13.0 INTRODUCTION

The Clean Air Act (CAA) of 1970 and its amendments required the United States Environmental Protection Agency (USEPA) to establish National Ambient Air Quality Standards (NAAQS) for ambient air pollutants considered harmful to public health and the environment known as "criteria pollutants." USEPA and local governments are also concerned about the toxic and hazardous air pollutants (HAPs) being emitted in the environment and their effect on the population. Under CAA, USEPA established New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAPS) to minimize emissions of criteria and hazardous air pollutants from manmade emission sources.

Air quality in regards to the criteria pollutants, as well as HAPs, will be reviewed in this section based on Federal, State, and local (i.e., county) requirements on a localized basis in the affected area.

The Proposed Actions are not expected to significantly alter traffic conditions, and maximum hourly incremental traffic would not exceed the *City Environmental Quality Review (CEQR) Technical Manual* carbon monoxide screening threshold of 170 peak hour trips at nearby intersections in the study area, nor would it exceed the particulate matter emission screening threshold discussed in Chapter 17, Sections 210 and 311 of the *CEQR Technical Manual*. Therefore, there is no potential for mobile-source impacts from the Proposed Actions, and a quantified assessment of mobile-source emissions is not warranted.

As described in Chapter 1, "Purpose and Need and Alternatives," Alternatives 2 and 3 propose a community Water Hub, which would include fossil fuel fired heat and hot water systems. Therefore, a stationary source analysis was conducted to evaluate potential future pollutant concentrations with the proposed heat and hot water systems. The Water Hub would be located at one of two potential locations as described in Chapter 1, "Purpose and Need and Alternatives." At Potential Location 1, two options and designs for the proposed Water Hub were analyzed; one to the east and one to the west of Page Avenue (Page East Option and Page West Option of Potential Location 1, respectively). The two options at Potential Location 2 (the Biddle House Option and the Rutan-Beckett House Option) would involve the rehabilitation and adaptive reuse of these two existing New York City Department of Parks and Recreation (NYC Parks) buildings. If selected, Water Hub activities at either of these existing houses would be located further from residential receptors (approximately 110 feet) than either of the options at Potential Location 1; therefore, the Potential Location 2 options were not analyzed, and this chapter conservatively presents the analysis and results for Potential Location 1.

The Proposed Actions would also include a public parking lot for park users. Therefore, an analysis was conducted to evaluate potential future pollutant concentrations in the vicinity of the proposed parking lot. The predicted increments from the parking lot were also added, where

appropriate, to the predicted concentrations from the stationary source analysis, to assess the cumulative impact of both sources.

The Proposed Actions would result in a minor increase in regional emissions from mobile and stationary sources associated with the Water Hub and parking lot. However, due to the small size of the heating and hot water system for the proposed Water Hub and the minor vehicle increments it is not likely that emissions would exceed the general conformity *de minimis* criteria. Therefore, a quantified regional assessment is not warranted.

13.1 PRINCIPAL CONCLUSIONS

The Proposed Actions would not exceed the respective mobile-source screening thresholds. Therefore, there is no potential for mobile-source impacts from the Proposed Actions.

Under both Alternatives 2 and 3, the proposed development of the Water Hub is below the maximum development size shown in Figures 17-7 and 17-8 of the Air Quality Appendix of the *CEQR Technical Manual* for nitrogen dioxide (NO_2) and sulfur dioxide (SO_2) annual concentrations. In addition, potential concentrations from the proposed Water Hub's heating and hot water systems are less than their respective thresholds. Therefore, there would be no potential for significant adverse air quality impacts from the potential heating and hot water systems.

Alternative 4 would include only the proposed Shoreline Project in place, without the proposed breakwaters, Water Hub, or on-shore landscape elements. Potential air quality impacts under Alternative 4 would be very similar to the potential air quality impacts under Alternative 1 (the No Action alternative). Similar to Alternative 1, under Alternative 4 there would be no potential for significant adverse air quality impacts.

Due to the small size of the heating and hot water system for the proposed Water Hub under Alternatives 2 and 3, as well as the minor vehicle increments associated with the Proposed Actions, emissions are well below the general conformity *de minimis* criteria.

13.2 POLLUTANTS FOR ANALYSIS

Ambient air quality is affected by air pollutants produced by both motor vehicles and stationary sources. Emissions from motor vehicles are referred to as mobile source emissions, while emissions from fixed facilities are referred to as stationary source emissions. Ambient concentrations of carbon monoxide (CO) are predominantly influenced by mobile source emissions. Particulate matter (PM), volatile organic compounds (VOCs), and nitrogen oxides (nitric oxide (NO) and NO_2, collectively referred to as NO_x) are emitted from both mobile and stationary sources. Fine PM is also formed when emissions of NO_x, sulfur oxides (SO_x), ammonia, organic compounds, and other gases react or condense in the atmosphere. Emissions of SO_2 are associated mainly with stationary sources, and some sources utilizing non-road diesel such as large international marine engines. On-road diesel vehicles currently contribute very little to SO_2 emissions since the sulfur content of on-road diesel fuel, which is federally regulated, is extremely low. Ozone is formed in the atmosphere by complex photochemical processes that include NO_x and VOCs. Ambient concentrations of CO, PM, NO_2, SO_2, ozone, and lead are regulated by the USEPA under the CAA, and are referred to as 'criteria pollutants'; emissions of VOCs, NO_x, and other precursors to criteria pollutants are also regulated by USEPA.

13.2.1 CARBON MONOXIDE

CO, a colorless and odorless gas, is produced in the urban environment primarily by the incomplete combustion of gasoline and other fossil fuels. In urban areas, approximately 80 to 90 percent of CO emissions are from motor vehicles. CO concentrations can diminish rapidly over relatively short distances; elevated concentrations are usually limited to locations near crowded intersections, heavily traveled and congested roadways, parking lots, and garages. Consequently, CO concentrations must be analyzed on a local (microscale) basis.

The Proposed Actions would include new parking facilities. Therefore, an analysis was conducted to evaluate future CO concentrations with the operation of the proposed parking facilities.

