impacted debris and soil) in 1996, no further action was taken. All site characterization activities were performed during the Phase IID RFI in 2005.

4.18.4 Phase IID Investigation

The Phase IID objective for Spill No. 92 was to characterize the nature and extent of the media potentially impacted by the kerosene spill. To meet this objective, three temporary monitoring wells (K119 through K121) were installed to determine if kerosene remained in the area of the spill, and five soil samples were collected at depths ranging from 1-2 feet below the surface to 1-2 feet above the water table. Soil samples were analyzed for VOCs, SVOCs (including cPAHs and non-cPAHs), and PCBs. In addition, boring location Y142, installed and sampled for VOCs, SVOCs, and PCB as part of the Western Pipe Yard Area study area, provides supplemental data to characterize this spill. An overview of soil data is presented in Table 4.18-1. Each of the three temporary wells was gauged for the presence of LNAPL, using an oil/water interface probe. Potential impacts to groundwater from Spill No. 92 were assessed, based on the results obtained from monitoring well F58, which is associated with the Site Perimeter Monitoring Well Network.

4.18.5 Cumulative Site Characterization Findings

As shown in Table 4.18-1 and the series of Figures 4.18, no VOCs, non-cPAHs, non-PAH SVOCs, or PCBs were detected above the RSCO standards. Only cPAHs were detected in excess of their respective standards, at well K120. The most prevalent detection of cPAHs was in sample location K120, at a depth of 4-5.5 feet. Indeno(1,2,3-cd), pyrene (280 mg/kg), benzo(b)fluoranthene (350 mg/kg), benzo(k)fluoranthene (290 mg/kg), chrysene (350 mg/kg), benzo(a)pyrene (280 mg/kg), dibenz(a,h)anthracene (72 mg/kg), and benzo(a)anthracene (330 mg/kg) were all detected in the sample at concentrations above their respective RSCO standards. At a depth of 1-2 feet at location K120, all of the same cPAHs, with the exception of benzo(k)fluoranthene and chrysene, were also detected in excess of their respective RSCO standards but at much lower concentrations.

Based on the recorded spill type of kerosene and the close proximity of sample location K120 to the Pipe Yard SWMU, it is unlikely that the cPAH detections are related to that spill. Kerosene is primarily comprised of C_9-C_{16} hydrocarbons, while cPAHs are comprised of substantially heavier hydrocarbons. It is more likely that the cPAHs are associated with the subsurface material present throughout the Pipe Yard SWMU. These impacts from cPAHs are consistent with soil conditions at the nearby Former Gas Condensate Tank. Both of these areas are recommended for further action as part of the overall Pipe Yard SWMU (refer to Section 4.8).

The temporary wells were gauged for LNAPL as presented in Table 2-6. No LNAPL has been measured in any of the wells.

Potential impacts to groundwater from Spill No. 92 were addressed on a facility-wide basis as discussed in Section 4.41 – Facility-wide Groundwater.

4.19 Spill No. 60

Spill No. 60 is located in the eastern portion of the Astoria property adjacent to the Triangle Area study area to the south and the A-10 Dock Area to the east. Groundcover in the area of Spill No. 60 is primarily gravel, with grass to the east and paved roads to the north and west.

4.19.1 Site Description

As stated in Table 2-2, there are four separate spills associated with Spill No. 60. Two spills are identified as occurring on September 18, 1980 near the oil/water separator (refer to Figure 4.19-1). These spills were the result of prior operations involving the discharge of condensate and oily water from a steam/oil line trench. According to Table 2-2, Spill Nos. 34C and 34F were recorded on June 14, 1994 in the same area and involved an estimated 25 gallons of No. 6 fuel oil each.

4.19.2 Site Geology and Subsurface Observations

The subsurface is relatively consistent with concrete, brick fragments and sand fill. Coal ash generally started to appear below a depth of 7 feet, with exception of location K122, where coal ash was recorded at 5 feet. At location K125, coal slag was apparent at the surface and again at a depth of 7 feet. Also, a petroleum odor was recorded at a depth of 11 feet at each of the sampling locations. No headspace readings exceeded 25 ppm of organic vapors at any of the sampling locations in this area. For more detailed records, refer to Appendix A for measurements and descriptions for each sampling location.

4.19.3 Previous Investigations

The spill was fully investigated by Con Edison, and remedial plans were approved by the NYSDEC. However, subsequent discussions between the NYSDEC and Con Edison have resulted in an agreement to investigate Spill No. 60 as a new study area.

Site characterization activities were completed as part of the Phase IID investigation in 2005 and 2006.

4.19.4 Phase IID Investigation

The Phase IID objectives for Spill No. 60 were to characterize the nature and extent of the soil potentially impacted by the spill, and to evaluate whether LNAPL is present.

To meet this objective, six temporary wells (K122 through K127) were installed, as shown in Figure 4.19-3. Soil samples were collected from both shallow soils (0-2 feet) and deep soils (1-2 feet above the water table) for analysis of VOCs, SVOCs and PCBs. The deep soil sample from well K126 was also analyzed for TPH. In addition, the temporary monitoring wells were gauged on numerous occasions to determine if LNAPL was present on the groundwater.

4.19.5 Cumulative Site Characterization Findings

A total of 12 soil samples were collected from six sampling locations in the area. Analytical data for all 12 samples is presented in Table 4.19-1. A summary of those parameters that exceed RSCO standards in soil is presented in Table 4.19-2. As shown in Figure 4.19-5 and detailed in Table 4.19-1, VOCs were detected in all the samples at very low levels (< 1 mg/kg), well below their respective RSCO standards.

As shown in Table 4.19-1, PCBs were detected in nine of the 12 samples. However, all concentrations were below the RSCO standard of 25 mg/kg for total PCBs. As shown in Figure 4.19-7, total PCBs ranged from

less than 1 mg/kg at three locations to 1-10 mg/kg at the remaining three locations. TPH was detected in the deep soil sample, from K126 at 230 mg/kg.

SVOCs were detected at varying depths throughout the subsurface soil in the area. As shown in Figure 4.19-6, SVOCs were detected primarily in the 10-100 mg/kg range, with only one sample result in the 1-10 mg/kg range. As shown in Table 4.19-2, only three SVOCs (all cPAHs) exceeded their respective RSCO standards. Benzo(a)anthracene at 19 mg/kg and dibenz(a,h)anthracene at approximately 1.4 mg/kg exceeded their respective RSCO standards of 11 mg/kg and 1.1 mg/kg at only one location (K125) in the deepest sample at a depth of 13-15 feet. As shown in the depth-specific Figure 4.19, benzo(a)pyrene exceeded its RSCO at varying depths in five out of the six sampling locations, with the highest concentration of 12 mg/kg also in location K125,at a depth of 13-15 feet.

The cPAHs in this area are similar to the nearby detections in the northern portion of the Triangle Area. It is unclear whether they are residuals from the No. 6 fuel release. Based on the proximity of these two study areas and the similarities of the cPAH impacts in soil, further action is recommended for the Triangle Area (refer to Section 4.22). The temporary wells were gauged for LNAPL, as presented in Table 2-6. No LNAPL has been measured in any of the wells.

Potential impacts to groundwater from Spill No. 60 were addressed on a facility-wide basis, as discussed in Section 4.41 – Facility-wide Groundwater.

4.20 Coal Tar Seeps

Several coal tar seeps have historically been observed by Con Edison personnel in the western section of the Pipe Yard SWMU. The historic locations of these seeps are depicted on Figure 4.20-1.

4.20.1 Site Description

Since the early 1990s, facility personnel have reported observing tar-like seeps appearing throughout the Pipe Yard (refer to Figure 4-20.1). The origin of these seeps is unknown. USEPA and the NYSDEC believe that the seeps are the result of waste disposal practices associated with the former MGP operations. However, facility information indicates that most of the wastes associated with the MGP operations were sold and removed from the site. Analytical data associated with sampling these seeps and the soils of the Pipe Yard indicate coal tar constituents (i.e., high PAHs and BTEX) to be present. Recent sampling of the coal tar seeps by Con Edison during the fall of 2001 indicated no detectable levels of PCBs in the tar.

To eliminate these coal tar seeps from the surface of the Pipe Yard, Con Edison developed an internal procedure for reporting and removal of coal tar. The procedure includes notifying Con Edison's Environment, Health and Safety (EH&S) Department and subsequently making arrangements to have properly-trained personnel remove the coal tar from the ground surface (down to a depth of 6 inches). Excavated coal tar and soil are placed into drums or plastic-lined roll-off containers and disposed of properly. These excavated seep areas are then backfilled with clean fill and restored to pre-existing conditions.

4.20.2 Site Geology and Subsurface Observations

The Coal Tar Seeps do not comprise a contiguous parcel of land. The areas are widespread in the approximately vicinity of the Pipe Yard. In general, the sampling locations in and around the Coal Tar Seep areas exhibit sand, trace gravel, clay, coal ash and coal slag. The specific stratigraphy of the soil among the various sampling locations varies widely. Generally, sand is present throughout all layers. Coal ash and slag tend to appear at deeper horizons below 5 feet, but some areas show coal ash and slag at shallower depths (0-5 feet). An MGP-type odor was reported at many locations throughout the area. In general, the reported odor first becomes evident at depths below 5 feet. The exception being location Y94 (2-4 feet), were a layer of sludge-like material was observed exhibiting a "very strong" MGP-type odor with a soil headspace reading of 1,280 ppm. The underlying soil sample from 4-6 feet had a much lower soil headspace reading of 2.6 ppm.

At boring location Y227, continuous elevated headspace readings in excess of the organic vapor meter digital scale (9,999 ppm) were recorded at depths of 5-15 feet. At 5 feet, the areas that noted a strong MGP-type odor were locations K121, K120, K119, F15, Y133, Y227 and Y18. At boring Y18, soil headspace readings ranged from 69 to 223 ppm from 5-7 feet.

An MGP-type odor was noted at 7-9 feet in soil samples from locations Y37, Y133, Y22, F15 and F37. At a depth of 9-11 feet, an MGP-type odor was reported in the soil samples from locations Y37, Y96, Y227, F15, F17 and F25. Elevated headspace readings were reported in boring Y96 (4,200 ppm) and Y37 (1,778 ppm).

At a depth of 11-13 feet, an MGP-type odor was detected at borings Y227 and Y37, where coal ash was observed to be mixed with NAPL, with a headspace reading of 1,740 ppm. Similarly at boring Y226, a coal ash and NAPL mixture was observed, with a headspace reading of 1,660 ppm. At continuing depths up to 19 feet, soil samples from borings Y226, Y227 and Y37 exhibited "slight" MGP-type odors and elevated headspace readings greater than 4,000 ppm. Refer to Appendix A to review the detailed geologic logs compiled for the Coal Tar Seep sampling locations.

4.20.3 Previous Investigations

No prior investigations of the coal tar seeps have been conducted as part of the RFI. Con Edison has implemented a maintenance plan for managing the coal tar seeps (refer to prior description of procedure under Section 4.20.1).

4.20.4 Phase IID Investigation

The objectives of the Phase IID RFI for the Coal Tar Seeps were to evaluate the presence of coal tar underground and to assess its potential impacts to groundwater.

To evaluate the presence of coal tar underground and potential impacts to groundwater, Con Edison completed eight soil borings (Y92 through Y99) at historic locations where coal tar seeps have been observed. Shallow (0-2 feet) and deep (1-2 feet above the water) soil samples were collected from each boring and analyzed for VOCs, SVOCs, PCBs, and total cyanide. Borings were completed to the water table. All boring activities were closely overseen during drilling to verify the presence/absence of coal tar or oil-saturated soils.

To assess potential impacts from the coal tar seeps to the groundwater, Con Edison installed permanent monitoring well F77 and collected groundwater samples from this well and five other monitoring wells, including F15, F18B (replacement well for F18, destroyed during site trenching activities), F54, F58, and F72 for analysis of VOCs, SVOCs, PCBs and total cyanide.

4.20.5 Cumulative Site Characterization Findings

The observations of coal tar seeps within the Pipe Yard by Con Edison personnel are consistent with drilling observations of coal slag and ash in that general portion of the Astoria facility. Six areas of cPAH impacts within the Pipe Yard are recommended for further action, as discussed in Section 4.8, the Pipe Yard SWMU. These six areas encompass the area characterized as being impacted by cPAHs and potentially contributing to the coal tar seeps.

Seventeen soil samples were collected from borings Y92 through Y99 to depths of up to 8 feet for laboratory analysis of VOCs, SVOCs, PCBs, and total cyanide. These results are summarized in Table 4.20-1, and those samples exceeding RSCO standards are summarized in Table 4.20-2. Most VOC concentrations in these samples were less than 1 mg/kg, except for the samples from borings Y96 and Y98, which yielded VOC concentrations in the range of 1-10 mg/kg (refer to Figure 4.20-5). All concentrations of VOCs detected were below RSCO standards.

SVOCs were reported at higher concentrations, typically up to the range of 100-1,000 mg/kg, as shown in Figure 4.20-6. These concentrations are consistent with the percentage of spent coal by-products noted in the samples. According to Table 4.20-2, 10 samples from seven locations (Y92 to Y94 and Y96 to Y99) contained concentrations of certain cPAHs greater than the respective RSCO standards. These cPAHs included benzo(a)anthracene in six samples at concentrations from 21 to 100 mg/kg, benzo(a)pyrene in all samples at concentrations from 5.1 to 130 mg/kg, benzo(b)fluoranthene in five samples at concentrations from 13 to 110 mg/kg, chrysene in one sample (Y98, 0-2 feet) at 120 mg/kg, dibenz(a,h)anthracene in seven samples at estimated concentrations from 1.7 to 20 mg/kg, and indeno(1,2,3-c,d)pyrene at concentrations in four samples from 16 (estimated) to 60 mg/kg.

PCB concentrations were all below the RSCO standard of 25 mg/kg. The highest concentration reported was 13 mg/kg in the samples from Y96 (6.5-7.5 feet) and Y98 (0-2 feet).

Total cyanide concentrations were also below the RSCO standard of 10,000 mg/kg, with the highest concentration of 27.4 mg/kg in the sample from Y92 (6-7 feet).

Potential impacts to groundwater from the coal tar seeps were addressed on a facility-wide basis as discussed in Section 4.41 – Facility-wide Groundwater.

4.21 Cable Storage Yard AOC

The Cable Storage Yard is a gravel-covered area approximately 800 feet long and 300 feet wide and located north of the East Yard and south of the Pipe Yard (refer to Figure 4-21.1 for Cable Storage Yard study area). Based on the operational activities throughout the area, characterization of the subsurface was included as part of the RFI characterization program, with samples collected in the 2005/2006 timeframe.

4.21.1 Site Description

The large spools of cable stored in this area contain oil-insulated cable, some of which may have contained PCBs. The ends of some of these oil-filled cables have often been severed, and thus may have leaked oil onto surface soil. According to facility personnel, cables that are identified as leaking oil, or having the potential to leak oil, are placed on a sheet of polyethylene and covered with the same. Additionally, any cutting of lead cable that occurs at the Cable Storage Area could potentially result in releases of lead to the grass/soil surface.

4.21.2 Site Geology and Subsurface Observations

The area of the Cable Storage Yard study area has a geological composition of tightly-packed sand and gravel. With the exception of borings Y100 and Y110, every boring had coal slag and tar present to the bottom of the boreholes. Two areas showed “odor.” Sampling location Y122 contained a MGP-type odor (1 foot) and location Y108 had a “strong petroleum-type” odor (4 feet). For a full description of subsurface observations at the Cable Storage Yard study area, refer to Appendix A, which provides the geologic records.

4.21.3 Previous Investigations

No prior investigation of the Cable Storage Yard was warranted, as there were no recorded spills or other issues of significance. In 2005/2006, 24 sampling locations were used to characterize the vadose zone soils throughout the entire area. The sample results are described below.

4.21.4 Phase IID Investigation

Due to the nature of operations at the Cable Storage Yard, the objective of the Phase IID RFI was to assess the soil quality with respect to PCBs and lead. To meet this objective, Con Edison installed 24 soil borings (Y100 through Y123) as shown in Figure 4.21-2. Two shallow soil samples (i.e., 0-3 foot interval) were

collected from each boring, and deeper samples (up to approximately 7 feet) were collected in five borings (Y100, Y107, Y111, Y116, and Y123) to assess conditions near the water table interface.

In addition, as part of the sludge delineation efforts for Blue Dog Lake, soil boring Y312 was advanced within the northern central area of the Cable Storage Yard. Analytical data (i.e., VOCs, SVOCs, PCBs, and TPH) collected from that boring Y312 is also included as part of the Cable Storage Yard dataset for supplemental information.

4.21.5 Cumulative Site Characterization Findings

Concentrations of lead detected in the soil samples were below the RSCO standard of 3,900 mg/kg, with concentrations ranging from 5.2 mg/kg at Y102 (2-2.5 feet) up to 759 mg/kg at Y123 (1-1.5 feet). Refer to Table 4.12-1.

A majority of the samples analyzed for PCBs were also below the RSCO standard of 25 mg/kg, with the exception of nine samples from nine separate locations. At these nine locations, PCB concentrations generally ranged from 27 mg/kg (Y109, 2-2.5 feet) to 160 mg/kg (Y117, 0.5-1 feet), with the highest concentration of 480 mg/kg detected at Y112 (0-0.5 feet). As shown in Figure 4.21-7, the distribution of PCBs in soil has been adequately characterized. The PCB concentrations at most locations are within 1-10 mg/kg, with a maximum concentration of 480 mg/kg at Y117 in surface soil (the upper 6 inches).

