11

Greenhouse Gas Emissions and Climate Change

This section describes the potential impact of the Proposed Action on greenhouse gas (GHG) emissions and considers whether the Proposed Action is consistent with the Citywide GHG emissions reduction goals.

Introduction

As discussed in the *2020 CEQR Technical Manual*, increased concentrations of greenhouse gases change the global climate and result 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. In 2014, the City Council passed a bill to reduce citywide greenhouse gas emissions by 80 percent by 2050 (Local Law 66 of 2014). New York Climate Mobilization Act, Local Law 97 of 2019, the most recent legislation, is the most aggressive climate legislation to date. It requires buildings larger than 25,000 square feet to meet strict GHG emission limits starting in 2024. Buildings are the largest source of greenhouse gas emissions, representing nearly 70 percent of New York City's total emissions. Focusing on the city's largest buildings will promote energy efficiency and renewable energy and discourage reliance on fossil fuels. The GHG emission reduction goal for NYC buildings is 40% by 2030 and 80% by 2050, compared to 2005.

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 by which to analyze a project under CEQR. The GHG consistency assessment focuses on those projects that have the greatest potential to produce GHG emissions and evaluates their potential to result in significant inconsistencies with the GHG reduction goal.

The Proposed Action would facilitate redevelopment of the Project Site with a commercial office building of approximately 925,630 gross square feet (gsf). The Proposed Project is located outside of the areas vulnerable to flooding—marked as Special Flood Hazard Areas (prone to flooding by 1% annual chance of storm) or 500-year flood plain (prone to flooding from 0.2% annual chance of storm)—as defined by Federal Emergency Management Agency (FEMA). Therefore, no storm surge or coastal flooding assessment was conducted for this project.

Principal Conclusions

The Proposed Action would be 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 result in approximately 3,829 metric tons of carbon dioxide equivalent (CO_2e) emissions from its annual operations and 429 metric tons a year of CO_2e emissions from mobile sources annually; accordingly, the Proposed Action would result in an annual total of approximately 4,258 metric tons of CO_2e emissions. This represents less than 0.01 percent of the City's overall 2017 GHG emissions of 50.7 million metric tons, an insignificant contribution.

The Proposed Project would comply with the 2020 Energy Conservation Construction Code of New York State and 2020 New York City Energy Conservation Code, which govern performance requirements of heating, ventilation, and air conditioning systems, as well as the exterior building envelope of new buildings. As a result, the Proposed Project would generate emissions below the City's Climate Mobilization Act (Local Law 97) requirements and would contribute towards the NYC GHG reduction goals. The Proposed Project would be located next to Grand Central Terminal (GCT), avoiding demand for vehicular travel. In addition, this transit-oriented development would incorporate measures to encourage the use of public transportation, would include an additional entrance to the LIRR East Side Access concourse, measures to improve passenger circulation at Grand Central – 42nd Street Subway Station and would advance New York City's GHG reduction goals by virtue of their nature and location.

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 both naturally and are emitted into the atmosphere through human activities. The *CEQR Technical Manual* lists six GHGs that could potentially be included in the scope of an environmental impact assessment: CO_2, nitrous oxide (N_2O), methane (CH_4), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and Sulfur Hexafluoride (SF_6).

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 GHGs which are emitted as a result of human activities and their GWPs are presented in **Table 11-1**.

Table 11-1 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

- 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. 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). 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), plays an important role in GHG emissions 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 as reflected in their high global warming potential.

- 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 focuses on CO_2, N_2O, and CH_4 (collectively as CO_2e) as there are no significant direct or indirect sources of HFCs, PFCs, or SF_6 associated with the Proposed Action.

Because of the growing consensus that GHG emissions resulting from human activity have the potential to profoundly impact the Earth's climate, countries around the world have undertaken efforts to reduce emissions by implementing both global and local measures that address energy consumption and production, land use, and other areas. Although the U.S. has not ratified the international agreements that set emissions targets for GHGs, in December 2015, the U.S. signed the international Paris Agreement[1], which pledged deep cuts in emissions and has a stated goal of reducing annual emissions to a level that, by 2025, would be between 26 and 28 percent lower than 2005 emissions.[2] The United States withdrew from the Paris Climate Accord in 2020 and subsequently rejoined in February 2021.