13.2.2 NITROGEN OXIDES, VOCS, AND OZONE

NO_x are of principal concern because of their role, together with VOCs, as precursors in the formation of ozone. Ozone is formed through a series of reactions that take place in the atmosphere in the presence of sunlight. Because the reactions are slow, and occur as the pollutants are advected downwind, elevated ozone levels are often found many miles from sources of the precursor pollutants. The effects of NO_x and VOC emissions from all sources are therefore generally examined on a regional basis. The contribution of any action or project to regional emissions of these pollutants would include any added stationary or mobile source emissions.

The Proposed Actions would not have a significant effect on the overall volume of vehicular travel in the metropolitan area; therefore, no measurable impact on regional NO_x emissions or on ozone levels is predicted. An analysis of Proposed Action-related emissions of these pollutants from mobile sources was therefore not warranted.

In addition to being a precursor to the formation of ozone, NO_2 (one component of NO_x) is also a regulated pollutant. Since NO_2 is mostly formed from the transformation of NO in the atmosphere, it has mostly been of concern further downwind from large stationary point sources, and not a local concern from mobile sources. (NO_x emissions from fuel combustion consist of approximately 90 percent NO and 10 percent NO_2 at the source.) However, with the promulgation of the 2010 1-hour average standard for NO_2, local sources such as vehicular emissions may be of greater concern. However, any increase in NO_2 associated with the Proposed Actions would be relatively small due to the very small increases in the number of vehicles. This increase would not be expected to significantly affect levels of NO_2 experienced near roadways.

Potential impacts on local NO_2 concentrations from the proposed Water Hub's stationary heat and hot water systems were evaluated.

13.2.3 LEAD

Airborne lead emissions are currently associated principally with industrial sources. Lead in gasoline has been banned under the CAA and would not be emitted from any other component of the Proposed Actions. Therefore, an analysis of this pollutant was not warranted.

13.2.4 RESPIRABLE PARTICULATE MATTER—PM_{10} AND $PM_{2.5}$

PM is a broad class of air pollutants that includes discrete particles of a wide range of sizes and chemical compositions, as either liquid droplets (aerosols) or solids suspended in the atmosphere. The constituents of PM are both numerous and varied, and they are emitted from a wide variety of sources (both natural and anthropogenic). Natural sources include the condensed and reacted forms of naturally occurring VOC; salt particles resulting from the evaporation of sea spray; wind-borne pollen, fungi, molds, algae, yeasts, rusts, bacteria, and material from live and decaying plant and animal life; particles eroded from beaches, soil, and rock; and particles emitted from volcanic and geothermal eruptions and from forest fires. Naturally occurring PM is generally greater than 2.5 micrometers in diameter. Major anthropogenic sources include the combustion of fossil fuels (e.g., vehicular exhaust, power generation, boilers, engines, and home heating), chemical and manufacturing processes, all types of construction, agricultural activities, as well as wood-burning stoves and fireplaces. PM also acts as a substrate for the adsorption (accumulation of gases, liquids, or solutes on the surface of a solid or liquid) of other pollutants, often toxic, and some likely carcinogenic compounds.

As described below, PM is regulated in two size categories: particles with an aerodynamic diameter of less than or equal to 2.5 micrometers ($PM_{2.5}$) and particles with an aerodynamic diameter of less than or equal to 10 micrometers (PM_{10}, which includes $PM_{2.5}$). $PM_{2.5}$ has the ability to reach the lower regions of the respiratory tract, delivering with it other compounds that adsorb to the surfaces of the particles, and is also extremely persistent in the atmosphere. $PM_{2.5}$ is mainly derived from combustion material that has volatilized and then condensed to form primary PM (often soon after the release from a source) or from precursor gases reacting in the atmosphere to form secondary PM.

All gasoline-powered and diesel-powered vehicles, especially heavy duty trucks and buses operating on diesel fuel, are a significant source of respirable PM, most of which is $PM_{2.5}$; PM concentrations may, consequently, be locally elevated near roadways. The Proposed Actions would not result in any significant increases in truck traffic near the project site or in the region, nor in a potentially significant increase in $PM_{2.5}$ vehicle emissions as defined in Chapter 17, Sections 210 and 311 of the *CEQR Technical Manual*. Therefore, an analysis of potential impacts from PM from mobile sources was not warranted. For the Proposed Actions, potential PM impacts were evaluated for the parking facilities and the proposed Water Hub's stationary heating and hot water system.

13.2.5 SULFUR DIOXIDE

SO_2 emissions are primarily associated with the combustion of sulfur-containing fuels (oil and coal). SO_2 is also of concern as a precursor to $PM_{2.5}$ and is regulated as a $PM_{2.5}$ precursor under the New Source Review permitting program for large sources. Due to the federal restrictions on the sulfur content in diesel fuel for on-road and non-road vehicles, no significant quantities are emitted from vehicular sources. Vehicular sources of SO_2 are not significant and therefore, analysis of SO_2 from mobile sources was not warranted.

As part of the Proposed Actions, ultra-low sulfur distillate (ULSD) fuel oil could be burned in the heating and hot water system. Therefore, potential impacts of SO_2 from the heating and hot water system were examined.

13.2.6 NONCRITERIA POLLUTANTS

In addition to the criteria pollutants discussed above, USEPA and local governments are also concerned about noncriteria pollutants being emitted in the environment and their effect on the population. These pollutants are emitted by a wide range of man-made and naturally occurring sources and are sometimes referred to as HAPs or air toxics. Emissions of noncriteria pollutants from industries are regulated by USEPA.

Federal ambient air quality standards do not exist for noncriteria pollutants; however, USEPA established NESHAPS to minimize emissions of HAPs from manmade emission sources.

The proposed Water Hub would include a heating and hot water system that may have boilers burning ULSD fuel oil; therefore, they may be subject to and would comply with the requirements in the NESHAPs.

