Chapter 13: Greenhouse Gas Emissions and Climate Change

A. INTRODUCTION

This chapter evaluates the greenhouse gas (GHG) emissions that would be generated by the Proposed Actions and their consistency with the citywide GHG reduction goals. According to the 2025 *City Environmental Quality Review (CEQR) Technical Manual*, evaluation of GHG emissions serves as a proxy for evaluating the Proposed Project's impact on climate change.

Climate change is projected to have 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 State and New York City have each established sustainability initiatives and goals for greatly reducing GHG emissions and for adapting to climate change.

According to the *CEQR Technical Manual,* the citywide GHG reduction goal is currently the most appropriate standard by which to analyze a project under CEQR. Among the project types identified in the *CEQR Technical Manual* for which a GHG consistency assessment is appropriate are those projects that require the preparation of an Environmental Impact Statement and would result in 350,000 square feet (sf) or more of development.

The co-Applicants, the New York City Educational Construction Fund (ECF) and 240 Nassau Street Holdings, LLC, are seeking zoning approvals, including zoning map and text amendments, a special permit, and other City and State approvals and potential future U.S. Department of Housing and Urban Development (HUD) actions (the "Proposed Actions"), to facilitate the construction of a proposed mixed-use development on Block 110, Lot 25 and Block 111, Lot 1 (the "Project Site") in Downtown Brooklyn, Community District (CD) 2. The proposed development would include four new buildings totaling approximately 1.7 million gross square feet (gsf), including public school facilities; residential, retail, and community facility space; cultural center space; and open space (the "Proposed Project").

The Proposed Actions include the transfer, reallocation, and lease of property among 240 Nassau Street Holdings, LLC, ECF, and the City of New York to allow for the Proposed Project and ECF financing and discretionary zoning approvals from the New York City Planning Commission (CPC) and New York City Council. A detailed description of the Proposed Project and the approvals needed to facilitate the Proposed Project is presented in Chapter 1, "Project Description."

Because components of the Proposed Project would be constructed and operated within coastal areas and on the water, the potential effects of global climate change have been considered. Therefore, a GHG consistency assessment is provided where future potential climate conditions are reviewed in the context of the impact of climate change, and the implications for the Proposed Project and its potential environmental consequences are discussed.

PRINCIPAL CONCLUSIONS

To determine the potential for significant impacts, an individual project's consistency with the City's emission reduction goals is considered. The Proposed Project would have fully electric, energy efficient heating, ventilation, and air conditioning (HVAC) systems. Additionally, by virtue of its transit-rich location and the nature of construction in New York City, which includes measures to reduce direct and embodied emissions, the Proposed Project would align with the City's emissions reduction goals. Therefore, the Proposed Actions would not result in a significant adverse impact on GHG emissions or climate change.

The building energy use and vehicle use associated with the Proposed Project would result in up to approximately 6,936 metric tons of carbon dioxide equivalent (CO_2e) emissions per year in the 2033 analysis year. The Proposed Project is designed with the goal of achieving certification under the Leadership in Energy and Environmental Design (LEED) v4.1 Communities framework. Consequently, the design would target energy efficiency measures, support for transit alternatives, and carbon emission reductions consistent with the City's goals. In addition, future emissions associated with the Proposed Project's consumption of grid electricity are expected to decrease as New York State and New York City target 100 percent renewable electricity; this would result in a significant reduction of emissions associated with the buildings' electricity consumption.

Specific energy efficiency measures and design elements that may be implemented with the Proposed Project are being evaluated as the project design moves forward. At a minimum, the Proposed Project aims to achieve the energy efficiency requirements of the New York City Building Code. In 2020, as part of the City's implementation of strategies aimed at achieving the *OneNYC* GHG reduction goals, the City brought the New York City Energy Conservation Code (NYCECC) up to date with the 2020 Energy Conservation Code of New York State (2020 ECCNYS), which substantially increased the stringency of the building energy efficiency requirements by adopting the ASHRAE 90.1-2016 standard as a benchmark and aligning with NYStretch Energy Code 2020, as developed by the New York State Energy Research and Development Authority (NYSERDA).

Additional sustainable design features that are being evaluated for the Proposed Project would, among other benefits, result in lower GHG emissions. Most significantly, the Proposed Project is anticipated to utilize fully electrified HVAC systems—eliminating the need for on-site fossil fuel consumption for normal operations. The construction of the proposed school building would be designed in accordance with the New York City School Construction Authority's (SCA's) *NYC Green Schools Guide*[1] sustainability rating system—including building electrification, compliance with local New York City green building requirements, refrigerant management, and achieving a minimum energy performance beyond the New York City energy code.

Overall, the Proposed Project would be designed to comply with New York City's carbon intensity limits designed to reduce building emissions within the City and achieve its sustainability goal of net zero emissions (carbon neutral) by 2050.

The Proposed Project would also align with other GHG goals by virtue of its proximity to public transportation, commitment to construction air quality controls and recycling

[1] New York City Department of Education & New York City School Construction Authority. *New York City Green Schools Guide 2019*. Updated April 4, 2025

construction materials, and the fact that, as a matter of course, construction in New York City uses recycled steel and includes cement replacements.

The Proposed Project would be designed to provide resilience protections up to 16 feet NAVD88[2] and flood protection for commercial, lobby, and other non-critical non-residential spaces, and may include additional adaptive measures like flood gates or removable barriers should this be necessary in the future to accommodate increased flood elevations throughout the end of the century. Additionally, the proposed school building would be designed to manage rainwater and urban heat impacts, consistent with the *NYC Green Schools Guide*.

Together, these factors demonstrate that the Proposed Project is consistent with the City's sustainability and resiliency policies, designed to meet the GHG reduction goals, and incorporates future climate conditions into the design. Consequently, the Proposed Project demonstrates that it would not interfere with the attainment of the statewide GHG limits for 2030 or 2050.

B. GREENHOUSE GAS EMISSIONS

POLLUTANTS OF CONCERN

GHGs are the 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. The general warming of the Earth's atmosphere caused by this phenomenon is known as the "greenhouse effect." Water vapor, carbon dioxide (CO_2), nitrous oxide (N_2O), methane, and ozone are the primary GHGs in the Earth's atmosphere.

