7 GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

7.1 Introduction

As noted in the 2020 *City Environmental Quality Review (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.

Through PlaNYC, New York City's long-term sustainability program, and enhanced by OneNYC 2050, the City advances sustainability initiatives and goals to both greatly reduce GHG emissions and increase the City's resilience to climate change. 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 greenhouse gas reductions. Subsequently, the City committed to an 80 percent reduction in greenhouse gases in by the year 2050 ("80 x 50"). On November 13, 2014, the City Council passed a bill to reduce citywide greenhouse gas emissions by 80 percent by 2050 (INT. 378) and was codified as Local Law 66 of 2014 on December 14, 2014. In April 2019, OneNYC 2050 was published as an update to OneNYC, and committed to citywide carbon neutrality by 2050.

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. However, certain projects' contribution of GHG emissions still should be analyzed to determine their consistency with the City's GHG reduction goal, which is currently the most appropriate standard to analyze a project under CEQR. The GHG consistency assessment focuses on those projects that have the greatest potential to produce GHG emissions that may result in inconsistencies with the GHG reduction goal to a degree considered significant. The *CEQR Technical Manual* recommends that a GHG consistency assessment be conducted for

any project resulting in 350,000 square feet (sf) or more of development where an environmental impact statement (EIS) is required, and for other energy-intensive projects.

The Proposed Actions require the preparation of a Targeted EIS and would facilitate the construction of four new mixed-use buildings totaling 930,886 sf and comprising of residential, commercial, and accessory parking uses across two projected development sites.[1] Therefore, a GHG consistency assessment is warranted. GHG emissions that would be generated as a result of the Proposed Actions are presented in this chapter, along with an assessment of the Proposed Actions' consistency with the citywide GHG reduction goal.

7.2 Principal Conclusions

The RWCDS established for the Proposed Actions would generate approximately 3,802 total metric tons carbon dioxide equivalent (CO_2e) of annual emissions from building operations, and 10,479 metric tons of CO_2e emissions from mobile sources annually, for an annual total of approximately 14,281 metric tons of CO_2e emissions. This represents a worst-case scenario, and would be less than 0.028 percent of the City's overall 2017 GHG emissions of approximately 51.0 million metric tons (the latest available data). Based on the assumption construction-generated GHG emissions would be equivalent to between five and ten years' worth of operational GHG emissions, the estimated construction-generated GHG emissions would be between 71,405 and 142,810 metric tons of CO_2e over the course of project-generated construction.

The Proposed Actions would advance New York City's GHG reduction goals because the Project Area is in a downtown urban area with access to a variety of transit options and within walking distance of ferry, bus, and rail connections available at St. George Terminal. Development facilitated by the Proposed Actions would be required to comply with local laws intended to reduce the GHG emissions such as Local Law 22 of 2008 (known as the New York City Climate Protection Act), Local Law 66 of 2014 ("80 x 50"), and Local Law 97 of 2019. The new buildings would be subject to the New York City Energy Conservation Code (NYCECC), which was updated in 2020 to be one of the highest energy efficient standards nationwide for sustainability and efficiency. The NYCEEC governs performance requirements for heating, ventilation, air conditioning systems, and exterior building envelope; the proposed buildings would be constructed in compliance with this code. The Proposed Project would therefore comply with the City's emissions reduction goals of transit-oriented development and the construction of new resource- and energy-efficient buildings.

The Project Area is entirely outside the existing 100- and 500-year flood zones, and therefore is not susceptible to storm surge and coastal flooding. The Project Area is also outside the future 100- and 500-year projected flood zones developed by the New York City Panel on Climate Change (NPCC) through the year 2100. The Proposed Actions would be consistent with the New York City policies regarding adaptation to climate change because the Project Area is in an area of minimal flood risk.

