Chapter 14: Greenhouse Gas Emissions

14.1 Introduction

As discussed in the *2014 CEQR Technical Manual*, increased concentrations of greenhouse gases (GHGs) are changing the global climate, resulting in wide-ranging effects on the environment, including rising sea levels, increases in temperature, and changes in precipitation levels. Although this is occurring on a global scale, the environmental effects of climate change are also likely to be felt at the local level. New York City's sustainable development policy, starting with PlaNYC, and continued and enhanced in OneNYC, established sustainability initiatives and goals for greatly reducing GHG emissions and for adapting to climate change in the City. The goal to reduce citywide GHG emissions to 30 percent below 2005 levels by 2030 was codified by Local Law 22 of 2008, known as the New York City Climate Protection Act (the "GHG reduction goal"). This goal was developed for the purpose of planning for an increase in population of almost one million residents while achieving significant GHG reductions. In this same vein, on November 13, 2014, the City Council passed a bill to reduce citywide greenhouse gas emissions by 80 percent by 2050. The bill was adopted on December 14, 2014 (Local Law 66 of 2014).

Although the contribution of a proposed project's GHG emissions to global GHG emissions is likely to be considered insignificant when measured against the scale and magnitude of global climate change, certain projects' contribution of GHG emissions still should be analyzed to determine their consistency with the City's citywide GHG reduction goal, which is currently the most appropriate standard by which to analyze a project under CEQR. The *CEQR Technical Manual* recommends that any project resulting in 350,000 square feet of development, or more, and other energy-intense projects, quantify project-related GHG emissions and assess the project's consistency with the citywide GHG reduction goal.

The Proposed Action, which is expected to facilitate the construction of large new office buildings, would result in the total development of over 14,234,517 gross square feet (gsf), a GHG consistency assessment has been conducted. As such, GHG emissions that would be generated as a result of the Proposed Action are presented in this chapter, along with an assessment of the Proposed Action's consistency with the citywide GHG reduction goal.

Principal Conclusions

The Proposed Action is consistent with the applicable City GHG emissions reduction and climate change goals, and there would be no significant adverse GHG emission or climate change impacts as a result of the Proposed Action.

Following the methodology provided in the *CEQR Technical Manual*, it is estimated that the Proposed Action would annually result in approximately 133,556 metric tons of carbon dioxide equivalent (CO_2e) emissions from its operations and 92,494 metric tons of CO_2e emissions from mobile sources - for an annual total of approximately 226,050 metric tons of CO_2e emissions. This represents approximately 0.46 percent of the City's overall 2014 GHG emissions of 49.1 million metric tons.[1] It should also be

[1] Inventory of New York City Greenhouse Gas Emissions in 2014 (April 2016).

noted that, to assure a conservative analysis, the estimated GHG emissions for the Proposed Action do not account for any energy efficiency measures that may be implemented by individual developments on Projected Development Sites.

As compared to the City's overall GHG emissions, the contribution of the Proposed Action's GHG emissions is miniscule. Further, the new buildings associated with the Proposed Action would be located in a dense, transit-rich environment, and will be required to comply with the New York City Energy Conservation Code (NYCECC), which governs performance requirements of heating, ventilation, and air conditioning systems, as well as the exterior building envelope of new buildings. This locational advantage and performance requirements should contribute to reducing potential GHG emissions.

14.2 Pollutants of Concern

GHGs are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds. This property causes the general warming of the Earth's atmosphere, or the "greenhouse effect." Some GHGs, such as carbon dioxide (CO_2), occur naturally and are emitted into the atmosphere through natural processes and human activities. The *CEQR Technical Manual* lists six GHGs that could potentially be included in the scope of an environmental impact statement: CO_2, nitrous oxide (N_2O), methane, Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and Sulfur Hexafluoride (SF_6). These GHGs, which are emitted as a result of human activities are described below.

Carbon Dioxide (CO_2)

CO_2 enters the atmosphere via the combustion of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and also as a result of other chemical reactions (e.g., manufacture of cement). CO_2 is also removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle.

Methane (CH_4)

CH_4 is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices, as well as by the decay of organic waste in municipal solid waste landfills.

Nitrous Oxide (N_2O)

N_2O is emitted during agricultural and industrial activities, as well as during the combustion of fossil fuels and solid waste.