There are also a number of entirely anthropogenic GHGs in the atmosphere, such as halocarbons and other chlorine- and bromine-containing substances, which also damage the stratospheric ozone layer (and contribute to the "ozone hole"). Since these compounds are being replaced and phased out due to the 1987 Montreal Protocol (an international agreement), significant emissions of these substances are not anticipated and there is no need to address them in GHG assessments for most projects. Although ozone itself is also a major GHG, it does not need to be assessed since it is a rapidly reacting chemical and efforts are ongoing to reduce ozone concentrations as a criteria pollutant (see Chapter 12, "Air Quality"). Similarly, water vapor is of great importance to global climate change, but is not directly of concern as an emitted pollutant since the negligible quantities emitted from anthropogenic sources are inconsequential.

The *CEQR Technical Manual* lists six GHGs that could potentially be included in the scope of a GHG analysis: CO_2, N_2O, methane, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). This analysis focuses primarily on CO_2, N_2O, and methane. There are no significant direct or indirect sources of HFCs, PFCs, or SF_6 associated with the Proposed Project.

CO_2 is the primary pollutant of concern from anthropogenic sources. Although not the GHG with the strongest effect per molecule, CO_2 is by far the most abundant and, therefore, the

[2] The North American Vertical Datum of 1988 (NAVD 88) is the official vertical reference system used to measure land elevations in the United States, Canada, and Mexico.

most influential GHG. CO_2 is emitted from any combustion process (both natural and anthropogenic); from some industrial processes such as the manufacture of cement, mineral production, metal production, and the use of petroleum-based products; from volcanic eruptions; and from the decay of organic matter. CO_2 is removed ("sequestered") from the lower atmosphere by natural processes such as photosynthesis and uptake by the oceans. CO_2 is included in the analysis of GHG emissions, consistent with *CEQR Technical Manual* guidelines.

Methane and N_2O also play an important role in the greenhouse effect since the removal processes for these compounds are limited and because they have a relatively high impact on global climate change as compared with an equal quantity of CO_2. Emissions of these compounds are therefore included in GHG emissions analyses when the potential for substantial emission of these gases exists.

To present a complete inventory of all GHGs, component emissions are added together and presented as CO_2e emissions—a unit representing the quantity of each GHG weighted by its effectiveness using CO_2 as a reference. This is achieved by multiplying the quantity of each GHG emitted by a factor called global warming potential (GWP). GWPs account for the lifetime and the radiative forcing[3] of each chemical over a period of 100 years (e.g., CO_2 has a much shorter atmospheric lifetime than SF_6, and therefore has a much lower GWP). Consistent with the *CEQR Technical Manual,* CO_2e emissions are estimated using the GWP over a 100-year horizon. While New York State GHG emission reduction goals use a 20-year horizon,[4] the emissions of GHGs other than CO_2 represent a very minor component of the emissions associated with the Proposed Actions and the difference between the two GWPs would be negligible. The GWPs for the main GHGs discussed here are presented in **Table 13-1**.

[3] *Radiative forcing* is a measure of the influence a gas has in altering the balance of incoming and outgoing energy in the Earth-atmosphere system and is an index of the importance of the gas as a GHG.

[4] As part of the 2026-27 fiscal budget, New York State enacted amendments to the CLCPA that established CO_2e estimates would use a 100-year horizon, rather than a 20-year horizon.

Table 13-1
Global Warming Potential (GWP) for Major GHGs

Greenhouse Gas	100-year Horizon GWP[1]	20-year Horizon GWP[2]
Carbon Dioxide (CO_2)	1	1
Methane (CH_4)	21	84
Nitrous Oxide (N_2O)	310	264
Hydrofluorocarbons (HFCs)	140 to 11,700	427 to 10,800
Perfluorocarbons (PFCs)	6,500 to 9,200	4,880 to 8,210
Sulfur Hexafluoride (SF_6)	23,900	17,500

Notes:
[1] The 100-year horizon GWPs presented above are based on the Intergovernmental Panel on Climate Change's (IPCC's) Second Assessment Report to maintain consistency in GHG reporting. The IPCC has since published updated GWP values that reflect new information on atmospheric lifetimes of GHGs and an improved calculation of the radiative forcing of CO_2. In some instances, if combined emission factors were used from updated modeling tools, some slightly different GWP values may have been used for this study. Since the emissions of GHGs other than CO_2 represent a very minor component of the CO_2e emissions, these differences are negligible.
[2] The 20-year horizon GWPs presented above are consistent with New York State's approach to GHG emission estimates as described in the Climate Leadership and Community Protection Act (CLCPA).
Source: *CEQR Technical Manual; 2023 Statewide GHG Emissions Report*

POLICY, REGULATIONS, STANDARDS, AND BENCHMARKS FOR REDUCING GHG EMISSIONS

FEDERAL POLICIES

Because of the growing consensus that human activity resulting in GHG emissions has 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 addressing energy consumption and production, land use, and other sectors. Although the United States (U.S.) has not ratified the international agreements that set emissions targets for GHGs, the U.S. signed the international Paris Agreement[5] in December 2015 that pledged deep cuts in emissions by 2025, with a stated goal of reducing annual emissions to levels that would be between 26 and 28 percent lower than 2005 levels.[6] The U.S. has since withdrawn as of January 20, 2025.

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 (RFS) program, which phased in requirements for the inclusion of renewable fuels that increased annually up to a total of 36.0 billion gallons by 2022. On December 1, 2022, EPA announced a proposed rule to establish the required fuel volumes and percentage standards for 2023, 2024, and 2025, as well as important modifications to strengthen and

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

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

expand the RFS program. EPA issued the Affordable Clean Energy rule on June 19, 2019; the rule establishes emissions reduction measures accepted as best technology for power plants and focuses on energy efficiency improvements in place of direct emissions reduction measures.

NEW YORK STATE POLICIES

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.

The New York State Energy Plan (last amended in April 2020) outlines the state's energy goals and provides strategies and recommendations for meeting those goals. The 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.

In 2019, New York State enacted the CLCPA to achieve the GHG reductions goals established in the New York State Energy Plan and expand on them by: 1) establishing state-wide GHG emission limits to achieve new long-term goals to reduce state-wide GHG by 100 percent (compared with 1990 levels) by 2050; and 2) providing 100 percent of electricity generation in the state from renewable sources by 2040. Among other requirements to meet the state's emission reduction goals, the CLCPA requires state agencies to determine if their decisions are consistent with the statewide GHG emission limits established by the CLCPA in the Environmental Conservation Law (ECL) Article 75[7] and ensure that decisions shall not disproportionately burden disadvantaged communities.[8]

The legislation also charges the New York State Climate Action Council with recommending agency regulations to reduce emissions, increasing investments in renewable energy sources, and ensuring that significant portions of investments are made in disadvantaged communities. Pursuant to these requirements, the New York State Climate Action Council prepared and approved a scoping plan on December 19, 2022.

