Zoning for Coastal Flood Resiliency
Chapter 15: Air Quality

A. INTRODUCTION

As detailed in **Chapter 1, "Project Description,"** the New York City Department of City Planning (DCP) is proposing a zoning text amendment to update the Special Regulations Applying in Flood Hazard Areas (Article VI, Chapter 4) of the New York City Zoning Resolution (ZR), which includes the "Flood Resilience Zoning Text" (the "2013 Flood Text") and "Special Regulations for Neighborhood Recovery" (the "2015 Recovery Text"). These temporary zoning rules were adopted on an emergency basis to remove zoning barriers that were hindering the reconstruction and retrofitting of buildings affected by Hurricane Sandy and to help ensure that new construction there would be more resilient. The 2013 Flood Text provisions are set to expire with the adoption of new and final Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs), which is anticipated to occur within the next few years. Applicability of the 2015 Recovery Text expired in July 2020. Therefore, DCP is proposing a citywide zoning text amendment, "Zoning for Coastal Flood Resiliency" (the "Proposed Action"), to improve upon and make permanent the relevant provisions of the existing temporary zoning rules of the 2013 Flood Text and 2015 Recovery Text. In addition, the Proposed Action includes special provisions to help facilitate the city's long-term recovery from the COVID-19 pandemic and its associated economic effects by providing more time for existing non-conforming uses to reopen and builders to undertake certain construction projects. The Proposed Action also includes updates to other sections of the ZR, including the Special Regulations Applying in the Waterfront Area (Article VI, Chapter 2) and provisions within various Special Purpose Districts. The Proposed Action would mostly affect New York City's current 1% annual and 0.2% annual chance floodplains. However, select provisions of the Proposed Action would be applicable citywide. To help the City prepare for or respond to other disasters, select provisions in the Proposed Action regarding power systems and other mechanical equipment, ramps and lifts, vulnerable populations, and disaster recovery rules, would be applicable citywide.

Due to the broad applicability of the Proposed Action, it is difficult to predict the sites where development would be facilitated. In addition, the Proposed Action is not in-and-of-itself expected to induce development where it would not otherwise have occurred absent the Proposed Action. Although the Proposed Action may allow developments and existing buildings to retrofit to resilient standards, the overall amount, type, and location of construction within the affected area is not anticipated to change. Owing to the generic nature of this action, there are no known or projected as-of-right development sites identified as part of the Proposed Action's Reasonable Worst-Case Development Scenario (RWCDS). To produce a reasonable analysis of the likely effects of the Proposed Action, 14 representative Prototypical Analysis Sites containing either new developments, infill, reconstructions, or retrofits of existing buildings in the city's 1% and 0.2% annual chance floodplains were identified to demonstrate the wide range of proposed regulations for sites that would be able to develop as-of-right in the future with the Proposed Action, as detailed further in **Chapter 1**.

As detailed in the 20202014 *City Environmental Quality Review* (CEQR) *Technical Manual*, the potential for air quality impacts from a proposed action can be either direct or indirect. Direct impacts result from emissions generated by stationary sources at a development site, such as emissions from on-site fuel combustion for heat and hot water systems, or emissions from parking garage ventilation systems. Indirect impacts are caused by off-site emissions associated with a project, such as emissions from nearby existing stationary sources (i.e., impacts on the Prototypical Analysis Sites) or by emissions from on-road

vehicle trips generated by a proposed action or other changes to future traffic conditions due to a project. An analysis of potential stationary and mobile source impacts with the Proposed Action is provided below.

B. PRINCIPAL CONCLUSIONS

Based on the preliminary assessment provided below, it is concluded that the Proposed Action would not result in any significant adverse air quality impacts. The Proposed Action would not exceed the thresholds referenced in the *CEQR Technical Manual* for mobile source analyses during any traffic peak period. Therefore, based on *CEQR Technical Manual* guidance, no additional mobile source analysis is required for the Proposed Action. As the relevant thresholds are not exceeded, the Proposed Action is therefore not expected to result in any significant adverse air quality impacts due to mobile sources. Additionally, based on the modeling analysis of stationary sources performed for Prototypical Analysis Sites 3, 5, and 11, the Proposed Action would also not result in any impacts with respect to stationary source air emissions. Therefore, it is concluded that the Proposed Action would not result in any air quality impacts.