Fluorinated Gases

Hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride are powerful synthetic greenhouse gases that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for ozone-depleting substances (e.g., chlorofluorocarbons [CFCs],

hydrochlorofluorocarbons [HCFCs], and halons). These gases are typically emitted in smaller quantities. However, because they are potent greenhouse gases, they are sometimes referred to as High Global Warming Potential gases (High GWP gases).

This analysis is focused on CO_2, N_2O, and methane as there are no significant direct or indirect sources of HFCs, PFCs, or SF_6 associated with the Proposed Action.

GHGs differ in their ability to trap heat. To compare emissions of GHGs, compilers use a weighting factor called a Global Warming Potential (GWP), where the heat-trapping ability of 1 metric ton (1,000 kilograms) of CO_2 is taken as the standard, and emissions are expressed in terms of CO_2 equivalents (CO_2e), but can also be expressed in terms of carbon equivalents. The GWPs for the main GHGs are presented in Table 14.1.

Table 14.1: Global Warming Potential for Primary Greenhouse Gases

Greenhouse Gas	Common sources	Global Warming Potential
CO_2 - Carbon Dioxide	Fossil fuel combustion, forest clearing, cement production	1
CH_4 - Methane	Landfills, production and distribution of natural gas and petroleum, anaerobic digestion, rice cultivation, fossil fuel combustion	21
N_2O - Nitrous Oxide	Fossil fuel combustion, fertilizers, nylon production, manure	310
HFCs - Hydrofluorocarbons	Refrigeration gases, aluminum smelting, semiconductor manufacturing	140–11,700*
PFCs - Perfluorocarbons	Aluminum production, semiconductor manufacturing	6,500–9,200*
SF_6 - Sulfur Hexafluoride	Electrical transmissions and distribution systems, circuit breakers, magnesium production	23,900

Notes: Since the Second Assessment Report (SAR) was published in 1995, the Intergovernmental Panel on Climate Change (IPCC) has published updated GWP values in its Third Assessment Report (TAR) and Fourth Assessment Report (AR4) that reflect new information on atmospheric lifetimes of greenhouse gases and an improved calculation of the radiative forcing of CO_2. However, GWP values from the SAR are still used by international convention to maintain consistency in GHG reporting, including by the United States, when reporting under the United Nations Framework Convention on Climate Change.

* The GWPs of HFCs and PFCs vary depending on the specific compound emitted. A full list of these GWPs is available in Table ES-1 of the U.S. Environmental Protection Agency's *Inventory of Greenhouse Gas Emissions and Sinks: 1990-2008*, available at: http://epa.gov/climatechange/emissions/usinventoryreport.html.

14.3 Methodology

According to the *CEQR Technical Manual*, a GHG emissions assessment is typically conducted for larger projects undergoing an EIS, especially projects that would result in development of 350,000 square feet or greater. The Proposed Action is would result in a total development of over 14,234,517 gross square feet (gsf) of commercial and residential development at 16 Projected Development Sites spread throughout the 78-block proposed rezoning area.

A project's GHG emissions are generally assessed in two steps: the first would be to estimate the GHG emissions of the Proposed Action and the second would be to examine the action in terms of the qualitative goals for reducing GHG emissions. The *CEQR Technical Manual* recommends that the project's emissions be estimated with respect to the following main emissions sources: on-site operational emissions (direct and indirect); mobile source emissions (direct and indirect); and, when applicable, construction emissions and emissions from solid waste management. Pursuant to *CEQR Technical Manual* methodology, the assessment is based on the total GHG emissions associated with the Proposed Action, rather than the relative increment of the Proposed Action's GHG emissions as compared to the No-Action Condition.

Operational emissions and mobile source emissions were quantified for this analysis. Given the lack of specific construction sequences and data for the Projected Development Sites, emissions associated with construction of the Proposed Action have been described based on other similar analyses for large building construction. Also, because the project is not expected to fundamentally change the City's solid waste management system, no estimate of emissions from solid waste management is required.

14.4 Assessment

GHG Emissions

Operational Emissions

According to the *CEQR Technical Manual*, for projects such as a proposed rezoning action, where the action would result in construction on sites that are not under the control of an applicant and where details such as the specific fuel type to be used are unknown, annual GHG emissions should be estimated based on a project's built floor area. Table 18-5 of the *CEQR Technical Manual* provides the carbon intensities of New York City building types, which were used to calculate annual operations emissions of the Proposed Action's reasonable worst-case development scenario (RWCDS) projected developments.

