Chapter 13: Greenhouse Gas Emissions and Climate Change

A. INTRODUCTION

This chapter evaluates the greenhouse gas (GHG) emissions that would be generated by the construction and operation of the ~~Proposed Project~~previously proposed project and its consistency with the citywide GHG reduction goals (Section B). This chapter also evaluates the resilience of the ~~Proposed Project~~previously proposed project to climate conditions throughout the lifetime of the project (Section C).[1] Per the 2020 *City Environmental Quality Review* (*CEQR) Technical Manual,* evaluation of GHG emissions serves as a proxy for evaluating the ~~Proposed Project~~previously proposed project's impact on climate change.

As discussed in the *CEQR Technical Manual*, 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 experienced 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.

Per the *CEQR Technical Manual,* the citywide GHG reduction goal is currently the most appropriate standard by which to analyze a project under CEQR. The *CEQR Technical Manual* recommends that a GHG consistency assessment be undertaken for any project preparing an environmental impact statement expected to result in 350,000 square feet or more of development and other energy-intense projects. The ~~Proposed Project~~previously proposed project would result in approximately 680,500 gross square feet (gsf) of developed floor area. Accordingly, a GHG consistency assessment is provided.

PRINCIPAL CONCLUSIONS

The ~~Proposed Project~~previously proposed project, as detailed below, would be consistent with the City's emissions reduction goals, as defined in the *CEQR Technical Manual*. Furthermore, the ~~Proposed Project~~previously proposed project would incorporate flood resilience measures to address flood risk through the 2050s and, as necessary, any adaptations for end-or-century potential flood elevations; and would not have the potential to increase flood risk to of adjacent properties.

The building energy use and vehicle use associated with the ~~Proposed Project~~previously proposed project would result in up to approximately 10 thousand~~,000~~ metric tons of carbon dioxide

[1] Since the publication of the DEIS, the Applicant has withdrawn the application for the previously proposed project and submitted a modified application (Application Number C 210438(A) ZSM; the "A-Application") with proposed changes to the project—this modified version of the project is described and considered in this FEIS as the Reduced Impact Alternative, as outlined in Chapter 18, "Alternatives."

equivalent (CO_2e) emissions per year in 2026. The design of the ~~Proposed Project~~previously proposed project, according to the Applicant, would target energy efficiency measures, the inclusion of renewable energy, and carbon emission reductions in line with the City's goals. In addition, emissions associated with the ~~Proposed Project~~previously proposed project's consumption of grid electricity is expected to decrease as New York State and New York City target 100 percent renewable electricity and would result in significant reduction of emissions associated with the buildings' electricity consumption. Total GHG emissions associated with the construction, including direct emissions and upstream emissions associated with construction materials, would be approximately 23 thousand~~,000~~ metric tons.

The *CEQR Technical Manual* defines five goals by which a project's consistency with the City's emission reduction goal is evaluated: (1) efficient buildings; (2) clean power; (3) sustainable transportation; (4) construction operation emissions; and (5) building materials carbon intensity.

The Applicant is currently evaluating the specific energy efficiency measures and design elements that may be implemented for both the Development Site and the Museum Site and is ~~seeking~~ committed to achieve at least a ~~Gold~~Silver-level certification under the Leadership in Energy and Environmental Design (LEED) Core and Shell rating system, version 4, for the proposed building on the Development Site. The Applicant is committed at a minimum to achieve the prerequisite energy efficiency requirements under LEED and would likely exceed them. To qualify for LEED, the proposed building on the Development Site would be required to exceed the energy requirements of New York City's building code (currently the same as ASHRAE 90.1-2013), resulting in energy expenditure lower than a baseline building designed to meet but not exceed the minimum building code requirements by approximately two to four percent for new construction and one to two percent for major renovations or core and shell projects. Furthermore, additional energy savings would likely be achieved via guidance for tenant build-out, which would control much of the building's energy use and efficiency, but those are unknown at this time. The project's commitment to building energy efficiency, exceeding the building code energy requirements, ensures consistency with the efficient buildings goal defined in the *CEQR Technical Manual* as part of the City's GHG reduction goal.