Regardless of the Paris Agreement, the U.S. Environmental Protection Agency (EPA) is required to regulate GHGs under the Clean Air Act and has begun preparing and implementing regulations. In coordination with the National Highway Traffic Safety Administration (NHTSA), EPA currently regulates GHG emissions from newly manufactured on-road vehicles. In addition, EPA regulates transportation fuels via the Renewable Fuel Standard program, which will phase in a requirement for the inclusion of renewable fuels, increasing annually up to 36.0 billion gallons in 2022. In 2015, EPA also finalized rules to address GHG emissions from both new and existing power plants that would, for the first time, set national limits on the amount of carbon pollution that power plants can emit. The Clean Power Plan sets carbon pollution emissions guidelines and performance standards for existing, new, and modified and reconstructed electric utility generating units. On February 9, 2016, the Supreme Court stayed implementation of the Clean Power Plan pending judicial review. On March 28, 2017, the President of the U.S. signed an executive order directing the EPA to review the Clean Power Plan, and, in May 2019, the EPA administrator announced plans to change the way the EPA calculates health risks of air pollution, known as the Affordable Clean Energy Rule.

There are also regional and local efforts to reduce GHG emissions. In 2009, Governor Paterson issued Executive Order No. 24, establishing a goal of reducing GHG emissions in New York State by 80 percent, compared with 1990 levels, by 2050, and creating a Climate Action Council tasked with preparing a climate action plan outlining the policies required to attain the GHG reduction goal; an interim draft plan has been published.[3] The State is now seeking to achieve some of the emission reduction goals via local and regional planning and

[1] Conference of the Parties, 21st Session. *Adoption of The Paris Agreement, decision -/CP.21*. Paris, December 12, 2015.

[2] Unites States of America. *Intended Nationally Determined Contributions (INDCs)* as submitted. March 31, 2015.

[3] New York State Climate Action Council. New York State Climate Action Plan Interim Report. November 2010.

projects and though its Cleaner Greener Communities and Climate Smart Communities programs. The State also has adopted California's GHG vehicle standards (which are at least as strict as the federal standards).

The New York State Energy Plan outlines the State's energy goals and provides strategies and recommendations for meeting them. The latest version of the plan was published in June 2015. The new plan outlines a vision for transforming the state's energy sector that would result in increased energy efficiency (both demand and supply), increased carbon-free power production, and cleaner transportation in addition to achieving other goals not related to GHG emissions. The 2015 plan also establishes new targets: (1) reducing GHG emissions in New York State by 40 percent, compared with 1990 levels, by 2030; (2) providing 50 percent of electricity generation in the state from renewable sources by 2030; and (3) increasing building energy efficiency gains by 600 trillion British thermal units (Btu) by 2030.

To meet its commitment to the Regional Greenhouse Gas Initiative (RGGI), New York State has also developed regulations to cap and reduce CO_2 emissions from power plants. Under the RGGI agreement, the governors of nine northeastern and Mid-Atlantic states have committed to regulate the amount of CO_2 that power plants are allowed to emit, gradually reducing annual emissions to half the 2009 levels by 2020. The RGGI states and Pennsylvania have also announced plans to reduce GHG emissions from transportation, through the use of biofuel, alternative fuel, and efficient vehicles.

Many local governments worldwide, including New York City, are participating in the Cities for Climate Protection™ campaign and have committed to adopting policies and implementing quantifiable measures to reduce local GHG emissions, improve air quality, and enhance urban livability and sustainability. New York City's long-term comprehensive plan for a sustainable and resilient New York City, which began as PlaNYC 2030 in 2007, and continues to evolve today as OneNYC, includes GHG emissions reduction goals, many specific initiatives that can result in emission reductions, and initiatives aimed at adapting to future climate change impacts. The goal to reduce citywide GHG emissions to 30 percent below 2005 levels by 2030 ("30 by 30") was codified by Local Law 22 of 2008, known as the New York City Climate Protection Act (the "GHG reduction goal").[4] The City also has announced a longer-term goal of reducing emissions to 80 percent below 2005 levels by 2050 ("80 by 50"), which was codified by Local Law 66 of 2014, and has published a study evaluating the potential for achieving that goal. More recently, as part of OneNYC, the City has announced a more aggressive goal for reducing emissions from building energy down to 30 percent below 2005 levels by 2025.

In December 2009, the New York City Council enacted four laws addressing energy efficiency in large new and existing buildings, in accordance with PlaNYC. The laws require owners of existing buildings larger than 50,000 square feet to conduct energy efficiency audits and retro-commissioning every 10 years, to optimize building energy efficiency, and to "benchmark" the building energy and water consumption annually, using an EPA online tool. By 2025, commercial buildings over 50,000 square feet also will require lighting upgrades, including the installation of sensors and controls, more efficient light fixtures, and the installation of submeters, so that tenants can be provided with information on their electricity consumption. The legislation also creates a local New York City Energy

[4] Administrative Code of the City of New York, §24-803.