C. PRELIMINARY SCREENING

Introduction

As noted above, **Chapter 1, "Project Description,"** identifies 14 representative sites to demonstrate how the proposed regulations would apply to sites that could be developed as-of-right under the With-Action scenario. These 14 Prototypical Analysis Sites and their associated transportation patterns and building configurations were used to assess the potential for the Proposed Action to result in significant air quality impacts. A RWCDS (see **Chapter 1, "Project Description**) was developed for the future without the Proposed Action (No-Action condition) and the future with the Proposed Action (With-Action condition) in both the 1% annual and 0.2% annual chance floodplains, and the incremental difference between No-Action and With-Action conditions for both the 1% annual and 0.2% annual chance floodplains was used as the basis for assessing the potential impacts of the Proposed Action.

Mobile Source Analysis

Tables 14-1a and **14-1b** in **Chapter 14 "Transportation"** compare the No-Action and With-Action scenarios for both the 1% annual and 0.2% annual chance floodplains for the 14 Prototypical Analysis Sites. As detailed therein, the Proposed Action would result in a total incremental change of no residential dwelling units (DUs) and an incremental increase of approximately 1,110 square feet (sf) of commercial retail space in the 1% annual chance floodplain. In the 0.2% annual chance floodplain, the Proposed Action would result in a total incremental change of no DUs and an incremental decrease of approximately 645 sf of commercial retail space. The net increment between the No-Action and With-Action scenarios would therefore not exceed the CEQR thresholds for a mobile source air quality analyses and are well below the *CEQR Technical Manual* thresholds. Therefore, it is concluded that the Proposed Action would not result any significant adverse air quality impacts related to mobile sources and a detailed assessment of mobile source impacts is not warranted.

Stationary Source Analysis

With respect to the potential for impacts from heating system emissions, Prototypical Analysis Sites that are anticipated under the RWCDS to have a reduction in total residential and commercial use would not require analyses of heating, ventilation and air conditioning (HVAC) systems and were not analyzed.

Prototypical Analysis Sites that are anticipated under the RWCDS to have an incremental increase in total residential and commercial space between No-Action and With-Action were analyzed. Based on the incremental total development size, incremental building height, building setback requirement (with a minimum of 10 feet as per the New York City Department of Buildings [DOB] code) between No-Action and With-Action, and total development size under the With-Action scenario, Prototypical Analysis Sites 3 and 5 were selected as the RWCDS for the 1% annual chance floodplain, while Prototypical Analysis Sites 5 and 11 were selected as the RWCDS for the 0.2% annual chance floodplain for analysis.

Based on the above, three sites were selected for analysis of heating and hot water systems with the Proposed Actions: Prototypical Analysis Site 3, Site 5, and Site 11. Prototypical Analysis Sites 3 and 5 were selected as the RWCDS for the 1% annual chance floodplain, while Prototypical Analysis Sites 5 and 11 were selected as the RWCDS for the 0.2% annual chance floodplain. The results of the analyses for these sites are presented below.

Note that all the 14~~3~~ prototypes will comply with the proposed zoning text amendment and any stack associated with mechanical equipment exhausts must be located at a height taller than the tallest building on the zoning lot. As a result, significant adverse air quality impacts are not expected, and a detailed HVAC source impact analyses are not warranted for other prototypes.

Prototypical Analysis Site 5

To assess air quality impacts associated with emissions from heating and hot water systems for Site 5, a screening analysis was performed. The methodology described in the *CEQR Technical Manual* was used for the analysis, which determines the threshold of development size below which the action would not have a significant adverse impact. The screening procedure considers the fuel to be used, the maximum development size, type of development, and the stack height, to evaluate whether a significant adverse impact is likely. Based on the distance from the proposed project 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 analysis for Prototypical Analysis Site 5 assumes an eight-story, 80-foot tall building in both the 1% and 0.2% annual chance floodplain scenarios. Assuming a building size of 60,980 gross square feet (gsf) and residential use type, the analysis showed that at distances equal to greater than approximately 84 feet using No. 2 oil as the fuel type and 62 feet assuming natural gas, no significant adverse air quality impacts would be predicted for both the 1% and 0.2% floodplain scenarios. Furthermore, compared with the No-Action condition, Site 5 would be seven feet and 10 feet taller in the 1% and 0.2% floodplain scenarios, respectively. Based on this analysis it is concluded that, when compared with the No-Action condition, Prototypical Analysis Site 5 in the With-Action condition would not result in any new or additional significant adverse air quality impacts.