The Applicant is required at a minimum 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 and adopted the ASHRAE 90.1-2016 standard as a benchmark and aligns with NYStretch Energy Code 2020 developed by New York State Energy Research and Development Authority (NYSERDA). The ~~Proposed Project~~previously proposed project would implement any measures required under such programs, as legally applicable. Therefore, the ~~Proposed Project~~previously proposed project~~s~~ would support the goal identified in the *CEQR Technical Manual* of building efficient buildings.

The ~~Proposed Project~~previously proposed project would also support the other GHG goals by virtue of its proximity to public transportation, reliance on natural gas, commitment to construction air quality controls, and the fact that as a matter of course, construction in New York City uses recycled steel and includes cement replacements. All of these factors demonstrate that the proposed development supports the GHG reduction goal.

Therefore, based on the commitment to energy efficiency and by virtue of location and nature, the ~~Proposed Project~~previously proposed project would be consistent with the City's emissions reduction goals, as defined in the *CEQR Technical Manual*.

RESILIENCE TO CLIMATE CHANGE

The new construction for the Development and Museum Sites would be designed to provide flood resilience to the potential conditions projected through the 2050s, and the designs would 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. This may include protecting all critical infrastructure up to potential flood conditions projected out to the year 2100, elevating all residential units above those levels, and designing non-critical uses located below the potential flood elevations projected for 2050 to either be protected from flood waters via stand-alone deployable barriers or to flood and quickly recover from severe flooding events. Nothing in the project's designs would be intended to structurally or otherwise preclude the introduction, at a later date, of additional flood protection measures (such as flood barriers) to protect project elements up to potential flood elevations projected for 2100. As discussed in Chapter 9, "Natural Resources," the floodplain at the Development and Museum 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, the ~~Proposed Project~~previously proposed project would not affect the floodplain or result in increased risk of flooding of areas adjacent to the study area. Similarly, the flood resilience measures that would be incorporated into the ~~Proposed Project~~previously proposed project to address flood risk through the 2050s and any adaptations for end-or-century potential flood elevations at the sites of the proposed projects would not have the potential to increase flood risk to of adjacent properties.

B. GREENHOUSE GAS EMISSIONS

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. 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, 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 as such at the project level 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.

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 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 any analysis of GHG emissions.

Methane and N_2O also play an important role 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, therefore, are included in GHG emissions analyses when the potential for substantial emission of these gases exists.

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 mostly 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~~previously proposed project.

To present a complete inventory of all GHGs, component emissions are added together and presented as carbon dioxide equivalent (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[2] 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). The GWPs for the main GHGs discussed here are presented in **Table 13-1**.

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

Greenhouse Gas	100-year Horizon GWP
Carbon Dioxide (CO_2)	1
Methane (CH_4)	21
Nitrous Oxide (N_2O)	310
Hydrofluorocarbons (HFCs)	140 to 11,700
Perfluorocarbons (PFCs)	6,500 to 9,200
Sulfur Hexafluoride (SF_6)	23,900

Note: The GWPs presented above are based on the Intergovernmental Panel on Climate Change's (IPCC) Second Assessment Report (SAR) 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 may have been used for this study. Since the emissions of GHGs other than CO_2 represent a very minor component of the emissions, these differences are negligible.
Source: 2020 *CEQR Technical Manual*

[2] *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.

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

~~GHG EMISSIONS~~

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 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[3] that pledged deep cuts in emissions, with a stated goal of reducing annual emissions to levels that would be between 26 and 28 percent lower than 2005 levels by 2025.[4] On January 20, 2021, the President of the United States signed an executive order to bring the United States back into the Paris Agreement.

Regardless of the Paris Agreement, the United States 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 emission 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. In October 2017, EPA proposed to repeal the Clean Power Plan and issued the Affordable Clean Energy rule June 19, 2019, replacing the Clean Power Plan. The Affordable Clean Energy rule establishes revised emissions reduction measures accepted as best technology and focusing on energy efficiency improvements in place of direct emissions reduction measures.