7.3 Methodology

New York City determined that consideration of GHG emissions is appropriate under CEQR for at least certain projects for several reasons: (a) greenhouse gas emission levels may be directly

[1] Pursuant to CEQR, the GHG assessment is based on total GHG emissions associated with a project, rather than the relative increment of a project's GHG emissions as compared to the No-Action scenario.

affected by a project's effect on energy use; (b) the U.S. Supreme Court has upheld the determination that carbon dioxide, one of the main greenhouse gases, is an air pollutant, subject to regulation as defined by the Clean Air Act; and (c) Local Law 22 of 2008 codified PlaNYC's citywide GHG emissions reduction goal of 30 percent below 2005 levels by 2030; (d) Local Law 66 of 2014 codified the City's longer-term goal to reduce GHG emissions to 80 percent below 2005 levels by 2050, and has published a study evaluating the potential for achieving that goal. In accordance with the *CEQR Technical Manual*, the GHG consistency assessment focuses on Proposed Actions that would result in development of 350,000 sf or greater and other energy-intense projects. The Proposed Actions are projected to result in approximately 930,886 sf of mixed-use residential and commercial development across two development sites.

A project's GHG emissions can generally be assessed in two steps: first, the GHG emissions resulting from the Proposed Actions are estimated, and second step would be to examine the Proposed Actions in terms of the qualitative goals for reducing GHG emissions as defined in the *CEQR Technical Manual*. A project's emissions are estimated using the main emissions sources: on-site operational emissions (direct and indirect); mobile source emissions (direct and indirect); and, when applicable, construction emissions or emissions from solid waste management. After the emissions are estimated, the source of GHG emissions are examined in terms of goals for reducing GHG emissions using qualitative considerations. As defined in the *CEQR Technical Manual*, the qualitative goals that should be assessed, as relevant to the Proposed Actions are: (1) pursuing transit-oriented development; (2) generating clean, renewable power; (3) constructing new resource- and energy-efficient buildings and/or improving the efficiency of existing buildings; and (4) encouraging sustainable transportation.

Recognized Greenhouse Gases

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, occur naturally and are emitted into the atmosphere through natural processes and human activities. The principal GHGs emissions of concern resulting from human activities are described below.

Carbon Dioxide (CO_2)

Carbon dioxide (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. Although not the GHG with the strongest effect per molecule, CO_2 is by far the most abundant and, therefore, the most influential GHG.

Methane (CH_4)

Methane (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. Methane, in addition to nitrous oxide (noted below), play an important role since the removal processes for these compounds are limited and they have a relatively high impact on global climate change as compared to an equal quantity of CO_2.

Nitrous Oxide (N_2O)

Nitrous oxide (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).

Global Warming Potential

The *CEQR Technical Manual* lists six GHGs that could potentially be included in the scope of an environmental review: CO_2, N_2O, Methane, Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and Sulfur Hexafluoride (SF_6). This analysis 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 Actions. 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 one metric ton (1,000 kilograms (kg)) of CO_2 is taken as the standard, and emissions are expressed in terms of CO_2e, but can also be expressed in terms of carbon equivalents. The GWPs for the main GHGs are presented in Table 7-1.

Table 7-1: Global Warming Potential for Primary Greenhouse Gases

Greenhouse Gas	Common Sources	Warming Potential
CO_2	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
HFC's – Hydro-fluorocarbons	Refrigeration gases, aluminum smelting, semiconductor manufacturing	140-11,700[1]
PFC's - Perfluorocarbons	Aluminum production, semiconductor manufacturing	6,500-9,200[2]
SF_6 - Sulfur Hexafluoride	Electrical transmissions and distribution systems, circuit breakers, magnesium production	23,900

[1, 2] The GWPs of HFCs and PFCs vary depending on the specific compound emitted. A full list of these GWPs is available at https://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html.

Notes**:** Since the Second Assessment Report (SAR) was published in 1995, the International Panel on Climate Change (IPCC) has published updated GWP values in its Fifth Assessment Report (AR5) 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.

