Prepared for:
Astoria Gas Turbine Power LLC

Prepared by:
AECOM
April 2020

SPDES Permit Modification
Turbine Replacement Project

Astoria Gas Turbine Power LLC
Astoria, Queens County, New York

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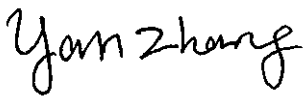

Reviewed by Yan Zhang

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List of Acronyms

BESS	Battery energy storage system
BOD	Biological Oxygen Demand
BTEX	Benzene, Toluene, Ethylbenzene, & Xylenes
cfs	cubic feet per second
COC	Cycles of Concentration
COD	Commercial Operation Date
COD	Chemical Oxygen Demand
CTG	Combustion Turbine Generator
Con-Ed	Consolidated Edison, Inc.
FRC	Free Residual Chlorine
g	grams
GE	General Electric
g N	grams as Nitrogen
gpm	gallons per minute
kg	kilograms
kg $CaCO_3$	kilograms as Calcium Carbonate
MCF	Thousand Cubic Feet
mg	milligrams
mg/L $CaCO_3$	milligrams per liter as Calcium Carbonate
mg/L N	milligrams per liter as Nitrogen
mg/L	milligrams per liter
MW	Megawatt
NYPA	New York Power Authority
NYSDEC	New York State Department of Environmental Conservation
O&G	Oil & Grease
OWS	Oil-Water Separator
P&W	Pratt & Whitney
ppm	parts per million
SMP	Stormwater Management Practice
SPDES	State Pollutant Discharge Elimination System
SPCC	Spill Prevention, Control, and Countermeasure
SWDM	Stormwater Management Design Manual
TMDL	Total Maximum Daily Load
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
USLD	Ultra-Low Sulfur Distillate Liquid Fuel
ULSK	Ultra-Low Sulfur Kerosene Liquid Fuel
WQv	Water Quality Volume
µg/L	micrograms per liter

1.0 Introduction

1.1 Introduction

Astoria Gas Turbine Power LLC ("Astoria") is proposing to modify its previously approved project ("Replacement Project" or "Project") and replace 24 existing natural gas and liquid fuel fired combustion turbine generators ("CTG") at the Astoria Gas Turbine Generating Facility ("Facility") with a single new state-of-the-art simple cycle CTG. The Facility is located on a 15-acre site at 31-01 20th Avenue, Astoria, Queens County, New York. The Facility is situated within a large 600+ acre complex (referred to as the "Astoria ConEd Complex"), which is home to several power generating facilities, as well as barge delivery facilities, a liquefied natural gas plant, a decommissioned wastewater treatment plant, and other miscellaneous energy and utility scale operations. This area has been the site of electrical generation, transmission, distribution and associated energy activities since the 1890s and remains exclusively a major electric generating and manufacturing complex.

The Project, as previously configured and permitted in 2010, consisted of the replacement of the existing CTGs with four General Electric ("GE") 7F.04 CTGs and four steam turbine generators to create a combined cycle facility capable of generating 1,040 electrical megawatts ("MWe"). However, the Project was not constructed at that time due to prevailing market conditions.

The Facility currently consists of 31 older, peaking-only gas and oil-fired CTGs including 24 operating Pratt & Whitney ("P&W") turbines and 7 previously retired Westinghouse turbines, with a combined nameplate rating of 646 MWe. The Project, as modified, will replace all of these turbines with a new state-of-the-art simple cycle dual-fuel peaking CTG[1]. The Project is planned to become operational in 2023 following a construction period starting in 2021.

The Facility's current State Pollutant Discharge Elimination System ("SPDES") permit (No. NY0201235) will expire at midnight (24:00 AM) on November 30, 2020. This report and the attached forms have been prepared to support the renewal and modification of the Facility's current SPDES permit covering existing activities and discharges that will be associated with the site after the completion of the Replacement Project.