Conservation Code, which along with the Energy Conservation Construction Code of New York State (as updated in 2016), requires equipment installed during a renovation to meet current efficiency standards.

To achieve the 80 by 50 goal, the City is convening Technical Working Groups to analyze the GHG reduction pathways from the building, power, transportation, and solid waste sectors to develop action plans for these sectors. The members of the Technical Working Groups will develop and recommend the data analysis, interim metrics and indicators, voluntary actions, and potential mandates to effectively achieve the City's emissions reduction goal. In 2016, the City published the building sector Technical Working Group report, which included commitments by the City to change building energy codes and take other measures aimed at substantially reducing GHG emissions.

For certain projects subject to CEQR (e.g., projects with 350,000 gsf or more of development or other energy intense projects), an analysis of the projects' contributions to GHG emissions is required to determine consistency with the City's reduction goal, which is currently the most appropriate standard by which to analyze a project under CEQR, and is therefore applied in this chapter.

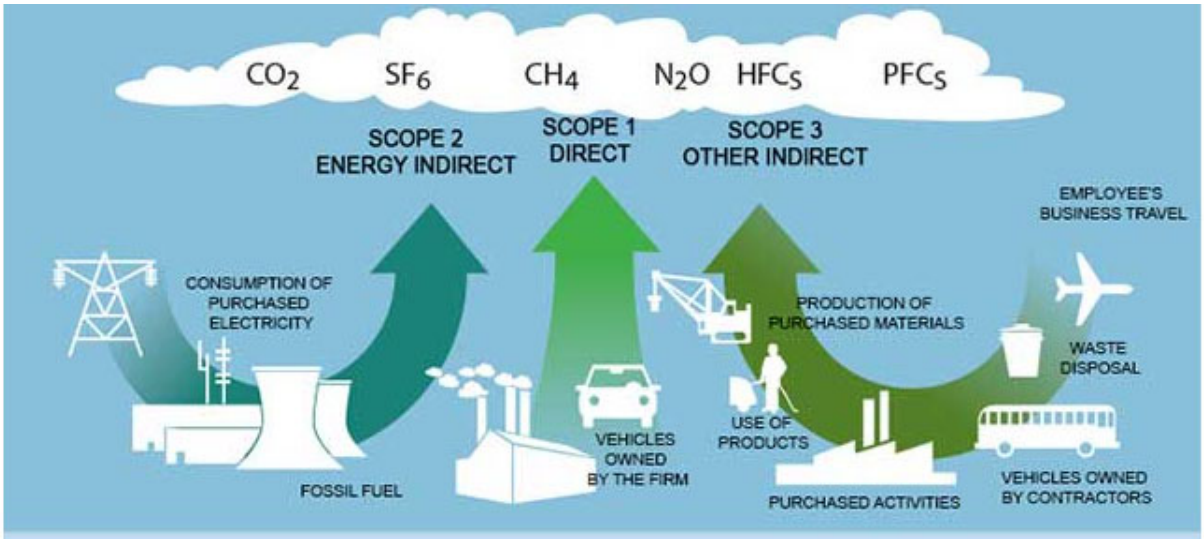
A number of benchmarks for energy efficiency and green building design have also been developed. For example, the LEED system is a benchmark for the design, construction, and operation of high-performance green buildings that includes energy efficiency components. EPA's Energy Star is a voluntary labeling program designed to identify and promote the construction of new energy efficient buildings, facilities, and homes and the purchase of energy efficient appliances, heating and cooling systems, office equipment, lighting, home electronics, and building envelopes.

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 would result in development of a 925,630-gsf commercial office building.

GHG emissions are generally divided into three types, three scopes, as illustrated in **Figure 11-1**.

Figure 11-1 Three Scopes of GHG Emissions



Scope 1, or direct emissions, are emissions resulting from the fossil fuel combustion by the proposed building or by vehicles owned or operated by the proposed building. Emissions from heating, ventilation and air conditioning (HVAC) systems are the most typical source of GHG emissions for new building projects in New York City. Scope 2, or indirect emissions, are emissions from the generation of purchased electricity used by the building. Scope 3 are all other GHG emissions, including emissions from the vehicular trips generated by the proposed building, like employees' commute.