As part of this effort, New York State is now seeking to achieve some of the emission reduction goals via local and regional planning and projects through its Cleaner Greener Communities and Climate Smart Communities programs. On December 29, 2022, New York State also announced the adoption of California's GHG vehicle standards, the Advanced Clean Cars II Rule, which are at least as strict as the federal standards and would require all new passenger cars and trucks sold in New York State to be zero-emissions by 2035.

New York State has also developed regulations to cap and reduce CO_2 emissions from power plants to meet its commitment to the Regional Greenhouse Gas Initiative (RGGI). Under the RGGI agreement, the governors of nine northeast and Mid-Atlantic states 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 (decreasing by 2.5 percent each year) and reducing

[7] CLCPA Section 7(2). 01/2020

[8] CLCPA Section 7(3). 01/2020

an additional 26 percent from 2020 to 2030. 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.

NEW YORK CITY POLICIES

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 began as PlaNYC 2030 in 2007 and continued to evolve as *OneNYC*, with the inclusion of more ambitious GHG emissions reduction goals, many specific initiatives that can result in emission reductions, and initiatives aimed at adapting to future climate change impacts. In April 2023, New York City published *PlaNYC: Getting Sustainability Done*—the latest outline of the City's strategies to achieve its sustainability goals. The goal to reduce city-wide 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").[9] The City has also 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, under the *OneNYC 2050* report and continued in *PlaNYC*, the City announced a more aggressive goal for reducing emissions from building down to 30 percent below 2005 levels by 2025 and achieving net-zero city-wide GHG emissions by 2050. A progress report of *PlaNYC: Getting Sustainability Done* was published in May 2025 detailing key actions that were accomplished in the past year.

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 sf 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. Commercial buildings over 50,000 sf are required to implement 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 NYCECC, which along with the 2020 ECCNYS, requires equipment installed during a renovation to meet current efficiency standards.

To achieve the GHG reduction goals, the City continues to convene 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 and achieve its GHG reduction goals. The members of the technical working groups develop and recommend data analysis, interim metrics and indicators, voluntary actions, and potential mandates to effectively achieve these goals. In 2016, the City published the building sector technical working group report, which included commitments by the City to enact changes to the building energy code and take other measures aimed at substantially reducing GHG emissions.

In May 2019, the New York City Council enacted the Climate Mobilization Act (CMA)—including Local Law 97 of 2019 (LL97), targeting GHG emissions associated with building

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

energy consumption. For most buildings that exceed 25,000 gsf (excluding electricity/steam generation facilities, rent-regulated accommodations, places of public worship, and City-owned properties), the City established annual building emission limits beginning in 2024 and requires the owner of a covered building to submit annual reports demonstrating that the building complies with the current GHG emission limits. For buildings not covered under the GHG emissions limits, owners may either demonstrate compliance with the current limits or implement specified energy conservation measures where applicable. In 2023, the New York City Department of Buildings (DOB) adopted maximum carbon intensity factors for buildings through 2050 by Energy Star Portfolio Manager (ESPM) property type.[10] Under the 2023 rule, a building's emissions limit would be estimated using the appropriate carbon intensity factor for each property type and the floor area of that property type. Maximum carbon intensity factors would decrease over time until 2050, when all covered buildings are required to demonstrate that the systems would have no direct GHG emissions.

As part of the CMA, Local Laws 92 and 94 of 2019 (LL92 and LL94) would include requirements for all new construction and any building that would undergo major modification of the rooftop requiring a permit to utilize available roofing space for the installation of either a green roof or a solar photovoltaic system generating at least 4 kilowatt (kW), or a combination of the two.

In addition, Local Law 154 of 2021 (LL154) established GHG emission limits that would prohibit fossil fuel systems in new buildings and major renovations where an application for approval of construction documents would be required (DOB threshold for alterations) emitting 25 kilograms (kg) or more of CO_2 per million British thermal units (Btu) of energy.

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 include 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

Climate change is driven by the collective contributions of diverse individual sources of emissions to global atmospheric GHG concentrations. Identifying potential GHG emissions from a proposed action can help decision makers identify practicable opportunities to reduce GHG emissions and ensure consistency with policies aimed at reducing overall emissions. While the increments of criteria pollutants and toxic air emissions are assessed in the context of health-based standards and local impacts, there are no established thresholds for assessing the significance of a project's contribution to climate change.

As detailed above, this chapter presents the total GHG emissions potentially associated with the Proposed Project and identifies measures that would be implemented and measures that are still under consideration to limit emissions. (Note that this differs from most other technical areas in that it does not account for only the increment between the future with the Proposed

[10] Rules of the City of New York, 1 RCNY §103-14. Requirements for Reporting Annual Greenhouse Gas Emissions for Covered Buildings.

Actions [the "With Action" condition] and the future without the Proposed Actions [the "No Action" condition]). Consistent with the *CEQR Technical Manual*, the focus of this analysis is on the total emissions associated with the Proposed Project and on the effect of measures to reduce those emissions.

Estimates of potential GHG emissions associated with the Proposed Project are based on the methodology presented in the *CEQR Technical Manual*. Estimates of emissions of GHGs have been quantified, including off-site emissions associated with use of electricity to power on-site heat and hot water systems and other operations, and emissions from project-generated vehicle use.

Emissions from transportation conservatively applies the emission factors for the 2033 analysis year. Since vehicular emission factors will continue to decrease in future years as vehicle engine efficiency increases and emissions standards continue to decrease, the Proposed Actions would result in lower emissions in future years. However, the *CEQR Technical Manual* methodology does not account for future years or explicitly address potential changes in future consumption associated with climate change, such as increased electricity for cooling. Therefore, this analysis results in overall conservatively high estimates of potential GHG emissions.

As described above, CO_2 is the primary pollutant of concern from anthropogenic emission sources and is accounted for in the analysis of emissions from all development projects (see "Pollutants of Concern," above). GHG emissions for gases other than CO_2 are included where practicable or in cases where they comprise a substantial portion of overall emissions. The various GHG emissions are added together and presented as metric tons of CO_2e emissions per year.