1.2 Application Overview

In accordance with the NYSDEC instructions for SPDES permit applications, this package includes the following forms in support of the SPDES permit modification (**Appendix A**):

- SPDES Industrial Application Form NY-2C: For New Permits and Modifications to Discharge Industrial Wastewater and Storm Water; and
- SPDES Industrial Application Form NY-2C Supplement C: Mixing Zone Analysis for Estuarine Marine Waters Data Requirements – Pipe Discharge.

[1] One Pratt & Whitney Twin Pac (consisting of two combustion turbines and a single generator) will be retained to make the site black-start capable until replaced by an approximately 24 MWe battery energy storage system.

In addition, the following forms are attached in support of the SPDES permit renewal (**Appendix B**):

- SPDES Notice / Renewal Application; and
- SPDES Renewal Application Questionnaire.

The report is organized into four sections:

- Section 1 (this section): Introduction and application overview;
- Section 2: Overview of site activities, including power generation operations, materials storage, and outfall & drainage networks, both for the existing Facility and for the Replacement Project;
- Section 3: Overview of the water sources, uses, and discharges on the Facility, under existing and modified conditions; and
- Section 4: Details of the estimated quality of discharge to the East River.

1.3 Applicant Contacts

The applicant for this modification & renewal package is Astoria Gas Turbine Power LLC. The primary contacts for this application are:

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2.0 Facility Overview

The Facility is situated near the eastern bank of the East River and is located approximately 0.5 miles from Rikers Island and 6 miles from the Throgs Neck Bridge. The property is zoned by the City of New York as an M3-1 Manufacturing District and is situated within a large 600+ acre complex home to several power generating facilities, as well as barge delivery facilities, a liquefied natural gas plant, a decommissioned wastewater treatment plant, and other miscellaneous energy and utility-scale operations. The Facility location is shown on **Figure 2-1**. The East River is classified as an estuarine system and is a Class I Impaired Waterbody, as listed on the Final 2016 New York State Section 303(d) List of Impaired/TMDL Waters (NYSDEC, 2016). The site currently has one SPDES-permitted Outfall (No. 001) discharging to the East River.

As discussed in **Section 1**, the Replacement Project includes the replacement of existing power generation units with a new, state-of-the-art simple cycle dual-fuel peaking CTG. All of the existing units, with the exception of one P&W Twin Pac consisting of two combustion turbines and a single generator, will be permanently shut down no later than the date when the Project completes its shakedown period. The two remaining P&W turbines will remain operational to make the site black-start capable until replaced by an approximately 24 MWe battery energy storage system ("BESS"). Construction of the Project will include site regrading and the installation of a limited stormwater drainage system alongside the new power generating equipment. This section details the Facility's power generation operations, materials storage, and outfall-linked drainage systems for both existing facilities at the site and the Replacement Project. After the Replacement Project is completed, the Facility will continue to have only one SPDES permitted Outfall (No. 001) discharging to the East River.

2.1 Existing Facility

2.1.1 Existing Power Generation Operations

The Westinghouse CTG units have not operated since mid-2015. The P&W units operate using natural gas and ultra-low sulfur kerosene fuel ("ULSK").

2.1.2 Existing Materials Storage

To support current power generation operations, several materials are stored onsite. Of these, ULSK is stored in the highest volume. Two tanks are located on site within diked containment areas, with maximum capacities of 1,887,830 gallons and 1,999,777 gallons (3,887,507 gallons total) and an average on-hand volume of 2,401,240 gallons of fuel storage between the two tanks. In addition, approximately 50,000 gallons of dielectric oil are enclosed in transformers and other electrical equipment across the site, and less than 1,000 gallons of sulfuric acid are enclosed in batteries within the P&W generating units. The Facility maintains a Spill Prevention, Control, and Countermeasure ("SPCC") plan that identifies these chemicals. Per New York City Department of Environmental Protection ("NYCDEP") regulations, the Facility also maintains a Risk Management Plan for the storage of sulfuric acid.