Regarding the nearby soil data collected as part of the facility-wide groundwater monitoring program, cPAHs were detected at levels that exceed their respective RSCO standards. Six of the seven analyzed cPAHs were reported above RSCO standards, at concentrations up to 56 mg/kg for dibenz(a)anthracene. This finding is consistent with many other areas of the facility where cPAHs are detected in the subsurface fill above RSCO standards. This particular location is not considered to be representative to assess potential spills or other operational releases at the Cable Storage Yard.

Overall, the PCB impacts to soil in the Cable Storage Yard are consistent with the historical and ongoing operations in this area. Incidental releases of PCB-containing oil from electric cables could have occurred and impacted the shallow subsurface. The area impacted by PCBs is recommended for further action.

4.22 Triangle Area AOC

The Triangle Area gets its name from the shape of this parcel, which abuts the earthen trench where Spill No. 60 occurred. It is an undeveloped, gravel-covered area that is sometimes used for the storage of bulk items such as steel storage containers.

4.22.1 Site Description

The Triangle Area is located northeast of the LNG plant (refer to Figure 4-22.1 for the Triangle Area site plan). During the summer of 1997, fuel oil seeps were observed coming up through the ground surface in the Triangle Area. The source of the fuel oil is not known, but is likely due to past spills.

4.22.2 Site Geology and Subsurface Observations

The Triangle Area was relatively uniform in its subsurface composition, consisting of sand, silt, and gravel with fill materials (bricks, concrete, ash and slag). Most locations exhibited a petroleum-like odor in subsurface soil samples. Location Y90, in particular, contained coal ash from 2-12 feet, along with a petroleum-like odor, and was directly underlain by NAPL-saturated sand, with a strong MGP-type odor from 12-14 feet. An elevated headspace reading was recorded in the 12-14 foot sample at 2,138 ppm. Refer to Appendix A in the geologic logs for more information concerning the Triangle Area.

4.22.3 Previous Investigations

The Triangle Area had not been investigated previously during the RFI. The following activities were conducted during the Phase IID RFI.

4.22.4 Phase IID Investigation

The objective of the Phase IID RFI was to evaluate the presence of fuel oil seeps. To meet this objective, Con Edison conducted two subsurface investigations of this area. The first investigation involved the excavation of five exploratory test pits (Y87 through Y91) using an excavator up to depths of 14 feet (groundwater interface) as depicted in Figure 4.22-2. Oil-saturated soil was observed in test pit Y90 (northernmost test pit) and, to a lesser degree, in test pit Y91 (northwestern-most test pit) at about 12 – 14 feet just above the water table interface. These observations occurred along the northern edge of the Triangle Area, directly adjacent to Spill No. 60. Shallow (0-2 feet) and deep (12-14 feet, or 1-2 feet above the water table) soil samples were collected from test pits Y87, Y90 and Y91 for analysis of VOCs, SVOCs, and PCBs. Two soil samples were collected from the oil-impacted layer encountered at locations Y90 and Y91 for TPH-DRO analysis.

The second investigation involved the advancement of five soil borings Y313 through Y317 in a semi-circular fashion to delineate the lateral extent of oil-impacted soil excavation encountered at locations Y90 and Y91. Each boring was advanced to 20 feet, approximately 7 feet into the water table. No oil-impacted layer was encountered in any of these five borings; however, a petroleum-like odor was noted at all locations, starting at approximately 13 feet, which coincided with the water table interface. Soil samples were collected from each boring for PAH analysis.

4.22.5 Cumulative Site Characterization Findings

The series of Tables 4.22 and Figures 4.22 present the comprehensive information compiled for the Triangle Area. A discussion of specific observations follows.

In general, the SVOCs in the central portion of the Triangle Area include cPAHs and non-cPAHs. The impacted area overlaps the nearby cPAHs in the vicinity of Spill No. 60. TPH-DRO concentrations detected in the groundwater interface samples from Y90 and Y91 were 76,000 mg/kg and 50,000 mg/kg, respectively. This area is recommended for further action, incorporating the impacts of the nearby soil associated with Spill No. 60 (refer to Section 4.19).

Potential impacts to groundwater from the Triangle Area are addressed on a facility-wide basis as discussed in Section 4.41 – Facility-wide Groundwater.

4.23 AOC West of Main Gate

The AOC West of Main Gate is located in the southern portion of the facility, adjacent to 20th Avenue to the west and the guard shack at the main gate entrance to the east. This study area consists of an area of PCB-impacted soil initially discovered in 1997. Site characterization activities were completed as part of the Phase IID RFI investigation in 2005 and 2006.

4.23.1 Site Description

The area is primarily grass covered, bounded by an unpaved parking area on the west and main entrance road on the east. Refer to the series presented as Figure 4-23. On October 10, 1997, Con Edison notified the NYSDEC that, while completing general construction activities, a new area of impacted soil was discovered approximately 100 feet west of the guard shack at the main gate entrance (refer to Figure 4.23-1 for the area site plan). While digging, the contractor exposed stained soils at approximately 2-3 feet. A sample of the stained soil was collected, and the results indicated the presence of PCBs (Aroclor 1260 at 550 mg/kg). This finding prompted the NYSDEC to qualify this area as a new study area to be investigated during the Phase IID RFI.

4.23.2 Site Geology and Subsurface Observations

The study area west of the Main Gate was generally uniform in geologic stratigraphy, with sand and trace gravel at all depths assessed. There was a petroleum odor present at location Y129 at 8 feet, while Y131 contained a petroleum odor at 3 feet, with coal ash present at 4 feet. A similar odor was recorded at location Y328 at depths of 5 and 9 feet. Refer to the geologic logs provided in Appendix A for a full description of observations and measurements.

4.23.3 Previous Investigations

All site characterization activities at this study area were performed during the Phase IID RFI in 2005 and 2006. The set of soil samples collected to characterize this study area were analyzed for only PCBs, as the only issue of concern. However, soil from a nearby sampling location (Y328) was analyzed for other parameters as part of the installation of groundwater monitoring wells for the facility-wide groundwater assessment (refer to Section 4.41 for a discussion of the property-wide groundwater results). The results of PCB analysis, as well as these additional parameters, are discussed below.

4.23.4 Phase IID Investigation

The objective of the Phase IID for the AOC West of Main Gate was to investigate the extent of PCBs in soil. To meet this objective, four soil samples (Y129 through Y132) were collected from the area of the 1997 discovery for PCB analysis, as shown in Figure 4.23-2. The sampling depths extended from the near-surface (0-2 feet) to the bottom of the estimated potential impacted zone (8-10 feet). Boring Y328 was advanced as a data point associated with the Auction Yard soil investigation (refer to Section 4.38). Since it is adjacent to boring Y132, it has been included in this assessment of the AOC West of Main Gate.

4.23.5 Cumulative Site Characterization Findings

The series of Tables 4.23 and Figures 4.23 present the comprehensive information compiled for this area. A discussion of specific observations follows.

An overview of soil data is presented in Table 4.23-1. As shown in Figure 4.23-6, PCBs detected in soil ranged from <1 mg/kg in the southwestern portion of the area to the vicinity of 10 mg/kg in the other portions of the area. The highest concentration of PCBs was in the shallowest soil samples collected from depths of less than6 feet. The highest detection of PCBs was at location Y129, at a concentration of 6.8 mg/kg at a depth of 0-2 feet.

Total PCBs detected do not exceed the RSCO standard of 25 mg/kg at any of the locations sampled.

The additional soil samples collected from boring Y328 were analyzed for cPAHs, non-cPAHs and metals. As shown in Table 4.23-1, one cPAH [benzo(a)pyrene] was the only parameter detected in excess of RSCO standards. The detection of 4.3 mg/kg in soil collected from 4-6 feet was in excess of the relatively low RSCO standard of 1.1 mg/kg. No other parameters of interest were detected in this location. Based on the proximity of location Y328 to the nearby unpaved parking lot, it is likely that this cPAH detection is attributable to the road base and vehicles, not related to the release of PCBs at this site.

The cPAH impacts associated with this site were detected in one location within the study area. Similar impacts were detected south of the area at the nearby Areas Unrelated to Other Waste Management Practices (refer to Section 4.10). The exceedances in both of these areas are recommended for further action under the context of this study area.

4.24 AOC South of Transformer Shop

The Transformer Shop study area is located in the western portion of the Astoria facility, adjacent to the Astoria Transformer Shop to the east and 20th Avenue to the west. Ground cover in this area is predominantly gravel.

4.24.1 Site Description

This study area consists of an area near the southern entrance door to the Transformer Shop, which consists of PCB-impacted soil initially discovered in 2000 (refer to Figure 4.24-1 for the site plan). Spill No. 59A, which is discussed in Section 4.25, also occurred in this area on March 4, 1980 and involved an estimated 3,400 gallons of mineral oil.

4.24.2 Site Geology and Subsurface Observations

The area in the vicinity of the Transformer Shop has a general soil composition of brown sand, clay and traces of gravel, with some coal ash and slag present at deeper horizons. However, there was coal ash and slag present in the 0-3 foot horizon in locations Y234 and Y237. While hand-clearing location Y233, an elevated headspace reading of 143 ppm of organic vapors was recorded at a depth of 6 feet, but there were no other headspace readings that exceeded 50 ppm. One area of interest was location Y236. In September 2006, coal ash and coal slag were present near the surface of the area; however, in May 2006, there was no recorded evidence of coal ash or coal slag. This indicates that the coal ash and coal slag are not prevalent, but are more like impurities in the native subsurface strata and fill. Appendix A contains the full set of geologic logs for this study area, for reference of observational and quantitative information regarding this study area.

4.24.3 Previous Investigations

As reported in Con Edison's February 28, 2000 RCRA Bi-Monthly Progress Update for the facility, 10 soil samples were collected from a triangular area adjacent to the southwestern corner of the Transformer Shop on January 4, 2000. PCB concentrations in these samples ranged from 2 mg/kg to 142 mg/kg. After the initial sampling, no other action was implemented. Site characterization activities were completed as part of the Phase IID RFI investigations in 2005 and 2006.

4.24.4 Phase IID Investigation

The objective of the Phase IID RFI was to evaluate PCBs in soil near the southern entrance door to the Transformer Shop.

To meet this objective, six soil borings (Y232 through Y237) were installed, as shown in Figure 4.24-1. Soil samples were collected from both shallow soils (0-2 feet) and soils near the maximum extent of each boring (1-2 feet above the water table) and analyzed for PCBs, as shown in Figure 4.24-3. Soil samples from Y236 were also analyzed for petroleum.

4.24.5 Cumulative Site Characterization Findings

A total of 18 samples were collected from the six borings located in the paved ditch located near the southern entrance door to the Transformer Shop. The complete analytical data for these samples is presented in Table 4.24-1. As shown in Figure 4.24-5, PCBs were detected at all six locations from a minimum of <1 mg/kg at four of the locations to a maximum of 1-10 mg/kg at the remaining two locations. Total PCBs did not exceed the RSCO of 25 mg/kg for PCBs in any of the locations analyzed at any depth.

Based on the lack of PCBs or other parameters detected in excess of RSCOs, no further action is recommended for the Transformer Shop study area as an independent study area under the Corrective Action program.

4.25 Spill No. 59

Spill No. 59 occurred adjacent to the southwestern side of the Transformer Shop (Building 82) in an area of several above-ground oil storage tanks. This area is very close to the Transformer Shop (refer to Section 4.24).

4.25.1 Site Description

This spill was added to the Phase IID RFI program after the official work plan had been approved by the NYSDEC. Therefore, the scope of work for this Spill was submitted to the NYSDEC during December 2003 as Addendum #1 to the work plan.

Spill #59 occurred on March 4, 1980, when a pipe elbow ruptured at Tank #2, located on the south side of the Transformer Building (Bldg. 82) (refer to Figure 4-25.1 for Spill No. 59 site plan). The rupture resulted in an estimated 3,400 gallons of mineral oil spilling into a covered concrete trench (i.e., pipe chase), which drains into a storm sewer that discharges to the East River. Subsequently, the trench was cleaned out. Due to heavy rains at the time of the spill, it was presumed that the oil had been flushed out of the sewer and into the river.

4.25.2 Site Geology and Subsurface Observations

The subsurface of this area is characterized by the same sampling locations described for the Transformer Shop study area (refer to Section 4.24). As described in Section 4.24.2, the subsurface soil is composed of brown sand, clay and traces of gravel, with some coal ash and slag present at deeper horizons. Headspace readings ranged from non-detect to 143 ppm in sampling location Y233 (6 feet). Refer to Section 4.24.2 for more detail, as well as Appendix A for the geologic logs compiled for this area of the property.

4.25.3 Previous Investigations

This spill had not been investigated until the Phase IID RFI, as discussed in the next section.

4.25.4 Phase IID Investigation

The objective of the Phase IID RFI was to assess whether the spill has impacted the soil immediately adjacent to the pipe chase and may be the cause of the PCBs recently detected in Catch Basin #22.

Based on discussions between Con Edison and the NYSDEC, four soil borings (Y234 through Y237) were advanced at locations up to a depth of 11 feet, as depicted in Figure 4-25.2. These locations are oriented along both sides of the pipe chase. Three soil samples were collected from each boring and analyzed for PCBs. The soil samples included one shallow sample (0-2 feet), one intermediate sample (below the invert of the pipe chase) and one deep sample (1-2 feet above the water table). One deep soil sample was also collected from boring Y236 for TPH-DRO analysis.

4.25.5 Cumulative Site Characterization Findings

The series of Tables 4.25 and Figures 4.25 present the comprehensive information compiled for this area. PCB concentrations ranged from non-detect to less than 1 mg/kg, which is well below the RSCO standard of 25 mg/kg. TPH-DRO concentrations in the sample from 8-10 feet from Y236 were 1,100 mg/kg. Overall, no subsurface impacts were detected in the Spill No. 59 area and, therefore, no further action is warranted.

4.26 Western Pipe Yard Area

The Western Pipe Yard Area is located in the central portion of the Astoria facility, within the overall Pipe Yard SWMU. Refer to the upfront figures in Section 2.0 for the location of this area relative to the overall facility.

4.26.1 Site Description

The majority of the western section of the Pipe Yard is paved and is used for the storage of a variety of materials and supplies used by Con Edison's field operations crews. Refer to Figure 4-26.1 for the Western Pipe Yard Area site plan. The area was investigated during several of the RFI study phases. As shown in Figure 4.26-2, soil samples were collected in the 1994/1995 timeframe as one of the first study areas to be assessed. Further characterization was conducted through subsequent sampling programs, including the Phase IID program, in the 2005/2006 timeframe. The sampling locations were generally well distributed across the site, as there were no specific spills recorded. The closest spills are Spill Nos. 73 and 92, which have been identified as separate study areas (refer to Sections 4.33 and 4.18, respectively).

4.26.2 Site Geology and Subsurface Observations

The Western Pipe Yard Area is mostly comprised of sand, gravel and trace silt. There were two locations with relatively significant headspace readings. Location F27 contained a headspace of 125 ppm at 2-4 feet, and 119 ppm at 8-10 feet. Location Y94, which is a part of the surrounding area, exhibited a reading of 1,280 ppm at 2-4 feet. In general, this study area is a subset of the larger Pipe Yard. For more subsurface detail in this vicinity of the property, refer to the geologic logs compiled in Appendix A of this document.

4.26.3 Previous Investigations

Prior to the Phase IID program, very few samples were collected from the area. Three locations were assessed: one at the former Fire Fighting School, one near Spill No. 73, and one in the material storage area at the western corner of the site. Soil samples were collected from depths ranging from 2 feet (F27A) up to 6 feet (F27) for analysis of VOCs, SVOCs and PCBs. VOCs (specifically BTEX) were only detected at relatively low concentrations (0.041 mg/kg). Total cPAH concentrations ranged from 2.6 mg/kg at location F27A (0-2 feet) to 15 mg/kg at location F27 (4-6 feet). PCB concentrations were less than 9 mg/kg (F27 at 0-2 feet). A groundwater sample was collected from F27 and analyzed for VOCs, SVOCs and PCBs. Results of the analyses reported no detectable levels of VOCs, relatively low concentrations of SVOCs (near the detection limits), and trace concentrations of PCBs estimated at 3 ug/L. A follow-up investigation as part of the Phase IID program was recommended, primarily to increase the distribution of sampling locations.

4.26.4 Phase IID Investigation

Based on the evaluation of prior data and discussions with the NYSDEC during the April 2002 site strategy sessions, additional sampling was planned. The sampling program was not based on the result of contaminants detected (as little evidence of site impacts existed). Instead, it was to increase delineation of the area to better characterize the site overall. Soil sample analysis was to span a broad range of parameters, including VOCs, SVOCs and PCBs. The results of the Phase IID program, combined with the prior data, are discussed in the next subsection.

4.26.5 Cumulative Site Characterization Findings

The full set of analytical data collected for the Western Pipe Yard Area is presented in Table 4.26-1. A summary of parameters that exceed RSCO standards in soil is presented in Table 4.26-2. As shown in Figure 4.26-5, VOCs were essentially non-detect throughout the area. The one exception is location F57, which is further into the main Pipe Yard area (refer to Section 4.8) and in close proximity to the historic observations of coal tar seeps (refer to Section 4.20). Total VOCs were in the 100 mg/kg range in soil collected from that location. As shown in Tables 4.26-1 and -2, none of the individual VOCs exceed their respective RSCO standards.