13.3 AIR QUALITY REGULATIONS, STANDARDS, AND BENCHMARKS

13.3.1 NATIONAL AND STATE AIR QUALITY STANDARDS

As required by the CAA, primary and secondary NAAQS have been established for six major air pollutants: CO, NO_2, ozone, respirable PM (both $PM_{2.5}$ and PM_{10}), SO_2, and lead. The primary standards represent levels that are requisite to protect the public health, allowing an adequate margin of safety. The secondary standards are intended to protect the nation's welfare, and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the environment. The primary standards are generally either the same as the secondary standards or more restrictive. The NAAQS are presented in **Table 13-1**. The NAAQS for CO, annual NO_2, and 3-hour SO_2 have also been adopted as the ambient air quality standards for New York State, but are defined on a running 12-month basis rather than for calendar years only. New York State also has standards for total suspended particles, settleable particles, non-methane hydrocarbons, 24-hour and annual SO_2, and ozone which correspond to federal standards that have since been revoked or replaced, and for the noncriteria pollutants beryllium, fluoride, and hydrogen sulfide.

USEPA has revised the NAAQS for PM, effective December 18, 2006. The revision included lowering the level of the 24-hour $PM_{2.5}$ standard from 65 $\mu g/m^3$ to 35 $\mu g/m^3$ and retaining the level of the annual standard at 15 $\mu g/m^3$. The PM_{10} 24-hour average standard was retained and the annual average PM_{10} standard was revoked. USEPA later lowered the primary annual $PM_{2.5}$ average standard from 15 $\mu g/m^3$ to 12 $\mu g/m^3$, effective March 2013.

USEPA has also revised the 8-hour ozone standard, lowering it from 0.08 to 0.075 parts per million (ppm), effective as of May 2008, and the previous 1997 ozone standard was fully revoked effective April 1, 2015. Effective December 2015, EPA further reduced the 2008 ozone NAAQS, lowering the primary and secondary NAAQS from the current 0.075 ppm to 0.070. USEPA expects to issue final area designations by October 1, 2017; those designations likely would be based on 2014-2016 air quality data.

USEPA lowered the primary and secondary standards for lead to 0.15 $\mu g/m^3$, effective January 12, 2009. USEPA revised the averaging time to a rolling 3-month average and the form of the standard to not-to-exceed across a 3-year span.

USEPA established a 1-hour average NO_2 standard of 0.100 ppm, effective April 12, 2010, in addition to the annual standard. The statistical form is the 3-year average of the 98th percentile of daily maximum 1-hour average concentration in a year.

USEPA also established a 1-hour average SO_2 standard of 0.075 ppm, replacing the 24-hour and annual primary standards, effective August 23, 2010. The statistical form is the 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour concentrations (the 4th highest daily maximum corresponds approximately to 99th percentile for a year.)

Table 13-1
National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary		Secondary	
	ppm	µg/m^3	ppm	µg/m^3
Carbon Monoxide (CO)				
8-Hour Average	9 (1)	10,000	None	
1-Hour Average	35 (1)	40,000		
Lead				
Rolling 3-Month Average (2)	NA	0.15	NA	0.15
Nitrogen Dioxide (NO_2)				
1-Hour Average (3)	0.100	188	None	
Annual Average	0.053	100	0.053	100
Ozone (O_3)				
8-Hour Average (4,5)	0.070	140	0.070	140
Respirable Particulate Matter (PM_{10})				
24-Hour Average (1)	NA	150	NA	150
Fine Respirable Particulate Matter ($PM_{2.5}$)				
Annual Mean (6)	NA	12	NA	15
24-Hour Average (7)	NA	35	NA	35
Sulfur Dioxide (SO_2) (8)				
1-Hour Average (9)	0.075	196	NA	NA
Maximum 3-Hour Average (1)	NA	NA	0.50	1,300

Notes: ppm – parts per million (unit of measure for gases only)
µg/m^3 – micrograms per cubic meter (unit of measure for gases and particles, including lead)
NA – not applicable
All annual periods refer to calendar year.
Standards are defined in ppm. Approximately equivalent concentrations in µg/m^3 are presented.

1. Not to be exceeded more than once a year.
2. USEPA has lowered the NAAQS down from 1.5 µg/m^3, effective January 12, 2009.
3. 3-year average of the annual 98th percentile daily maximum 1-hr average concentration. Effective April 12, 2010.
4. 3-year average of the annual fourth highest daily maximum 8-hr average concentration.
5. USEPA has lowered the NAAQS down from 0.075 ppm, effective December 2015.
6. 3-year average of annual mean. USEPA has lowered the primary standard from 15 µg/m^3, effective March 2013.
7. Not to be exceeded by the annual 98th percentile when averaged over 3 years.
8. USEPA revoked the 24-hour and annual primary standards, replacing them with a 1-hour average standard. Effective August 23, 2010.
9. 3-year average of the annual 99th percentile daily maximum 1-hr average concentration.

Source: 40 CFR Part 50: National Primary and Secondary Ambient Air Quality Standards.

13.3.2 NAAQS ATTAINMENT STATUS AND STATE IMPLEMENTATION PLANS

The CAA, as amended in 1990, defines non-attainment areas (NAA) as geographic regions that have been designated as not meeting one or more of the NAAQS. When an area is designated as NAA by USEPA, the state is required to develop and implement a State Implementation Plan (SIP), which delineates how a state plans to achieve air quality that meets the NAAQS under the deadlines established by the CAA, followed by a plan for maintaining attainment status once the area is in attainment.

In 2002, USEPA re-designated New York City as in attainment for CO. Under the resulting maintenance plans, New York is committed to implementing site-specific control measures throughout the city to reduce CO levels, should unanticipated localized growth result in elevated CO levels during the maintenance period. The second CO maintenance plan for the region was approved by USEPA on May 30th, 2014.

Manhattan, which had been designated as a moderate NAA for PM_{10}, was reclassified by USEPA as in attainment on July 29, 2015.