A project's GHG emissions under CEQR are assessed in two steps: first, GHG emissions of the proposed action are estimated, and second, the proposed action is assessed in comparison with the City 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 GHG emissions associated with the Proposed Action.

Operational and mobile source emissions were quantified for this analysis. Emissions associated with construction are described qualitatively. The Proposed Project is not expected to fundamentally change the City's solid waste management system, therefore, no estimate of emissions from solid waste management is warranted.

Assessment

Direct GHG Emissions

Operational GHG emissions would be generated by the Proposed Project's HVAC systems. The Proposed Project is not planning to own or operate any vehicles. The Proposed Project plans to use a dedicated outdoor air system (DOAS) HVAC type, with a low energy use intensity and a high energy performance standard. The proposed system would score at the rate of 84 in the 1-to-100 EPA's Energy Star performance scorecard. Direct emissions from

the operation of the natural gas-fired boilers of HVAC systems in the Proposed Project would result in a total of 2,437 metric ton of CO_2e annually as shown in **Table 11-2**.

Table 11-2 GHG Emissions from Natural Gas-Fired HVAC Systems

		Unit
HVAC Energy Use Intensity	49.5	kBtu/gsf
***2020 CEQR TM* CO_2e Carbon Conversion Factor**	53.196	kg CO_2e/MMBtu
HVAC CO_2e	2,437,371	kg CO_2e
	2,437	MT CO_2e

Indirect GHG Emissions

Indirect GHG emissions would be generated to produce electricity for the Proposed Project. Electricity consumption is consistent with a DOAS HVAC systems. Estimates of the GHG emissions from the electricity are presented in **Table 11-3**. A total of 1,391 metric tons of CO_2e per year would be generated to satisfy the Proposed Project's annual consumption.

Table 11-3 GHG Emissions from Electricity Generation

		Unit
Building Electricity Use Intensity	12.28	kWhr/gsf
***2020 CEQR TM* CO_2e Carbon Conversion Factor**	35.902	kg CO_2e/MMBtu
Electricity CO_2e	1,391,382	kg CO_2e
	1,391	MT CO_2e

Mobile Source Emissions

The number of annual 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 9, Transportation**. The Proposed Project is located in Midtown Manhattan close to the Grand Central Terminal and several subway and bus stops. Because of the proximity of transit, the Proposed Project would generate very few vehicular trips. The number of project-generated trips by autos, taxis and trucks was obtained from the transportation analysis. Annual VMT was estimated based on the weekday trips and the average one-way distances as shown in Table 18-6 and Table 18-7 of the *CEQR Technical Manual*. The average truck trip was assumed to be 38 miles as per the *CEQR Technical Manual*. Tables 18-6 and 18-7 of the *CEQR Technical Manual* were used to determine the one-way trip distances for personal and taxi trips in Manhattan and the mobile GHG emissions calculator provided in the *CEQR Technical Manual* was used to obtain an estimate of auto, taxi, and truck CO_2e emissions attributable to the Proposed Action. The resultant GHG emissions are presented in **Table 11-4.** The total CO_2e emissions from the mobile sources attributable to the Proposed Action would be 429 metric tons annually.

Table 11-4 GHG Emissions from Mobile Sources

Vehicle Type	Annual VMT generated	Annual CO_2e [MT]
Auto	200,592	104
Taxi	51,448	24
Truck	153,216	301
Total	405,256	429

Note: All trips were assumed on arterial roadways in Manhattan

Construction Emissions

Construction of the Proposed Project would comply with the New York City Air Pollution Control Code, the latest version of which was adopted on May 12, 2020. As per *CEQR Technical Manual* guidance, emissions associated with construction of the Proposed Project have been assessed qualitatively. Typical construction emissions can account for about 5-10 years of building operational GHG emissions, i.e., approximately from 19,150 to 38,300 MT of CO_2e. The actual amount of CO_2e could change depending on the efficiency of building operations and efficiency and use of sustainable practices during construction.

Construction of the Proposed Project would follow New York City regulations and codes for construction that require the use of recycled materials, reduced diesel emissions, limited idle time for vehicles and equipment on-site, and other measures to reduce carbon emissions. In addition, following these practices would contribute to the overall goal of reducing GHG emissions from construction.