BUILDING OPERATIONAL EMISSIONS

GHG emissions from the Proposed Project are assumed to be designed to meet the City's carbon intensity limits at the time that construction is completed as specified in the Rules of the City of New York.[11] While the carbon intensity limits do not preclude the use of fossil fuels, the Proposed Project will utilize electric-powered equipment to provide heating and cooling to the Project Site buildings (with the potential for fossil fuel-fired emergency generators to provide reliable power in the event of a utility power outage) and comply with LL154. The estimated annual GHG emissions from buildings under the Proposed Project are based on energy consumption rates for average existing buildings within the Northeastern region reported in the latest energy consumption information collected by the U.S. Energy Information Administration (EIA) for commercial[12] buildings.

The Proposed Project is conservatively estimated to consume up to 74,606 million British thermal units (MMBtu) of energy per year, or approximately 21,864,802 kilowatt-hours (kWh) per year. However, these estimates are based on average energy consumption estimates for existing buildings. Therefore, actual annual energy consumption from the Proposed Project's building HVAC operations are anticipated to be well below these estimates.

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[11] Rules of the City of New York. 1 RCNY §103-14.

[12] EIA. *2018 Commercial Building Energy Consumption Survey (CBECS) Data*. https://www.eia.gov/consumption/commercial/data/2018/

GHG emissions are estimated using the anticipated carbon intensity for New York City's electrical grid for the 2030-2034 reporting years: 0.000145 ton CO_2e per kWh (145 gram CO_2e per kWh).

MOBILE SOURCE EMISSIONS

The number of annual weekday and Saturday vehicle trips by mode (cars, taxis, and trucks) that would be generated by the Proposed Project were calculated using the transportation planning assumptions developed for the analysis and presented in Chapter 11, "Transportation." The assumptions used in the calculation include average daily person trips and delivery trips by proposed use, the percentage of vehicle trips by mode, and the average vehicle occupancy. Travel distances shown in Tables 18-5 and 18-6 of the *CEQR Technical Manual*, along with the associated text, were used in the calculations of annual vehicle miles traveled by cars, taxis, and trucks. Table 18-7 of the *CEQR Technical Manual* was used to determine the percentage of vehicle miles traveled by road type, and the mobile GHG emissions calculator provided with the *CEQR Technical Manual* was used to estimate GHG emissions from all trips attributable to the Proposed Project. Since the mobile GHG emissions calculator does not assume an increased percentage of electric vehicles in the regional vehicle fleet, the GHG vehicle emissions are expected to be less as New York State implements new zero emission vehicle sale and lease requirements beginning in 2035.

Based on the latest fuel lifecycle model from Argonne National Laboratory,[13] emissions from producing and delivering fuel ("well-to-pump") are estimated to add an additional 26 percent to the GHG emissions from gasoline and 27 percent from diesel. Although upstream emissions (emissions associated with production, processing, and transportation) of all fuels can be substantial and are important to consider when comparing the emissions associated with the consumption of different fuels, fuel alternatives are not being considered for the Proposed Project, and as per the *CEQR Technical Manual* guidance, the well-to-pump emissions are not considered in the analysis. The assessment of tailpipe emissions only is in accordance with the *CEQR Technical Manual* guidance on assessing GHG emissions and the methodology used in developing the New York City GHG inventory, which is the basis of the GHG reduction goal.

The projected total annual vehicle miles traveled by roadway type, forming the basis for the GHG emissions calculations from mobile sources, are summarized in **Table 13-2**.

Table 13-2
Vehicle Miles Traveled per Year

Roadway Type	Passenger Vehicle	Taxi	School Bus	Truck
Local	964,894	136,068	984	278,561
Arterial	1,978,032	278,939	2,017	571,049
Interstate / Expressway	1,881,542	265,333	1,918	543,193
Total	**4,824,468**	**680,340**	**4,918**	**1,392,803**

Note:
Totals may not sum due to rounding.

[13] Based on GREET_1_2024 model from Argonne National Laboratory.

CONSTRUCTION EMISSIONS

A project's impact on climate change comes from the GHG emissions over the full lifecycle of a project—from both construction and operation of the Proposed Project. GHG emissions from construction activity include on-site direct emissions from engines, indirect emissions from vehicle trip generation to/from the Project Site, and emissions associated with the extraction, production, and transport of raw construction materials.

Construction under the Proposed Actions would require the use of both non-road construction equipment and on-road vehicles. Non-road construction equipment includes equipment operating on-site, such as cranes, loaders, and excavators that would be active over the duration of six years. On-road vehicles include worker vehicles and construction trucks arriving to and departing from the Project Site as well as operating on-site. A description of construction activities and emission reduction measures is provided in Chapter 17, "Construction." Analyses of similar building development projects have shown that construction emissions are typically equivalent to the total operational emissions up to approximately 5 to 10 years.

EMISSIONS FROM SOLID WASTE MANAGEMENT

The Proposed Project would not fundamentally change the City's solid waste management system. Therefore, as per the *CEQR Technical Manual*, the GHG emissions from the Proposed Project's solid waste generation, transportation, treatment, and disposal are not quantified and no further assessment is warranted.

PROJECTED GHG EMISSIONS

BUILDING OPERATIONAL EMISSIONS

The building floor area, energy consumption rate, and resulting GHG emissions from each of the uses for the Proposed Project are presented in detail in **Table 13-3**. Energy consumption for buildings in the Proposed Project was estimated using building energy intensities provided in the Commercial Building Energy Consumption Survey performed by the EIA. The analysis presents the total emissions after construction.