The five New York City counties and Nassau, Suffolk, Rockland, Westchester, and Orange Counties had been designated as a $PM_{2.5}$ NAA (New York Portion of the New York–Northern New Jersey–Long Island, NY–NJ–CT NAA) since 2004 under the CAA due to exceedance of the 1997 annual average standard, and was also nonattainment with the 2006 24-hour $PM_{2.5}$ NAAQS since November 2009. The area was redesignated as in attainment for that standard effective April 18, 2014, and is now under a maintenance plan. As stated above, USEPA lowered the annual average primary standard to 12 $\mu g/m^3$ effective March 2013. EPA designated the area as in attainment for the new 12 $\mu g/m^3$ NAAQS effective April 15, 2015.

Effective June 15, 2004, USEPA designated Nassau, Rockland, Suffolk, Westchester, and the five New York City counties (NY portion of the New York–Northern New Jersey–Long Island, NY-NJ-CT, NAA) as moderate non-attainment areas for the 1997 8-hour average ozone standard. In March 2008 USEPA strengthened the 8–hour ozone standards. USEPA designated the New York–Northern New Jersey–Long Island, NY-NJ-CT NAA as a marginal NAA for the 2008 ozone NAAQS, effective July 20, 2012. On April 11, 2016, as requested by New York State, USEPA reclassified the area as a moderate NAA. New York State has begun submitting SIP documents in December 2014. The state is expected to be able to meet its SIP obligations for both the 1997 and 2008 standards by satisfying the requirements for a moderate area attainment plan for the 2008 ozone NAAQS.

New York City is currently in attainment of the annual-average NO_2 standard. USEPA has designated the entire state of New York as "unclassifiable/attainment" of the 1-hour NO_2 standard effective February 29, 2012. Since additional monitoring is required for the 1-hour standard, areas will be reclassified once three years of monitoring data are available (likely 2017).

USEPA has established a 1-hour SO_2 standard, replacing the former 24-hour and annual standards, effective August 23, 2010. Based on the available monitoring data, all New York State counties currently meet the 1-hour standard. Additional monitoring will be required. Draft attainment designations were published by USEPA in February 2013, indicating that USEPA is deferring action to designate areas in New York State and expects to proceed with designations once additional data are gathered.

13.3.3 GENERAL CONFORMITY

In November 1993, USEPA promulgated the General Conformity Rule under the CAA to ensure that actions taken by federal entities do not impede SIP efforts to attain and maintain the NAAQS. Actions conforming to the SIP would not:

1. Cause or contribute to any new violation of any standard in any area;
2. Interfere with provisions in the applicable SIP for maintenance of any standard;
3. Increase the frequency or severity of any existing violation of any standard in any area; or
4. Delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

Conformity for federally assisted, funded, permitted, and approved projects must be analyzed according to the general conformity regulations (40 CFR Part 93 Subpart B). Under this rule, a conformity determination is required for any criteria pollutant in a non-attainment or maintenance area affected by a federal action if the action would result in pollutant emissions exceeding the established screening criteria (*de minimis*) emissions rates or exceeding 10 percent of the area-wide emissions. Actions that would not result in emissions exceeding the above criteria would conform to the SIPs.

The Proposed Actions must conform to the CO_2, ozone, PM_{10}, and $PM_{2.5}$ SIPs in the metropolitan area. The applicable *de minimis* threshold for PM_{10}, CO, $PM_{2.5}$, SO_2 ($PM_{2.5}$ precursor), and NO_x (a $PM_{2.5}$ and ozone precursor) is 100 tons per year; the *de minimis* threshold for VOC (an ozone precursor) is 50 tons per year since New York City is within an ozone transport zone.

The Proposed Actions would result in a minor increase in emissions from mobile and stationary sources. However, due to the small size of the heating and hot water system for the proposed Water Hub and the minor vehicle increments it is not likely that emissions would exceed the above *de minimis* criteria.

Temporarily, during construction, there would be emissions associated with on-site construction equipment and with the transport of construction deliveries. Aggregate emissions from the construction of the Proposed Actions are evaluated in Chapter 17, "Construction."

13.3.4 DETERMINING THE SIGNIFICANCE OF AIR QUALITY IMPACTS

The State Environmental Quality Review Act (SEQRA) regulations and the *CEQR Technical Manual* state that the significance of a predicted consequence of a project (i.e., whether it is material, substantial, large or important) should be assessed in connection with its setting (e.g., urban or rural), its probability of occurrence, its duration, its irreversibility, its geographic scope, its magnitude, and the number of people affected.[1] In terms of the magnitude of air quality impacts, any action predicted to increase the concentration of a criteria air pollutant to a level that would exceed the concentrations defined by the NAAQS (see **Table 13-1**) would be deemed to have a potential significant adverse impact.

[1] New York City. *CEQR Technical Manual*. Chapter 1, section 222. March 2014; and New York State Environmental Quality Review Regulations. 6 NYCRR § 617.7

In addition, in order to maintain concentrations lower than the NAAQS in attainment areas, or to ensure that concentrations will not be significantly increased in non-attainment areas, threshold levels have been defined for certain pollutants; any action predicted to increase the concentrations of these pollutants above the thresholds would be deemed to have a potential significant adverse impact, even in cases where violations of the NAAQS are not predicted. The applicable incremental thresholds are discussed below.

CO DE MINIMIS CRITERIA

New York City has developed *de minimis* criteria to assess the significance of the incremental increase in CO concentrations that would result from proposed projects or actions on mobile sources, as set forth in the *CEQR Technical Manual*. These criteria set the minimum change in CO concentration that defines a significant environmental impact. Significant increases of CO concentrations in New York City are defined as: (1) an increase of 0.5 ppm or more in the maximum 8-hour average CO concentration at a location where the predicted No Action 8-hour concentration is equal to or between 8 and 9 ppm; or (2) an increase of more than half the difference between baseline (i.e., No Action) concentrations and the 8-hour standard, when No Action concentrations are below 8.0 ppm.