2.1.3 Existing Outfall

The Facility's current SPDES permit allows limited discharge through Outfall 001 to the East River via a 24-inch unperforated pipe. As the Facility is not located along the shoreline, the discharge pipe crosses property owned by the New York Power Authority ("NYPA") and Con Edison before discharging to the East River. The East River is tidal, and the outfall was designed with a cast-iron flap gate to prevent river water from entering the pipe during high tide. Currently, the only flow to Outfall 001 is the

discharge from an oil-water separator ("OWS") system that treats stormwater collected within the diked containment areas of the ULSK tanks and the adjacent truck unloading area. This OWS also treats water used during hydrostatic testing of the fuel tanks, which is conducted approximately once every ten years.

Historically, Outfall 001 was connected to the Facility's stormwater drainage system, which collected stormwater runoff from outside the containment areas. This connection was plugged in the mid-1990s, and stormwater discharge is not included in the Facility's existing SPDES permit. Dye tracing tests have confirmed that the disconnection was effective, hence Outfall 001 does not currently discharge stormwater runoff. **Figure 2-2** shows the existing outfall network at the Facility. There are no drinking water supply wells within 10 miles of the Facility.

2.2 Replacement Project

2.2.1 Future Power Generation Operations

The Replacement Project includes the installation of a new CTG which will be a high-efficiency, fast-starting, GE H-Class 7HA.03 or equivalent unit with a nominal generator output of approximately 437 MWe. The new CTG will fire natural gas as the primary fuel with limited firing of ultra-low sulfur distillate ("ULSD") liquid fuel. All existing units, with the exception of one P&W Twin Pac consisting of two combustion turbines and a single generator, will be permanently shut down no later than the date when the Project has completed its shakedown period. The two remaining P&W combustion turbines will remain operational to make the site black-start capable until replaced by an approximately 24 MWe BESS.

2.2.2 Future Materials Storage

The primary fuel that will be utilized by the new CTG is natural gas, with limited firing of ULSD. ULSD for the CTG will be stored in the existing ULSK tanks. In addition to ULSD, several other materials will be stored at the Facility. A list of these materials, along with expected storage volumes, is shown below in **Table 2-1**. Spill containment areas will be constructed around storage areas for ammonia and turbine lubricant oil. Additional containment structures will be constructed around all liquid-filled transformers and generator step-up transformers.

Table 2-1. Future Material Storage

Hazardous Material	Quantity	Notes
ULSD	3,887,507 gal	ULSD will be stored in the two existing ULSK tanks.
ULSK	7,500 gal	N/A
19% Aqueous Ammonia	20,000 gal	N/A
Transformer Oil	45,000 gal	N/A
Turbine Lubricant Oil	15,000 gal	N/A
Hypochlorite	300 gal	For water tank disinfection. To be stored in a 300-gal tote.
Turbine Wash Detergent	1,200 gal	N/A
Sulfur Hexafluoride Gas	3,300 lbs	N/A
Hydrogen Gas	54,371 cf	Based on trailer volume.
Carbon Dioxide Gas	1,800 cf	Based on data provided by GE.
Propylene Glycol	12,000 gal	For use in antifreeze.
Demineralized Water	1,000,000 gal	Generated onsite.

2.2.3 Future Use of Existing Outfall

Discharge from the existing OWS will continue and Outfall 001 will receive several connections from the Replacement Project. A new OWS treating runoff coming from the power generation area (where the new CTG will be installed) will be connected to the outfall. Blowdown from the evaporative cooler unit associated with the new CTG will be directed to Outfall 001 after several cycles of concentration ("COC"). Hydrostatic testing of the fuel tanks will continue and runoff generated during testing will be handled following existing procedures.