Table 13-3
Annual Building Operational Emissions
(metric ton CO_2e)

Use in With Action Condition	Size	Average Annual Energy Rate	Annual Energy Consumption (kWh/year)	Annual GHG Emissions[1]
Residential	1,502 DUs	11,605.6 kWh/year per DU	17,431,633	2,528
Retail	34,000 gsf	19.5 kWh/year per gsf	664,627	96
Community Facility	30,000 gsf	26.4 kWh/year per gsf	791,292	115
Cultural	15,000 gsf	26.4 kWh/year per gsf	395,646	57
Primary & Intermediate School	121,000 gsf	21.3 kWh/year per gsf	2,581,604	374
			Total Building Operational Emissions	**3,170**

Notes:
Totals may not sum due to rounding.
gsf = gross square feet; DUs = dwelling units; kWh = kilowatt-hour
[1] Projected 2030 emission factor of 145 g CO_2e per kWh specified by DOB under 1 RCNY §103-14.
Sources: *US EIA, 2018.* Residential Energy Consumption Survey (RECS) Table CE2.2
US EIA, 2020. Commercial Building Energy Consumption Survey (CBECS) Table C10

Additionally, the building emission limits for the Proposed Project were calculated using the building floor area and carbon intensity limit, resulting in GHG emissions caps for all the uses comprising the Proposed Project (presented in detail in **Table 13-4**). The Proposed Project's GHG emission limits for the 2030–2034, 2035–2039 and 2040–2049 reporting years under LL97 were estimated to be 5,539, 4,394, and 3,273 metric ton CO_2e per year, respectively. Beginning in 2050, buildings will be required to be zero emission. Therefore, the Proposed Project would result in annual building operational emissions below the emission limits before 2050.

Table 13-4
Annual Building Operational Emission Limits

Source Use	Building Area (gsf)	Carbon Intensity Limit[1] (metric ton CO_2e / gsf - year)			Annual GHG Emissions (metric tons CO_2e)		
		2030 – 2034	2035 – 2039	2040 – 2049	2030 – 2034	2035 – 2039	2040 – 2049
Residential	1,502,000	0.0033	0.0027	0.0021	5,027	4,044	3,083
Retail	34,000	0.0021	0.0012	0.0002	72	41	6
Community Facility	30,000	0.0038	0.0029	0.0019	114	86	57
Cultural	15,000	0.0038	0.0029	0.0019	57	43	29
Primary & Intermediate School	121,000	0.0022	0.0015	0.0008	270	180	98
				Total	**5,539**	**4,394**	**3,273**

Notes:
Totals may not sum due to rounding.
[1] GHG emissions for the Proposed Actions were estimated based on the carbon intensity limits specific to individual ESPM Property Types for the 2030-2034, 2035-2039, and 2040-2049 time periods established by DOB under 1 RCNY §103.

As New York State achieves its renewable energy goals under the CLCPA for a zero emissions electric grid by 2040, the GHG emissions from building energy usage would be reduced to zero. However, in the event New York State does not achieve its renewable

energy goals, further emission reductions may be necessary to comply with New York City's building emission limits beyond 2050.

MOBILE SOURCE EMISSIONS

The mobile-source-related GHG emissions from the Proposed Project are presented in **Table 13-5**.

Table 13-5
Annual Mobile Source Emissions
(metric tons CO2e)

Use	Passenger Vehicle	Taxi	School Bus	Truck	Total
Residential	887	178	0	1,469	**2,534**
Retail	492	0	0	179	**671**
Community Facility	44	10	0	175	**228**
Cultural	22	5	0	88	**114**
Primary & Intermediate School	101	1	6	110	**219**
Total	**1,545**	**194**	**6**	**2,020**	**3,766**

Note:
Totals may not sum due to rounding

In addition to the direct emissions included in the analysis, an additional approximately 25 percent of direct emissions would be emitted upstream (associated with fuel extraction, production, and delivery).

SUMMARY

A summary of GHG emissions for the Proposed Project is presented in **Table 13-6**. Note that if new buildings were to be constructed elsewhere to accommodate the same space for other uses, the emissions from the use of electricity, energy for heating and hot water, and vehicle use could equal or exceed those estimated for the Proposed Project, depending on building type and energy efficiency measures.

Table 13-6
Summary of Annual GHG Emissions
(metric tons CO_2e)

Source Use	Building Operations	Mobile	Total
Residential	2,528	2,534	**5,062**
Retail	96	671	**767**
Community Facility	115	228	**343**
Cultural	57	114	**172**
Primary & Intermediate School	374	219	**593**
Total	**3,170**	**3,766**	**6,936**

Note:
Totals may not sum due to rounding.

Analyses of similar building development projects have shown that construction emissions are typically equivalent to the total operational emissions up to approximately 5 to 10 years. Therefore, GHG emission associated with construction under the Proposed Action may result in up to 69,360 additional metric tons of CO_2e.

PROJECT ELEMENTS THAT WOULD REDUCE GHG EMISSIONS

The Proposed Project would include a number of sustainable design features which would, among other benefits, result in lower GHG emissions. Furthermore, compliance with the City's carbon intensity limits would also result in energy efficient building designs that would exceed energy code requirements. Moreover, development with access to transit and existing roadways is, in general, consistent with sustainable land use planning and smart growth strategies to reduce the carbon footprint of new development. These features and other measures currently under consideration are discussed in this section, addressing the PlaNYC/OneNYC goals as outlined in the *CEQR Technical Manual* as well as New York State GHG reduction goals stated in the CLCPA. The implementation of the various design measures and features described would result in development that is consistent with the City's emissions reduction goal, as defined in the *CEQR Technical Manual*.

BUILD EFFICIENT BUILDINGS

The co-Applicants have committed to utilizing fully electric HVAC systems for the Proposed Project—resulting in significant energy efficiency and GHG emission reductions. In addition, several measures have been identified that are under consideration to be implemented in the final design of the Proposed Project that would reduce GHG emissions (directly or indirectly).

Furthermore, at a minimum, all buildings are required to achieve the energy efficiency requirements of New York City's building code. Each of the proposed new buildings intends to exceed the minimum energy requirements of New York City's building code such that the developments would achieve energy consumption that is 10 percent lower as compared with a baseline development designed to meet the current sustainability requirements to achieve the relevant sustainability certifications (either the LEED v4.1 or SCA's *NYC Green Schools Guide*[14] sustainability rating systems). Therefore, the Proposed Project would support the goal identified in the *CEQR Technical Manual* of building efficient buildings.