$PM_{2.5}$ DE MINIMIS CRITERIA

New York State Department of Environmental Conservation (NYSDEC) has published a policy to provide interim direction for evaluating $PM_{2.5}$ impacts.[2] This policy applies only to facilities applying for permits or major permit modifications under SEQRA that emit 15 tons of PM_{10} or more annually. The policy states that such a project will be deemed to have a potentially significant adverse impact if the project's maximum impacts are predicted to increase $PM_{2.5}$ concentrations by more than 0.3 $\mu g/m^3$ averaged annually or more than 5 $\mu g/m^3$ on a 24-hour basis. Projects that exceed either the annual or 24-hour threshold will be required to prepare an Environmental Impact Statement (EIS) to assess the severity of the impacts, to evaluate alternatives, and to employ reasonable and necessary mitigation measures to minimize the $PM_{2.5}$ impacts of the source to the maximum extent practicable.

In addition, New York City uses *de minimis* criteria to determine the potential for significant adverse $PM_{2.5}$ impacts under CEQR are as follows:

- Predicted increase of more than half the difference between the background concentration and the 24-hour standard;
- Annual average $PM_{2.5}$ concentration increments which are predicted to be greater than 0.1 $\mu g/m^3$ at ground level on a neighborhood scale (i.e., the annual increase in concentration representing the average over an area of approximately 1 square kilometer, centered on the location where the maximum ground-level impact is predicted for stationary sources; or at a distance from a roadway corridor similar to the minimum distance defined for locating neighborhood scale monitoring stations); or
- Annual average $PM_{2.5}$ concentration increments which are predicted to be greater than 0.3 $\mu g/m^3$ at a discrete receptor location (elevated or ground level).

[2] NYSDEC. *CP33:Assessing and Mitigating Impacts of Fine Particulate Emissions*. December 29, 2003.

Actions under CEQR predicted to increase $PM_{2.5}$ concentrations by more than the above *de minimis* criteria will be considered to have a potential significant adverse impact.

The Proposed Action's annual emissions of PM_{10} are estimated to be well below the 15-ton-per-year threshold under NYSDEC's $PM_{2.5}$ policy guidance. The above *de minimis* criteria have been used to evaluate the significance of predicted impacts of the Proposed Action on $PM_{2.5}$ concentrations.

13.4 METHODOLOGY

13.4.1 STATIONARY SOURCES

Stationary source analyses were conducted using the methodology described in the *CEQR Technical Manual* to assess potential air quality impacts associated with emissions from the Proposed Action's fossil fuel fired heating and hot water system at the proposed Water Hub (a proposed project element under Alternatives 2 and 3). Further screening was prepared using the USEPA approved AERSCREEN model to evaluate potential 1-hour average NO_2, 1-hour and 3-hour average SO_2 concentrations, and 24-hour and annual average $PM_{2.5}$ impacts. The predicted 1-hour average NO_2 and SO_2 concentrations added to the representative background concentration in the area were compared to the NAAQS. Potential 24-hour and annual average incremental concentrations of $PM_{2.5}$ were compared to the $PM_{2.5}$ *de minimis* criteria thresholds defined in the *CEQR Technical Manual*.

INITIAL SCREENING ANALYSIS

An initial screening analysis was performed using the methodology described in Section 322.1 of Chapter 17 of the *CEQR Technical Manual*, which determines the threshold of development size below which the Proposed Actions would not have a significant adverse impact. The screening procedure utilizes information regarding the type of fuel to be burned, the maximum development size, and the system's exhaust stack height, to evaluate whether or not a significant impact is likely.

Based on the distance from the development to the nearest building of similar or greater height, if the maximum development size is greater than the threshold size in the *CEQR Technical Manual*, there is the potential for significant adverse air quality impacts, and a refined dispersion modeling analysis would be required. Otherwise, the source passes the screening analysis, and no further analysis is required.

The proposed Water Hub's maximum development floor area of approximately 8,900 square feet and a stack exhaust heights of approximately 27 and 32 feet for Page West Option and Page East Option, respectively, above grade were used as input for the initial screening analysis. Since the fuel source is not known at this time, ULSD fuel oil or natural gas are both assumed to be utilized, with SO_2 and NO_2 the primary pollutants of concern when burning fuel oil and natural gas, respectively. Figures 17-8 and 17-9 in the *CEQR Technical Manual* were used to assess annual NO_2 and SO_2 concentrations from the Proposed Actions.

AERSCREEN ANALYSIS

Potential 1-hour average NO_2, 1-hour and 3-hour average SO_2, and 24-hour and annual average $PM_{2.5}$ impacts from the Proposed Action's heating and hot water system emissions were evaluated using the USEPA's AERSCREEN model (version 15181 EPA, 2015). The

AERSCREEN model projects worst-case 1-hour impacts downwind from a point, area, or volume source and generates application-specific worst-case meteorology using representative minimum and maximum ambient air temperatures, and site-specific surface characteristics such as albedo, Bowen ratio, and surface roughness length.[3] The AERSCREEN model was used to calculate worst-case ambient concentrations of criteria pollutants from the Proposed Actions downwind of the stack.

The model incorporates the Plume Rise Model Enhancements (PRIME) downwash algorithm, which is designed to predict impacts in the "cavity region" (i.e., the area around a structure which under certain conditions may affect an exhaust plume, causing a portion of the plume to become entrained in a recirculation region). AERSCREEN utilizes the PRIME Building Profile Input Program (BPIPPRM) to provide a detailed analysis of downwash influences on a direction-specific basis. AERSCREEN also incorporates AERMOD's complex terrain algorithms and utilizes the AERMAP terrain processor to account for the actual terrain in the vicinity of the source on a direction-specific basis.

The AERSCREEN model was run both with and without the influence of building downwash, using urban diffusion coefficients that were based on a review of land-use maps of the area. Other model options were selected based on USEPA guidance.

NO_2 1-hour concentrations were estimated using an NO_2 to NO_x ratio of 0.8 for the maximum 1-hour concentration. The 0.8 ratio used for the maximum 1-hour concentration is the recommended default ambient ratio per USEPA's guidance.[4]

Emission Rates and Stack Parameters

The emission rates and exhaust stack parameters used in the AERSCREEN analysis are presented in **Table 13-2**.