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.[5] The 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. The State has also adopted California's GHG vehicle standards (which are at least as strict as the federal standards).

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

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

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

The New York State Energy Plan outlines the State's energy goals and provides strategies and recommendations for meeting those goals. 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.

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 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, and reducing an additional 30 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.

In 2019, New York State enacted the Climate Leadership and Community Protection Act (CLCPA) to achieve the GHG reductions goals established in the New York State Energy Plan as well as establishing a new long-term goal to reduce statewide GHG by 100 percent, compared with 1990 levels by 2050. The legislation charges New York State Climate Action Council with establishing statewide GHG emission limits and agency regulations to reduce emissions, increase investments in renewable energy sources, and ensure that significant portions of investments are made in disadvantaged communities. Pursuant to these requirements, the Climate Action Council will prepare and approve a scoping plan outlining recommendations for attaining the GHG emission limits and reduction goals. A final scoping plan is anticipated to be approved by 2022.

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").[6] 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, 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 and achieving net-zero citywide GHG emissions by 2050.

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

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

building energy and water consumption annually, using an EPA online tool. By 2025, commercial buildings over 50,000 square feet will also 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 NYCECC, 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 GHG reduction goals, the City has convened several Technical Working Groups to analyze the GHG reduction pathways from the building sector, power, transportation, and solid waste sectors to develop action plans for these sectors. The members of the Technical Working Groups are tasked to 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 to building energy code and take other measures aimed at substantially reducing GHG emissions.

In 2019, the New York City Council enacted a legislative package targeting GHG emissions associated with building energy consumption—the Climate Mobilization Act. 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 has established annual building emission limits beginning in 2024 and would require the owner of a covered building to submit annual reports demonstrating the building is in compliance 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.

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. The Applicant is currently evaluating the specific energy efficiency measures and design elements which would be implemented, and ~~intends~~ is committed to achieve at least ~~Gold~~ Silver-level certification under the LEED rating system.

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. Nonetheless, prudent planning dictates that all sectors address GHG emissions by identifying GHG sources and practicable means to reduce them. Therefore, this chapter presents the total GHG emissions potentially associated with the ~~Proposed Project~~previously 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 condition with and without the Proposed Action. The reason for that different approach is that to truly account for the incremental emissions only would require speculation regarding where people would live in a No Action condition if residential units are not built at this location, what energy use and efficiency might be like for those alternatives and other related considerations, and similar assumptions regarding commercial and other uses. The focus is therefore on the total emissions associated with the uses, and on the effect of measures to reduce those emissions.

Estimates of potential GHG emissions associated with the ~~Proposed Project~~previously proposed project are based on the methodology presented in the *CEQR Technical Manual*. Estimates of emissions of GHGs from the development have been quantified, including off-site emissions associated with use of electricity, on-site emissions from heat and hot water systems, and emissions from vehicle use associated with the proposed development. GHG emissions that would result from construction are discussed as well. As per the guidance, analysis of building energy is based on the average current carbon intensity of electricity in 2008, which will likely be lower in the 2026 build year and lower still in future years as the fraction of electricity generated from renewable sources continues to increase. Emissions from transportation conservatively apply the emission factors for the 2026 analysis year, although the Development Site and the Museum Site would likely not all be fully occupied by then and emissions would be lower due to the lower traffic generated. Vehicular emission factors will also continue to decrease in future years as vehicle engine efficiency increases and emissions standards continue to decrease, resulting in lower emissions in future years. Since the methodology does not account for future years and other changes described above, it also does not explicitly address potential changes in future consumption associated with climate change, such as increased electricity for cooling, or decreased on-site fuel for heating. Overall, this analysis results in conservatively high estimates of potential GHG emissions.

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. 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 carbon dioxide equivalent (CO_2e) emissions per year (see "Pollutants of Concern," above).