SVOCs were detected throughout subsurface soil in the area. As shown in Figure 4.26-6, the ranges vary, with generally lower concentrations (1-100 mg/kg) in the western portion of the area (farther away from the main Pipe Yard Area) and higher concentrations (1,000-10,000 mg/kg) in the northeastern portion. Table 4.26-2 shows that seven of the SVOC compounds (all cPAHs) exceed their respective RSCO

standards. These exceedances are in five specific locations. Three of the locations (MGP18, MGP19 and Y143) were part of the MGP AOC sampling program (refer to Section 4.40). The fourth location (K120) is adjacent to Spill No. 92 (refer to Section 4.18) and the fifth (Y36) is in the former Fire Fighting School Area (refer to Section 4.7).

PCBs were not detected in most locations analyzed. As shown in Figure 4.26-7 concentration ranges were highest as the sampling program approached the main portion of the Pipe Yard (southeastern portion of the site) at ranges in the 10 mg/kg vicinity. Table 4.26-1 reveals that only one sample (Y52 at 2-4 feet) exceeded the 25 mg/kg PCB RSCO standard, with a reported concentration of 34 mg/kg at that horizon.

None of the metals analyzed in soil exceeded their respective RSCO standards.

This site evaluation indicates that there is little evidence to support retaining the Western Pipe Yard Area as an independent study area for further action. The impacts in the area appear to be associated with either the Former Fire Fighting School (Section 4.7) or Pipe Yard SWMU (Section 4.8), both of which are recommended for further action relative to the presence of cPAHs and PCBs. Thus, no further action is recommended for the Western Pipe Yard Area as a separate study area.

4.27 Former Corporate Transportation USTs SWMU

The Former Corporate Transportation USTs SWMU is located in the western-central portion of the facility, with Transportation Building #137 directly to the west and the former Fire Fighting School to the east. The ground cover in this area is primarily pavement.

4.27.1 Site Description

The former Corporate Transportation USTs were two 4,000-gallon underground storage tanks (gasoline and diesel fuel) located in the Corporate Transportation Facility at the intersection of 23rd Street and 16th Avenue (refer to Figure 4.27-1 for a site plan of this area). These tanks, constructed of concrete-encased steel, were installed in 1983 and removed during 1998. Subsequently, Con Edison replaced the two USTs with two new 4,000-gallon USTs, which are also currently used to store gasoline and diesel fuel.

Spill No. 39 was recorded in this area, northwest of the location of the former Corporate Transportation USTs. As shown in Table 2-2, on April 13, 1989, an estimated 25-40 gallons of diesel fuel were released onto the surface.

4.27.2 Site Geology and Subsurface Observations

This area mostly consists of sand and gravel. In portions of the F64 and Y149 boring locations, coal slag and coal ash were present at depths of 2 feet. Below 7 feet at locations Y148 and Y150, there was a brownish-yellow tinge to the sand. Also, in the F64 boring, there was a slight petroleum odor reported at a depth of 9-11 feet. In that same borehole at a depth of 11 feet, there was a slight sheen on the split-spoon sampler, yet no odor was reported to be present. Headspace readings were relatively low, with the exception of location Y148, where the reading in the first 2 feet of the subsurface reached 165 ppm of organic vapors. Appendix A contains the geological logs for this site with more detailed subsurface measurements and observations.

4.27.3 Previous Investigations

In August of 1996, Environmental Concepts, Inc. (ECI) collected soil and groundwater samples adjacent to the two tanks. Field screening of samples with an organic vapor meter revealed VOC concentrations from non-detect to 54 mg/kg. Soil samples were sent to a laboratory for analysis of PCBs, VOCs, SVOCs, and TCLP lead. Groundwater samples were collected and analyzed for PCBs, VOCs, SVOCs, 13 priority pollutant metals, TPH and oil & grease, pH, flashpoint, and total suspended solids (TSS). Soil sample results showed VOC and SVOC concentrations warranting further study. There were no detectable concentrations of the

target analytes in the groundwater, with the exception of lead, which exceeded the applicable TOGS (NYSDEC, Technical and Operational Guidance Series) groundwater standard. Site characterization activities were performed during the Phase IID RFI in 2005.

4.27.4 Phase IID Investigation

The objective of the Phase IID was to evaluate the extent of BTEX, including methyl tertiary butyl ether (MTBE), PAHs, and lead contamination in the vicinity of the former USTs.

To meet this objective, three borings (Y148 through Y150) and one permanent monitoring well (F64) were completed in the vicinity of former USTs. One soil sample was collected from each boring and analyzed for VOCs, cPAHs, non-cPAHs. A soil sample collected during installation of location F64 was analyzed for VOCs, SVOCs, cPAHs, non-cPAHs, and PCBs. Potential impacts to groundwater from the former Corporate Transportation USTs were assessed, based on the results obtained from monitoring well F64, which is associated with the Site Perimeter Monitoring Well Network.

4.27.5 Cumulative Site Characterization Findings

Analytical data for all four samples analyzed is presented in Table 4.27-1. A summary of those parameters that exceed RSCO standards in soil is presented in Table 4.27-2. As shown in Figure 4.27-5 and detailed in Table 4.27-1, VOCs were detected in all four samples at low levels (< 1 mg/kg), well below their respective RSCO standards.

As shown in Table 4.27-1 and Figure 4.27-7, PCBs were detected in the only soil sample analyzed for PCBs (F64) at a concentration of .078 mg/kg, which is well below the RSCO of 25 mg/kg for total PCBs. Lead concentrations ranged from a minimum of 6.2 mg/kg at Y150 to a maximum of 161 mg/kg at Y149, which is located south of the former USTs in the parking area (see Figure 4.27-8). None of the samples analyzed exceeded the RSCO for lead.

SVOCs were detected in the < 0.1 mg/kg range at two locations (Y148 and Y150), in the 1-10 mg/kg range at one location (F64) and in the 100 -1000 mg/kg range at the remaining location Y149. As shown in Table 4.27-2, five SVOCs (all cPAHs) exceeded their respective RSCO standards, and all of the exceedances were confined to one location (Y149) at a specific depth (4-6 feet). SVOCs in all of the other samples analyzed were detected at levels well below their respective RSCOs.

One location (Y149) revealed soil impacts from cPAHs. No other sources of cPAHs appear to be nearby this particular area. Characteristics of unsaturated soil from the depth of 6-15 feet are unclear (soil characterization extended to 6 feet). Further action is recommended for this area to address the cPAH impacts.

4.28 Building 139 Septic System SWMU

This SWMU was added to the Phase IID RFI program after the official work plan had been approved by the NYSDEC. Therefore, the scope of work for this SWMU was submitted to the NYSDEC during July 2005 as an addendum to the work plan. The NYSDEC approved the work plan in an e-mail dated July 27, 2005.

4.28.1 Site Description

As referenced previously in Section 1.2.8, Building 139 is a relatively small, single-story building located in the extreme southeast corner of the Pipe Yard (refer to Figure 4-28.1 for Building 139 Septic System SWMU site plan). Operations conducted within Building 139 include the testing and repair of field equipment. The system provides on-site septic disposal for Buildings 139 and 142, located on the Con Edison Astoria Facility. As the septic tank fills, the waste is separated into three layers: scum on top; liquid in the middle; and solids on the bottom. As more liquid enters the system (e.g., from sinks, toilets and other appliances), the liquid is displaced

through the outlet into the first set of seepage pits and discharges into the gravel bed. If these tanks were to back up, the liquid would then get displaced and flow into the second set of seepage pits and would also discharge or seep into the gravel bed.

4.28.2 Site Geology and Subsurface Observations

Based upon the soil types observed during drilling activities at location F87, the top 10 feet of material is comprised of fill. The fill material consists of coal ash and slag, bricks and gravel. A thin layer of clay was observed and recorded at 10 feet, followed by a brown coarse-to-medium sand from 10-15 feet (end of boring). Refer to Appendix A for further subsurface detail.

4.28.3 Previous Investigations

Con Edison submitted a SWMU Assessment Report for this septic system to the NYSDEC on July 24, 2002. Based upon the discussions with the NYSDEC on September 19, 2002, Con Edison investigated potential impacts to groundwater downgradient of the septic system because of the low-pH process wastes that were previously disposed of down the sink drain of Building 139.

4.28.4 Phase IID Investigation

The objective of Phase IID for this SWMU was to determine potential groundwater impacts from wastewater discharged to the septic tank system. Analytical data was collected from soil and groundwater in the vicinity of the building, which is in incorporated into the Pipe Yard SWMU (refer to Section 4.8 for a full set of tables and figures relating to the Pipe Yard area).

In addition to the sampling conducted around the building as part of the Pipe Yard area study, Con Edison installed an additional permanent monitoring well F87 immediately downgradient of the septic system, as shown in Figure 4-28.2. The well was constructed with a 2-inch PVC and a 10-foot length of screen that straddles the water table. The well was installed, using the vacuum excavation method, from ground surface to the water table, and subsequently completed, using a conventional hollow stem auger drill rig below the water table. The well was developed and sampled using the low-flow sampling method and analyzed for VOCs, SVOCs, PCBs, TAL metals and pH. The pH was measured in the field during groundwater sampling activities, using a flow-through cell equipped with a pH probe. Throughout the groundwater purging and sampling cycle of well F87, field pH measurements ranged from 7.1 to 7.3.

4.28.5 Cumulative Site Characterization Findings

No soil impacts were detected in the vicinity of Building 139; and therefore no further action is warranted. Field pH measurements of groundwater from well F87 are neutral, indicating no negative pH impacts from the septic system. Groundwater quality results are discussed on a facility-wide basis in Section 4.41. Refer to Section 4.8 for the broader characterization of the Pipe Yard area.

4.29 Spill No. 91

Spill No. 91 occurred adjacent to the northeast corner of Building 136.

4.29.1 Site Description

On January 6, 1996, dielectric fluid was found leaking into Feeder 28243M and coming up out of the ground adjacent to the northeast corner of Building 136. Refer to Figure 4-29.1 for a site plan of this area. The reported quantity was estimated to be 2,250 gallons over the course of the leakage.

4.29.2 Site Geology and Subsurface Observations

This area is characterized by two sampling locations (K128 and K129). The subsurface in these locations consists of black sand and gravel, with fragments of brick and cobble material. Coal slag and ash were observed at a depth of 4 feet, while silt became visible at deeper depths (9 feet) in both borings. At a depth of approximately 9 feet, a petroleum-like sheen was observed on the split-spoon sampler, and the respective soil core exhibited a slight MGP-type odor. No elevated soil headspace readings were detected in either boring. For a full description of the subsurface in these sampling locations refer to Appendix A.

4.29.3 Previous Investigations

An environmental cleanup contractor excavated, repaired, cleaned up and investigated the impacts from the leak. The impacted soil was removed, and two "T" wells were installed in the excavation as a means of monitoring and recovering the dielectric fluid. Over the course of two site visits, the contractor was able to recover approximately 3.5 gallons of dielectric fluid and 60 gallons of water from the two wells. During the period of January 17 through March 28, 1996, nine site visits were conducted by the contractor to gauge the wells for LNAPL. During this time, the wells were vacuumed on two occasions to recover LNAPL, and LNAPL thickness was reduced to trace levels (0.01 feet) in both wells during three follow-up visits.

4.29.4 Phase IID Investigation

The objective of Phase IID RFI for Spill No. 91 was to assess potential residual impacts to soil and groundwater following initial spill cleanup measures conducted during 1996.

To accomplish this objective, Con Edison installed two temporary monitoring wells (K128 and K129) in the immediate vicinity of the spill, as shown in Figure 4-29.2. Soil samples were collected from 0-2 feet and 1-2 feet above the water table at both boring locations and analyzed for VOCs, SVOCs and PCBs. These two temporary wells were gauged for the presence of LNAPL. The two "T" wells installed by the spill cleanup contractor during 1996 were not located and, therefore, not gauged for LNAPL measurements. The data previously obtained from sampling locations associated with Spill No. 70 (addressed during the Phase IIC RFI) were also included, as needed, in evaluating the Phase IID RFI data collected from Spill No. 91.

4.29.5 Cumulative Site Characterization Findings

Analytical data for all four soil samples analyzed is presented in Table 4.29-1, and a summary of those parameters that exceed RSCO standards in soil is presented in Table 4.29-2.

VOCs, mainly BTEX compounds, were detected at total concentrations of less than 2 mg/kg.

Each of the PAH compounds was detected in the soil samples, but only two compounds (benzo(a)pyrene and dibenz(a,h)anthracene) exceeded their RSCO standards. Benzo(a)pyrene exceeded the RSCO standard of 1.1 mg/kg at concentrations ranging from 1.2 mg/kg to 7.1 mg/kg, while dibenz(a,h)anthracene exceeded the RSCO standard of 1.1 mg/kg in only one sample, at an estimated concentration of 1.4 mg/kg.

PCBs were detected in two of four samples at a maximum concentration of 7.9 mg/kg (K129, 1-2 feet), well below the RSCO standard of 25 mg/kg.

Given the volume of the prior release (2,250 gallons) and the detection of cPAH impacts in the reported spill location, further action is recommended for this area.

Temporary wells (K128 and K129) were gauged for LNAPL on numerous occasions as presented in Table 2-6. No LNAPL was detected in these wells. In addition, no LANPL was detected previously in the temporary wells (K47 to K51) associated with Spill No. 70, which were gauged during Phase IIC. Impacts to groundwater from Spill No. 91 were evaluated on a facility-wide basis, as discussed in Section 4.41.

4.30 A-10 Dock Area

The A-10 Dock Area is located in the northeast section at the confluence of the East River and Luyster Creek (refer to Figure 4.30-1). This area is leased by US Power Gen and used for the bulk off-loading of fuel oils and natural gas. Con Edison records indicate that 11 spills have been reported for this area. Most spills were in the range of 10-50 gallons and consisted of No. 6 fuel oil. Two spills in particular (Spill Nos. 44 and 77) were in the range of 2,000-to-2,500 gallons. A list of recorded spills follows, with additional detail provided in Table 2-2.

- Spill No. 31 (10/24/1992), 30-40 gallons of No. 6 fuel oil
- Spill No. 43 (12/25/1989), unknown quantity of No. 6 fuel oil
- Spill No. 44 (12/27/1989), 2,500 gallons of No. 6 fuel oil
- Spill No. 49 (02/06/1985), 40 gallons of No. 6 fuel oil
- Spill No. 53 (12/25/1984), 10 gallons of No. 2 fuel oil
- Spill No. 62 (01/12/1980), <100 gallons of No. 6 fuel oil
- Spill No. 66 (06/22/1979), 50 gallons of No. 6 fuel oil
- Spill No. 68 (10/31/1979), 50 gallons of unspecified oil
- Spill No. 71 (07/18/1976), 75 gallons of No. 6 fuel oil
- Spill No. 76 (10/22/1982), 10-25 gallons of unspecified fuel oil
- Spill No. 77 (11/23/1973), 2,000 gallons of No. 6 fuel oil

This area was characterized by Arcadis, a consultant to US Power Gen. Characterization information is contained in two Arcadis reports entitled "*A-10 Dock Subsurface Pre-characterization Summary Report*", dated May 5, 2003, and "*A-10 Dock Remediation Program Summary*," dated May 6, 2003. A summary of this report is provided below, relative to completion of the RFI for that area.

4.30.1 Summary of US Power Gen Characterization

US Power Gen leases the A-10 Dock property from Con Edison. This area was re-built following the collapse of the dock retaining wall into the East River. During the reconstruction, the area was remediated due to the petroleum-impacted soil encountered as a result of historic spills in this area. Therefore, it is important to include the remediation of this area for the purposes of the RFI report. Following is a summary of the investigation and remediation conducted by Arcadis at the A-10 Dock. Refer to the "*A-10 Dock Subsurface Pre-characterization Summary Report*" (Arcadis, May 5, 2003) and "*A-10 Dock Remediation Program Summary*" (Arcadis, May 6, 2003) for further detail.

Soil Pre-characterization Program

Arcadis conducted a comprehensive soil boring investigation of the A-10 Dock to pre-characterize the subsurface soils in this area for remediation. Sixty soil borings were advanced in a grid-style pattern, with a Geoprobe direct push drill rig to depths ranging from approximately 4 feet to 12 feet during October and December 2002. In addition, a diver collected eight soil samples from the material that sloughed in to the East River when the dock collapsed. All soil samples were analyzed for TCLP analysis of VOCs, SVOCs, and RCRA 8 metals, and TPH-DRO, PCBs, percent moisture, ignitability and reactivity.

Arcadis noted evidence of elevated PID soil headspace readings, petroleum odors, staining and free-phase product in some of the samples. The free-phase product was observed in boring D-20 from 6 to 10 feet and was immediately reported to Con Edison EH&S personnel. This discovery was catalogued as Incident No. 145475 in Con Edison's E2MIS database and as Spill No. 02-07053 with the NYSDEC.