In addition to OWS and evaporative cooler blowdown, limited quantities of stormwater runoff from the power generation area will also be directed to existing Outfall 001. Per the New York State Stormwater Management Design Manual ("SWDM") redevelopment guidelines, 25% of the runoff Water Quality Volume ("WQv") will be treated through state-approved stormwater management practices ("SMPs"). Treated stormwater effluent from these SMPs will be discharged through Outfall 001. However, flow rates associated with this stormwater connection will be subject to the outfall's existing 15 cubic feet per second ("cfs") capacity based on an estimated pipe slope of approximately 0.4%. No changes to the outfall or the discharge pipe will be made as part of the Project.

Section 3.2 of this report provides more details on the discharges that will be directed towards Outfall 001 after implementation of the Replacement Project. Proposed layout plans for the Replacement Project are attached to this report as **Appendix C**.

3.0 Water Use and Discharges

This section details water supply, specific water uses, and discharges to the Facility's outfall system after implementation of the Replacement Project. **Figure 3-1** displays a flow diagram of contributing flows that will discharge from Outfall 001 after implementation of the Replacement Project. Discussion of the existing discharges from Outfall 001 are included in **Section 2.1**. **Figure 2-2** displays the Facility's existing outfall network.

3.1 Water Supplies and Sources

Water will be supplied by Con-Ed ("city water") for use at the Facility at an estimated average daily rate of 85 gallons per minute ("gpm"). The source of this water is the New York City Municipal Water Supply. This water will be used for various purposes, including the demineralization system, the CTG evaporative cooler unit, and other CTG operations. Of these, the only discharge to Outfall 001 will be blowdown from the evaporative cooler unit. Details on this process can be found in **Section 3.2.3** of this report.

3.2 Water Usage & Discharges to SPDES Outfall

3.2.1 Facility Stormwater Runoff

As part of the Replacement Project, a new stormwater management system will be installed in the future power generation area. Stormwater draining from this portion of the Facility will be managed per the stormwater management and treatment policies laid out in the New York State SWDM. Per Sections 9.4 and 9.5 of the SWDM, the Replacement Project will be classified as a Redevelopment Project, and SMPs will be installed to treat 25% of the WQv runoff generated by areas disturbed during development. The treated portion of stormwater runoff from the redevelopment area will be routed to existing Outfall 001.

3.2.2 Containment Area Oil-Water Separator

The two ULSK storage tanks (which will be used to store ULSD for the Project) are located within spill containment dikes. Each dike has the capacity to contain the full volume of each tank. These containment areas, along with the adjacent fuel truck unloading area, collect stormwater during weather events. This stormwater is pumped to and treated by an existing OWS unit capable of a maximum flow rate of 200 gpm. This discharge is already covered under the Facility's existing SPDES permit.

This OWS also treats water used to conduct hydrostatic testing of the fuel tanks. This testing is conducted approximately every ten years and generates about 3,896,000 gallons of effluent. Once testing is complete, this water is stored within the containment areas and drains to the East River via the OWS unit.

3.2.3 Power Generation Area Oil-Water Separator

To prevent oil drips and spills from contaminating stormwater runoff, a second OWS unit will be installed to treat runoff generated in the CTG power generation area. The new OWS unit will have a maximum capacity of 250 gpm and will also discharge to Outfall 001.

3.2.4 Power Generation Evaporative Cooling

The CTG that will be installed as part of the Replacement Project contains an evaporative cooling unit. This evaporative cooler will be operated using a 50/50 mixture of city water and demineralized water. The evaporative cooler will be operated to 10 cycles of concentration COC and the blowdown from this process will be discharged to Outfall 001 (as shown in **Figure 3-1**). **Section 4** of this report describes the expected quality of this blowdown effluent.

Blowdown from the evaporative cooling process will be discharged to the East River at ambient temperatures. The Replacement Project will not result in any thermal discharges to the East River.