Annual emissions rates for heating and hot water systems were calculated based on fuel consumption estimates, using energy intensity estimates based on the type of development and size of the building (8,900 gross square feet) as recommended in the *CEQR Technical Manual*, and applying maximum emission factors for either ULSD fuel oil or natural gas fired boilers, as a conservative assumption.[5] The exhaust from the heating and hot water system was assumed to be vented through a single stack located on the bulkhead roof of the building at a stack height of approximately 27 and 32 feet above grade (3 feet above the height of the bulkhead roof for Page West Option and Page East Option, respectively).

[3] The albedo is the fraction of the total incident solar radiation reflected by the ground surface. The Bowen ratio is the ratio of the sensible heat flux to the latent (evaporative) heat flux. The surface roughness length is related to the height of obstacles to the wind flow and represents the height at which the mean horizontal wind speed is zero based on a logarithmic profile.

[4] USEPA. *Memorandum: Clarification on the use of AERMOD Dispersion Modeling for Demonstrating Compliance with the NO_2 National Ambient Air Quality Standard*. September 30, 2014.

[5] USEPA. *Compilations of Air Pollutant Emission Factors AP-42*. Fifth Edition, Volume I, Chapter 1, Section 3. http://www.epa.gov/ttn/chief/ap42. September, 1998.

Table 13-2
Exhaust Stack Parameters and Emission Rates

Stack Parameter	ULSD Fuel Oil	Natural Gas
Stack Height (feet)	27 / 32 [3]	27 / 32 [3]
Stack Diameter (feet)[1],	1.0	1.0
Exhaust Velocity (meters/second)[2]	0.37	0.35
Exhaust Temperature (degrees Fahrenheit) [1]	422	422
Emission Rate (grams/second)		
NO_2 (1-hour average)	3.62E-03	2.76E-03
SO_2 (1- and 3-hour average)	4.29E-05	1.66E-05
$PM_{2.5}$ (24-hour average)	3.24E-04	2.10E-04
$PM_{2.5}$ (Annual average)	9.37E-05	5.75E-05

Note:
[1] Assumptions for stack diameter and exhaust temperature for the proposed systems were obtained from a survey of boiler exhaust data prepared and provided by the New York City Department of Environmental Protection (NYCDEP), and were used to calculate the exhaust velocity.
[2] The exhaust velocity was calculated based on the exhaust flowrate for the boiler capacity, estimated using the energy use of the proposed project and USEPA's fuel factors.[6]
[3] Stack Heights for Page West Option and Page East Option, respectively.

The designs for the Biddle House Option and Rutan-Beckett Option (if Water Hub programming is sited at Potential Location 2) may include the replacement of the existing heating and hot water systems. Based on the smaller size of the buildings under these two options, the replacement heating and hot water are anticipated to be similar or less than the systems presented for Potential Location 1.

Background Concentrations

To estimate the maximum expected total pollutant concentration at a given location (receptor), the modeled concentrations from the emission sources must be added to a background value that accounts for existing pollutant concentrations from other sources (see **Table 13-3**) that are not directly accounted for in the model. To develop background levels, concentrations measured at the most representative NYSDEC ambient monitoring station over the latest available 5-year period (2011–2015) were used. Note that the background concentrations for the 1-hour and 24-hour standards are consistent with the form of the NAAQS.

Receptor Locations

Receptors (locations in the model at which concentrations are projected) are generally placed at windows in residential or other sensitive buildings, air intakes, and publically accessible open space locations, as applicable. Discrete receptors were modeled at ground level receptors and at multiple heights along the façade of nearby residential buildings along Ottavio Promenade and Page Avenue to represent potential locations of operable windows. The minimum distances to the nearest buildings were determined to be 92 feet and 70 feet from the proposed Water Hub under Page West Option and Page East Option, respectively. Concentrations were analyzed at these receptor distances for the AERSCREEN analysis in addition to taking the maximum predicted concentration at a ground level receptor.

[6] USEPA. *Standards of Performance for New Stationary Sources.* 40 CFR Chapter I Subchapter C Part 60. Appendix A-7, Table 19-2. 2013.

Table 13-3
Maximum Background Pollutant Concentrations

Pollutant	Average Period	Location	Concentration	NAAQS
NO_2	1-hour	Queens College 2, Queens[1]	60.2 ppb	100 ppb
	Annual	Queens College 2, Queens[2]	21.62 ppb	53 ppb
SO_2	1-hour	Queens College 2, Queens[3]	11.1 ppb	75 ppb
	3-hour	Queens College 2, Queens[3]	34 ppb	500 ppb
CO	1-hour	CCNY, Manhattan[5]	2.7 ppm	35 ppm
	8-hour	CCNY, Manhattan[5]	1.7 ppm	9 ppm
PM_{10}	24-hour	Division Street, Manhattan[6]	44 $\mu g/m^3$	150 $\mu g/m^3$
$PM_{2.5}$	24-hour	Port Richmond, Staten Island[7]	20.3 $\mu g/m^3$	35 $\mu g/m^3$
	Annual	Port Richmond, Staten Island[7]	8.3 $\mu g/m^3$	15 $\mu g/m^3$

Source: NYSDEC, New York State Ambient Air Quality Data.
Notes:
(1) The 1-Hour NO_2 background concentration is the 98th percentile of daily maximum 1-hour average concentrations, averaged over the recent 3 years and is calculated in the AERMOD model.
(2) Annual average NO_2 background concentration is based on the 5-year highest value from 2011–2015.
(3) The 1-Hour SO_2 background concentration is the annual 99th percentile of daily maximum 1-hour average concentration, averaged over the recent 3 years (2013–2015).
(4) The 3-hour SO_2 background concentrations are based on the 5-year highest second-highest measured value from the most recent years reported (2008–2012).
(5) The 1-hour and 8-hour CO background concentrations are based on the 5-year highest second-highest measured value from 2011–2015.
(6) PM_{10} is based on the 3-year highest second-highest value from 2013–2015.
(7) The $PM_{2.5}$ 24-hour concentration is the average of the annual 98th percentile from 2013–2015. The $PM_{2.5}$ annual concentration is also measured from the same years.