Specific measures are listed below and represent those that are currently under consideration and are likely to be implemented, along with other measures that may be included once building-specific designs are further advanced:

- HVAC systems would be designed to utilize high efficiency heat pumps to provide space heating and cooling;
- Exhaust systems and split air systems would be designed with energy recovery technology;

[14] New York City Department of Education & New York City School Construction Authority. *New York City Green Schools Guide 2019*. Updated April 4, 2025

- Heat pumps would produce domestic hot water and the plumbing systems would use high-efficiency fixtures and appliances;
- Windows would be located such that designs would incorporate thermal breaks and utilize high-performance coatings;
- Efficient, directed exterior lighting and maximizing of interior daylighting would be incorporated into project buildings;
- Motion sensors for lighting control for back-of-house and support spaces would be incorporated into project buildings;
- Efficient lighting and elevators would be installed in all project buildings, exceeding code requirements;
- Sub-metering of electricity would be implemented, allowing tenants to track and optimize their use;
- Water conserving fixtures, meeting New York City's stringent building code requirements, would be incorporated throughout project buildings;
- Project buildings would feature high performance, continuously insulated envelope assemblies; and
- High-albedo roofing materials would be utilized for all project buildings.

The estimated GHG emissions associated with building energy use for the Proposed Project would fall below the carbon intensity limits through 2050 due to the use of fully electrified HVAC systems. With implementation of the measures above, the Proposed Project would comply with the City's energy efficiency measures and carbon emission reduction goals. Further, the Proposed Project's GHG emissions would likely achieve future building emissions limits as the carbon intensity associated with grid electricity is expected to decrease as the State and City target 100 percent renewable electricity by 2040.

Therefore, the Proposed Project would support the goal identified in the *CEQR Technical Manual* of building efficient buildings.

USE CLEAN POWER

Under the carbon intensity limits for most buildings in New York City established under the Rules of the City of New York,[15] the Proposed Project would be required to report its GHG emissions each year and compare its emissions to the applicable carbon intensity limits. Stricter GHG emission limits would also be phased into developments in later years with a requirement that buildings show zero emissions beginning in 2050. While the use of fossil fuels would not be specifically prohibited by the City, the Proposed Project would utilize electric-powered systems for the normal operation of the heat and hot water systems.

Therefore, the Proposed Project would support the goal identified in the *CEQR Technical Manual* of using clean power.

[15] Rules of the City of New York, 1 RCNY §103-14. Requirements for Reporting Annual Greenhouse Gas Emissions for Covered Buildings.

TRANSIT-ORIENTED DEVELOPMENT AND SUSTAINABLE TRANSPORTATION

The Project Site would be supported by many transit options. These include the Jay Street-MetroTech Station (A, C, F, R trains), York Street Station (F train), High Street Station (A and C trains), and Dekalb Avenue Station (B, D, N, Q, R trains) located in the vicinity of the Project Site. In addition, the Proposed Project is supported by the nearby B57, B62, B67, and B69 bus routes and ferry access (the Astoria route) at the Fulton Ferry terminal. The surrounding area also includes Citi Bike stations and conventional bicycle paths, notably the Brooklyn Waterfront Greenway, which is a 26-mile protected route for pedestrians and cyclists. Therefore, the Proposed Project would support the goal identified in the *CEQR Technical Manual* of supporting transit-oriented development and sustainable transportation.

REDUCE CONSTRUCTION OPERATION EMISSIONS

As described in detail in Chapter 17, "Construction," construction specifications would include an extensive diesel emissions reduction program, including diesel particulate filters for large construction engines, use of electric equipment in lieu of fossil fuel-powered where feasible, limiting idle times on site, and other measures. These measures would reduce particulate matter emissions. While particulate matter is not included in the list of standard GHGs ("Kyoto gases"), recent studies have shown that black carbon—a constituent of particulate matter—may play an important role in climate change. Therefore, the Proposed Project would support the goal identified in the *CEQR Technical Manual* of reducing construction emissions.

USE BUILDING MATERIALS WITH LOW CARBON INTENSITY

For new materials needed, recycled steel may be used for most structural steel, to the extent feasible, since the steel available in the region is mostly recycled and would result in reduced upstream emissions. Upstream emissions for recycled steel are associated with both the production of steel using scrap metal (compared to iron ore) and with transportation of steel to the construction site. However, construction of the Proposed Project may result in further reductions by considering procurement using less energy intensive production technologies (such as electric arc furnaces to process scrap metals as opposed to traditional fossil fuel-fired blast furnaces used to process raw iron.)

Low-carbon cement replacements (such as fly ash, slag, or other pozzolans) would also be used to the extent feasible. Therefore, the Proposed Actions would support the goal identified in the *CEQR Technical Manual* of using low carbon building materials.

CONCLUSION

The operation of the Proposed Project would result in the emission of 6,936 metric tons of CO_2e per year. Total GHG emissions are anticipated to be equivalent to the total operational emissions up to approximately 5 to 10 years.

The Proposed Project would incorporate several sustainable design factors that demonstrate that the Proposed Project is consistent with the City's sustainability policies designed to meet the GHG reduction goals. The Proposed Project is designed with the goal of achieving certification under the LEED v4.1 Communities framework. The construction of the proposed school building would be designed to achieve certification under the *NYC Green Schools Guide*. All buildings are committed to including building electrification, compliance with local

New York City green building requirements, and achieving a minimum energy performance beyond the New York City energy code.

Consequently, the Proposed Actions are consistent with the City's sustainability policies and commitment to utilizing fully electrified HVAC systems, and the Proposed Project demonstrates that it would not interfere with the attainment of the statewide GHG limits for 2030 or 2050. Since the Project Site is located within a disadvantaged community, these measures would also ensure against disproportionate burdens by avoiding additional emissions within the disadvantaged community.

C. RESILIENCE TO CLIMATE CHANGE

The Waterfront Revitalization Program (WRP) [16] addresses climate change and sea-level rise. The WRP requires consideration of climate change and sea-level rise in the planning and design of developments within New York City's Coastal Zone (the Project Site is within the City's designated Coastal Zone). As set forth in more detail in the *CEQR Technical Manual*, the provisions of the WRP are also applied by the New York City Department of City Planning (DCP) and other city agencies when conducting environmental reviews. The Proposed Project's consistency with WRP policies is described in Chapter 2, "Land Use, Zoning, and Public Policy," and **Appendix B**.

Since the Project Site is within the projected future 0.2-percent annual probability ("500-year") and 1-percent annual probability ("100-year") flood areas identified by New York City, the potential effects of global climate change on the Proposed Project were considered and measures that would be implemented as part of the project to improve its resilience to climate change are identified.