Applicable Regulations

Local Law 22 of 2008

In 2008, Local Law 22 – known as the New York City Climate Protection Act (the "GHG reduction goal") – codified the City's goal to reduce citywide GHG emissions to 30 percent below 2005 levels by 2030 ("30 x 30"). This goal was developed to plan for an increase in population of almost one million residents while achieving significant greenhouse gas reductions.

Local Law 66 of 2014

In 2014, the City Council passed Local Law 66, a bill that committed the City to reduce citywide greenhouse gas emissions by 80 percent below 2005 levels by 2050. It is known as "80 x 50". The law also set forth an interim target to reduce GHG emissions 40 percent by 2030 (known as "40 x 30").

Local Law 97 of 2019

Local Law 97 reflects the city's aim to reduce overall emissions by 80% by 2050. Under Local Law 97, buildings over 25,000 gross square feet must meet annual whole-building carbon intensity limits based on building type beginning in 2024. To comply, building owners must submit an emissions intensity report stamped by a registered design professional every year starting in 2025. For buildings that do not comply with the emissions targets, building owners must pay fines of $268 per metric ton that the building's carbon footprint exceeds the limit. The law, which applies citywide, incentivizes reduction in GHG emissions.

New York City Energy Conservation Code (NYCECC)

The NYCECC is one of the Construction Codes that protects public health, safety, general welfare, and the environment by establishing minimum standards for the design, construction, and occupancy of buildings. The energy code regulates building systems that most impact energy use: the envelope, heating and cooling, hot water, lighting and power. The code specifies requirements for each system to ensure a baseline of efficiency is built in. The NYCECC continues to ensure that the construction of new buildings, additions and alterations will meet the 80% greenhouse gas reduction by 2050.

7.4 Assessment

Greenhouse Gas Emissions Sources

Operational, mobile source, and construction emissions were considered for this analysis. Pursuant to *CEQR Technical Manual* methodology, the assessment is based on the total GHG emissions associated with the With-Action Condition (including construction), rather than the relative increment of the Proposed Actions' GHG emissions when compared to the No-Action Condition. The Proposed Actions are not expected to fundamentally change the City's solid waste management system; therefore, an estimate of emissions from solid waste management is not warranted.

Building 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 anticipated future floor area. The Proposed Actions would result in development on one site controlled by the applicant (Projected Development Site 1) and one site that is not controlled by the applicant (Projected Development Site 2). Table 18-5 of the *CEQR Technical Manual* provides the carbon intensities of New York City building types, which were used to estimate annual operations emissions resulting from the Proposed Actions. The Applicant intends to develop a building that would use electricity as the primary energy source. While the energy source for the Projected Development Site 2 remains unknown, this assessment assumes it would also use electricity as the primary energy source because Local Law 97 and the recent updates to the NYCECC highly disincentivize the use of fossil fuels to power building operations.

Mobile Source Emissions

The number of annual weekday vehicle trips by mode (cars, taxis, and trucks) that would be generated by the Proposed Actions was calculated using the transportation planning assumptions developed for the traffic analysis and presented in Chapter 5"Transportation." 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. To calculate annual totals, 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*. Table 18-8 of the *CEQR Technical Manual* was used to determine the percentage of vehicle miles traveled by road type.

The projected daily and annual vehicle miles traveled under the RWCDS for the Proposed Actions, forming the basis for the GHG emissions calculations from mobile sources, are summarized in Table 7-2 and Table 7-3. The mobile GHG emissions calculator was used to obtain an estimate of car, taxi, and truck GHG emissions attributable to the Proposed Actions.

Table 7-2: Daily Trips (Including Off-Peak) by Mode

	Passenger Vehicles	Taxi	Truck
Residential Use			
Weekday Daily Trips	2,232	14	54
Saturday Daily Trips	2,653	17	18
Retail Use			
Weekday Daily Trips	235	123	10
Saturday Daily Trips	276	144	1

Table 7-3: With-Action Condition – Annual Miles Traveled (miles per year)

Use	Passenger Vehicles	Taxis	Trucks	Total
Residential	5,746,208	32,448	604,656	6,383,312
Retail	359,216	281,736	102,752	743,704
Total	**6,105,424**	**314,184**	**707,408**	**7,127,016**

Construction Emissions

Consistent with CEQR practice, emissions associated with project-generated construction have not been estimated explicitly for the Proposed Actions, but analyses prepared for other development projects in New York City 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 operational emissions from the operation of the buildings over approximately five to ten years.