BUILDING OPERATIONAL EMISSIONS

Estimates of emissions due to building electricity and fuel use for proposed buildings on the Development Site and the Museum Site were prepared using building carbon intensity by use type as detailed in the *CEQR Technical Manual*. Per *CEQR Technical Manual* guidance, the building carbon intensity data represents 2008 citywide averages by use type and not projections for the future build year (2026). Estimates of emissions due to parking facility electricity and fuel use were prepared using building carbon intensity data calculated from the 2014 local law 88

benchmark data,[7] representing reasonable worst-case intensity for parking facilities (carbon intensity for these uses is not available in the *CEQR Technical Manual*.) Future emissions for buildings on both the Development Site and the Museum Site do not consider emission reduction measures that will be implemented and are expected to be lower as efficiency and renewable energy use for grid-supplied electric power continue to increase with the objective of meeting State and City future GHG reduction goals. Therefore, the emissions for buildings on both the Development Site and the Museum Site are conservatively estimated.

The Applicant is ~~pursuing~~ committed to at least a LEED Rating of v4 BD+C, ~~Gold~~ Silver Level Certification for the proposed building on the Development Site. In order to demonstrate the proposed building would meet the energy reduction requirements under LEED, detailed energy consumption estimates were developed specifically for the proposed development based on a preliminary design of the proposed building on the Development Site. Based on the results of the energy modeling, the energy savings for the proposed building is expected to reduce energy consumption by approximately 18 percent compared to the baseline condition (meeting the energy requirements of the NYCECC). Additionally, the Applicant is also considering additional energy conservation measures (ECMs) that may be implemented and would result in a further reduction in energy consumption. With the ECMs in place, ~~the~~ a further reduction in the energy consumption for the preliminary design was modeled ~~to be reduce by an additional six percent from the preliminary design and~~ approximately 23 percent ~~from~~ below the baseline. While the energy modeling was performed before the design was finalized, it is anticipated that a similar reduction would be applicable to any updates in the building design.

Estimates of emissions from building electricity and fuel use of the preliminary design of the proposed building on the Development Site were prepared using the projections of energy consumption from the detailed energy modeling performed and the emission factors referenced in the 2019 GHG emissions inventory for New York City.[8] The preliminary design of the proposed building for the Development Site was estimated to require 8.48 gigawatt-hours per year (GWh/yr) of electricity for general building use and a total of 330 million British thermal units per year (MMBtu/yr) of natural gas for heat and hot water. This would be reduced to 7.94 GWh/yr and 314 MMBtu/yr for electricity and natural gas, respectively, with the additional energy conservation measures. Since the electricity emissions represent the latest data (2019) and not future build year (2026), future emissions are expected to be lower as efficiency and renewable energy use continue to increase with the objective of meeting State and City GHG reduction goals.

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~~previously proposed project was 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 weekday and Saturday person trips and delivery trips by proposed use, the percentage of vehicle trips by mode, and the average vehicle occupancy. To calculate annual totals, the number of trips on Sundays was assumed to be the same as on Saturday. Travel distances shown in Table 18-5 and 18-6 and

[7] NYCMOS. *2015 LL84 Energy and Water Data Disclosure* (Data for Calendar Year 2014). Latest version dated 12/8/15.

[8] The City of New York Mayor's Office of Long-Term Planning and Sustainability. Inventory of New York City Greenhouse Gas Emissions in 2019.

associated text of the *CEQR Technical Manual* 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 manual was used to estimate GHG emissions from all trips attributable to the ~~Proposed Project~~previously proposed project.

Based on the latest fuel lifecycle model from Argonne National Laboratory,[9] emissions from producing and delivering fuel ("well-to-pump") are estimated to add an additional 25 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 development, 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	Taxi	Truck
Local	390,790	53,342	271,226
Arterial	852,632	116,383	591,765
Interstate/Expressway	532,895	72,740	369,853
Total	1,776,317	242,465	1,232,844

CONSTRUCTION EMISSIONS

A description of construction activities is provided in Chapter 17, "Construction." Construction emissions include emissions from on-road trips, on-site non-road engines, and materials extraction, production, and transport.