DEVELOPMENT OF POLICY TO IMPROVE CLIMATE CHANGE RESILIENCE

The New York State Sea Level Rise Task Force was created to assess potential impacts on the state's coastlines from rising seas and increased storm surge. The Task Force prepared a report of its findings and recommendations, including protective and adaptive measures.[17] The recommendations are to: provide more protective standards for coastal development, wetlands protection, shoreline armoring, and post-storm recovery; implement adaptive measures for habitats; integrate climate change adaptation strategies into state environmental plans; and amend local and state regulations or statutes to respond to climate change. The Task Force also recommended the formal adoption of projections of sea-level rise.

The New York State Climate Action Plan Interim Report identified a number of policy options and actions that could increase the climate change resilience of natural systems, the built environment, and key economic sectors—focusing on agriculture, vulnerable coastal zones, ecosystems, water resources, energy infrastructure, public health, telecommunications and information infrastructure, and transportation.[18] New York State's Community Risk and

[16] New York City Department of City Planning. *The New York City Waterfront Revitalization Program*. October 30, 2013. Approved by the New York State Department of State, February 3, 2016.

[17] New York State Sea Level Rise Task Force. *Report to the Legislature*. December 2010.

[18] New York State Energy Research and Development Authority. *New York State Climate Action Plan Interim Report*. November 2010.

Resiliency Act (CRRA)[19] requires that applicants for certain State programs demonstrate that they have taken into account future physical climate risks from storm surges, sea-level rise, and flooding, and required the New York State Department of Environmental Conservation (NYSDEC) to establish official State sea-level rise projections. In February 2017, NYSDEC adopted a rule (6 New York Codes, Rules, and Regulations [NYCRR] Part 490) defining the existing projections for use. These projections provide the basis for State adaptation decisions and are available for use by all decision makers. CRRA applies to specific State permitting, funding, and regulatory decisions, including smart growth assessments; funding for wastewater treatment plants; siting of hazardous waste facilities; design and construction of petroleum and chemical bulk storage facilities; oil and gas drilling; and State acquisition of open space. As required under the CRRA, NYSDEC published implementation guidance and references to climate change projections specific to New York State in August 2021.

In New York City, the Climate Change Adaptation Task Force is tasked with fostering collaboration and cooperation between public and private organizations working to build the resilience of the City's critical infrastructure against rising seas, higher temperatures, and changing precipitation patterns. The Task Force is composed of over 57 New York City and State agencies, public authorities, and companies that operate, regulate, or maintain critical infrastructure in New York City. Led by the Mayor's Office of Climate and Environmental Justice, the Task Force works together to assess risks, prioritize strategies, and examine how standards and regulations may need to be adjusted in response to a changing climate.

To assist the Task Force, the New York City Panel on Climate Change (NPCC) has prepared a set of climate change projections for the New York City region,[20] which was subsequently updated,[21,22] and has suggested approaches to create an effective adaptation program for critical infrastructure. The NPCC includes leading climatologists, sea-level rise specialists, adaptation experts, and engineers, as well as representatives from the insurance and legal sectors. The climate change projections include a summary of baseline and projected climate conditions throughout the 21st century, including heat waves and cold events, intense precipitation and droughts, sea-level rise, and coastal storm levels and frequency.

TEMPERATURE & URBAN HEAT ISLAND

The probability that New York City would experience an increase in air temperatures and relative humidity (characterized as the heat index of a given location) is considered by NPCC to be "very likely." NPCC projected that temperatures are likely to increase by up to 6.6 degrees Fahrenheit by the 2050s and that New York City would experience up to 7 heat waves per year with an average duration up to 6 days. By the end of the century,

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[19] *Community Risk and Resiliency Act.* Chapter 355, NY Laws of 2014. April 9, 2013. Signed September 22, 2014.

[20] New York City Panel on Climate Change. *Climate Change Adaptation in New York City: Building a Risk Management Response*. Annals of the New York Academy of Sciences. May 2010.

[21] New York City Panel on Climate Change. Climate Risk Information 2013: Observations, Climate Change Projections, and Maps. June 2013.

[22] New York City Panel on Climate Change. *New York City Panel on Climate Change 2015 Report*. Ann. N.Y. Acad. Sci. 1336. 2015.

temperatures are likely to increase by up to 12.1 degrees Fahrenheit with up to 9 heat waves per year with an average duration of 8 days.

PRECIPITATION

NPCC projected that precipitation levels are likely to increase by up to 13 percent by the 2050s when compared to the 1971–2000 base period, and up to 25 percent by the end of the century with up to 5 rainfall events projected to result in 2 inches or more of precipitation.

As part of the New York City Green Infrastructure Program's goal to reduce sewer operations during rainfall events, the City has established design standards and specifications to address the impact that stormwater would have on the City's combined sewer systems. The Program includes retrofits to streets, sidewalks, and other public properties with standard green infrastructure practices such as bioswales, rain gardens, greenstrip, stormwater seepage basins, and infiltration basins. The Program also incentivizes green infrastructure on private property and permitting projects triggered by stormwater regulations. While the primary goal of the Program is to alleviate surcharge and flooding conditions, green infrastructure projects can result in several co-benefits that may include reduced localized stormwater flooding and a reduction in the impact of the urban heat island effect.

SEA LEVEL RISE

NPCC has projected that sea levels are likely to increase by up to 30 inches by the 2050s and up to 75 inches by the end of the century (more detailed ranges and timescales are available). In general, the probability of increased sea levels is characterized by NPCC as "extremely likely," but there is uncertainty regarding the probability, the various levels projected, and timescale. Intense hurricanes are characterized by NPCC as "more likely than not" to increase in intensity and/or frequency, and the likelihood of changes in other large storms ("Nor'easters") are characterized by NPCC as unknown. Therefore, the projections for future 1-in-100 coastal storm surge levels for New York City include only sea-level rise at this time, and do not account for changes in storm frequency.

The New York City Green Code Task Force has also recommended strategies for addressing climate change resilience in buildings and for improving storm water management.[23] Some of the recommendations call for further study, while others could serve as the basis for revisions to building code requirements. Notably, one recommendation was to require new developments within the projected future "100-year" floodplain (the area that would potentially be flooded in a severe coastal storm with a probability of 1-in-100 of occurring in any given year) to meet the same standards as buildings in the current "100-year" flood hazard zone.

While strategies and guidelines for addressing the effects of climate change are being developed at all levels of government, there are currently no specific requirements or accepted recommendations for development projects in New York City. However, the revisions to the WRP and accompanying guidance[24] require consideration of climate change

[23] New York City Green Codes Task Force. *Recommendations to New York City Building Code*. February 2010.