Emissions from Solid Waste Management

The Proposed Actions would not modify the City's solid waste management system. Therefore, pursuant to *CEQR Technical Manual* guidelines, GHG emissions from solid waste generation, transportation, treatment, and disposal are not quantified.

Climate Change

According to the *CEQR Technical Manual*, depending on a project's sensitivity, location, and useful life, it may be appropriate to provide a qualitative discussion of the potential effects of climate change on a proposed project in environmental review. Rising sea levels and increases in storm surge and coastal flooding are the most immediate threats in New York City for which site-specific conditions can be assessed, and an analysis of climate change may be deemed warranted for projects at sites located within the existing 100- or 500-year flood zone.

Based on the Federal Emergency Management Agency (FEMA) Preliminary Flood Insurance Rate Maps (FIRMs) issued in 2015 and NPCC projected sea level rises, the Project Area is not within the 100- and 500-year flood zones, and is not within the NPCC 100-and 500-year projections for the 2020s through 2100. Additionally, the Project Area is outside of the City's Coastal Zone Boundary and did not warrant an assessment under the Waterfront Revitalization Program (WRP). Therefore, the Project Area is not susceptible to storm surge and coastal flooding, and an assessment of climate change is not warranted.

7.5 Projected GHG Emissions from the Proposed Actions

Operational Emissions

Table 7-4 displays the estimated GHG emissions associated with the operational emissions resulting from the Proposed Actions under the RWCDS. While the Applicant intends to use electricity as the energy source for Projected Development Site 1, it is reasonable to assume electricity would also be the energy source at Projected Development Site 2 because of recent changes to the NYCECC. As shown in the table, operational GHG emissions are estimated to be approximately 3,802 metric tons of CO_2e. This represents less than 0.007 percent of the City's overall 2017 GHG emissions of approximately 51.0 million metric tons.[2]

Table 7-4: Project-Generated Annual Operational Emissions

RWCDS Energy Use (MMBTUs/Year)	Energy Source – Electricity (kg CO_2e/MMBtu)	GHG Emissions (kg)	GHG Emissions (metric tons)
105,888	35.902	3,801,602	**3,802**

[2] City of New York Inventory of New York City's Greenhouse Gas Emissions 2017, Mayor's Office of Sustainability, New York, 2017 https://nyc-ghg-inventory.cusp.nyu.edu/.

Mobile Source Emissions

The number of annual weekday motorized vehicle trips by mode (cars, taxis and trucks) that would be generated by the under the Proposed Actions was calculated using the transportation planning assumptions developed for the traffic analysis and presented in Chapter 5, "Transportation." The assumptions used in the calculation include average daily weekday and Saturday person trips and delivery trips by proposed use, the percentage of vehicle trips by mode, and the average vehicle occupancy. To calculate annual totals, the number of trips on Sundays was assumed to be the same as on Saturdays. As presented in Table 7-3, the vehicle trips generated by the Projected Actions would travel an estimated total of 7,127,016 miles annually; annual passenger vehicle miles would total 6,105,424, annual taxi vehicle miles would total 314,184, and annual truck trip miles would total 707,408.

The mobile GHG emissions calculator provided in the *CEQR Technical Manual* was used to obtain an estimate of car, taxi, and truck GHG emissions attributable to the Proposed Actions. Table 7-5 shows annual mobile source emissions related to the Proposed Actions would result in an estimated 10,479 metric tons ofCO_2e.