The Proposed Action would result in a total development of 14,234,517 gross square feet (gsf), including 13,996,676 gsf of commercial (office and retail) space and 237,841 gsf of residential space.

Table 14.2: Operational Emissions

Building Type	Carbon Dioxide Equivalent (CO_2e) kilogram (kg) / square foot / year	Floor Area (square ft)	CO_2e (metric tons/year)
Commercial*	9.43	13,996,676	131,989
Large Residential	6.59	237,841	1,567
		TOTAL	**133,556**

Note:
* includes retail space per the RWCDS

Table 14.2 displays the estimated GHG emissions associated with the operation emissions of the Proposed Action for year 2036 once all development sites are assumed to be operational. As shown, operational GHG emissions are estimated to be approximately 133,556 metric tons of CO_2e. This represents approximately 0.27 percent of the City's overall GHG emissions in 2014, which, according to the most recent *Inventory of New York City Greenhouse Gas Emissions* from 2016 (utilizing 2014 data), is approximately 49.1 million metric tons.

Mobile Source Emissions

The number of annual weekday motorized vehicle trips by mode (cars, taxis, trucks) that would be generated by the Proposed Action was calculated using the transportation planning assumptions presented in Chapter 12, "Transportation," Table 12.4. The assumptions used in the calculation include average daily weekday and Saturday person trips and delivery trips by use, the percentage of vehicle trips by mode, and the average vehicle occupancy. The number of trips on Sundays was assumed to be

the same as on Saturdays. Average one-way trip distances as shown in Tables 18-6 and 18-7 of the *CEQR Technical Manual* were used in the calculations of annual vehicle miles traveled by cars and taxis. The average truck trip was assumed to be 38 miles as per the *CEQR Technical Manual*. It is assumed that all road types in the project area are arterials. The mobile GHG emissions calculator provided in the *CEQR Technical Manual* was used to obtain an estimate of car, taxi, and truck CO_2e emissions attributable to the Proposed Action.

The projected annual vehicle miles traveled under the RWCDS for the Proposed Action, forming the basis for the GHG emissions calculations from mobile sources, are summarized in Table 14.3. The annual mobile source emissions related to the Proposed Action is presented in Table 14.4. As shown in Table 14.4, the Proposed Action would result in approximately 92,494 metric tons of CO_2e, approximately 0.19 percent of the City's overall GHG emissions in 2014.

Table 14.3: Proposed Action (RWCDS) Annual Vehicle Miles Traveled (miles per year)

Land Use	Annual Auto VMT	Annual Taxi VMT	Annual Truck VMT	Total VMT
Office	12,356,982	1,082,256	41,623,224	55,062,462
Local Retail	1,610,820	1,139,400	1,581,408	4,331,628
Residential	120,132	21,636	75,696	217,464
Destination Retail	1,046,460	186,444	543,096	1,776,000
Total VMT	***15,134,394***	***2,429,736***	***43,823,424***	***61,387,554***

Table 14.4: Mobile Source Emissions

Carbon Dioxide Equivalent (CO_2e) Emissions (metric tons/year)				
Road type	**Passenger Vehicles**	**Taxis**	**Trucks**	**TOTAL**
Arterial	7,221	1,037	84,235	92,494

Construction Phase Emissions

A description of construction activities is provided in Chapter 18, "Construction." During construction, each building constructed pursuant to the Proposed Action will comply with the New York City Air Pollution Control Code. As per *CEQR Technical Manual* guidance, given the lack of specific construction sequences and data for the Projected Development Sites, emissions associated with construction of the Proposed Action have not been estimated explicitly. Other similar analyses for large building construction have shown that construction emissions (both direct and emissions embedded in the production of materials, including on-site construction equipment, delivery trucks, and upstream emissions from the production of steel, rebar, aluminum, and cement used for construction) would be equivalent to the total emissions from the operation of the buildings over approximately five to ten years. This would lead to a range of GHG emissions from 667,780 metric tons of CO_2e to 1,335,560 metric tons of CO_2e over the construction period.

Emissions from Solid Waste Management

The Proposed Action would not change the City's solid waste management system. Therefore, as per *CEQR Technical Manual* guidance, GHG emissions from solid waste generation, transportation, treatment, and disposal were not quantified.