Prototypical Analysis Sites 3 and 11

An analysis of heating and hot water using EPA's AERSCREEN model was conducted for Prototypical Analysis Site 3 in the 1% annual chance floodplain scenario and Prototypical Analysis Site 11 in the 0.2% annual chance floodplain scenario. The analysis was performed using natural gas as well as No. 2 oil as the fuel type as a conservative worst-case assumption. The primary pollutants of concern when combusting No. 2 oil are sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$). The AERSCREEN model projects worst-case one-hour average concentrations downwind from a point, area, or volume source, and longer-period averages are estimated by multiplying the one-hour results by persistence factors established by EPA or provided in the *CEQR*

Technical Manual. AERSCREEN 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.[1] The AERSCREEN model was used to calculate worst-case ambient concentrations of SO_2, NO_2 and $PM_{2.5}$ from the Prototypical Analysis Sites downwind of the stack.

The AERSCREEN model was run 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 EPA guidance.

Maximum one-hour average NO_2 concentrations were estimated using an NO_2 to NO_x ratio of 0.8—the recommended default ambient ratio per EPA guidance.[2]

Emission Rates and Stack Parameters

Annual emission rates for heating and hot water systems for Prototypical Analysis Sites 3 and 11 were calculated based on fuel consumption estimates, using energy intensity estimates based on type of development and size of the building (3,927 gsf for Prototypical Analysis Site 3 and 3,182 gsf for Prototypical Analysis Site 11) as recommended in the *CEQR Technical Manual*, and applying emission factors for oil-fired boilers.[3] $PM_{2.5}$ emissions include both the filterable and condensable components. The short-term emission rates (24-hour and shorter) were calculated by scaling the annual emissions to account for a 100-day heating season. The exhaust from the heat and hot water systems was assumed to be vented through a single stack located three feet above the roof of the building.

To calculate exhaust velocity, the fuel consumption of the anticipated development was multiplied by EPA's fuel factor for No. 2 fuel oil,[4] providing the exhaust flow rate at standard temperature; the flow rate was then corrected for the exhaust temperature, and exhaust velocity was calculated based on the stack diameter. Assumptions for stack diameter and exhaust temperature for the proposed systems were estimated to calculate the exhaust velocity.

The emission rates and exhaust stack parameters used in the modeling analyses are presented in **Table 15-1** below.

Table 15-1
Exhaust Stack Parameters and Emission Rates

Stack Parameter	Site 3	Site 11
Stack Height (feet)	40	30
Stack Diameter (feet)	1	1
Exhaust Velocity (meters/second)	0.15	0.04
Exhaust Temperature (degrees Fahrenheit)	200	200
Emission Rate (grams/second)		
SO_2 (1-hour average)	1.91E-5	1.55E-5
NO_2 (1-hour average)	1.79E-3	1.45E-3
NO_2 (Annual average)	4.91E-4	3.98E-4
$PM_{2.5}$ (24-hour average)	1.91E-4	1.55E-4
$PM_{2.5}$ (Annual average)	5.23E-5	4.24E-5

[1] 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.

[2] EPA. Memorandum: Clarification on the use of AERMOD Dispersion Modeling for Demonstrating Compliance with the NO2 National Ambient Air Quality Standard. September 30, 2014.

[3] EPA. *Compilation of Air Pollutant Emission Factors AP-42*. 5th Ed., V. I, Ch. 1 3. September, 1999.

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

Background Concentrations

To estimate the maximum projected total one-hour average NO_2 concentration at a given receptor, the projected concentration increment from the source was added to corresponding background concentration of 108.7 µg/m^3. This background level represents the three-year average (2016–2018) of the annual 98th percentile of the daily highest one-hour average NO_2 concentrations (this is the statistical form of the standard) as monitored by New York State Department of Environmental Conservation (NYSDEC) background monitoring station stations in New York City. Note that the maximum concentration increment would not necessarily coincide with the maximum background levels, and, therefore, this approach results in a conservatively high estimate.

To estimate the maximum expected pollutant concentration at a given location (receptor), the predicted impacts must be added to a background value that accounts for existing pollutant concentrations from other sources that are not directly accounted for in the model (see **Table 15-2**). To develop background levels, concentrations measured at NYSDEC ambient monitoring stations over the latest available three-year period (2016–2018) were reviewed, and most appropriate concentrations were used for the 1-hour and annual NO_2 and one-hour SO_2.