Lab results indicated that the soil was non-hazardous, with the exception of one soil sample from boring D-15 (10 feet), which had a TCLP lead level of 13.1 mg/L, in excess of the 5 mg/L guidance concentration used for comparison at that time. PCBs were reported at a maximum concentration of 13 mg/kg in boring D-7 (3-5 feet). Elevated TPH – DRO concentrations (greater than 2,500 mg/kg) were detected in four borings, which was consistent with observed petroleum impacts.

Soil Remediation Program

Approximately 6,300 cubic yards of material were removed from seven areas of impacted soil between March and April 2003 for off-site disposal. The material was generally excavated, up to a depth of approximately 10 feet, and designated for off-site disposal as either hazardous waste or non-hazardous petroleum-impacted. Approximately 525 cubic yards (CY) were removed from Area 1 (hazardous for lead), 2,750 CY from Areas 2, 3A and 3B, 275 CY from Area 3C, 525 CY from Area 3D, and 2,225 CY from Area 4. The material was taken to Clean Earth facilities in New Jersey and Pennsylvania for disposal.

4.30.2 Overview of Site Impacts

Based on the information compiled by Arcadis, excavation of targeted areas has been completed. The only residual issue at the A-10 Dock Area appears to be the presence of benzo(a)pyrene, which is similar to other areas throughout the Astoria facility. No further action is recommended.

4.31 A-11 Dock Fire Pump House AOC

This study area was added to the Phase IID RFI program after the official work plan had been approved by the NYSDEC. Therefore, the scope of work for this study area was submitted to the NYSDEC during July 2005 as an addendum to the work plan. The NYSDEC approved the work plan in an e-mail dated July 27, 2005.

4.31.1 Site Description

As part of a construction excavation performed by Con Edison in the vicinity of the A-11 Dock, an approximate 10x10-foot area of petroleum-impacted soil was discovered on January 14, 2004 in the excavation for the Deadmen Earth Restraint system. This area is located immediately adjacent to a structure on the A-11 Dock ,referred to as the LNG Plant, Fire Pump House (refer to Figure 4-30.1 for the A-11 Dock Fire Pump House site plan). The NYSDEC was informed of the discovery at that time and conducted a site visit to assess the situation. The NYSDEC requested that Con Edison conduct an investigation of the area and assess the need for remedial actions.

4.31.2 Site Geology and Subsurface Observations

The subsurface in this area is generally consistent, with gravel, black silt, sand, coal ash and tar. Gravel dominates the shallowest zone (0-5 feet). The other materials are fairly well mixed throughout the remainder of the subsurface assessed. No odors or excessive headspace readings were recorded. Appendix A provides the geological logs compiled to characterize the physical characteristics of this study area.

4.31.3 Previous Investigations

The A-11 Dock Area was investigated previously during the Phase IIC RFI to assess petroleum spills (Nos. 64, 95, and 96) that occurred north of the Fire Pump House study area. During the Phase IIC investigation, three temporary wells and one permanent well were installed to determine if free-phase product was present as a result of these spills, and to also assess groundwater quality. No free-phase product was detected in any of the wells. Refer to the Phase IIC RFI report for additional details.

4.31.4 Phase IID Investigation

The objective of the Phase IID RFI sampling for this area was to characterize and delineate impacts to the soil. To accomplish this objective, three borings were advanced to the water table at locations Y220, Y221, and Y222. Because this area is tidally influenced, the soil sampling was done during low tide, when the water table was at its lowest elevation. Boring Y222 was advanced within the area where impacted soils were discovered to assess the nature and extent of contamination. Borings Y220 and Y221 were advanced outside the area, where the impacted soil was discovered to delineate the extent of impacted soil. Evidence of a tar-like material was observed during drilling activities in boring Y222 only from approximately 6–12 feet. Soil samples were collected from each boring at depths of 0-2 feet, and at a depth of 1-2 feet above the water table, for laboratory analysis of BTEX, PAHs, PCBs, and TPH – DRO.

4.31.5 Cumulative Site Characterization Findings

Analytical results of soil samples collected from Phase IID and IIC sampling locations are presented in Table 4.31-1. Based on these findings, only two VOCs (benzene and toluene) and six PAHs exceeded their respective NYSDEC RSCO standards. The VOCs exceedances were reported in only one sample (Y221, 8-10 feet) and cPAH exceedances were reported in six samples, from four locations (F34, Y220, Y221 and Y222).

In summary, the cPAH and non-cPAH soil impacts were detected along the dock area. Given that three reported releases of unknown fluids were recorded in this area, further action is recommended.

4.32 Spill No. 70

Spill No. 70 occurred in the northwestern portion of the facility, near the adjacent NYPA property. The fuel spill was recorded in November 17, 1977, with no specific information on the exact fuel type or quantity. After the initial response (spill containment and removal of visible contamination) in 1977, no further action was taken. Based on limited documentation, further evaluation of the area was included as part of the RFI program.

4.32.1 Spill Description

An unspecified quantity of fuel was spilled in November 1977. No other specific information is available. The area in the vicinity of the reported spill is primarily a gravel and coal slag covered area.

4.32.2 Site Geology and Subsurface Observations

The area in the vicinity of spill No. 70 is generally comprised of medium-to-fine gray or black sand and gravel. In locations K49BS and K48, at 3-5 feet, the soil in both areas exhibits an oily sheen. Location K49BS revealed an elevated headspace reading of 139 ppm, while location K48 had a relatively low headspace reading of 20 ppm. No other locations exhibited an organic vapor headspace greater than 1 ppm. For more geologic detail in this area, refer to Appendix A.

4.32.3 Previous Investigations

Samples were collected from the area in 1997 and 1998 as part of the RFI program. Refer to Figure 4.32-2. Soil samples were analyzed for a wide range of parameters, based on the little information that was known about the specific fuel type. Samples were analyzed for VOCs, SVOCs (including cPAHs and non cPAHs) and metals. Parameters from each of these groupings were detected, but at generally low concentrations relative to common background expectations (refer to Section 4.32.4 for more detail).

4.32.4 Phase IID Investigation

No Phase IID sampling was conducted for the Spill No. 70 area. The site was considered to be adequately characterized, following the earlier investigation phases in 1997 and 1998.

4.32.5 Cumulative Site Characterization Findings

In total, nine soil samples were collected from seven sampling locations in the area. Sampling depths extended to 5 feet. A comparison to RSCO standards reveals that no VOCs, PCBs or metals exceed their respective RSCO standards. Of the SVOCs analyzed, only two cPAHs exceed their RSCO standards. Benzo(a)pyrene was detected in all nine locations, with the highest concentration of 8.3 mg/kg in location K48, at a depth of 3-5 feet. Dibenz(a,h)anthracene was detected in seven of the locations, with the highest concentration of an estimated 3 mg/kg also in location K48, at a depth of 3-5 feet.

The fluid released in this spill area is unknown. The cPAH detections spanned the length of the reported spill location, and the pattern of cPAH impacts is not consistent with nearby MGP impacts. Thus, it is possible that residuals from the Spill No. 70 are causing the cPAH impacts. Further action is recommended for this area.

4.33 Spill No. 73

Spill No. 73 is located in the northwestern portion of the Astoria facility, near the NYPA property. The initial release was reported in1988. After the initial response, no other action was implemented. For completeness, assessment of this prior spill area was included in the RFI program.

4.33.1 Site Description

Spill No. 73 occurred on May 31, 1988 in a small area between Building 136 and the western edge of the Pipe Yard (refer to Figure 4-33.1). According to the Con Edison spill summary, approximately 25,000 gallons of dielectric fluid were released from a 10-inch cable line near manhole #19717. Spill response measures were performed, including the recovery of approximately 1,500 gallons of dielectric fluid and the excavation of approximately 900 cubic feet of impacted soil. The spill was cleaned up by June 10, 1988. The surface of the area around Spill No. 73 is asphalt pavement.

4.33.2 Site Geology and Subsurface Observations

The subsurface in this area consists primarily of gravel and sandy fill. Coal ash and slag residuals were also reported in most of the locations, but were not prevalent. Bluish-gray staining was observed at a depth of 4-6 feet at location K114. Headspace measurements of soil during the drilling programs revealed generally low-to-moderate levels of organic vapors (0-30 ppm), with the exception of K112, where a measurement of 164 ppm at a depth of 2-4 feet was recorded. Refer to the geologic logs provided in Appendix A for a full description of observations and measurements.

4.33.3 Previous Investigations

Following the spill response cleanup measures, there have been no investigations to assess residual impacts from the spill. Facility personnel felt confident that the spill received an adequate response to mitigate potential impacts. As part of the RFI program, samples were collected from this area in 2006 to complete the spill closure process. Details are provided below.

4.33.4 Phase IID Investigation

The objective of the Phase IID RFI for Spill No. 73 was to determine if LNAPL or other fuel-related residuals remained in the area of the spill. To meet this objective, three temporary wells (K112 through K114) were installed to determine if LNAPL was present, and soil samples were collected from those boreholes prior to well construction. Refer to the Figure 4.33 series of figures. Soil samples were analyzed for VOCs, SVOCs (including cPAHs and non-cPAHs), PCBs and metals. The results are presented in Table 4.33-1.

4.33.5 Cumulative Site Characterization Findings

The subsurface in this area consists primarily of gravel and sandy fill. Coal ash and slag residuals were reported in most of the locations. Bluish-gray staining was observed at a depth of 4-6 feet in location K114. Headspace measurements of soil during drilling revealed generally low-to-moderate levels of organic vapors (0-30 mg/kg), with the exception of K112, where a measurement of 164 mg/kg at a depth of 2-4 feet was recorded. Refer to the geologic logs provide in Appendix A for a full description of observations and measurements.

As shown on Table 4.33-1 and the series of Figures 4.33, no VOCs, PCBs or metals were detected above RSCO standards. Similarly, non-cPAHs and other non-PAH SVOCs were not in excess of the RSCO standards. Only cPAHs were detected in excess of their respective RSCO standards. The most prevalent detection of cPAHs was in sample K114 at a depth of 4-6 feet. Indeno(1,2,3-cd)pyrene (16 mg/kg), benzo(b)fluoranthene (23 mg/kg), benzo(a)pyrene (4.1 mg/kg), dibenz(a,h)anthracene (4.1 mg/kg) and benzo(a)anthracene (12 mg/kg) were all detected at that location and depth in excess of their respective RSCO standards.

Based on the recorded spill type (dielectric fluid), it is unlikely that the cPAH detections are related to that spill. As discussed in Section 4.12, many dielectric fluids would not contain cPAHs. However, it is possible that if the dielectric fluid released under Spill No. 73 was an aliphatic hydrocarbon (such as mineral oil), it could have contained small amounts of cPAH impurities. The cPAH impacts overlap impacted soil within the Pipe Yard SWMU. Accordingly, this area will be incorporated into the Pipe Yard for further action (refer to Section 4.8). No further action is recommended for the former Spill No. 73 location as a separate study area.

The temporary wells were gauged for LNAPL, as presented in Table 2-6. No LNAPL has been measured in any of the wells.

4.34 Transportation Department Former Waste Oil USTs A&B SWMU

The Transportation Department former waste oil USTs were located on the south side of the Transportation building #137. This area was initially investigated under the Phase I RFI.

4.34.1 Site Description

The Transportation Department's former waste oil USTs A and B SWMU consist of two 'former' underground steel waste oil tanks. Tank A was a 1,000-gallon tank utilized for storing waste oil generated during routine vehicle maintenance activities, and Tank B was a 275-gallon tank utilized for storing waste oil received from the Transportation Department's oil/water separator. Both tanks are located south of the Transportation Building and Garage, a short distance from the oil change bay, and are believed to have been installed in 1966 (refer to Figure 4-34.1). According to facility personnel, the tanks managed approximately 3,100 gallons of waste oil annually. The waste oil was removed and disposed off site. These tanks were in operation until approximately 1988, at which time the waste oil was removed and the tanks were cleaned and filled with concrete. Confirmatory sampling was not conducted during or after these procedures. There are no available records indicating whether these tanks had release control equipment or secondary containment.

4.34.2 Site Geology and Subsurface Observations

This area is comprised of sand and trace gravel. Coal slag and trace brick fragments at a depth of 2 feet at location T02, and cinders at a depth of 2 feet in T03, were reported. There were no elevated or high headspace readings in the area. For more references to this area, refer to Appendix A, which contains all of the nearby geologic logs.

4.34.3 Previous Investigations

During the initial and supplemental RFA-SV, soil samples were collected from various depths at four borings (T01 to T04) in the vicinity of the Transportation Department Waste Oil USTs A and B, and field-screened for VOCs using the jar-headspace method. A jar headspace reading of 24 ppm was detected at T04. Subsequently, the NYSDEC requested that Con Edison assess the potential VOC impacts at T04.

4.34.4 Phase IID Investigation

To meet this objective, soil boring T05 was advanced immediately adjacent to T04 to 7 feet at a depth that the water table was encountered (refer to Figure 4.34-2). Soil headspace readings were similar to those detected previously in boring T04 24 (mg/kg), with concentrations ranging from 31–39 ppm. Soil samples were collected from 0-2 feet and 6-8 feet for analysis of VOCs and TPH-DRO. Low levels of VOCs, including BTEX compounds, were reported in the samples. TPH was only detected in the shallow soil sample at 1,100 mg/kg.

4.34.5 Cumulative Site Characterization Findings

As shown in Tables 4.34-1 and 4.34-2 and the series of Figures 4.34, all VOCs were below the respective RSCO standards, while cPAHs and PCBs were above the RSCO standards in samples collected from locations T01 and T02 during the RFI Phase I. Individual concentrations of cPAHs in these samples ranged from an estimated 2 mg/kg to an estimated 31 mg/kg (benzo(a)pyrene at T02, 1.35 – 3.5 feet). PCBs only exceeded the RSCO standard in one sample, T01 (1.25–3.75 feet) at 38.5 mg/kg.

The cPAH and PCB impacts appear to be localized within the former location of USTs. They do not appear to overlap any other nearby or underlying areas of concern. Further action is recommended specific to the former UST locations.

4.35 Spare Transformer Storage Yard AOC

This study area is within the footprint of the former MGP AOC and was investigated separately during 2003 during the former MGP investigation. Refer to Section 2.0 of the draft MGP AOC Site Characterization Report for additional details (ENSR, May 2005, revised July 2005).

4.35.1 Site Description

This study area is located immediately north of the CWTF along the eastern boundary of the Transformer Storage Yard (refer to Figure 4-35.1). During excavation activities to repair an underground feeder line on March 18, 1992, Con Edison personnel reported oil seeping into the excavation from one of the excavation sidewalls.

4.35.2 Site Geology and Subsurface Observations

The Spare Transformer Storage Yard study area has a consistent subsurface geological composition of sand, gravel and fine particulates. There is variation at deeper horizons within the subsurface. Sample location MGP3 was the only boring site in the area where gravel was present at all levels, with no other observations. The other locations assessed exhibited gravel strata to a depth of 5-8, after which the stratigraphy varied. Finer particulates consistent with clay, silt and fine sand were evident at depths below 13 feet. In both locations MGP7 and F83, odors were noted at depths from 6-20 feet. Location MGP7 had a “very strong” petroleum odor evident at 6 feet, while the soil field headspace reading just above that interval (5 feet) was recorded at 178 ppm. Refer to Appendix A for the geologic logs that contain the specific detailed observations and measurements for this study area.

4.35.3 Previous Investigations

This study area was investigated as part of the former MGP AOC site characterization in 2005. At that time, four locations were advanced in the area of where Con Edison personnel observed oil seeping into the excavation. These locations included three soil borings (MGP-3, MGP-4 and MGP-8) and one permanent monitoring well F83. The locations were advanced to depths ranging from 17 feet to 31 feet. No stained soils were observed by field personnel during drilling activities at any of the four locations and no odors were reported in the soil samples collected from borings MGP-3 and MGP-4. A very mild naphthalene-like odor was reported in the 6-8 foot soil sample from boring MGP-8, but the resulting soil field headspace reading was only 0.7 ppm. In addition, odors were also noted in the soil samples from F83 within the 8 to 16 foot interval, but the resulting soil field headspace readings were a maximum of 8.2.

4.35.4 Phase IID Investigation

The Phase IID objective for the Transformer Storage Yard study area was to characterize the nature and extent of potentially-impacted media in the vicinity of where the excavation occurred. To meet this objective, this study area was evaluated as part of the previous former MGP AOC investigation. The data obtained from soil borings MGP-3, MGP-4 and MGP-8, and one permanent monitoring well F83 were used to assess potential impacts at the former excavation (refer to Figure 4.35-2). Additional information on the former MGP study area investigation is presented in Section 4.40.

4.35.5 Cumulative Site Characterization Findings

At least two soil samples were collected from each location for laboratory analysis of VOCs, SVOCs, PCBs, TAL metals and total cyanide. The results are summarized in the series for Table 4.35. VOCs (ethylbenzene and xylenes) were detected in soil samples from F83 (5.5 feet) and MGP3 (5 feet) at total concentrations of 394 mg/kg and 78.5 mg/kg, respectively. Concentrations of these compounds dropped to non-detect or less than 1 mg/kg in the deeper soil samples at both locations. All VOCs detected are below the respective RSCO standards.

PCBs were detected in only one soil sample at 0.26 mg/kg which is well below the RSCO standard of 25 mg/kg. No total cyanide was detected in any of the soil samples. Various TAL metals were detected in the soil samples but at levels below their RSCO standards. The highest level of lead was 10 mg/kg (MGP-8, 5 ft).

