## A. INTRODUCTION

This chapter addresses the potential air quality impacts associated with the proposed plan to redevelop the Victoria Theater site on the north side of West 125th Street, midblock between Frederick Douglas Boulevard and Adam Clayton Powell, Jr. Boulevard in Harlem. Air quality impacts may be direct or indirect. Direct impacts result from emissions generated by stationary sources at a development site, such as emissions from fuel burned on site for heating. Indirect effects include emissions from motor vehicles ("mobile sources") traveling to and from a project, or from existing pollutant emission sources impacting air quality on the proposed project.

The proposed project is not expected to alter traffic conditions in the study area such that air quality would be affected. The maximum hourly incremental traffic from the proposed projects would not exceed the *City Environmental Quality Review (CEQR) Technical Manual* carbon monoxide screening threshold of 170 peak hour trips, nor would it exceed the particulate matter emission screening threshold discussed in Chapter 17, Sections 210 and 311 of the *CEQR Technical Manual*. The level of traffic resulting from the proposed project would not have the potential to significantly change air quality conditions; therefore, a quantified assessment of on-street mobile source emissions is not warranted.

The proposed project would result in new construction and the renovation and adaptive reuse of existing spaces, which will create new heating and cooling demands and emissions. Therefore, this analysis focuses on the fossil-fuel fired heating, ventilation, and air conditioning (HVAC) system for the proposed project.

### PRINCIPAL CONCLUSIONS

As discussed above, the proposed redevelopment would not significantly alter traffic conditions; therefore, the proposed project would not cause significant adverse impacts from mobile source emissions and no further analysis of on-street mobile source emissions is warranted.

Based on the stationary source analyses, there would be no potential significant adverse stationary source air quality impacts from emissions of nitrogen dioxide, sulfur dioxide, and particulate matter from the proposed fossil fuel-fired HVAC systems of the proposed project.

Overall, the proposed project would not have significant adverse air quality impacts.

## B. METHODOLOGY FOR PREDICTING POLLUTANT CONCENTRATIONS

Stationary source analyses were conducted for the fossil fuel-fired HVAC systems for the proposed project. Initially, a screening level analysis was performed following the *CEQR Technical Manual* procedures to evaluate potential impacts from the project's boilers. Further

analysis was performed using the EPA-approved AERSCREEN model to specifically evaluate potential impacts of $PM_{2.5}$ and impacts of 1-hour average $NO_2$ with respect to the recently promulgated 1-hour NAAQS for the latter. In addition, although ultra low sulfur fuel oil would be used in the proposed boilers for the project, an analysis to evaluate potential 1-hour $SO_2$ impacts with respect to the recently promulgated NAAQS was performed.

## CEQR TECHNICAL MANUAL HVAC SCREENING ANALYSIS

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

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*, then there is the potential for significant air quality impacts and a refined dispersion modeling analysis would be required. Otherwise, the source passes the screening analysis and no further study is required.

Any nearby development of similar or greater height was analyzed as a potential receptor. The design for the site assumes that boilers would be used for heating and hot water systems, and the exhausts would be ducted to a single stack to be located above the roof of the proposed tower. The Adam Clayton Powell Jr. State Office Building was used as a receptor location for the screening analysis. The office building was used since it would be the tallest building close to the proposed site.

The maximum proposed development floor area of the entire site was used as input for the screening analysis. It was conservatively assumed that No. 2 fuel oil would be used in the boiler systems. The primary pollutant of concern is $SO_2$ from fuel oil combustion.

## AERSCREEN ANALYSIS

The $NO_2$ and $SO_2$ 1-hour analyses were performed using the EPA-approved AERSCREEN model (version 11076, EPA, 2011). The AERSCREEN model was recently endorsed by EPA[1] as a replacement to the SCREEN3 model. AERSCREEN predicts worst-case one-hour impacts downwind from a point, area, or volume source. 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[2]. The model incorporates the PRIME downwash algorithms that are part of the AERMOD refined model and utilizes the PRIME plume rise model enhancements to the Building Profile Input Program (BPIPRIM) to provide a detailed analysis of downwash influences on direction-specific basis. AERSCREEN also incorporates AERMOD's complex terrain algorithms and utilizes the

[1] Memorandum, "AERSCREEN Released as the EPA Recommended Screening Model", April 11, 2011.

[2] 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.

AERMAP terrain processor to account for the actual terrain in the vicinity of the source on a direction-specific basis.

The AERSCREEN model was used to calculate ambient concentrations of criteria pollutants from the proposed project. The model was run both with and without the influent of building downwash and with urban diffusion coefficients based on a review of land-use maps of the area. Other model options were selected based upon USEPA guidance.