13.4.2 PARKING FACILITIES

While there are two possible locations for the proposed Water Hub site, both sites would include a main parking facility west of Page Avenue—closer to nearby sensitive receptors. Therefore, the parking analysis conservatively assumes all parking demand would be met in that location. The Proposed Actions could include up to approximately 42 parking spaces (40 automobiles and 2 buses) within a public surface lot with an entrance off of Page Avenue. Emissions from vehicles using the parking areas could potentially affect ambient levels of pollutants at receptors adjacent to the parking lot. An analysis was performed using the methodology delineated in the 2014 *CEQR Technical Manual* to calculate pollutant levels. Since the parking lot would be used by automobiles and school buses, the primary pollutants of concern are both CO and PM.

Potential impacts from the proposed parking lot on CO and PM concentrations were assessed at multiple receptor locations. The CO concentrations were determined for when overall lot usage would be the greatest. It was conservatively assumed that all arriving vehicles would enter the parking lot within the same hour. PM concentrations were analyzed conservatively assuming that these conditions would continue throughout a 24-hour or annual period. Emissions from vehicles entering, parking, and exiting the parking lots were estimated using the USEPA's MOVES2014a mobile source emission model as referenced in the *CEQR Technical Manual*. All arriving and departing vehicles were conservatively assumed to travel at an average speed of 5 miles per hour within the parking facility. In addition, all departing vehicles were assumed to idle for 1 minute before exiting.

Receptors were placed at the façade of nearby residential buildings and at ground level locations adjacent to the parking lot. To determine compliance with the NAAQS, CO concentrations were determined for the maximum 1-hour and 8-hour average periods. PM concentrations were

determined for maximum 24-hour and annual average periods and compared to the CEQR *de minimis* criteria. Persistence factors of 1.0, 0.70, 0.6, and 0.1[7] were used to convert the calculated 1-hour average maximum concentrations to 3-hour, 8-hour, 24-hour, and annual averages, accounting for meteorological variability over the averaging periods. Background and stationary source CO concentrations were added to the modeling results to obtain the total ambient levels. The stationary source CO and PM concentrations were determined from the AERSCREEN analysis described above and combined with the concentrations from the proposed parking lot.

13.4.3 GENERAL CONFORMITY

Emissions associated with the Proposed Actions would include direct emissions from the proposed Water Hub's heating and hot water systems (a proposed project element under Alternatives 2 and 3). In addition, indirect emissions would result from minor increases in regional vehicular miles traveled due to the project generated vehicle increments.

EXISTING CONDITIONS

Representative criteria pollutant concentrations measured in recent years at NYSDEC air quality monitoring stations nearest to the proposed project are presented in **Table 13-4**. The values presented are consistent with the NAAQS format. For example, the 8-hour ozone concentration shown is the 3-year average of the 4th highest daily maximum 8-hour average concentrations. The concentrations were obtained from the 2015 New York State Ambient Air Quality Report, the most recent report available. As shown, there were no monitored violations of the NAAQS for the pollutants at these sites in 2015 with the exception of the 8-hour ozone standard of 0.070 ppm.

[7] 8-hour persistence factor:
New York City. *CEQR Technical Manual*. Chapter 17, Section 321. March 2014
3-hour, 24-hour, and annual persistence factors:
EPA. *AERSCREEN User's Guide*. EPA-454/B-15-005. Sections 1.1. J 2015.

Table 13-4
Representative Monitored Ambient Air Quality Data

Pollutant	Location	Units	Averaging Period	Concentration	NAAQS
CO	CCNY, Manhattan	ppm	8-hour	1.5	9
			1-hour	2.3	35
SO_2	Queens College 2, Queens[1 2]	µg/m^3	3-hour	45	1,300
			1-hour	11.1	196
PM_{10}	Division Street, Manhattan	µg/m^3	24-hour	44	150
$PM_{2.5}$	Port Richmond, Staten Island	µg/m^3	Annual	8.6	15
			24-hour	20.3	35
NO_2	Queens College 2, Queens[3]	µg/m^3	Annual	17.16	100
			1-hour	60.2	188
Lead	J.H.S. 126, Brooklyn	µg/m^3	3-month	0.0061	0.15
Ozone	Susan Wagner, Staten Island	ppm	8-hour	0.074	0.070

Notes:
(1) The 1-hour value is based on a three-year average (2013-2015) of the 99th percentile of daily maximum 1-hour average concentrations.
(2) The 3-hour value is based on the most recently reported 3-hour value (2012).
(3) The 1-hour value is based on a three-year average (2013-2015) of the 98th percentile of daily maximum 1-hour average concentrations.
Source: NYSDEC, New York State Ambient Air Quality Report (2015).

13.5 EFFECTS ASSESSMENT

13.5.1 ALTERNATIVE 1—NO ACTION ALTERNATIVE

In the No Action Alternative there would be no changes in the use of the project sites. Overall emissions from existing sources in the area would decrease with the phased implementation of State and local laws that restrict the use of No. 6 and No. 4 fuel oil for heating, and lower the sulfur content of No. 2 fuel oil. With the implementation of New York State and New York City regulations that would require the use of cleaner fuels for heat and hot water, an overall improvement in air quality is anticipated.