The number of vehicle trips by mode (worker cars, delivery trucks) that would be generated by the ~~Proposed Project~~previously proposed project's construction was calculated using the assumptions developed for the analysis and presented in Chapter 17, "Construction." The assumptions used in the calculation include average daily workers, the percentage of auto trips, and the average vehicle occupancy to develop annual vehicle miles traveled (VMT) associated with commuting workers. An average round-trip commute distance for construction workers in the New York City Region of 25.3 miles (based on the average trip to work distance for the New York Metropolitan Area area)[10] was used. Similarly, the numbers of trucks (concrete trucks, dump trucks, and tractor trailers) for each phase of construction activity were used to estimate truck VMT. Distances for truck deliveries were developed based on estimates of the origin and destination of materials for the ~~Proposed Project~~previously proposed project. Table 18-7 of the

[9] Based on GREET1_2016 model from Argonne National Laboratory.

[10] NYSDOT. *2009 NHTS, New York State Add-On*. Key Tables. Table 3: Average Travel Day Person-Trip Length by Mode and Purpose, trip-to work distance for SOV in NYMTC 10-county area. 2011.

CEQR Technical Manual was used to determine the percentage of vehicle miles traveled by road type and the most recent version of the EPA MOVES model was used to obtain an estimate of car and truck GHG emission factors used to produce the associated emissions attributable to the ~~Proposed Project~~previously proposed project.

The ~~Proposed Project~~previously proposed project, over its entire construction period, would result in construction worker travel of 2.0 million VMT. Additionally, the ~~Proposed Project~~previously proposed project would result in construction truck trips totaling 0.8 million VMT. These data were used as the basis for the GHG emissions calculations from mobile sources, applying emission factors as described above for operational mobile source emissions.

On-site emissions were calculated for non-road construction engines based on specific estimates of construction activity and fuel consumption data from the NONROAD emissions module within model EPA's MOVES model. A detailed schedule for the use of non-road construction engines was developed, as described in Chapter 17, "Construction." The detailed data, including the number, type, power rating, and hours of operation for all construction engines was coupled with fuel consumption rate data from EPA's MOVES model to estimate total fuel consumption throughout the duration of the construction activities. Non-road construction engines are estimated to require approximately 378,000 gallons of diesel equivalent throughout the duration of construction. The quantity of fuel was then multiplied by an emission factor of 10.30 kilograms CO_2e per gallon of diesel fuel.[11]

Upstream emissions related to the production of construction materials were estimated based on the expected quantity of iron or steel and cement. Although other materials will be used, cement and metals have the largest embodied energy and direct GHG emissions associated with their production, and substantial quantities would be used for the ~~Proposed Project~~previously proposed project.

The construction is estimated to require 8,545 metric tons of cement. An emission factor of 0.928 metric tons of CO_2e per metric ton of cement produced was applied to estimate emissions associated with energy consumption and process emissions for cement production.[12] The precise origin of cement for this project is unknown at this time.

Construction is estimated to require 7,252 metric tons of steel. An emission factor of 0.6 metric tons of CO_2e per metric ton of steel product produced was applied to estimate emissions associated with production energy consumption,[13] and 0.65 metric tons of CO_2e per metric ton of steel product produced for process emissions associated with iron and steel production were applied.[14]

EMISSIONS FROM SOLID WASTE MANAGEMENT

The ~~Proposed Project~~previously proposed project would not fundamentally change the City's solid waste management system. Therefore, as per the *CEQR Technical Manual*, the GHG emissions from solid waste generation, transportation, treatment, and disposal are not quantified.

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[11] EPA. Emission Factors for Greenhouse Gas Inventories. 26 March 2020.

[12] The Portland Cement Association. Life Cycle Inventory of Portland Cement Manufacture. 2006.