Table 7-5: Annual Mobile Source Emissions (CO_2e – metric tons/year)

Road Type	Passenger Vehicles	Taxis	Trucks	Total
Local	2,726.98	126.03	1,383.25	4,236.25
Arterial	2,407.50	110.88	1,158.01	3,676.38
Interstate/Expressway	1,700.27	76.97	789.42	2,566.66
Total	**6,834.75**	**313.88**	**3,330.68**	**10,479.30**

The estimated project-generated GHG emissions are shown in Table 7-6. The estimated total of 14,281 metric tons of GHG emissions is comprised of 3,802 metric tons of CO_2e from operational emissions and 10,479 metric tons of CO_2e from mobile source emissions, which is approximately 0.028 percent of New York City's 2017 annual total of 51.0 million metric tons.

Table 7-6: Summary of Annual GHG Emissions Resulting from Proposed Actions

Emissions Source	CO_2e Emissions (metric tons)
Operations	3,802
Mobile Sources	10,479
Total	**14,281**

Construction Emissions

Construction-generated GHG emissions were not modeled explicitly for this project, 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). For this project – which would generate a CO_2e of 14,281 metric tons annually during its operational period – the estimated construction-generated GHG emissions would equate to between 71,405 and 142,810 metric tons of CO_2e over the course of construction.

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 30 percent below 2005 levels by 2030?" To determine consistency with the City's overall GHG reduction goal, the four major goals as cited in the *CEQR Technical Manual* are used to assess a project:

- 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 the case of this Proposed Actions);
- Construct new resource- and energy-efficient buildings (including the use of sustainable construction materials and practices) and improve the efficiency of existing buildings; and
- Encourage sustainable transportation through improving public transit, improving the efficiency of private vehicles, and decreasing the carbon intensity of fuels.

The Proposed Actions show consistency with these goals in that:

- The Project Area is well served by public transportation being close to the Staten Island Ferry, the MTA Staten Island Railway, and local bus routes. St. George is an urban mixed-use neighborhood, and the Proposed Actions would facilitate targeted infill development in an area with access to variety of transit options to destinations throughout Staten Island and Manhattan, with onward transit connections available to more distant destinations such as Midtown Manhattan and Long Island;
- The Proposed Actions would increase density along Richmond Terrace and Stuyvesant Place with mixed-use development, while also improving the pedestrian realm with active streetscape. New retail development would support the proposed and existing nearby residential population while also providing new local employment opportunities accessible by transit. By collocating retail and residential uses, trips could also be linked, thereby reducing localized dependence on vehicle travel for retail needs;
- The Proposed Actions connect to existing urban infrastructure and would redevelop vacant sites in a downtown urban area. The buildings facilitated by the Proposed Actions would be constructed with modern construction materials typical of other recent construction projects in New York City;
- The new buildings facilitated by the Proposed Actions would be subject to the NYCECC, which are among the nation's highest standards of sustainability and efficiency, 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 resulting from the Proposed Actions must meet standards for energy efficiency;
- During construction of Projected Development Site 1 – the Applicant's site – the Applicant would employ a range measures to reduce air quality emissions, including of GHGs. Such measures would include a requirement that diesel engines with capacity greater than 50 horsepower use diesel particulate filters, that on-site idling be restricted, and, where practicable, the use of:
  - ultra-low sulfur diesel fuel;
  - equipment that meets or exceeds US Environmental Protection Agency (EPA) Tier 3 standards; and
  - Best Available Tailpipe (BAT) Reduction Technologies;

- The new buildings facilitated by the Proposed Actions would also be required to comply with GHG-reduction measures required by local laws, such as Local Law 22 of 2008, Local Law 66 of 2014, and Local Law 97 of 2019;
- Portions of the development sites would be restored with green roofs and native plantings, which would capture and sequester CO_2 through photosynthesis; and
- The Proposed Actions would not involve energy-intensive uses such as data centers or web hosting facilities, nor would they remove a source of energy generation. For these reasons, the Proposed Actions would not result in a significant adverse impact on energy systems. The Proposed Actions also do not have the potential to affect the city's waste management system.