*EMISSION RATES AND STACK PARAMETERS*

**Table 15-1** presents the emission rates and stack parameters used in the modeling analysis.

**Table 15-1**
**HVAC Emission Rates and Stack Parameters**

| Parameter | Value |
|---|---|
| **Stack Parameters** | |
| Stack Height (ft) | 307 |
| Stack Diameter (ft) (1) | 1.5 |
| Exhaust Velocity (m/s) (1) | 7.2 |
| Exhaust Temperature (°F) (1) | 300 |
| **Emission Rates (g/s)** (2) | |
| $NO_x$, 1-Hour | 0.148 |
| $NO_x$, Annual | 0.0405 |
| $PM_{2.5}$, 24-Hour | 0.018 |
| $PM_{2.5}$, Annual | 0.00480 |
| $PM_{10}$ | 0.00743 |
| $SO_2$ | 0.00175(3) |
| CO | 0.041 |

**Notes:**
1. The stack diameter, exhaust velocity, and exhaust temperature were based on a DEP permit database for similar size boiler systems.
2. The emission rates are based on peak and annual average fuel usage for the design and AP-42 emission factors.
3. The $SO_2$ emission rate for fuel oil assumes the use of ultra low sulfur diesel with a maximum sulfur content of 15 parts per million.

**Sources:** EPA AP-42 Section 1.3 and Section 1.4

The exhaust stack for the boiler systems was assumed to be located three feet above the roof of the proposed building at a height of 307 feet above-grade as per the *CEQR Technical Manual*.

$NO_2$ concentrations from the boiler systems at the project site were estimated using $NO_2$ to $NO_x$ ratios of 0.63 for the annual average concentration and 0.8 for the maximum 1-hour concentration. The 0.63 ratio used for the annual average is based on the highest ambient annual average $NO_2$ to $NO_x$ background ratio as measured at New York City monitoring stations over the most recent available consecutive three-year period (2007-2009), consistent with the EPA's *Guideline on Air Quality Models* at 40 CFR part 51 Appendix W, Section 5.2.4.[1] The 0.8 ratio used for the maximum 1-hour concentration is the recommended default ambient ratio per EPA's guidance memo providing additional clarification regarding application of Appendix W Modeling Guidance for the 1-hour $NO_2$ NAAQS.[2]

[1] http://www.epa.gov/scram001/guidance/guide/appw_05.pdf

[2] EPA, Memorandum, "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour $NO_2$ National Ambient Air Quality Standard, March 1, 2011.

*METEOROLOGICAL DATA*

The meteorological data used by the AERSCREEN model are generated by the MAKEMET program, which uses 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 to determine worst-case hourly impacts. The default minimum and maximum air temperatures of 250 K and 310 K, a minimum wind speed of 0.5 m/s, and an anemometer height of 10 m were used in the model. Surface characteristics from the LaGuardia meteorological station were also used.

*RECEPTOR LOCATIONS*

Receptor information provides the distance from the source, terrain height, and height above ground for selected locations. A receptor array was chosen to represent discrete receptors in the area. The automated array began at the property line of the project site and went out to a distance of 1,000 meters in order to capture the location of maximum impact. In addition to automated receptors, an additional discrete receptor was modeled at the nearest sensitive receptor, the Adam Clayton Powell Jr. Office Building, approximately 454 feet away from the project area. Flat terrain was assumed.

*BACKGROUND CONCENTRATIONS*

To estimate the maximum expected pollutant concentration at a given receptor, the predicted impact 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. The background levels are based on concentrations monitored at the nearest DEC ambient air monitoring stations over a recent five-year period for which data are available. Consistent with the form of the standard, for the 1-hour $NO_2$ averaging period, the 3-year average of the annual 98th percentile daily maximum 1-hour average concentration was used. These background concentrations, 134.8 $\mu g/m^3$ for $NO_2$ and 138.0 $\mu g/m^3$ for $SO_2$, were added to the maximum 1-hour $NO_2$ and $SO_2$ concentration, respectively, from the AERSCREEN model to obtain the total 1-hour $NO_2$ and $SO_2$ concentrations.

## ADDITIONAL SOURCES

The *CEQR Technical Manual* requires an assessment of any actions that could result in the location of sensitive uses within 1,000 feet of a large emission source (e.g., a power plant), or within 400 feet of commercial, institutional, or large-scale residential developments where the proposed structure would be of a height similar to or greater than the height of an existing emission stack. To assess the potential effects of these existing sources on the proposed project, a review of existing permitted facilities was conducted. Sources of information reviewed included the EPA's Envirofacts database[1], the DEC Title V and state facility permit web sites[2], the New York City Department of Buildings web site[3], and DEP permit data.