4.0 Anticipated Discharge Quality

To satisfy Section 3 of Form NY-2C (attached to this report as **Appendix A**), the quality of dry weather discharge under future conditions was estimated based on historical data and proposed site flow diagram attached as **Figure 3-1**. As required in Form NY-2C, Section 3, Tables 1 and 3, estimates of maximum daily concentration and mass discharge for various chemicals have been calculated, and are provided below in **Table 4-1**. This section outlines the approach taken to provide these estimates.

Under dry weather conditions, two general processes will contribute flow to Outfall 001. The evaporative cooler unit located on the new CTG will discharge blowdown at a peak rate of 6 gpm when the Facility is generating power. The influent stream to the evaporative cooler will be a 50/50 mix of demineralized water and city water and will be operated to 10 COCs. So, the chemical and mineral makeup of the influent stream will be concentrated by a factor of 10 during the cooling process. Contaminants discharged from this process are limited to constituents found in the New York City water supply. While the New York City water supply carries an average Free Residual Chlorine ("FRC") concentration of 0.6 parts per million ("ppm"), sodium hypochlorite will be injected into the on-site water storage tanks to maintain a FRC concentration between 0.2 and 0.5 ppm at all times. The New York City 2018 Drinking Water Supply and Quality Report, which provides testing data for the City's drinking water, is attached to this report as **Appendix D**.

The two OWS units on site will have the capacity to discharge a combined flow of 450 gpm after rain events as they drain various stormwater containment areas. One of these units is existing and operational, and discharge from the unit is permitted by the Facility's existing SPDES permit. In accordance with the existing permit, monthly testing for oil and grease ("O&G") and quarterly testing for benzene, toluene, ethylbenzene, and xylenes ("BTEX") is conducted. Over the last three years, no BTEX was detected, and the maximum O&G detected was 2.4 milligrams per liter ("mg/L"). This historical testing record was used to predict maximum expected discharges of contaminants from both OWS units under future conditions.

As Form NY-2C requires both the maximum daily concentration and maximum daily mass that would be discharged from Outfall 001, a "worst-case" approach was taken to identify and calculate these parameters. For all constituents expected to be in the evaporative cooler blowdown, the operational "worst-case" resulting in the highest discharge concentrations would occur when no other Facility source was contributing to the outfall (i.e., both OWS units are inactive)[2]. Similarly, for all constituents in the OWS discharge, the operational "worst-case" resulting in the highest discharge concentrations would occur when no other Facility source was contributing to the outfall (i.e., power plant CTG & evaporative cooler unit are not operating)[3].

For all parameters required to be reported in Form NY-2C, Section 3, Table 1 that were not included in the OWS and evaporative cooler discharge, typical parameters for industrial facilities were used as estimates. **Table 4-1** below tabulates the maximum daily discharge concentrations and masses expected for the future Facility, and lists sources for each parameter.

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[2] Scenario: CTG operating and producing blowdown after a period of a week without rain. OWS would have no contained stormwater to treat, and blowdown would be the sole discharge.

[3] Scenario: Day after a rainstorm, OWS units operating at max capacity to drain remaining stormwater from site, CTG not operational.