Use of Low Carbon Intensity Materials

Recycled steel would most likely be used in construction of the Proposed Project. 93 percent of U.S. newly produced steel beams and columns are made of recycled materials. Recycled materials such as fly ash, pozzolans, slag, and silica fume are used to reinforce cement according to the NYC building codes5. Core components would use recycled materials or contain recycled content, materials that are manufactured locally, renewable materials, etc.

Reduce On-Site Equipment Emissions

Construction practices include a diesel emission reduction program, use of electric equipment where practical, reinforcing NYC 3-minute idle limits, and other measures. Reduction of diesel emissions reduce GHGs generated in combustion of fuel and at the same time reduce black carbon—not a GHG, but an absorber of sunlight that warms the atmosphere and surfaces on which it deposits by reducing their ability to reflect light (reducing albedo).

Thus, construction of the Proposed Project would adhere to the City goals to reduce GHG.

Consistency with the GHG Reduction Goals

According to the *CEQR Technical Manual*, the assessment of consistency with the City GHG reduction goals should answer the following question: Is the project consistent with the goal

[5] NYC Building Code, Chapter 19, Concrete, table 1904.4.2.

of reducing GHG emissions, specifically the attainment of the City's established goal of reducing Citywide GHG emissions by 80 percent below 2005 levels by 2050. The other more immediate goal is to meet the requirements of the Local Law 97, Climate Mobilization Act. This Act requires that all new New York buildings larger than 25,000 square feet become more efficient and reduce their GHG under a certain level depending on the building size. **Table 11-5** presents the Local Law 97 carbon intensity rates by the future year for the City business uses that include office buildings.

Table 11-5 GHG Emission Limits for Proposed Project

Year	Carbon Intensity Rate Kg of CO_2e/sq ft	Total Operational CO_2e Emission Limit in MT
2024-2029	8.46	7,831
2030-2034	4.53	4,193

Total Proposed Development 925,630 gsf

The Proposed Project total direct and indirect operational emissions estimated using the *CEQR Technical Manual* CO_2e conversion factors would be 3,829 metric tons. This is below the Local Law 97 limit for the years 2030-2034, the most restrictive limit currently set for the NYC buildings. Operational emissions would be even lower if the more recent CO_2e conversion factors were used for NYC electricity and natural gas. The estimate based on the 2017 NYC GHG Inventory, based on the most recent inventory available from the NYSDEC, showed that the total operational GHG emissions for the Proposed Project could be approximately 600 metric tons lower than emissions calculated from the *2020 CEQR Technical Manual* factors.

The overall GHG emissions from the Proposed Project constitute approximately 0.01 percent of the 2017 NYC annual GHG emissions of 50.7 million metric tons (MMT) of CO_2e.

In addition, *CEQR Technical Manual* outlines four major goals towards the GHG reduction:

- Pursue transit-oriented development;
- Generate clean, renewable power through replacement of inefficient power plants with state-of-the-art technology and expand 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; and
- Encourage sustainable transportation through improving public transit, improving the efficiency of private vehicles, and decreasing the carbon intensity of fuels.

The Proposed Project is consistent with some of these goals, as follows:

- The Proposed Project is a transit-oriented development well served by public transportation, including Hudson, Harlem and New Haven Metro-North commuter rail, subway (4, 5, 6, 7 and S lines), and bus (M101, M102, M103, M1, M2, M3, M4, Q32 and M42). The Proposed Action would allow increases in commercial density along a major corridor in Midtown Manhattan, and would expand opportunities for commercial uses, as well as directing higher densities to areas that can accommodate future growth, such as those close to subway lines.

- The Proposed Project would improve access to public transportation and pedestrian circulation. The project would provide transportation improvements on-site that create new pedestrian access to, and egress from, the Long Island railroad (LIRR) East Side Access (ESA) concourse. The Proposed Project would also improve passenger circulation at the Grand Central – 42nd Street Subway Station, including improvements to passenger connections to the IRT Flushing Line (#7 Train) platform.
- The Proposed Project would be built in accordance with the latest NYS and NYC codes, including the 2020 Energy Conservation Construction Codes of New York State (ECCNYS) and 2020 New York City Energy Conservation Code (NYCECC)—both of which govern building efficiency in the choice of HVAC system and the exterior building envelope. In compliance with these codes, the planned HVAC systems of the Proposed Project would achieve an EPA Energy Star score of 84 out of 100, which demonstrates its efficiency.

Accordingly, the Proposed Project would be in compliance with the NYC GHG reduction goals for large buildings and would contribute towards the goal of reducing Citywide GHG emissions by 40% by 2030 and 80% by 2050 compared to level of 2005.