Table 15-2
Maximum Background Pollutant Concentrations

Pollutant	Average Period	Location	Concentration (µg/m^3)	NAAQS (µg/m^3)
NO_2	1-hour	Queens College 2	105.8	188
	Annual	Queens College 2	29.7	100
SO_2	1-hour	IS 52	16.3	196
$PM_{2.5}$	24-hour	PS 19	21	35
Source: New York State Air Quality Report Ambient Air Monitoring System, DEC, 2016–2018.				

$PM_{2.5}$ impacts are assessed on an incremental basis and compared with the $PM_{2.5}$ *de minimis* criteria. The $PM_{2.5}$ 24-hour average background concentration of 21 µg/m^3 from the PS 19 ambient monitoring station was used to establish the *de minimis* value of seven µg/m^3.

Receptor Placement

Receptors (locations at which concentrations are projected) generally include operable windows in residential or other buildings, air intakes, and publicly accessible open space locations, as applicable. Flagpole receptors were modeled at various elevations, from ground level up to 70 feet for Prototypical Analysis Site 3 and Prototypical Analysis Site 11. For each elevation, receptors were placed at a minimum distance of 10 feet out to 200 feet, at 10-foot intervals.

Potential Air Quality Impacts

The results of the AERSCREEN analysis determined that for both Prototypical Analysis Site 3 and Prototypical Analysis Site 11, the maximum overall concentrations were found at a distance of 10 feet and an elevation of 40 feet and 30 feet, respectively. At these elevations, maximum concentrations of NO_2, and $PM_{2.5}$ were found to exceed applicable standards at distances less than 30 feet. However, based on the prototypical massings, it is very unlikely to encounter receptors at or near the elevation of the exhaust stacks due to zoning restrictions at lot setback requirements. Therefore, the maximum concentrations for 1-hour average SO_2 and NO_2, and 24-hour and annual average $PM_{2.5}$ as presented in **Table 15-3**, represent the maximum-modeled concentrations at other receptor locations. As presented in the table, no exceedance of the 1-hour average SO_2 and NO_2 NAAQS are predicted from Prototypical

Analysis Sites 3 and 11. In addition, the maximum predicted incremental concentrations of $PM_{2.5}$ are not predicted to exceed the CEQR *de minimis* criteria. Therefore, based on this analysis it is concluded that under the Proposed Action, the heating and hot water system for Prototypical Analysis Sites 3 and 11 would not result in any significant adverse air quality impacts.

Table 15-3
Prototypical Analysis Sites 3 and 11
Maximum Modeled Pollutant Concentrations
from Heating and Hot Water Systems (µg/m^3)

Site	Pollutant	Averaging Period	Maximum Modeled Impact	Background	Total Concentration	Criterion
3	NO_2	1-hour	78.8 (1)	105.8	184.6	188(2)
		Annual	2.7	29.7	32.4	100(2)
	SO_2	1-hour	1.05	16.3	17.4	196(2)
	$PM_{2.5}$	24-hour	6.29	N/A	N/A	7 (3)
		Annual	0.29	N/A	N/A	0.3(4)
11	NO_2	1-hour	69.7(1)	105.8	175.4	188(2)
		Annual	2.4	29.7	32.1	100(2)
	SO_2	1-hour	0.93	16.3	17.2	196(2)
	$PM_{2.5}$	24-hour	5.56	N/A	N/A	7 (3)
		Annual	0.25	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 EPA guidance.
(2) 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)

Air Toxics

Based on the prototypes of the RWCDS, since no new uses are expected between No-Action and With-Action conditions for all Prototypical Analysis Sites, there would be no significant adverse impacts due to air emissions of air toxics and no further analysis is warranted.

D. CONCLUSIONS

As the Proposed Action would not exceed the thresholds referenced in the *CEQR Technical Manual* for mobile source analyses during any traffic peak period, no additional analysis is required based on *CEQR Technical Manual* guidance and the Proposed Action would not result in any significant mobile source air quality impacts. Additionally, based on the modeling analysis of stationary sources performed for Prototypical Analysis Sites 3, 5, and 11, the Proposed Action would also not result in any impacts with respect to stationary source air emissions. Therefore, it is concluded that the Proposed Action would not result in any air quality impacts.