Table 4-1-1. Estimated Water Quality Parameters in Dry Weather Discharge

Chemical	CAS Number (if applicable)	Maximum Daily Concentration	Maximum Daily Mass	Source
Alkalinity	N/A	105 mg/L $CaCO_3$	3.43 kg $CaCO_3$	Evaporative Cooler Blowdown
Aluminum	07439-90-05	105 µg/L	3.43 g	Evaporative Cooler Blowdown
Ammonia	7664-41-7	0.2 mg/L	489.89 g	Oil-Water Separators, Typical Stormwater Data (Taylor et. al, 2005)
Barium	07440-39-3	0.1 mg/L	3.27 g	Evaporative Cooler Blowdown
Biological Oxygen Demand (“BOD”)	N/A	9.3 mg/L	22.78 kg	Oil-Water Separators, Typical Stormwater Data (USEPA, 1999)
Bromide	24959-67-9	102 µg/L	3.33 g	Evaporative Cooler Blowdown
Calcium	07440-70-2	38 mg/L	1.24 kg	Evaporative Cooler Blowdown
Chemical Oxygen Demand (“COD”)	N/A	57 mg/L	139.61 kg	Oil-Water Separators, Typical Stormwater Data (USEPA, 1999)
Chloride	N/A	100 mg/L	3.27 kg	Evaporative Cooler Blowdown
Chlorine, Total Residual	N/A	3 mg/L	97.98 g	Evaporative Cooler Blowdown
Chloropicrin	76-06-2	0.5 µg/L	16.33 mg	Evaporative Cooler Blowdown
Chromium VI	07440-47-3	0.2 µg/L	6.53 mg	Evaporative Cooler Blowdown
Copper	07440-50-8	0.04 mg/L	1.31 g	Evaporative Cooler Blowdown
Fluoride	16984-48-8	3.5 mg/L	114.31 g	Evaporative Cooler Blowdown
Iron	07439-89-6	160 µg/L	5.23 g	Evaporative Cooler Blowdown
Magnesium	07439-95-4	9.5 mg/L	310.26 g	Evaporative Cooler Blowdown
Manganese	07439-96-5	85 µg/L	2.78 g	Evaporative Cooler Blowdown
Nitrate	N/A	0.65 mg/L N	21.23 g N	Evaporative Cooler Blowdown
Oil & Grease	N/A	2.4 mg/L	5.88 kg	Oil-Water Separators, Historical Data
Orthophosphate	N/A	10.5 mg/L	342.92 g	Evaporative Cooler Blowdown
Potassium	07440-09-7	3.5 mg/L	114.31 g	Evaporative Cooler Blowdown
Silica (silicon oxide)	07631-86-9	12.5 mg/L	408.24 g	Evaporative Cooler Blowdown
Sodium	07440-23-5	65 mg/L	2.12 kg	Evaporative Cooler Blowdown
Strontium	07440-24-6	130 ug/L	4.25 g	Evaporative Cooler Blowdown
Sulfate	14808-79-8	26 mg/L	849.14 g	Evaporative Cooler Blowdown
Total Dissolved Solids (“TDS”)	N/A	360 mg/L	11.76 kg	Evaporative Cooler Blowdown
Total Organic Nitrogen (“TON”)	N/A	1.75 mg/L	4.29 kg	Oil-Water Separators, Typical Stormwater Data (USEPA, 1999)
Total Suspended Solids (“TSS”)	N/A	69 mg/L	169.01 kg	Oil-Water Separators, Typical Stormwater Data (USEPA, 1999)
Temperature (winter)	N/A	35.7ºF		Average Winter Temp in NYC
Temperature (summer)	N/A	75.6ºF		Average Summer Temp in NYC
pH	N/A	7.0-10.8		Evaporative Cooler Blowdown