[24] New York City Department of City Planning. The New York City Waterfront Revitalization Program: Climate Change Adaptation Guidance. March 2017.

and sea-level rise in planning and design of waterfront development. As set forth in more detail in the *CEQR Technical Manual*, the provisions of the WRP are applied by City agencies when conducting environmental reviews, and are described in detail in Chapter 2, "Land Use, Zoning, and Public Policy," and **Appendix B**.

RESILIENCE OF THE PROPOSED PROJECT TO CLIMATE CHANGE

TEMPERATURE & URBAN HEAT ISLAND

The Proposed Project is located in Downtown Brooklyn, a neighborhood that has been identified as being vulnerable to extreme heat by the New York City Department of Health (NYCDOH), with a moderate level of risk.[25] The Project Site is currently fully developed with most of the ground coverage comprising paved surfaces and little vegetation.

The Proposed Project would utilize rooftop space for regular occupation, such as play spaces and amenity space that includes rooftop open space that would provide minor mitigation effects for the urban heat island effect. On-site vegetation that may be included in occupied spaces would provide a localized cooling effect from the evapotranspiration processes and provide immediate shading.

Additionally, the incorporation of high-albedo roofing materials that would reflect incoming solar heat and prevent its absorption and re-emission through the urban heat island effect is being considered where rooftop space permits its implementation.

The design elements would provide resilience to potential heat increases and limit the impact of the urban heat island effect at the Proposed Project buildings within the surrounding neighborhood.

PRECIPITATION

As described in Chapter 10, "Water and Sewer Infrastructure," the Proposed Project would result in a decrease in the impervious rooftop area or paved ground area as compared to the existing condition. The Proposed Project would be required to provide stormwater detention facilities as a part of the New York City Department of Environmental Protection (DEP) site connection approval process and is committed to following the standards and guidelines under the DEP Green Infrastructure Program in consultation with DEP. This would allow the development to discharge at a rate that would not exacerbate the surcharged condition of the downstream storm sewers, in accordance with DEP regulations.

The floodplain area within the Project Site is affected by coastal flooding, which is controlled by astronomic tides and meteorological forces and is unaffected by occupancy of the floodplain. As such, development of the Proposed Project would not affect the floodplain or result in increased risk of flooding of areas adjacent to the study area. Similarly, flood resilience measures incorporated into the Proposed Project to address flood risk from sea level rise through the 2080s and any adaptations for end-of-century potential flood elevations would not have the potential to increase flood risk to adjacent properties.

[25] New York City Department of Health. Interactive Heat Vulnerability Index. https://a816-dohbesp.nyc.gov/IndicatorPublic/beta/key-topics/climatehealth/hvi/

SEA LEVEL RISE

According to current flood hazard projections,[26] the current 1-in-100 coastal storm surge could reach a base flood elevation (BFE) of 11 feet NAVD88 at locations within the Project Site. The existing ground elevations at the Project Site are above the current BFE, ranging from +13 feet NAVD88 in the eastern portion of the site up to about +17 feet NAVD88 in the western portion of the site. The Proposed Project would not increase the ground elevation. Consequently, the ground floor of Building 1 would be at +17 feet, Buildings 2 and 3 would be at +13 feet, and Building 4 would be at +14.7 feet NAVD88, all of which would be above the BFE.

Resilience considerations are accounted for throughout the lifetime of the uses being evaluated. Residential buildings typically have a projected lifetime of 80 years or more; therefore, the furthest available projections (end of century) are considered for the Proposed Project. According to the above cited NPCC data, by the 2050s, the 1-in-100 flood levels could reach between 6 inches (per NPCC "Low" scenario) and 30 inches higher due to sea-level rise (per NPCC "High" scenario), to between 11.5 and 13.5 feet NAVD88. By the end of the century, the 1-in-100 flood levels could reach between 25 inches (per NPCC "Low" scenario) and 75 inches higher (per NPCC "High" scenario), to approximately 13 to 17.25 feet NAVD88. Therefore, the official design flood elevation (DFE) for new buildings would consider potential increases in sea level rise, per the New York City Building Code, using a DFE of +13 feet for the Project Site.

Note that these flood areas and elevations are likely conservatively high and may be revised in the future. On October 17, 2016, the Federal Emergency Management Agency (FEMA) and New York City Mayor Bill de Blasio announced plans to revise the FEMA flood maps based on a 2015 New York City appeal of FEMA's flood risk calculations for New York City and the region. Therefore, it is possible that the revised FEMA current flood elevations would be lower, and the resulting future flood elevations, including sea-level rise, may also be lower than those presented here.

Construction would be designed in accordance with Appendix G, "Flood Resistant Construction," of the New York City Building Code to provide resilience to the potential conditions projected through the end of the century. The proposed buildings would be constructed at site grade and would be within the projected floodplain before the end of their design life. While the entries to these buildings would be at site grade, the lobbies and critical areas within the buildings would be elevated at least to the DFE. The design would also be adaptive such that enhancements could be implemented in the future to further protect uses up to the potential flooding conditions projected for the end of the century, if necessary, based on future adjustments to end-of-century potential flood elevations estimates. To that end, the following measures would be implemented:

[26] Federal Emergency Management Agency. *Preliminary Flood Insurance Rate Map*. Panel 3604970203G. Release Date: 12/05/2013.

- Critical building system equipment within each building would be located at least three feet above the DFE of +13 feet NAVD88 for the Project Site;
- The foundation system of the buildings would include continuous flight auger (CFA), friction, and/or micro piles with a mat slab and spread footing, which are common design measures to distribute structural loads and prevent sinking or uneven settlement;
- The Proposed Project would use corrosion-resistant finishes;
- The Proposed Project would use continuous waterproofing membrane designed to meet hydrostatic pressures and create a barrier against water and moisture associated with flood risks; and
- Installed dry floodproofing measures would also include fully waterproofed penetrations for incoming services, pile supports, and points of entry, and would fully encase entry points where required (e.g., elevators).

The Proposed Project would be designed to accommodate future enhancement (adaptive measures) of any protections designed for commercial, lobby, and other non-critical non-residential spaces up to 16 feet NAVD88, should this be necessary in the future to accommodate increased flood elevations throughout the end of the century. Adaptive measures like flood gates or removable barriers could also be installed in the future, if needed. ✷