13.5.2 ALTERNATIVE 2 (PREFERRED ALTERNATIVE)—THE LAYERED TOTTENVILLE SHORELINE RESILIENCY STRATEGY: LIVING BREAKWATERS AND TOTTENVILLE SHORELINE PROTECTION PROJECT (LAYERED STRATEGY)

As described in Chapter 1, "Purpose and Need and Alternatives," the Alternative 2 consists of the implementation of two individual projects: the Living Breakwaters Project and the Tottenville Shoreline Protection Project. The proposed Water Hub is included as a project element of the Breakwaters Project. Additionally, there are two locations and designs for the proposed Water Hub—one to the east and one to the west of Page Avenue (Page East Option and Page West Option, respectively)

STATIONARY SOURCES

Initial Screening Analysis

An initial screening level analysis was performed to evaluate the potential for significant adverse air quality impacts from operation of the proposed Water Hub's heating and hot water systems

under Alternative 2. The primary pollutants of concern are NO_2 and SO_2 from combustion of either natural gas or fuel oil. The distance below which impacts might occur on buildings of similar height was estimated as 33 feet. The distance to the nearest building of similar or greater height is 70 feet. Under Alternative 2, the proposed development is below the maximum development size shown in Figures 17-7 and 17-8 of the Air Quality Appendix of the *CEQR Technical Manual* for NO_2 and SO_2 annual concentrations.

AERSCREEN Analysis

An AERSCREEN analysis was performed to evaluate potential 1-hour average NO_2, 1-hour and 3-hour average SO_2, and 24-hour and annual average $PM_{2.5}$ concentrations from operation of the heating and hot water systems at the proposed Water Hub under Alternative 2. The maximum results between Page West Option and Page East Option are presented in **Table 13-5**. Concentrations for the Biddle House Option and the Rutan-Beckett House Option at Potential Location 2 would be similar to the results presented.

Table 13-5
Maximum Modeled Pollutant Concentrations(µg/m3)

Pollutant	Averaging Period	Maximum Modeled Impact	Background	Total Concentration	Criterion
NO_2	1-hour	22.1 [(1)]	60.2	82.3	188 [(2)]
SO_2	1-hour	0.3	11.1	11.4	195
SO_2	3-hour	0.3	89.1	89.4	1,300
$PM_{2.5}$	24-hour	1.6	20.3	N/A	7.4 [(3)]
$PM_{2.5}$	Annual	0.07	N/A	N/A	0.3 [(4)]

Notes:
N/A – Not Applicable.
[(1)] The 1-hour average NO_2 concentration is estimated using NO_2 to NO_x ratio of 0.8 as per USEPA guidance.
[(2)] 1-hour average NAAQS.
[(3)] $PM_{2.5}$ *de minimis* criteria — 24-hour average, not to exceed more than half the difference between the background concentration and the 24-hour standard of 35 µg/m^3.
[(4)] $PM_{2.5}$ *de minimis* criteria—annual (discrete receptor).

Potential concentrations from the proposed Water Hub's heating and hot water systems are less than their respective thresholds (NAAQS and *de minimis* criteria). Therefore, under Alternative 2, there would be no potential for significant adverse air quality impacts from the heating and hot water systems.

PARKING FACILITIES

The CO levels from the proposed parking lot associated with the Water Hub were predicted using the methodology set forth in the *CEQR Technical Manual*. Based on conservative assumptions for the projected parking demand assuming complete turnover for every hour, the analysis considered 42 vehicles entering and leaving the proposed parking lot in each hour.

Table 13-6 shows the future maximum predicted 1-hour and 8-hour average CO concentrations, 24-hour and annual $PM_{2.5}$ concentrations, with ambient background, and ground level stationary sources contributions. As shown in the table, the maximum predicted CO and $PM_{2.5}$ levels would be in compliance with the applicable *de minimis* criteria and federal ambient air quality standards. Therefore, there would be no potential for significant adverse impacts on air quality from the proposed parking lot.

Table 13-6
Future Maximum Predicted Concentrations

Pollutant (Unit)	Averaging Period	Proposed Parking Facilities	Total Concentration [1]	Increment [2]	*Criteria*
CO (ppm)	1-Hour	0.008	2.71	NA	35 [3]
	8-Hour	0.006	1.71	0.01	9 / 3.7 [3]
$PM_{2.5}$ ($\mu g/m^3$)	24-Hour	0.71	N/A	1.24	7.4 [4]
	Annual	0.01	N/A	0.06	0.3 [5]

Notes:
N/A – Not Applicable.
[1] Concentrations include background concentrations and ground level stationary source contributions.
[2] Increments include contributions from parking facilities and ground level stationary source contributions.
[3] The 1–hour concentration is compared to the NAAQS. The 8-hour concentration is compared to both the CEQR *de minimis* threshold and the NAAQS.
[4] $PM_{2.5}$ *de minimis* criteria — 24-hour average, not to exceed more than half the difference between the background concentration and the 24-hour standard of 35 $\mu g/m^3$.
[5] $PM_{2.5}$ *de minimis* criteria—annual (discrete receptor).

GENERAL CONFORMITY

Due to the small size of the heating and hot water system for the proposed Water Hub with a boiler capacity projected to be less than 1 million British Thermal Units per hour (MMBtu/hour) and the minor vehicle increments associated with the Proposed Actions, emissions are well below the general conformity *de minimis* criteria described above. See Chapter 17, "Construction," for a quantified assessment of the aggregate emissions from both construction and operation of the Proposed Actions, demonstrating compliance with general conformity.

13.5.3 ALTERNATIVE 3— BREAKWATERS WITHOUT SHORELINE PROTECTION SYSTEM

This alternative will include the proposed breakwaters in place (including the on-shore community Water Hub and landscape elements) included in Alternative 2, without a the Shoreline Project. Potential air quality impacts under Alternative 3 would be very similar to the potential air quality impacts under Alternative 2. Therefore, similar to Alternative 2, under Alternative 3 there would be no potential for significant adverse air quality impacts.

13.5.4 ALTERNATIVE 4—SHORELINE PROTECTION SYSTEM WITHOUT BREAKWATERS

This alternative would include only the proposed Shoreline Project in place, without the proposed breakwaters, Water Hub, or on-shore landscape elements. Potential air quality impacts under Alternative 4 would be very similar to the potential air quality impacts under Alternative 1 (the No Action alternative). Similar to Alternative 1, under Alternative 4 there would be no potential for significant adverse air quality impacts.

13.6 MINIMIZATION AND MITIGATION OF IMPACTS

The Proposed Actions would not result in significant adverse effects to air quality within the project area or study area. Therefore, no mitigation with respect to air quality is required. ✷