5.0 References

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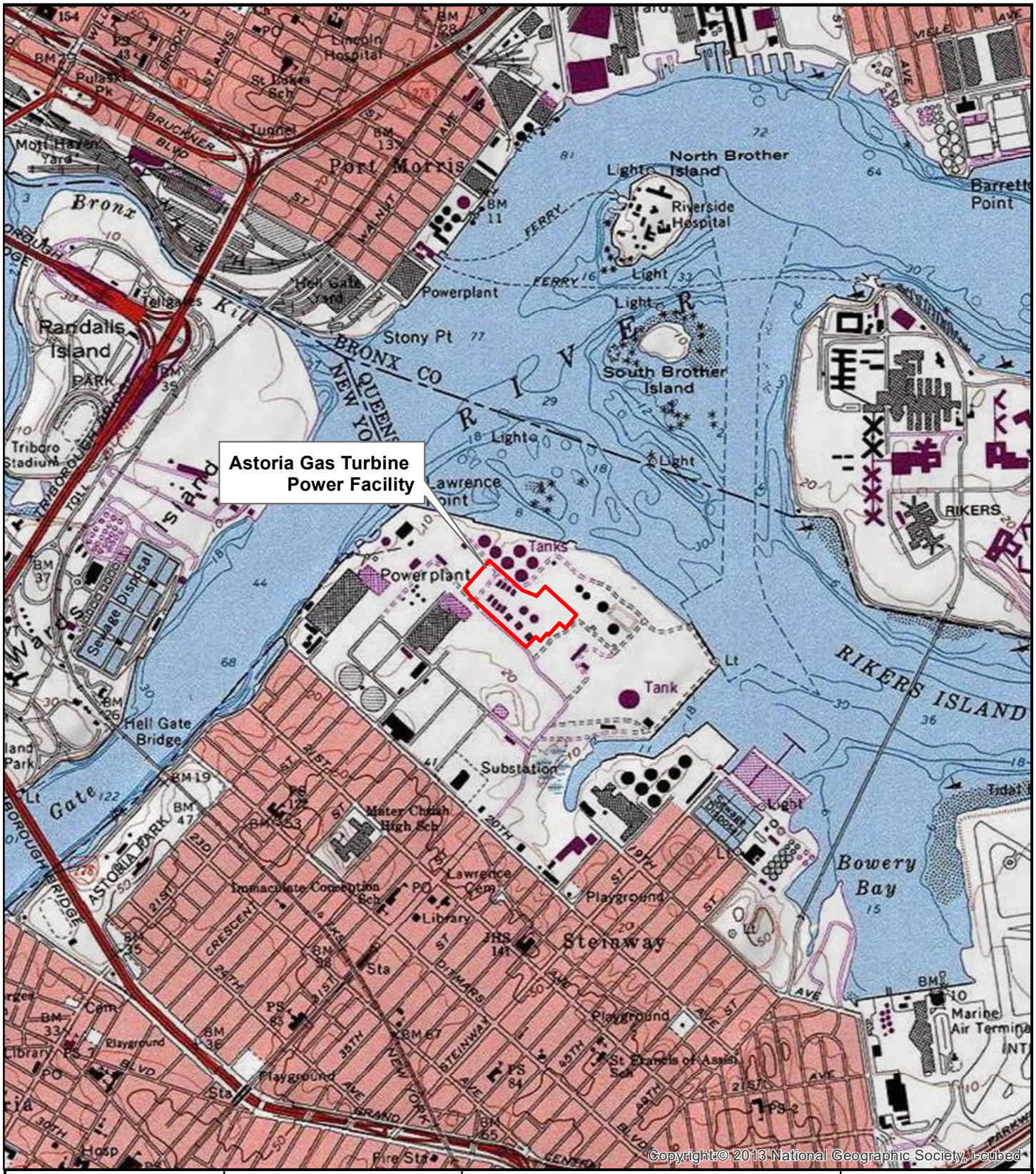

Locus Map

Legend

Property Line

N

SPDES Permit Modification
Figure 2-1
Location of Astoria Gas Turbine Power Facility
April 2020

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Scale 0 1,250 2,500 5,000 Feet

Locus Map

Legend

- Groundwater Monitoring Wells
- Property Line

Drainage System

- Abandoned
- Active

N

Scale 0 250 500 1,000 Feet

SPDES Permit Modification
Figure 2-2
Existing Facility & Outfall Configuration
April 2020