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[1] EPA, Envirofacts Data Warehouse, http://oaspub.epa.gov/enviro/ef_home2.air; [*December 30, 2009]*.

[2] DEC Title V and State Facility permit websites: http://www.dec.ny.gov/dardata/boss/afs/issued_atv.html; http://www.dec.ny.gov/dardata/boss/afs/issued_asf.html

[3] DOB website: http://www.nyc.gov/html/dob/html/applications_and_permits/applications_and_permits.shtml

No commercial, institutional, or large-scale residential developments of sufficient size were identified within 400 feet of the project area, and no large sources were identified within 1,000 feet. Therefore, an analysis of the impacts of existing sources on the proposed project was not warranted.

## C. PROBABLE IMPACTS OF THE PROPOSED PROJECT

### CEQR TECHNICAL MANUAL HVAC SCREENING ANALYSIS

A screening analysis was performed following the *CEQR Technical Manual* to evaluate the potential for significant adverse impacts on air quality from operation of boiler systems at the proposed project. The primary pollutant of concern is $SO_2$ while burning No. 2 fuel oil. The screening methodology in the *CEQR Technical Manual* was performed assuming the total size of the proposed development (approximately 360,133 gsf) and the use of No. 2 fuel oil. The exhaust stack would be located on the roof of the proposed tower at the height of the mechanical zone (approximately 307 feet) based on the proposed project design. There were no buildings of similar or greater height to the proposed building within 400 feet of the project site. Therefore, a distance of 400 feet was chosen in accordance with the guidance provided in the *CEQR Technical Manual*. Burning No. 2 fuel oil would not result in any significant stationary source air quality impacts because the proposed development is below the maximum development size shown in Figure 17-5 of the Air Quality Appendix of the *CEQR Technical Manual*. Therefore, based on the *CEQR Technical Manual* HVAC screening analysis, no potential significant adverse stationary source air quality impacts are predicted from the proposed project.

### AERSCREEN ANALYSIS

An analysis was performed using AERSCREEN model to evaluate potential impacts of $PM_{2.5}$, 1-hour $NO_2$ and 1-hour $SO_2$ from operation of boiler systems at the proposed project. The maximum predicted concentrations from the modeling analysis were added to the maximum 1-hour, 24-hour, and annual ambient background concentration and compared to the NAAQS. The results of this analysis are presented in **Table 15-2**.

**Table 15-2**
**Maximum Modeled Pollutant Concentration (in µg/m$^3$)**

| Pollutant | Averaging Period | Maximum Modeled Impact | Background(1) | Total Concentration | NAAQS / Threshold |
|---|---|---|---|---|---|
| $NO_2$ | 1-hour | 13.93 (2) | 134.7 | 148.5 | 188 |
| | Annual | 0.30 (3) | 54.6 | 54.9 | 100 |
| $SO_2$ | 1-hour | 0.21 | 138.0 | 138.2 | 196 |
| $PM_{2.5}$ | 24-hour | 1.2 | N/A | N/A | 5/2(4) |
| | Annual | 0.06 | N/A | N/A | 0.3/0.1 (5) |

**Notes:**
(1) Background concentrations for $NO_2$ 1-hour and $SO_2$ 1-hour, which are the maximum daily 98th percentile background concentrations, averaged over three years, and $PM_{2.5}$ 24-hour, which is the maximum 98th percentile background concentration averaged over three years, in accordance with the form of the standards.
(2) Includes a 1-hour conversion ratio of $NO_2$ to NOx of 80 percent
(3) Includes an annual conversion ratio of $NO_2$ to NOx of 63 percent
(4) 24-hour $PM_{2.5}$ interim guidance criterion, > 2 µg/m$^3$ (5 µg/m$^3$ not to exceed value), depending on the magnitude, frequency, duration, location, and size of the area of the predicted concentrations.
(5) Annual $PM_{2.5}$ interim guidance criterion, > 0.3 µg/m$^3$ at any discrete receptor location for localized impacts and >0.1 µg/m$^3$ averaged over a 1km by 1km ground level receptor grid for neighborhood-scale impacts.

As shown in **Table 15-2**, the predicted 1-hour $NO_2$ and $SO_2$ concentrations are less than their respective NAAQS, and the maximum incremental concentrations of $PM_{2.5}$ are below the City's interim guidance criteria. In addition, since the maximum annual average impact at a discrete receptor was predicted to be 0.06 µg/m$^3$, neighborhood-scale impacts would not exceed the City's interim guidance criterion of 0.1 µg/m$^3$. Based on the AERSCREEN analysis, there would be no potential significant adverse stationary source air quality impacts from the proposed project. ✷