[13] Arpad Horvath et al. Pavement Life-cycle Assessment Tool for Environmental and Economic Effects, Consortium on Green Design and Manufacturing. UC Berkeley. 2007.

[14] Based on 42.3 teragrams of CO_2e emitted and approximately 65,460,000 tons produced; Source: EPA. *Inventory of U.S. Climate Change and Sinks: 1990–2009*. April 15, 2011.

PROJECTED GHG EMISSIONS

BUILDING OPERATIONAL EMISSIONS

The building floor area, emission intensity, and resulting GHG emissions from each of the uses are presented in detail in **Table 13-3**. The analysis presents the total emissions after construction. In general, the uses with more floor area result in greater annual GHG emissions, except for the garage parking, which has a substantially lower GHG intensity than other uses.

Table 13-3
Annual Building Operational Emissions

Source Use	Building Area (gsf)	GHG Intensity[1] (kg CO_2e / gsf / year)	Annual GHG Emissions (metric tons CO_2e)
Office	267,747	9.43	2,525
Residential	394,000	6.59	2,599
Local Retail	13,353	9.43	126
Museum[2]	86,691	11.42	990
Community Facility	5,000	11.42	57
Parking	22,000[3]	1.24	27
		TOTAL:	**6,324**

Notes: Totals may not sum due to rounding.
Per *CEQR Technical Manual* guidance, electricity emissions are representative of existing conditions in 2008 and not the analysis year (2026). Future emissions are expected to be lower.
Representative emission intensity for existing buildings are higher than new and future construction, and do not include the expected energy efficiency measures.
Source:
[1] *CEQR Technical Manual*
[2] Located on the Museum Site, all other uses would be constructed on the Development Site.
[3] The Development Site will be designed to include 128 below-grade parking spaces. The area of the parking facilities within the Development Site were estimated for the GHG analysis based cellar design drawings for Development Site.

Energy Conservation Measures

The fuel consumption, electricity use, emission factors, and resulting GHG emissions based on projected energy consumption for the ~~Proposed Project~~previously proposed project with and without energy conservation measures under consideration are presented in detail in **Table 13-4**. When compared to a baseline building meeting the NYCECC, the preliminary design of the proposed building on the Development Site is anticipated to result in a 15 percent reduction in GHG emissions. If the additional energy conservation measures under consideration for the proposed building are implemented, ~~an additional six percent reduction in~~ GHG emissions ~~is~~ are anticipated to be reduced by up to ~~(~~21~~18~~ percent compared to the baseline condition).

Table 13-4
Annual Building Operational Emissions
Development Site—Preliminary Design

Scenario	Source	Annual Consumption	Emission Factor	GHG Emissions (metric tons CO_2e)
Baseline	Natural Gas	10,895 MMBtu	53.196 kg CO_2e/MMBtu[1]	580
	Grid Electricity	9.36 GWh	289.0 metric tons/GWh[2]	2,704
			TOTAL:	3,284
Without ECM	Natural Gas	6,205 MMBtu	53.196 kg CO_2e/MMBtu[1]	330
	Grid Electricity	8.48 GWh	289.0 metric tons/GWh[2]	2,452
			TOTAL:	2,782
With ECM	Natural Gas	5,903 MMBtu	53.196 kg CO_2e/MMBtu[1]	314
	Grid Electricity	7.94 GWh	289.0 metric tons/GWh[2]	2,295
			TOTAL:	**2,609**

Notes:
Totals may not sum due to rounding.
Per *CEQR Technical Manual* guidance, electricity emissions represent the latest data (2019) and not the future build year (2026). Future emissions are expected to be lower.
Sources:
[1] *CEQR Technical Manual*
[2] The City of New York Mayor's Office of Long-Term Planning and Sustainability. *Inventory of New York City Greenhouse Gas Emissions in 2019*. Note that this factor represents a correction of the factor presented in the 2020 *CEQR Technical Manual*.

MOBILE SOURCE EMISSIONS

The mobile-source-related GHG emissions from the ~~Proposed Project~~previously proposed project are presented in detail in **Table 13-5**.