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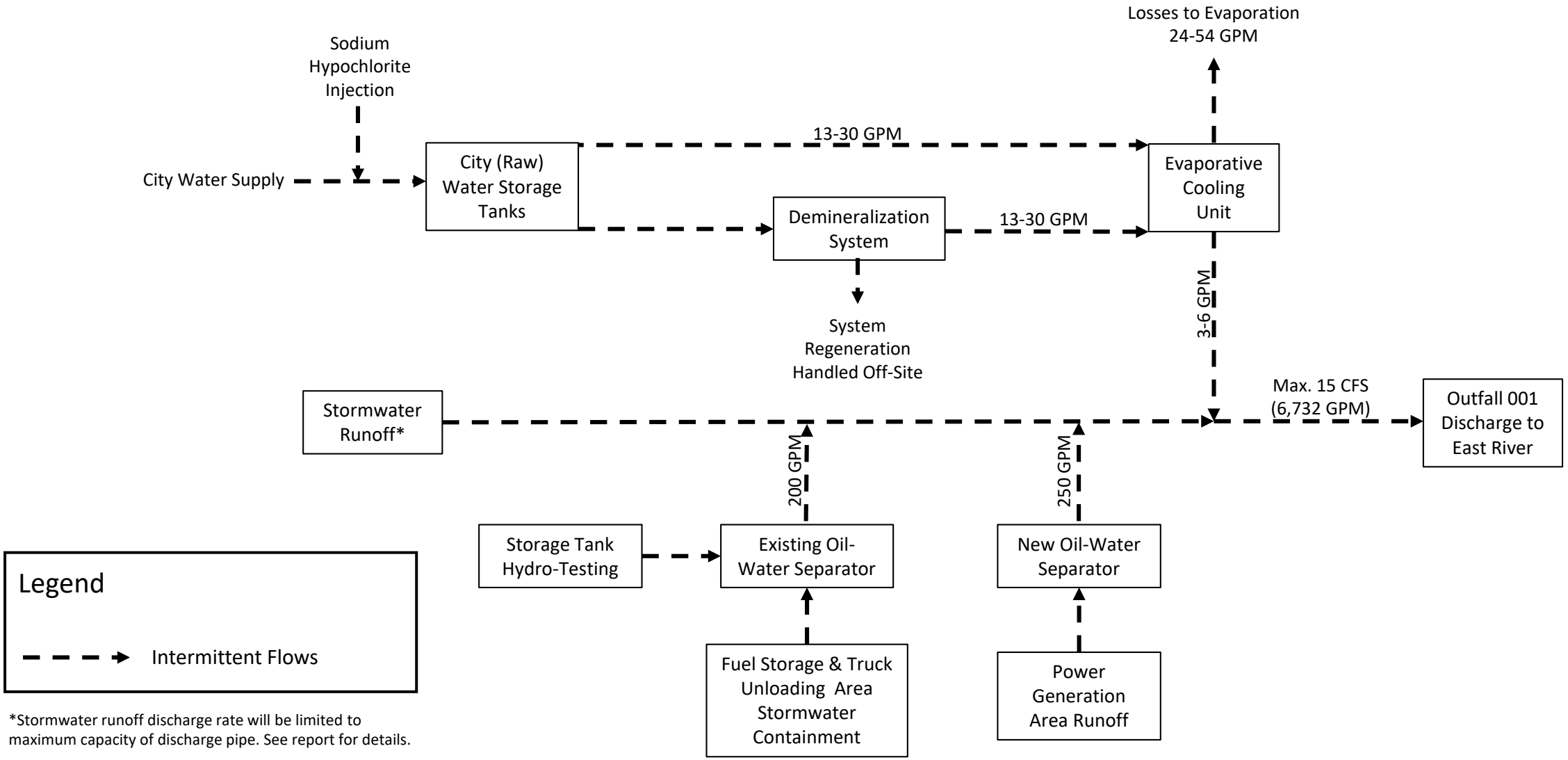
Figure 3-1
Outfall 001 Discharge Flow Diagram
Astoria Gas Turbine Power Facility
Astoria, New York City
SPDES Permit Modification
April 2020



*Stormwater runoff discharge rate will be limited to maximum capacity of discharge pipe. See report for details.