The highest levels of SVOCs in this area were reported in the samples from MGP-3 (5 feet) and F83 (5.5 feet). Similar to the distribution of VOCs at these locations, total SVOCs dropped to less than 1 mg/kg in the deeper soil samples at both locations. All SVOCs detected were below the respective RSCO standards, except for benzo(a)pyrene that was detected in the same two samples from MGP-3 and F83 at estimated concentrations of 1.6 mg/kg (average concentration from two samples) and 6.2 mg/kg, respectively.

Constituents detected in the groundwater from monitoring well F83 were evaluated on a facility-wide basis, as discussed in Section 4.41.

The relatively low detections of benzo(a)pyrene were identified in this area. No other cPAHs or evidence of a potential release was identified. The presence of benzo(a)pyrene is consistent with the characteristics of fill material in many other areas within the facility and does not appear to be attributable to individual spills, SWMUs or AOCs. For this reason, no further action is recommended specific to the Spare Transformer Storage Yard study area. A facility-wide interpretation of benzo(a)pyrene in particular is presented in Section 5.0.

4.36 North Storage Yard SWMU

The North Storage Yard is located immediately north of the Transformer Shop (Building 82). It is an integral part of Con Edison operations and has been the subject of several characterization events, primarily in anticipation of structural upgrades.

4.36.1 Site Description

The North Storage Yard is a relatively flat area, measuring approximately 300 x 400 feet. It is covered primarily by gravel, with one access road through the yard near the Transformer Shop, and a paved roadway making up the physical boundary of the area on all other sides. Refer to Figure 4.36-1 and the other figures in the Figure 4.36 series for site location and details. Transformers from Con Edison's service areas are brought into this yard where they are staged for draining, service, and reconditioning or off-site disposal. According to facility personnel, the servicing of transformers is infrequent. When work is necessary, much of the activities occurs in the Transformer Shop.

Historically, the North Storage Yard has also been used for the storage of transformers and other electrical equipment (some of which may have contained PCB dielectric fluid) and PCB waste (including PCB containing solids, oil/water mixtures and equipment). Information from Con Edison employees suggests that electrical cable (including oil-filled cable) was also transported to the North Storage Yard for cutting operations as needed.

Presently, there is a single-story structure in the North Storage Yard (referred to as the PCB storage shed) for the storage of containerized PCB waste. Adjacent to the south side of this building is a covered area with three storage tankers for bulk storage of PCB-containing oils and oil/water mixtures awaiting off-site disposal. The remainder of the area is used for storage of transformers for testing, servicing, reconditioning or disposal.

Four spills were recorded at the North Storage Yard. Spill Nos. 16 and 17 (October 7, 1993) involved an unrecorded quantity of PCB-containing dielectric fluid. Spill Nos. 56 (July 9, 1982) and 85 (January 29, 1995) involved the release 50 and 200 gallons of transformer oil, respectively. Other incidental operational releases likely occurred as part of routine operations, but none of enough significance to be recorded and given a formal spill number.

In the late 1990s, Con Edison approached the NYSDEC with plans to upgrade the PCB storage shed. Based on the necessary logistics involved (i.e., removal of potentially-impacted PCB soil and other materials, while avoiding the disruption of facility operations), the NYSDEC agreed to discuss potential cleanup values and other details to assist Con Edison with the planned upgrade. Over the next several years, Con Edison developed remediation design plans to address PCB-impacted material as well as stormwater management upgrade plans to simultaneously improve drainage in the area.

The remedial strategy was based partially on risk assessment analysis conducted by Con Edison, and selected guidance concentrations issued by the NYSDEC on November 2, 2000 for specific use at the North Storage Yard during remediation. These former guidance concentrations were as follows:

- cPAHs (10 mg/kg);
- PCBs (25 mg/kg); and
- lead (10 mg/kg total lead; 900 mg/kg provided the TCLP limit is not exceeded)

These concentrations were to be used only at the North Storage Yard to aid in assessing whether remedial activities were sufficient in mitigating potential risks. Because PCBs are regulated under the Toxic Substances Control Act (TSCA) and the TSCA program is enforced by representatives at the Environmental Protection Agency (USEPA), the NYSDEC did not have full primacy to regulate the North Storage Yard remediation program. Discussions among Con Edison, USEPA and the NYSDEC have delayed the upgrade of the PCB

storage shed and remediation of soil/gravel. However, during this time, Con Edison has reevaluated the excavation strategy and has deferred remediation until completion of the facility-wide RFI program to better understand the context of North Storage Yard impacts relative to the rest of the facility.

The next subsections present more detail relative to characterization information that has been compiled for the North Storage Yard, to aid in rendering a remedial action strategy for the area.

4.36.2 Site Geology and Subsurface Observations

The North Storage Yard subsurface is composed of sand and gravel, with clay and silt present at deeper horizons. There were no headspace readings that exceeded 50 ppm, and there was not a significant amount of coal ash or slag found in the area. Appendix A provides the geologic logs for this site. The stratigraphy in the areas assessed was generally consistent.

4.36.3 Previous Investigations

Four spills have been formally recorded at the North Storage Yard. Two dielectric fluid releases occurred on October 7, 1993 - Spill Nos. 16 and 17. The volume was reportedly minor, but no records of the exact quantity were recorded. Two other spills involved transformer oil. Spill No. 56 was a 50-gallon release on July 9, 1982, and Spill No. 85 was a 200-gallon release on January 29, 1995. All four of these releases (as well as other incidental discharges over the course of facility operation) were addressed immediately, with the removal and replacement of visibly impacted material.

Table 4.36-1 presents the analytical data for the North Storage Yard. The Figure 4.36 series of graphics shows the locations of samples collected for site characterization. As shown in Figure 4.36-2, the majority of data was collected during the mid-1990s (specifically, 1994, 1995 and 1996). Analytical parameters of interest for the area consisted of VOCs, SVOCs (including cPAHs and non-cPAHs), PCBs and metals. This is consistent with the initial concentration guidelines issued for the North Storage Yard in 2000. Results of the previous investigations are presented below.

4.36.4 Phase IID Investigation

The site was considered to be relatively well-characterized, following the 1996 characterization program. Thus, no further sampling was conducted as part of the Phase IID investigation.

4.36.5 Cumulative Site Characterization Findings

As stated, characterization data available for the North Storage Yard area was collected in the mid-1990s. Although prior guidance concentrations were issued in 2000 by the NYSDEC to guide the characterization and remediation of the area, those values are considered to be superseded by the more comprehensive NYSDEC RCSO standards. The following characterization discussion references these more recent RSCO standards, which are considered to consistently apply to the entire Astoria facility. In addition to consistency, the primary advantage of using the RSCO standards is their increased chemical-specific specificity. As an example, rather than apply one concentration guidance value to the total of all cPAHs, chemical-specific RSCO standards are available for each individual cPAH compound. Refer to Sections 1.4 and 5.2 for more detail relative to use of the historic concentration guidance values and current RSCO standards.

VOCs in soil at the North Storage Yard were essentially non-detect (refer to Figure 4.36-5), well below their respective RSCO standards. This is consistent with the gravel subsurface and cover in the area. VOCs would not be expected to absorb to site soils and persist as a soil concern. Note that VOCs are further analyzed as part of the facility-wide groundwater assessment presented in Section 4.41.

As shown in Figure 4.36-6, SVOCs were relatively well distributed in soil. Total SVOC values (including both cPAH and non-cPAH parameters) ranged from the 10 to 1,000 mg/kg range in most locations. Several cPAH

parameters exceeded the RSCO standards. Soil collected from location B02 revealed the following cPAHs in excess of RSCO standards: Benzo(b)fluoranthene (21 mg/kg), benzo(a)pyrene (15 mg/kg), dibenz(a,h)anthracene (2.6 mg/kg) and benzo(a)anthracene (12 mg/kg). Similar cPAH exceedances were reported in the surface at locations B01, N01, N04, N06, N07, N09 and N10. Some subsurface impacts of cPAHs were also measured, but at fewer locations. Subsurface cPAH impacts were reported at locations N03 (1-2 feet), N08 (1-2 feet), B07 (2-4 feet), N01 (6-7 feet) and N08 (6-7 feet). No other SVOCs (non-CPAHs or other SVOCs) were reported above RSCO standards.

PCBs, as expected, were detected throughout the North Storage Yard area. Concentrations varied widely, from non-detect to the vicinity of 100-200 mg/kg. As shown in Figure 4.36-7, PCB concentrations appear to be highest in the central portions of the North Storage Yard area rather than at the periphery. The highest values of total PCBs detected in soil at the North Storage Yard were at the gravel/soil surface, including locations B04 (126 mg/kg), B01 (125 mg/kg), B07 (97 mg/kg) and N04 (59 mg/kg).

Lead concentrations in soil at the North Storage Yard were some of the highest values across the Astoria facility. As shown in Figure 4.36-8, concentration ranges were highest in the central portion of the area, over 1,000 mg/kg. Surface soil/gravel samples from location B06 (5,820 mg/kg) and B08 (10,000 mg/kg) exceeded the RSCO standard. Arsenic was also detected above RSCO standards in one location. Surface soil/gravel at location B01 (17.5 mg/kg) exceeded the arsenic RSCO standard.

In summary, the residual impacts of ongoing operations at the North Storage Yard are primarily associated with surface and near-surface soil and gravel. Some localized detections of cPAHs were reported at deeper horizons (e.g., 6-7 feet); however, they are more likely due to the fill material than the operational releases of PCB-containing materials at the North Storage Yard. Based on the presence and persistence of PCBs at the North Storage Yard, further action is recommended. Because of the pending structural upgrades to the facility, assessment of the North Storage Yard is continuing, separate from this RFI program.

4.37 Eastern Parcel Area

The Eastern Parcel is at the southeastern border of the Astoria facility. It contains the Auction Yard (discussed as a separate area in Section 4.38) and Outfall G (refer to Section 4.39). Earlier RFI documents have been produced for the Eastern Parcel (refer to list of references in Section 6.0) to support the potential transfer of that portion of the property. The parcel is still owned and operated by Con Edison, but is expected to be this year (2008). The Eastern Parcel has also been of particular characterization interest, based on the detection of potential groundwater impacts and its close proximity to Luyster Creek.

4.37.1 Site Description

The majority of the Eastern Parcel is a grass-covered and landscaped parcel adjacent to Luyster Creek. The portion of the study area that encompasses the Auction Yard is across the access road. As described in Section 4.38, the Auction Yard is comprised of asphalt paving and gravel cover. Outfall G originates near the Auction Yard and transects the Eastern Parcel (Section 4.39). The northwestern edge of the parcel, essentially on the asphalt-paved portion of the Auction Yard, has been used for material storage. Otherwise, the parcel consists of a large athletic field, recreational field, ball field, basketball court and related amenities. There are little, if any, industrial operations that have occurred in the Eastern Parcel. It is primarily a well-landscaped outdoor portion of the facility, used by Con Edison staff for sports and related recreational activities.

4.37.2 Site Geology and Subsurface Observations

The subsurface in this area consists of silt, sand, gravel and organic material. The highest headspace measurement recorded was 2,856 ppm at location F46, at a depth of 15-17 feet. The other areas reported headspace readings in the 100-300 ppm range, but well below this particular measurement. Coal ash and coal slag were not prominent in the area, but there was evidence of some coal-related materials in surrounding

areas of the Auction Yard. For more information regarding the subsurface characteristics at the Eastern Parcel, refer to the geologic records contained in Appendix A.

4.37.3 Previous Investigations

The investigation of the Eastern Parcel has been focused on the two main sub-elements of the area, namely the Auction Yard and Outfall G. Beyond these two focus areas, a broader investigation has been conducted to characterize historic areas of potential materials storage or handling on the outskirts of the parcel adjacent to Luyster Creek. No specific spills have been recorded for the Eastern Parcel. A "fill mound area" was reported within the parcel (refer to Figure 4.37-1), which was of unknown origin. The mound is located at the northwestern edge of the parcel, across the access road from the Auction Yard. Characterization of the mound was included within the RFI program to assess the composition and conditions of the fill material. Work was completed in 2004, prior to the Phase IID program.

As shown in Figure 4.37-2, the progression of site characterization for the Eastern Parcel encompassed nearly a decade of activities. In the 1994/1995 timeframe, some localized areas were sampled to characterize potential evidence of impacts from routine site operations, focusing on areas adjacent to Luyster Creek. In 1999, the investigation focused on the mound area in support of the potential property transfer. Subsequent study from 2000-2004 consisted of expanding the investigation in the mound area, assessing conditions of the Auction Yard, and beginning to assess Outfall G. The next subsection presents the Phase IID activities conducted in the 2005/2006 timeframe.

4.37.4 Phase IID Investigation

The Phase IID investigation of the Eastern Parcel focused on the Auction Yard and Outfall G, both of which are discussed as separate study areas (refer to Sections 4.38 and 4.39). Soil samples were analyzed for VOCs, SVOCs, PCBs and metals. The objective was to complete the overall assessment of the Eastern Parcel Area.

4.37.5 Cumulative Site Characterization Findings

Soil data collected throughout the characterization program at the Eastern Parcel (1999-2006) is presented in Table 4.37-1 and the series of associated 4.37 figures. Parameter-specific discussions follow. Refer to Section 4.41 for a discussion of groundwater data as part of the facility-wide groundwater discussion.

VOCs in soil (as shown in Figure 4.37-5) were not detected in most areas. The concentration of total VOCs, where present, approached the 100-1,000 mg/kg range at the Auction Yard, with lesser total values (10-100 range) between the Auction Yard and the fill mound area. A comparison of individual VOC parameters detected and the RSCO standards for VOCs reveals that none of the individual compounds exceed their respective RSCO standards.

SVOCs were detected in soil at most locations. Total SVOC concentration ranges in the 10-1,000 range were most common, with some locations exhibiting total SVOCs approaching the 100,000 mg/kg level (such as Y64 in the Auction Yard). Of the individual parameters included in the SVOC analysis, only cPAHs exceeded their respective RSCO standards in soil, with the exception of location Y46, in which non-cPAHs were reported above the RSCO standards as well. Upon review of Table 4.37-1, individual cPAH concentrations were in the 10-100 mg/kg in many of the locations and depths sampled. Particular locations, such as Y332 at the suspected Outfall G pipeline breach area and Y46 at the Auction Yard, revealed individual cPAH concentrations in the 500 mg/kg range (refer to Table 4.37-1 for specific parameters and reported concentrations in excess of RSCO standards).

Refer to Figure 4.37-7 for the distribution of detected ranges of PCBs. PCBs were generally detected in the 1-20 mg/kg range, with the highest detections in the Auction Yard. None of the PCB values exceeded the RSCO standard of 25 mg/kg.

Of the metals analyzed, lead approached the 1,000 mg/kg range but was less than its 3,900 mg/kg RSCO standard in all samples collected.

In summary, only the Auction Yard and Outfall G areas of the Eastern Parcel revealed soil impacts in excess of RSCO standards. There was no soil data in excess of RSCO standards at the fill mound area, recreational areas, Luyster Creek embankment, or other areas of the Eastern Parcel assessed. Based on this finding, no further action is recommended for the Eastern Parcel as a whole. Further action is recommended for the Auction Yard and Outfall G areas specifically, areas that are further discussed and evaluated in subsequent sections (refer to Sections 4.38 and 4.39).

4.38 Auction Yard

The Auction Yard is in the southeastern portion of the property, within the Eastern Parcel. It consists of an asphalt and gravel surface, bounded by an asphalt-paved access road. Figure 4.38-1 shows the location of the site.

4.38.1 Site Description

Activities that occurred in the Auction Yard include the storage of used or broken corporate vehicles that were awaiting transport off site. There are no spills on record for the area. This area was investigated as a continuation of delineating the VOCs in soil reported southwest of the fill mound during the Eastern Parcel Phase I investigation in 1999.

4.38.2 Site Geology and Subsurface Observations

There are three sections of the Auction Yard. The soil primarily contains silt and sand, with some gravel. Areas which had both high headspace readings and the presence of coal ash and slag were in the "Auction Yard Area 1 and 2" (refer to Section 4.38.5 for an introduction to those area designations). The highest headspace reading recorded was 2,856 ppm at location F46 at a depth of 15-17 feet. While the other areas which recorded high headspace readings did not exceed 300 ppm throughout the area. The boring logs for the Auction Yard are available in Appendix A.

4.38.3 Previous Investigations

As shown on Figure 4.38-2, the area was characterized as part of the RFI program in the 2003-2006 timeframe. The work conducted during 2005/2006 was part of the Phase IID phase of study, which is discussed in more detail below. The earlier 2003/2004 work focused on the southeastern portion of the Auction Yard and included an assessment of the potential presence of typical facility parameters, including VOCs, SVOCs (including cPAHs and non-cPAHs), PCBs, and metals. As shown in Table 4.38-1 and the 4.38 series of figures, these parameter groups were detected fairly consistently across the area sampled (refer to characterization discussion below). This necessitated an expansion of the study area further to the northwest as part of the 2005/2006 Phase IID work (refer to Phase II discussion below).

4.38.4 Phase IID Investigation

The Phase IID investigation included the collection of additional samples in the northwestern portion of the area. Samples were analyzed for the same parameter groups as prior investigation programs, with less focus on VOCs, based on the prior data. Results of previous and Phase IID data are presented and discussed below.