Projected GHG Emissions from the Proposed Action

The total projected GHG emissions including operational and mobile source emissions from the projected developments under the Proposed Action are shown in Table 14-5 below. The estimated total of 226,050 metric tons of GHG emissions is approximately 0.46 percent of New York City's 2014 annual total of 49.1 million metric tons. As noted above, the estimated operational GHG emissions for the Proposed Actions conservatively do not include any additional energy efficiency measures that may be implemented by individual developments on Projected Development Sites. Construction emissions were not modeled explicitly, but are estimated to be equivalent to approximately five to ten years of operational emissions, including both direct energy and emissions embedded in materials (extraction, production, and transport). The Proposed Action is not expected to change the City's solid waste management system, and therefore emissions associated with solid waste are not presented.

Table 14.5: Total GHG Emissions

Emissions Source	CO2e Emissions (metric tons)
Operations	133,556
Mobile Sources	92,494
TOTAL	**226,050**

Consistency with the GHG Reduction Goal

According to the *CEQR Technical Manual*, the assessment of consistency with the City GHG reduction goal should answer the following question: Is the project consistent with the goal of reducing GHG emissions, specifically the attainment of the City's established GHG reduction goal of reducing citywide GHG emissions by 80 percent below 2005 levels by 2050. Four major goals are cited in the *CEQR Technical Manual*, as follows:

- Pursue transit-oriented development;
- Generate clean, renewable power through replacement of inefficient power plants with state-of-the-art technology and expanding the use of clean distributed generation; (not applicable in case of the Proposed Action);
- Construct new resource- and energy-efficient buildings (including the use of sustainable construction materials and practices) and improve the efficiency of existing buildings (applies only to new construction for the Proposed Action); and
- Encourage sustainable transportation through improving public transit, improving the efficiency of private vehicles, and decreasing the carbon intensity of fuels.

The Proposed Action shows consistency with these goals in that:

- The proposed rezoning area is very well served by public transportation, containing three subway stations/complexes and Grand Central Terminal, which provides commuter rail services. In addition, 15 local bus routes and 65 express bus routes also service the proposed rezoning area. The East Side Access project (completion anticipated by 2022) and the Second Avenue Subway (Phase I expected to be operational by the end of 2016) will render East Midtown even more transit-supported, and placing density where transit is readily available and where it will be expanded is a purpose of the Proposed Action. Reinforcing the economic competitiveness of the East Midtown business district supports transit-oriented development not only in New York City but throughout the region.
- The Pre-Identified Transit Improvements provided by the Metropolitan Transportation Authority-New York City Transit which are part of the Concept Plan of above-and below grade improvements would be funded by a surcharge on transfers of development rights that would occur with the Proposed Action would facilitate improvements in public transit facilities serving the East Midtown area. Refer to Chapter 1.0, "Project Description."
- The new buildings, which would replace existing structures, are subject to the New York City Energy Conservation Code (NYCECC), which comprises the 2010 Energy Conservation Construction Codes of New York State (ECCCNYS) in addition to a series of local laws. The NYCECC governs performance requirements of heating, ventilation, and air conditioning systems, as well as the exterior building envelope of new buildings. In compliance with this code, new development must meet standards for energy efficiency. In addition, using guidance provided by the Mayor's Office of Sustainability, it is intended that qualifying sites under the Proposed Action would be required to either utilize a district steam system for building heating and hot water system, or alternatively, would be designed such that the core and shell exceed the standards of the chosen commercial building energy-efficiency compliance path within the NYCECC, by three percent.
- The Proposed Action would neither substantially involve energy-intensive uses such as data centers or web hosting facilities, nor would it remove a source of energy generation. For these reasons, the Proposed Action would not result in a significant adverse impact on energy systems.
- The type of buildings anticipated as a result of the Proposed Action (e.g., new Class A office buildings) commonly adheres to LEED or other high standards for environmental performance. In addition, according to the guidance cited above, the Proposed Action is expected to include requirements for qualifying development sites, for use of a district steam system for building heating and hot water system, or, design incorporating a core and shell exceeding the standards of the chosen commercial building energy-efficiency compliance path within the NYCECC, by three percent.

Compared to the City's policies and goals to promote GHG reduction, as set forth in the *CEQR Technical Manual*, the Proposed Action comports with the goals and is consistent with them.