4.38.5 Cumulative Site Characterization Findings

As shown in Figure 4.38-5, VOCs were detected in soil collected from the central portion of the Auction Yard. Total VOC concentrations were in the 1,000 mg/kg in some locations. However, none of the individual VOC parameters exceeded their respective RSCO standard (refer to Table 4.38-1).

SVOCs analysis of soil in the Auction Yard was primarily intended to evaluate the potential presence and distribution of cPAHs. Total SVOCs (including cPAHs, non-cPAHs and other SVOCs) had concentrations ranging up to the 10,000 mg/kg range in location Y46, in the southeastern-most portion of the Auction Yard area (refer to Figure 4.38-6). A review of individual SVOC parameters in Table 4.38-1 reveals that only cPAHs exceeded their respective RSCO standards. Non-cPAHs and other SVOCs were not detected above RSCO standards, with the exception of one location, Y46 (10-11 feet). In that location, pyrene (2,600 mg/kg), fluoranthene (1,300 mg/kg), phenanthrene (3,300 mg/kg) and naphthalene (2,000 mg/kg) were the non-cPAHs that exceeded their respective RSCO standards (refer to Table 4.38-1).

Soil collected from location Y323 (0-2 feet and 4-6 feet) and location Y46 (10-11 feet) exhibited the highest cPAH concentrations. Chrysene was detected at the highest concentration. Parameters in the Y46 location had individual cPAHs in the 100-500 mg/kg range (chrysene at 530 mg/kg). Parameters in the Y323 location had cPAHs in the 100-200 mg/kg range (chrysene at 220 mg/kg).

PCBs in soil ranged from non-detect at the outer edges of the Auction Yard, to values in the 10 mg/kg range in the central portion of the area, as shown in Figure 4.38-7. None of the PCB detections exceeded the RSCO standard of 25 mg/kg.

Lead was detected in soil at the 1,000 mg/kg range in many areas assessed (refer to Figure 4.38-8). However, none of the detections exceeded the RSCO standard of 3,900 mg/kg.

Overall, the Auction Yard Area is well characterized, in that the soil samples collected sufficiently characterize the surface and shallow subsurface. The distribution of cPAHs in excess of RSCO standards and the detection of non-cPAHs in one location (Y46) above RSCO standards indicate that further action is necessary at the Auction Yard. Because the PAH impacts are non-contiguous, the Auction Yard is recommended for further action as three individual sub-areas (Areas 1, 2 and 3).

4.39 Outfall G

Outfall G is a linear area, encompassing the location of a stormwater pipe and former stormwater outfall ("Outfall G"). The pipe spans from the Auction Yard (refer to Section 4.38), across the asphalt access road and into the southeastern portion of the Eastern Parcel (refer to Section 4.37), and is intended to discharge into Luyster Creek. Refer to Figure 4.39-1 for a depiction of the piping and discharge location.

4.39.1 Site Description

The Outfall G piping system is a 30-inch corrugated steel stormwater drain pipe that is used to channel overland stormwater from the Astoria East Substation and Auction Yard areas into Luyster Creek. Historically, the precise location of the outfall had not been verified and was presumed to be hidden under the rip-rap embankment of the creek. Based on numerous inspections during and after rain events, there is little evidence that stormwater from the pipeline reaches the creek. Geophysical surveys and subsurface exploration revealed that the concrete pipe may have lost its integrity prior to reaching the creek. The primary area of concern was the Eastern Parcel area north of the athletic field (refer to Figure 4.38-1). The theory was, if stormwater runoff from the Astoria East Substation and Auction Yard was impacted, it could have been channeled through the subsurface via the stormwater pipe and impacted the Eastern Parcel subsurface prior to reaching the creek.

4.39.2 Site Geology and Subsurface Observations

Outfall G is a small area that contains silt, sand and some gravel. There were no borings that reported evidence of coal ash or slag in the area, but there were some areas that showed high headspace readings. Location F11B reported elevated headspace readings of 634 ppm (6-8 feet) up to 1,208 ppm (14 feet). Sample location F11 also reported a headspace reading of 173 ppm (15 feet), accompanied with the report of

a “strong” odor. For more subsurface details recorded for this area, refer to Appendix A, which contains the geologic logs.

4.39.3 Previous Investigations

As shown in Figure 4.38-2, the Outfall G area was first assessed in 1999, with a sample in the area most likely to be impacted if the stormwater pipe had leaked. This was followed by manhole and near-manhole sampling at the ends of the pipeline in 2003. The Phase IID investigation focused on better characterizing the 1999 sampling location, which is further discussed under the Phase IID investigation subsection below.

Prior to the Phase IID investigation, Con Edison began exploring the location of the suspected pipeline leak and/or outfall. Between August and October 2003, geophysical surveys were conducted within the Eastern Parcel. The surveys consisted of using both ground penetrating radar (GPR) and electromagnetics. The GPR survey was performed, using a 200 MHz antenna, and the EM survey was performed, using a 9.8 kHz ground conductivity meter. The survey began at a known location of the pipe – Manhole 1. Manhole 1 is located in the road near the main entrance to the facility. The survey proceeded eastward to track the downstream location of the underground pipe. The survey identified the pipe from Manhole 1 as extending approximately 450-foot east/northeast of Manhole 1. At this mark, an anomaly was identified perpendicular to the pipe and interpreted to be approximately 10 feet long. This anomaly was presumed to be the historic point of discharge for the pipe.

The subsurface was physically explored on two separate occasions, based on the geophysical results, to investigate the anomaly (i.e., presumed point of discharge). Test pit excavations were conducted on January 11, 2005 to depths of approximately 12 feet, where groundwater was encountered. The headwall was not located in either of the test pits. Drilling and soil borings were subsequently conducted as part of the Phase IID investigation (further discussed below).

4.39.4 Phase IID Investigation

Phase IID activities began with the exploration of the area suspected of being the historic discharge point. Two soil borings (Y200 and Y201) were drilled in that immediate area to assess potential impacts to the soil from the stormwater pipe. In addition, a dye test was conducted on June 28, 2005. The dye test consisted of adding 4,000 gallons of clean water (provided by Sean’s Pool Water, West Harrison, NY) into Manhole 1 at four different times on June 28, 2005. The first test consisted of 1,000 gallons of water. No evidence of water was observed discharging into the creek. Three similar tests were repeated, each consisting of approximately 1,000 gallons of water and a Rhodamine dye. Again, no evidence of water or the dye was observed discharging into Luyster Creek.

Con Edison began an excavation program along the length of the pipeline to continue exploring where the pipeline is compromised. The excavation began approximately 50 feet downstream of Manhole 1 and proceeded easterly. At a point approximately 400 feet east of Manhole 1, a loose 4-foot section of the corrugated steel pipe was identified and removed. The location was consistent with the anomaly identified during the geophysical surveys. It was concluded that the pipe had likely been discharging to that subsurface area and never reaching Luyster Creek. Results of the prior (2003/2004) and more recent (2005/2006) investigations are discussed in the characterization subsection below.

4.39.5 Cumulative Site Characterization Findings

Sediment (residual material associated with the pipe) was collected and analyzed for VOCs, SVOCs, PCBs, and metals. Data is presented in Table 4.39-2 and Figures 4.39-9 through -12 (sample locations Y200 and Y201). The results do not indicate appreciable amounts of target compounds. VOCs were essentially not detected, total SVOCs were in the 10 mg/kg range, PCBs were not detected, and lead was in the 10-20 mg/kg range. Although RSCO soil standards are not intended for pipe residuals, the results of the sediment samples are all below RSCO standards.

Soil samples immediately adjacent to the pipeline and around the area were characterized throughout the RFI program (2003-2006). As shown in Figures 4.39-3 and -4, parameters analyzed in soil at the suspected Outfall G breach were analyzed for VOCs, SVOCs, PCBs, and metals.

As shown in Figure 4.39-5, VOCs were virtually not detected in most soil samples analyzed, with maximum ranges in the 10 mg/kg range for total VOCs. None of the individual VOCs detected exceeded their respective RSCO standards.

Total SVOCs (refer to Figure 4.39-6) include the cPAH and non-cPAH fractions classified as SVOCs. As shown, the majority of total SVOCs were in the 10-100 mg/kg range. Table 4.39-1 presents the full analytical results of parameters analyzed. Two SVOCs, benzo(a)pyrene and dibenz(a,h)anthracene (both of which are cPAHs), were the only parameters in excess of their RSCO standards. Benzo(a)pyrene was detected in locations F11, F329, F330 and Y332 in multiple depths, including a depth of up to 16 feet (Y332). The reported concentrations were relatively low (less than 10 mg/kg in most locations) compared to other detections across the Astoria facility, but these concentrations were in excess of the 1.1 mg/kg RSCO standard for that parameter. Dibenz(a,h)anthracene was detected in only one location above RSCO standards (Y332), at an estimated concentration of 1.4 mg/kg.

PCBs were detected in soil, as shown in Figure 4.39-7, in concentration ranges in the vicinity of 1-10 mg/kg. None of the detections exceeded the 25 mg/kg RSCO standard for total PCBs. Of the metals analyzed, only arsenic exceeded its respective RSCO standard. Soil collected from Y332 (14-16 feet) exhibited arsenic at a concentration of 23.7 mg/kg, which exceeds the 16 mg/kg RSCO standard. No other arsenic or other metals revealed concentrations in excess of the RSCO standards in the Outfall G area.

Refer to Section 4.41 for an evaluation of facility-wide groundwater. Groundwater conditions underlying Outfall G are similar to the groundwater quality at the Auction Yard and Eastern Parcel (refer to Sections 4.38 and 4.39).

Based on these findings, the area of the suspected pipeline breach reveals cPAH and arsenic impacts (values in excess of RSCO standards) at greater depths than most of the other study areas at the Astoria facility. No further exploration of the pipeline appears to be necessary. The location of the breach and area of potential impacts has been identified (refer to Figure 4.39-1). Further action is recommended for this area relative to the presence of cPAHs and arsenic in subsurface soil.

4.40 Former MGP AOC

The Manufactured Gas Plant (MGP) at the Astoria facility has been the subject of investigations and regulatory discussions under a separate facet of the RFI program, and under an expedited schedule. A draft Site Characterization Report specifically for the MGP area was produced in August 2005 (ENSR, 2005). The NYSDEC review of that report has been deferred until a similar report has been submitted for the remainder of the Astoria RFI program. This report compiles information accumulated throughout the entire Astoria RFI program, including the MGP AOC. Data collected and archived during the MGP investigations has been combined into the overall RFI dataset, which is included in this report. The subsections that follow characterize the MGP AOC relative to the RSCO standards, consistent with the other study areas presented in this facility-wide RFI report. For additional detail and historic information related to the MGP area, refer to the draft report that was previously produced (ENSR, 2005).

4.40.1 MGP Area Characteristics

The MGP AOC is a large operational area depicted as generally rectangular, spanning from the northern edge of the Con Edison property into the central portion of the property. It transects and overlaps several other AOCs and study areas, including the North Storage Yard, East Yard, and Pipe Yard. The plant was constructed in the 1906/1907 timeframe. Prior to construction, an extensive grading program was implemented in 1903 to address irregularities in the natural grade. Figure 4.40-1 shows the site layout. The

main building is the Building 136 warehouse. Details of the building layout are available in the draft MGP Site Characterization Report (ENSR, 2005). Areas around the warehouse are predominantly gravel, with some asphalt surfaces.

4.40.2 Overview of Site Impacts

The draft MGP Site Characterization Report (ENSR, 2005) presents analytical data tables and figures to display the distribution of chemicals detected at that site. An updated presentation of tables (with no new information) is presented in Table 4.40-1. Similarly, updated figures that compile, group and compare the analytical data are presented in the Figure 4.40 series of figures included with this report.

Data compiled for the MGP area spans from 1994 through 2005. As shown in Figure 4.40-2, the focus of the first investigations was in the southern and southwestern portions of the area, within and adjacent to the North Storage Yard. As the program progressed in the late 1990s, the sampling was targeted towards the northeastern edge of the Building 136 warehouse to assess possible impacts from the egress portions of that warehouse. Subsequent sampling in the early and mid 2000s completed the characterization detail, with relatively widespread data coverage throughout the former MGP operational areas, including locations directly underneath the warehouse (refer to Figure 4.40-2).

As shown in Figures 4.40-4 and -5, a comprehensive sampling program and set of analytical parameters were analyzed in samples collected from the MGP area.

The distribution of total VOCs in soil is generally in the 1-10 mg/kg range (refer to Figure 4.10-5). Higher total concentrations in the 100-1,000 mg/kg range were detected under the Building 136 warehouse and in the vicinity of the Spare Transformer Yard. One location exhibited one parameter in excess of RSCO standards. Benzene in location MGP-44 was detected at 100 mg/kg, which exceeds the RSCO benzene standard of 89 mg/kg. No other VOCs were in excess of their respective RSCO standards.

SVOCs, as shown in Figure 4.40-6, were detected throughout the MGP area. The highest total concentrations were under the Building 136 warehouse and in the vicinity of the Spare Transformer Yard and North Storage Yard areas. Of the SVOCs analyzed and detected, only cPAHs exceeded their respective RSCO standards. Table 4.40-2 presents each specific cPAH parameter that exceeds RSCO standards. In general, the predominant cPAH in exceedance was benzo(a)pyrene, which is present above the 1.1 mg/kg RSCO standard in most locations across the Astoria facility.

PCBs were in the 1-10 mg/kg range in most locations (refer to Figure 4.40-7), with some elevated concentrations at the Spare Transformer Yard and North Storage Yard. A subset of locations exhibited PCB concentrations above the 25 mg/kg RSCO PCB standard. Most of these exceedances were at the North Storage Yard, which is the subject of a separate RFI study area (refer to Section 4.36).

As shown in Figure 4.40-8, lead was present at varying concentrations in soil. Concentrations ranged from the 1-1,000 mg/kg range with no clear pattern or areas of greater impact, with the exception of the North Storage Yard area, where most of the locations exhibited higher concentrations of lead. Lead did not exceed its 3,900 mg/kg RSCO standard at the MGP area, other than at the North Storage Yard. The exceedance of lead in that area is the subject of the North Storage Yard investigation, not attributable to MGP operations.

Overall, the MGP AOC is relatively large and underlies many other individual study areas. No contiguous widespread impacts are present in the MGP area. Some impacted portions of the MGP area are recommended for further action as part of other study areas; the remaining impacted portions are grouped based on proximity. In total, five groups of MGP-impacted areas are recommended for further action (MGP AOC Areas 1, 2, 3, 4 and 5). DNAPL was reported to be present in locations MGP-31 and 41, underneath the foundation of Building 136. This area is included within the MGP AOC Area 1.

4.41 Facility-wide Groundwater

This section of the report encompasses the groundwater analytical data collected from two study area categories: "Historic SWMU Perimeter and former non-AOC Groundwater Monitoring Wells" and "Site Perimeter Groundwater Monitoring Well Network." Available groundwater data has been compiled from the 14-year history of the RFI program. As referenced earlier in this report, Table 2-4 presents the cumulative well construction details for the groundwater monitoring well network at the Astoria facility.

4.41.1 Groundwater Flow

The depth to groundwater was gauged at each monitoring well during their installation process, after well stabilization was confirmed. Similarly, samples were collected for laboratory analysis of groundwater quality during the same timeframes. As a result, much of the gauging and analytical data available is distributed over 14 years, with very little synoptic or simultaneous information. In preparing this report, a limited synoptic water level measurement event was conducted for approximately 80 wells distributed across the facility in July 2007 (July 2-6, 2007). The results are plotted in Figure 4.41-1. As shown, the generalized groundwater flow direction is towards Luyster Creek and the East River. Groundwater highs are apparent at Blue Dog Lake and the Former Pond Area. This is consistent with the natural structure of those ponds (i.e., unlined and well-connected to the subsurface). Water elevation data from two of the wells gauged (F47B and F64) was not used in generating this contour map because the elevation data appeared anomalously high. Upon further inspection, a clay/silt lens was observed during drilling above the screened intervals for those wells, indicating that the potentiometric surface from those wells was likely exaggerated and inconsistent with the other shallow overburden hydraulic characteristics. Overall, groundwater flows in two directions across the facility and generally follows the topography. In the eastern portion of the facility, groundwater flows east-northeasterly toward Luyster Creek, while in the western portion there is a northwesterly flow toward the East River.

4.41.2 Groundwater Conditions

As indicated previously, much of the groundwater analytical data was collected during different sampling events spanning a 14-year period. To view this information on a facility-wide scale, analytical data from the most recent sampling dates at each location was used to create groundwater isoconcentration contour maps. Table 4.41-2 presents the groundwater quality data compiled for the Astoria facility. Figures 4.41-2 through -9 depict the isoconcentrations of parameters or parameter groups detected in groundwater for each of the parameters or parameter groups that exceed RSCO standards in soil.

The distribution of VOCs in groundwater (Figure 4.41-2) reveals the highest levels in the vicinity of the Auction Yard, Blue Dog Lake, and the Cable Storage Yard. Total VOC concentrations in that area are in the 500-1,000 ug/L range. The concentration of total VOCs dissipates beyond those areas, with very little (at or near detection limits) present in the western portion of the facility. Specific VOCs detected are shown by color-coded pie chart symbols at each of the sampled locations.

Total SVOCs (other than PAHs) were most prevalent in the subsurface underlying Former Pond Area and Auction Yard at concentrations in the 100-150 ug/L range (Figure 4.41-3). Concentrations of non-PAH SVOCs elsewhere at the facility were generally lower, in the 10 ug/L range. Similar to the VOC figure, the individual SVOC parameters detected in groundwater are shown with color-coded pie chart symbols on the figure.

PAHs in groundwater are shown in three separate figures. Figure 4.41-4 shows non-cPAHs, Figure 4.41-5 shows cPAHs other than benzo(a)pyrene, and Figure 4.41-6 shows benzo(a)pyrene. These groupings were selected to parallel the observations of PAHs in soil at the facility. As shown, total non-cPAHs are highest at the Former Pond Area, approaching the 1,000 ug/L range (Figure 4.41-4). This is consistent with the presence of LNAPL in that area. Total concentrations of non-cPAHs in groundwater are in the 100-500 ug/L range throughout the mid-section of the facility, from the Tank Farm Area (north) to the Astoria East Substation (south). Specific parameters detected are shown in the figure in color-coded pie charts. The cPAHs [other than benzo(a)pyrene] are not prevalent in groundwater (Figure 4.41-5). The highest concentration of total

cPAHs (excluding benzo(a)pyrene) are in the vicinity of 10 ug/L. No clear pattern of detection is apparent at that concentration level. Figure 4.41-6 reveals that the benzo(a)pyrene is highest in the vicinity of the Former Pond Area, at concentrations in the 50 ug/L range. This is again consistent with the presence of LNAPL in that area. Another elevated detection of benzo(a)pyrene (40 ug/L range) was detected at the western corner of the facility, south of MGP AOC Area 4. Other than these locations, the detections of benzo(a)pyrene were either non-detect or in the 1-10 ug/L range at Blue Dog Lake and MGP AOC Area 1.

PCBs in groundwater were detected in the 20 ug/L range at Pipe Yard SWMU Area 2, the Purge Oil Pump House Area, and the former MGP AOC Area 3 (Figure 4.41-7). Concentrations in the 10 mg/L range were detected in the vicinity of Blue Dog Lake, Outfall G, and south of MGP AOC Area 4.

Two inorganic parameters of interest were revealed during the RFI evaluation: arsenic and lead. Accordingly, their distribution in groundwater was plotted. Figure 4.41-8 shows that arsenic has been present in groundwater at concentrations in the 30 ug/L in the western Pipe Yard area (south of Pipe Yard SWMU Area 1) and in the 20 ug/L range northeast of the Triangle Area. Lower detections at or near the detection limit were reported in groundwater underlying the former MGP Area. As shown in Figure 4.41-9, lead was more prevalent in groundwater (as expected given its ubiquitous natural presence). The highest detection of lead in groundwater was in the 1,000 ug/L range south of Pipe Yard SWMU Area 1, with lower detections in the 500 and 100 ug/L range moving west across the former MGP Area.

5.0 Property-wide Conceptual Site Model

This section summarizes the site-specific observations for the 41 study areas, and introduces common themes among them and facility-wide characteristics. Also in this section is a presentation of the most likely regulatory standards that apply to this Corrective Action program, which are the RSCO standards used for comparison throughout Section 4.0). As this RFI report is discussed with the NYSDEC, the selection of regulatory standards and the approach for proceeding with further action will be finalized.

5.1 Overview

As introduced in Section 2.0, the Con Edison Astoria facility is in the northwestern portion of the Astoria section of Queens, in New York City. The site has been owned by Con Edison or its predecessor companies since the late 1890s. Since that time, over 100 years of power and gas-generation activities have resulted in periodic spills and incidental releases of fuels and related liquids. The majority of impacts from these occurrences have been averted by quick response and recovery of liquids and nearby impacted soil immediately upon discovery of the occurrences. Despite these efforts, residual impacts remain. A preliminary comparison to regulatory standards and facility-wide observations of these impacts follows.

5.2 Preliminary Selection of Regulatory Standards

NYSDEC developed Remedial Program Soil Cleanup Objectives (SCOs) under the New York Code of Rules and Regulations (NYCRR). The specific citation is 6 NYCRR Subpart 375-6, effective December 14, 2006. This subpart could be applied to the development and implementation of the remedial programs for soil and other media set forth in the following programs:

- Subpart 375-2: Inactive Hazardous Waste Disposal Site Remedial Program;
- Subpart 375-3: Brownfield Cleanup Program; and
- Subpart 375-4: Environmental Restoration Program

These cleanup levels are interpreted as superseding other cleanup levels that have been developed by NYSDEC, such as the Soil Cleanup Objectives and Cleanup Levels developed under the Technical and Administrative Guidance Memorandum (TAGM) program, specifically TAGM No. 4046. The Con Edison site is an active permitted facility operating under a RCRA Part B Permit. Under that context, it is essential that NYSDEC participate in the selection of cleanup standards for the property as well as determining whether these SCOs should be applied.

The SCOs are based on the most recent chemical-specific toxicity values and exposure assumptions for a variety of scenarios. SCOs have been developed for a number of land uses, including unrestricted residential, restricted residential, commercial, and industrial, as well as for the protection of ecological resources and protection of groundwater. Under the Brownfield Cleanup Program (introduced in 6 NYCRR Subpart 375-3, with cleanup levels listed under 6 NYCRR Subpart 375-6), there are four cleanup tracks that can be used to determine the remedy at brownfields site. The tracks are briefly summarized as follows:

- *Track 1:* Unrestricted use. A cleanup under this track results in a site being cleaned up to a level that does not rely upon institutional or engineering controls; therefore, the unrestricted residential SCOs apply. These SCOs apply to soil that is at 0-15 feet in depth;
- *Track 2:* Restricted use. A cleanup under this track complies with the SCO values for restricted residential, commercial, and industrial uses, as well as for the protection of ecological resources and the protection of groundwater. Restrictions on site use and groundwater use are allowed, but

institutional or engineering controls to achieve the soil SCOs are not allowed. These SCOs apply to soil that is at 0 to 15 feet in depth;

- *Track 3:* Restricted use with modified SCO values. Cleanups are the same as those under Track 2, except that the values in the SCO tables may be modified, based on site-specific data. These SCOs apply to soil that is at 0 to 15 feet in depth; and
- *Track 4:* Site-specific SCOs. SCOs may be calculated using site-specific risk calculations. The top 2 feet of soil for residential uses and top one foot of soil for non-residential uses must comply with the Track 2 tables if that soil is exposed (not covered by buildings or paving).

Because the Con Edison site is not under the Brownfield Cleanup Program, it is not necessary to designate a specific track for this site. If the cleanup was being conducted under the brownfields program, Track 2 would be the most likely approach, using the restricted-use industrial SCOs (referred to as "RSCOs"). Industrial use is generally defined as land that is intended for the primary purpose of manufacturing, production, fabrication or assembly process and ancillary services. The entire Con Edison site falls under this category, and the future land use is intended to remain the same. There is no significant ecological habitat; therefore, the ecological SCOs would not be considered as being applicable. Because the chemicals detected at this site (mainly PAHs, PCBs and lead) are primarily adsorptive and generally above the water table, the SCOs based on groundwater protection would also not apply. The applicability of groundwater protection standards are further reduced by the fact that Con Edison does not currently use groundwater for consumption, has no plans to do so in the future, and would be amenable to a groundwater-use restriction if necessary. For these reasons, the groundwater protection standards are not applicable to the property.

Soil data collected over the course of the 14-year RFI program was compared to the RSCOs described above. For convenience, the RSCO standards are provided in Table 5-1. As introduced in Section 4.0, the RSCO standards were used in this RFI report as a preliminary screening mechanism to better define the parameters that warrant further attention. Under that context, all soil data was compared to these RSCO standards for the evaluation presented in Section 4.0, despite the regulation suggesting that they apply to only the upper 15 feet of soil. In this section, an overview of impacted areas based on this RSCO comparison is presented on a facility-wide scale.

5.3 Designation of Impacted Areas

The approach to this RFI consisted of first reviewing the 40 study areas individually, then assessing groundwater (the 41st study area) underlying those areas on a facility-wide scale. The results are presented in Section 4.0. This section (Section 5.0) provides the next level of evaluation by reviewing common observations among the individual study areas. This approach establishes the framework with which to determine the next appropriate action for each area.

Figure 5-1 summarizes the results of the RFI program on a facility-wide scale. All soil sampling locations are shown. Locations with no RSCO exceedances are presented in yellow and are unlabeled to reduce distractions. Locations with RSCO exceedances are shown as single colors or as multi-colored pie chart symbols, labeled, and coded to display the specific chemicals (or groups of chemicals) that exceed their respective RSCO standard. Also shown in the figure are the areas with measurable LNAPL or trace LNAPL, as detected through the RFI characterization programs or ongoing ICM program (Purge Oil Pump House Spill Area, Former Pond Area and Spill No. 89C). Locations with DNAPL observed (former MGP Area) are also depicted in the figure.

Impacted portions of the facility are depicted in red font in Figure 5-1. These areas were selected by encircling sampling locations that exhibited RSCO exceedances or measurable NAPL (LNAPL or DNAPL). Also considered was the source of site impacts, based on spill records and site histories. Study areas (e.g., AOCs or SWMUs) that appear to be impacted are labeled in red font. Study areas that do not appear to be impacted are labeled in black font.

As shown in Figure 5-1, three of the study areas (MGP AOC, Auction Yard and Spill No. 89C/D/E) contain non-contiguous impacted portions: five MGP areas (Areas 1, 2, 3, 4 and 5), three Auction Yard areas (Areas 1, 2 and 3), and two Spill 89C/D/E areas (Spill Nos. 89C and E).

5.4 Facility-wide Observations

As the RFI data was compiled and evaluated, it became apparent that one particular parameter, benzo(a)pyrene, does not appear to be associated with any of the particular study areas. It is present in soil throughout the facility and is most likely attributable to the facility-wide fill.

As the Con Edison Astoria facility was being constructed in 1903, a reported 485,000 cubic yards of soil were removed from high portions of the property and used to fill the low-lying portions in an effort to create contiguous operational areas. As operations continued over the next 100+ years, re-grading of the facility continued periodically to install footings and subsurface conduits, upgrade structures, respond to incidental spills, improve drainage and stormwater management, and enhance overall facility operations and the landscape. These activities have resulted in fill material being relatively well distributed throughout the majority of the facility. If the fill had been impacted by local operations, it could have been distributed to other areas of the facility during these re-grading events.

Some of the Astoria facility operations have resulted in cPAH generation and impacts to the nearby ground surfaces. Data collected from throughout the facility reveals that the re-grading and movement of soil and fill material have likely spread the distribution of those cPAHs. Many of the study areas that were evaluated for specific spills have exhibited little evidence of contamination from the specific spills, but do exhibit the consistent presence of low-level cPAHs. Benzo(a)pyrene, in particular, is the most common of the cPAHs detected. Its relatively low RSCO soil standard (1.1 mg/kg) is exceeded essentially throughout the facility. The other cPAHs, as well as PCBs, lead, arsenic, and some other chemicals exceed the RSCO standards in many locations, but the exceedances are not as widespread as benzo(a)pyrene. For these reasons, benzo(a)pyrene was not used to guide the designation of impacted areas (described in Section 5.3).

5.5 Depth-specific Evaluation

Depths of impacted areas on a facility-wide basis are displayed on Figures 5-2 through 11. As shown, the distribution of site impacts lessens with depth. The 0-2 foot horizon reveals the majority of site impacts, while the 16-18 foot depths and greater reveal much fewer areas of impact. This is consistent with the general CSM for the surface spills recorded and responded to at the facility over the history of operations.

As also evidenced by this depth-specific view of impacted areas, the characterization of the subsurface with respect to depth delineation appears to be comprehensive. Table 5-2 presents a comparison of soil depths characterized and analyzed at each of the study areas, and the depth of soil impacts with respect to RSCO standards. For the most part, the vertical extent of soil impacts has been defined by encountering non-impacted soil, saturation (i.e., groundwater), or bedrock.

As shown on Figure 5-2, surface and near-surface soil impacts (0-2 feet) are primarily confined to the mid-section of the facility, where active operations are ongoing in and around the Pipe Yard, Cable Storage Yard and North Storage Yard areas. Few impacts were detected at the 0-2 foot horizon in the western portion of the facility where the former MGP area, CWTF and other miscellaneous areas are located. Similarly, few impacts were detected at 0-2 feet in the northeastern and eastern portions of the facility where the LNG area, Eastern Parcel, Auction Yard and other associated areas are located.

Figures 5-3 through 5-10 show impacted portions of deeper soil horizons for each successive 2-foot interval (e.g., 2-4, 4-6, etc.) through a depth of 18 feet. These figures reveal a sharp reduction in areas that are impacted. For example, at the 2-4 foot depth, the majority of the North Storage Yard and several portions of the Pipe Yard and Cable Storage Yard are not impacted. The depth of impacts in those areas is primarily in the upper 0-2 feet.

As the depth of exploration increases to the 6-8 and 8-10 foot horizons, evidence of deeper impacts are evident in areas such as the former MGP area and Auction Yard (refer to Figures 5-5 and 5-6). Shallower impacts in those areas were not observed. The deepest level of comprehensive sampling was at the 16-18 foot horizon (refer to Figure 5-10). Impacts were observed in the vicinity of the Pipe Yard. Figure 5-11 shows the data collected from beyond depths of 18 feet. That depth of investigation was mainly associated with the former MGP area characterization. Some impacts were detected at that depth, as shown on the figure. The level of characterization at those deeper horizons was targeted in suspected areas of contamination, rather than comprehensive across the entire facility.

5.6 Recommendations

In general, further action for the impacted areas depicted in Figure 5-1 could consist of one or more of the following steps, as part of the RCRA Corrective Action process:

- Interim Corrective Measure (ICM) implementation to address an immediate threat (none identified);
- Exposure assessment to evaluate whether site-specific risks are posed by the chemicals that exceed the RSCO standards;
- Corrective Measures Study (CMS) to evaluate response actions to remediate the areas that exceed RSCO standards or present potential risks; and
- No further action based on the results of the RFI program.

Table 5-3 presents recommendations for each of the RFI study areas. Based on the observations at each of the areas, it does not appear that an ICM is warranted (other than the continued gauging of LNAPL at the three areas where it's been identified). To conduct a thorough, stepwise evaluation of precisely which actions are optimal for each study area, it is recommended that a CMS be conducted. The CMS would be the next step in the RCRA Corrective Action process and would include the following 22 study areas.

- East Yard SWMU;
- Purge Oil Pump House Spill Area;
- Blue Dog Lake;
- Former Pond Area;
- Former Fire Fighting School;
- Pipe Yard SWMU Areas 1, 2, 3 and 4;
- Astoria Central Wastewater Treatment Facility SWMU (evaluation ongoing);
- Astoria East Substation Spill Area;
- Spill Nos. 89 C and E;
- Cable Storage Yard AOC;
- Triangle Area AOC;
- AOC West of Main Gate;
- Former Corporate Transportation USTs SWMU;
- Spill No. 91;
- A-11 Dock Fire Pump House AOC;
- Spill No. 70;
- Transportation Department Former Waste Oil USTs A & B SWMU;

- North Storage Yard SWMU;
- Auction Yard Areas 1, 2 and 3;
- Outfall G;
- Former MGP AOC Areas 1, 2, 3, 4 and 5; and
- Facility-wide Groundwater.

As part of the RFI evaluation, opportunities for early corrective actions or additional ICM activities were considered, based on the data as it became available. No clear "hot spots" were identified, but it did become apparent that some portions of the ground surface contain soil impacts that exceed RSCO standards. Figure 5-2 (soil impacts at 0-2 feet) was expanded with the surface cover data layer to create Figure 5-12, which isolates areas of surface impacts that are unpaved (i.e., covered with soil/grass or gravel). As shown in Figure 5-12, the 0-2 foot horizons in some of the unpaved areas reveal exceedances of targeted compounds. Refer to the "exposed impacted surface area" designations on the figure. Unpaved locations in the Pipe Yard, Auction Yard, North Storage Yard and other subsets of study areas reveal surface or near-surface impacts that could pose potential risk to workers in those areas. Based on this observation, it may be beneficial to prioritize identifying an appropriate corrective action for those locations to reduce the potential impacts to industrial workers at the facility. Currently, corrective action activities are underway to address PCB impacts in shallow soil at the North Storage Yard. Activities at the North Storage Yard follow the guidelines of the Toxic Substances Control Act (TSCA).

Figure 5-13 summarizes the status of spills in and around the Con Edison facility. Three categories of spills are shown: 1) spills subject to continued investigation under the corrective action program; 2) spills outside the boundaries of the Con Edison property; and 3) spills that do not warrant further action and can be administratively closed.

In summary, the Con Edison facility is considered sufficiently characterized to understand the nature and extent associated of site impacts. Other than the continued ICM program for LNAPL (refer to Sections 4.2, 4.4 and 4.16), no further RFI characterization is planned. Any further site delineation (if necessary) would be most efficient if conducted as part of a corrective measure (e.g., pre-design sampling or post-excavation sampling). As this RFI report becomes finalized, the next step in the RCRA corrective action process will be to conduct a CMS evaluation to select specific actions for the impacted areas of the Astoria facility. Close interaction with the NYSDEC will be necessary throughout this process.

6.0 References

Arcadis, 2003, "*A-10 Dock Subsurface Pre-characterization Summary Report*", dated May 5, 2003

Arcadis, 2003, "*A-10 Dock Remediation Program Summary*," Doc. # NY001372.0003, May 2003

Brown & Caldwell, 2004, *"Engineering Report – Process Wastewater Treatment System – CWTF"*, June 2004

Brown & Caldwell, 2004, *"Site Safety and Health Plan – CWTF Wastewater Settling Tank – Sludge Sample Collection"*, June 2004

Brown & Caldwell, 2004, *"Approval to Discharge into Sewers – CWTF"*, September 2004

Brown & Caldwell, 2004, *"Engineering Report – Process Wastewater Treatment System – CWTF – NY – 0201243"*, December 2004

Brown & Caldwell, 2005, *"Investigation of Hardened Scale on Tank Walls and Cones for the CWTF Cleanout and Inspection Project"*, January 2005

Brown & Caldwell, 2005, *"Work Plan – CWTF – Wastewater Settling Tank Cleanout and Inspection"*, March 2005

Brown & Caldwell, 2005, "SPDES Industrial Application Form NY-2C", March 2005

Brown & Caldwell, 2005, *"Hazardous Waste Contingency Plan Addendum (HWCPA)"*, April 2005

Brown & Caldwell, 2005, *"Site Safety and Health Plan – CWTF – Wastewater Settling Tank Cleanout and Inspection"*, April 2005

Brown & Caldwell, 2005, *"Site Safety and Health Plan Addendum – CWTF – Wastewater Settling Tank - Scale Sample Collection"*, April 2005

Con Edision, 1993, *"Proposal for Consultant Services on a Corrective Action Project for Consolidated Edison's Astoria Site"*, Doc. # 9403K33, March 1993

Con Edison, 1997, *"Proposed Phase II RFI Activities, Gas Turbine Facility and Former Pond Area"*, Doc. # 53D15-OW.689, March 1997

Con Edison, 1998, *"Con Ed's Response to NYSDEC Comments on RFI Phase IIC Work Plan"*, February 1998

Con Edison, 1998, *"Phase I Environmental Site Assessment, Luyster Creek"*, Doc. # 1914.0001.3008.00004, September 1998

Con Edison, 2000, *"RCRA Bi-Monthly Progress Update"*, February 28, 2000

Con Edison, 2001, *"ICM Final Recommendations Report"*, January 2001

Con Edison, 2001, *"Conceptual Plan for the Remediation and Maintenance of the Yard"*, May 2001

Con Edison, 2002, *"Astoria Corrective Action and Appendix B Spills Program Responses to NYSDEC Comments and RCRA RFI Reports"*, March 2002

Con Edison, 2002, *"Responses to NYSDEC Comments Report (Phase I, IIB, IIC)*", March 2002

Con Edison, 2002, *"Revised RFI Reports for Phase I, IIB and IIC"*, April 2002

Con Edison, 2002, *"RCRA Corrective Action and Consent Order Progress Update"*, July 2002

Con Edison, 2002, *"SWMU Assessment Report for Building 139 Septic System"*, July 2002

Con Edison, 2005, *"ICMs: Request to NYSDEC to Remove Well K133 from the Program"*, February 2005

Con Edison, 2005, "ICMs: Request to NYSDEC to Remove Well A11 from the Program", May 2005

Con Edison, 2005: *"ICMs: Request to NYSDEC to Remove Well A25 from the Program",* May 2005

Con Edison, 2005: "ICMs: Request to NYSDEC to Remove Well F17 from the Program", May 2005

Con Edison, 2007, "Expanded Assessment of Groundwater Quality in Bedrock Formation (based on Brown and Caldwell observation) Letter Proposal to the NYSDEC", June 26, 2007

ENSR, 1990, *"Astoria Spill Prevention, Control and Countermeasure Plan"*, 1990

ENSR, 1992, *"Astoria Hazardous Waste Reduction Plan"*, 1992

ENSR, 1993, *"Astoria Community Relations Plan"*, 1993

ENSR, 1994, *"RFA Sampling Visit Work Plan"*, Doc. # 01869-001-210, March 1994

ENSR, 1994, *"RFA and Sampling Visit (RFA/SV) Report"*, May 1994

ENSR, 1994, *"Description of Current Conditions Report"*, Doc. # 01869-001-300, July 1994

ENSR, 1994, *"RFI Work Plan – North Storage Yard"*, Doc. # 01869-001-215, July 1994

ENSR, 1994, *"Pre-Investigation Evaluation of Corrective Measures"*, Doc. # -1869-001-400, September 1994

ENSR, 1994, *"RFA Sampling Visit Report"*, Doc. # 01869-001-203, September 1994

ENSR, 1994, *"North Storage Yard RFI Work Plan"*, Doc. # 01869-001-215, October 1994

ENSR, 1994, *"Proposal for Facility Storm Sewer System Investigations"*, Doc. # 01869-A10, December 1994

ENSR, 1995, *"North Storage Yard Preliminary RFI Report"*, Doc. # 01869-002-218, April 1995

ENSR, 1995, *"Con Edison Health and Safety Plan"*, Doc. # 01869-001-500, May 1995

ENSR, 1995, *"RFI Work Plan"*, Doc. # 01869-001-500, May 1995

ENSR, 1995, *"Draft North Storage Yard RFI Report"*, Doc. # 01869-003-208, June 1995

ENSR, 1995, *"Supplemental RFA SV Work Plan"*, Doc. # 01869-001-230, June 1995

ENSR, 1996, *"Draft Data Summary and SWMU/AOC/Spills Evaluation Report – Volume I – Sections 1 through 8"*, Doc. # 01869-002-518, April 1996

ENSR, 1996, *"Draft Data Summary and SWMU/AOC/Spills Evaluation Report – Volume II – Appendicies A through T"*, Doc. # 01869-002-518, April 1996

ENSR, 1996, *"Data Summary Report (Draft)"*, April 1996

ENSR, 1996, *"Phase I RFI Report (Draft)"*, April 1996

ENSR, 1996, *"Supporting Spills Information for the Draft Data Summary and SWMU/AOC/Spills Evaluation Report"*, Doc. # 01869-002-518A, April 1996

ENSR, 1996, *"Presentation Summary: Draft Data Summary and SWMU/AOC/Spills Evaluation Report"*, Doc. # 01869-003-811, May 1996

ENSR, 1996, *"Phase IIA RFI Report"*, June 1996

ENSR, 1997, *"Phase IIB RFI Work Plan for the Gas Turbine Facility and Former Pond Area"*, Doc. # 01869-003-210, February 1997

ENSR, 1997, *"Response to NYSDEC's Comments (on remaining 32 orig. spills)"*, ENSR doc. # 1869-003-100, February 1997

ENSR, 1997, *"Health and Safety Plan for Phase II RFI Activities at Gas Turbine Facility and Former Pond Area"*, May 1997

ENSR, 1997, *"RFI Phase IIC Work Plan"*, Doc. # 01869-003-220, October 1997

ENSR, 1998, *"Data Summary and SWMU/AOC/Spills Evaluation Report (Revised Draft)"*, Doc. # 01869-003-320, June 1998

ENSR, 1998, *"Phase IIB RFI Report for the Gas Turbine Facility and Former Pond Area"*, Doc. # 01869-003-446, June 1998

ENSR, 1998, *"Draft RFI Phase IIC Report"*, Doc. # 01869-003-466, August 1998

ENSR, 1998, *"Phase IIB RFI Report"*, 1998

ENSR, 1998, *"Interim Remedial Measure (IRM) Evaluations Work Plan"*, Doc. # 01869-003-470, September 1998

ENSR, 1998, *"Remediation Costs, Expected Value Analysis, Astoria Generating Station and Astoria Tank Farm Report"*, Doc. # 01869-022-200, November 1998

ENSR, 1999, *"Interim Remedial Measure (IRM) Evaluations Report"*, Doc. # 01869-003-473, January 1999

ENSR, 1999, *"Subsurface Investigation of NYSDEC Spills",* Doc. # 01869-003-485, January 1999

ENSR, 1999, *"Eastern Parcel RFI Work Plan"*, Doc. # 01869-025-100, February 1999

ENSR, 1999, *"Draft Data Summary Report, Eastern Parcel RFI"*, Doc. # 01869-025-300, March 1999

ENSR, 1999, *"Interim Corrective Measures (ICM) Evaluation Report"*, April 1999

ENSR, 1999, *"Interim Remedial Measure (IRM) Evaluation Report, Generating Station and Fuel Oil Depot"*, Doc. # 01869-003-473-A, April 1999

ENSR, 1999, *"Interim Remedial Measure (IRM) Evaluation Report, Gas Turbine Facility"*, Doc. # 01869-003-473-C, April 1999

ENSR, 1999, *"Interim Remedial Measure (IRM) Evaluation Report, Former Pond and Purge Oil Pump House"*, Doc. # 01869-003-473-B, August 1999

ENSR, 1999, *"Data Summary Report for the Eastern Parcel RFI*", Doc. # 01869-025-300, November 1999

ENSR, 2000, *"Eastern Parcel RFI Work Plan Phase II"*, Doc. # 01869-025-500, February 2000

ENSR, 2000, *"RFI Proposal"*, Doc. # 01869-A45, July 2000

ENSR, 2000, *"Environmental Specification for Disposal of Non-Hazardous Solid Waste"*, Doc. # ES-03, Rev. 2, November 2000

ENSR, 2000, *"Environmental Specification for Management of Characteristics/Listed Hazardous Wastes"*, Doc. # ES-063, November 2000

ENSR, 2000, *"Phase IIC RFI Report Addendum"*, November 2000

ENSR, 2001, *"North Storage Yard: Responses to NYSDEC Comments"*, May 2001

ENSR, 2001, *"Response to NYSDEC Comments: North Storage Yard RFI Report"*, Doc. # 01869-031-800, May 2001

ENSR, 2001, *"New Transformer Storage Yard Phase II RFI Work Plan (Revision)"*, Doc. # 01869-031-220, August 2001

ENSR, 2001, *"Proposal for East River Generating Station, Site 2 – Investigation Project"*, Doc. # 01869-A73, October 2001

ENSR, 2001, *"Astoria Central Waste Treatment Facility Sludge Study"*, November 2001

ENSR, 2001, *"Astoria Central Wastewater Treatment Facility Work Plan: Groundwater Quality Investigation Report"*, Doc. # 01869-040-101, November 2001

ENSR, 2001, *"Astoria Central Wastewater Treatment Facility Work Plan to Assess a Release from the East and West Settling Tanks"*, November 2001

ENSR, 2002, *"Eastern Parcel RFI Work Plan – Phase II"*, Doc. # 01869-025-500, February 2002

ENSR, 2002, *"North Storage Yard 3D Modeling Report"*, Doc. # 01869-031-0803, March 2002

ENSR, 2002, *"Response to NYSDEC Comments to the DDS, Phase IIB, and Phase IIC Reports"*, March 2002

ENSR, 2002, *"SPCC and Hazardous Waste Contingency Plan"*, March 2002

ENSR, 2002, *"Response to NYSDEC Comments – Recommendation and Conclusions to the DDS, Phase IIB and Phase IIC Reports",* April 2002

ENSR, 2002, *"Proposed Phase IID RFI Report"*, April 2002

ENSR, 2002, *"MGP Sites Pricing Proposal with Backup Pricing Information"*, Doc. # 01869-A79, June 2002

ENSR, 2002, *"Astoria Former MGP Site History Research"*, July 2002

ENSR, 2002, *"Response to NYSDEC Comments to Eastern Parcel RFI Work Plan – Phase II"*, June 2002

ENSR, 2002, *"Interim Sludge Report – Astoria Central Wastewater Treatment Facility"*, Doc. # 01869-040-140, July 2002

ENSR, 2002, *"North Storage Yard – Interim Corrective Measure Study to NYSDEC"*, Doc. # 01869-031-600, July 2002

ENSR, 2002, *"Final Sludge Report – Astoria Central Wastewater Treatment Facility"*, Doc. # 01869-040-150, August 2002

ENSR, 2002, *"Former MGP AOC PSA Phase II RFI Work Plan,"* Doc. # 01869-031-410, September 2002

ENSR, 2002, *"Sampling Work Plan and QAPP"*, September 2002

ENSR, 2003, *"Conceptual Site Restoration Plan Following ICM, North Storage Yard"*, Doc. # 01869-031-601, May 2003

ENSR, 2003, *"Interim Corrective Measures (ICM) Report"*, May 2003 & July 2003

ENSR, 2003, *"Astoria Abridged Sludge Sampling Report"*, Doc. # 01869-040-150, June 2003

ENSR, 2004, "Phase II RFI Work Plan: Response to NYSDEC and NYSDOH Comments (No. 3)", Doc. # 01869-031-415, March 2004

ENSR, 2004, *"Eastern Parcel Phase II RFI – Interim Summary of Findings Following Round 1 Field Program"*, Doc. # 01869-025, June 2004

ENSR, 2004, *"Technical Proposal: Future RCRA Corrective Action Activities at the Astoria Facility"*, Doc. # 01869-B04, September 2004

ENSR, 2004, *"Eastern Parcel: Slug Test Data Summary"*, Doc. # 01869-088-210, October 2004

ENSR, 2002, *"Health and Safety Plan for Former MFG PSA"*, October 2004

ENSR, 2004, *"North Storage Yard Work Plan"*, October 2004

ENSR, 2005, *"Eastern Parcel – Joint Permit Application (JPA) for Outfall G Sampling"*, Doc. # 1869-088-120, March 2005

ENSR, 2005, *"Eastern Parcel – Response to NYSDEC Comments on JPA"*, Doc. # 01869-088-120, March 2005

ENSR, 2005, *"Eastern Parcel – Phase II RFI Report"*, Doc. # 01869-088-800, March 2005

ENSR, 2005, *"North Storage Yard – Response to USEPA Comments on ICM Proposal"*, Doc. # 01869-031-625, April 2005

ENSR, 2005, *"Data Usability Summary Report"*, May 2005

ENSR, 2005, *"Former MGP AOC Site Characterization Report"*, Doc. # 01869-090-200, July 2005

ENSR, 2005, *"MGP AOC Report (Draft)"*, August 2005

ENSR, 2005, *"MGP Site Characterization Report*", August 2005

ENSR, 2006, *"North Storage Yard RFI Report*", 2006

ENSR, 2006, Phase IID: Evaluation of Temporary Well Gauging Data (letter to NYSDEC), Doc. # 01869-119-0031, September 2006

USEPA, 1991, *"Final PR/VSI Report"*, Doc. # NYD980593636, March 1991

USEPA, no date, "*East/North Queens Substation Hazardous Waste Contingency Plan"*, Doc. # NYD980593636

USEPA, no date, *"Astoria West Hazardous Waste Contingency Plan"*, Doc. # NYD980593636

Foster Wheeler, 1995, *"Storm Sewer Evaluation Summary Report (SWSS)"*, September 1995

Foster Wheeler, 1998,*"Phase I Environmental Site Assessment – Astoria Generating Station, Central Wastewater"*, April 1998

Foster Wheeler, 1998, *"Phase I Environmental Site Assessment – Astoria Gas Turbine Facility"*, May 1998

Foster Wheeler, 1998, *"Phase I Environmental Site Assessment – Oil Storage Depot, Pipeline Area"*, May 1998

Foster Wheeler, 1998, *"Phase I Environmental Site Assessment – Luyster Creek"*, September 1998

Foster Wheeler, 2001, *"Risk Management Plan for Sulfuric Acid"*, February 2001

LZA, 2002, *"Astoria Facility – North Storage Yard Evaluation of the Southwest Storm Sewer"*, Doc. # BB2331.00, July 2002

Malcolm Pirnie, 1999, *"Storm Sewer Investigation (Outfalls A through G)"*, January 1999

Malcolm Pirnie, 2002, *"Summary of Sampling and Cleaning of Manholes and Catch Basins for the Astoria Storm Sewer Water System"*, January 2002

NYSDEC, 1994, *"Hazardous Waste Management Permit for the Astoria PCB Storage Facility"*, doc. # 2-6301-0006/0002-0, May 1994

NYSDEC, 1994, *"Order on Consent", Doc. # R2-1023-88-06*, November 1994

NYSDEC, 2000, *"North Storage Yard NYSDEC Comments Report"*, November 2000

NYSDEC, 2001, *"Hazardous Waste Management Permit for the Astoria PCB Storage Facility"*, Doc. # 2-6301-00006-00002, March 2001

NYSDEC, 2001, "Comments Report on Phase I RFI" (letter), May 2001

NYSDEC, 2001, *"Revised DDS and SWMU Evaluation Report Review"*, May 2001

NYSDEC, 2001, "Comments Report on Phase IIB RFI" (letter), June 2001

NYSDEC, 2001, "Comments Report on Phase IIC RFI" (letter), July 2001

NYSDEC, 2006, "ICMs: Approval Letter from the NYSDEC to Remove A11, A25 and F17 from the ICM Program", April 2006

NYSDEC, 2006, "Phase IID: Approval letter from NYSDEC on Revising the Scope of the Temporary Well Gauging Program", September 2006

Parsons, 2001, *"MGP Work Plan for the PSA at the Farrington Street Facility"*, January 2001

URS, 2003, *"Limited Soil and Endwater Investigation Report for Results, 31st Street, Luyster Creek"*, Doc. # 21386844, August 2003