Table 13-5
Annual Mobile Source Emissions
(metric tons CO_2e, 2026)

Use	Passenger Vehicle	Taxi	Truck	Total
Office	688	32	1,808	2,529
Residential	204	20	559	783
Local Retail	16	19	102	137
Museum	71	48	90	209
Community Facility	6	1	32	38
Total	**984**	**120**	**2,591**	**3,696**

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

CONSTRUCTION EMISSIONS

The estimated GHG emissions from construction of the ~~Proposed Project~~previously proposed project are presented in **Table 13-6**. Total construction emissions, 23,156 metric tons CO_2e, would be equivalent to approximately 2.3 years of operational emissions. Emissions for the ~~Proposed Project~~previously proposed project are approximately proportional to the size of their respective development areas.

Table 13-6
Total Construction GHG Emissions
(metric tons CO_2e)

Use	2022	2023	2024	2025	*Total*
Nonroad	2,561	1,271	81	27	*3,940*
Transportation	486	769	932	65	*2,252*
Materials[1]					*16,964*
Total					***23,156***

Notes:
Totals may not sum due to rounding.
[1] Emissions associated with construction materials are not reported annually, as emissions are associated with the production of materials and may not occur within the same year.

SUMMARY

A summary of GHG emissions by source type is presented in **Table 13-7**. Emissions associated with mobile sources represent approximately two thirds of the total emissions, and building energy emissions represent approximately one third of the total. Note that if new buildings were to be constructed elsewhere to accommodate the same number of units and 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~~previously proposed project, depending on their location, access to transit, building type, and energy efficiency measures. The ~~Proposed Project~~previously proposed project, as noted above, is not expected to fundamentally change the City's solid waste management system, and therefore, emissions associated with solid waste are not presented.

Table 13-7
Summary of Annual GHG Emissions, 2026
(metric tons CO_2e)

Use	Building Operations	Mobile	*Total*
Office	2,525	2,529	*5,054*
Residential	2,599	783	*3,382*
Local Retail	126	137	*263*
Museum	990	209	*1,199*
Community Facility	57	38	*95*
Parking	27	0	*27*
Total	**6,324**	**3,696**	***10,020***

Note: Totals may not sum due to rounding.

The operational emissions from building energy use include on-site emissions from fuel consumption as well as emissions associated with the production and delivery of the electricity to be used on-site. The Applicant is currently evaluating the specific energy efficiency measures and design elements that would be implemented (see the following section) for the proposed buildings on both the Development Site and Museum Site, and intends to achieve certification under the LEED rating system for the proposed building on the Development Site. To qualify for LEED, the building would be required to exceed the energy requirements of ASHRAE 90.1-2013 so as to reduce energy expenditure by at least two to four percent as compared with a baseline building designed to meet the minimum building code requirements. Based on detailed energy modeling of a preliminary design, the proposed building on the Development Site is anticipated to achieve

reduced energy expenditures by approximately 18 percent. While the above estimate reflects a preliminary building design, the energy evaluation is not final and detailed design measures may continue to evolve as design to attain LEED energy efficiency requirements progresses. Furthermore, design guidelines for tenant build-out would likely result in much greater savings since much of a building's energy use and efficiency is tied to tenant uses, which are unknown at this time and could not be included in this estimate.

In addition, total GHG emissions associated with the construction, including direct emissions and upstream emissions associated with construction materials (excluding fuel), would be approximately 23,000 metric tons.

ELEMENTS THAT WOULD REDUCE GHG EMISSIONS

The ~~Proposed Project~~previously proposed project, according to the Applicant, would include a number of sustainable design features which would, among other benefits, result in lower GHG emissions for the proposed buildings on both the Development Site and Museum Site. As a prerequisite for LEED certification, the proposed development on the Development Site would use less energy than it would if built only to meet the building code. In general, dense, mixed-use development with access to transit and existing roadways is 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*. 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 energy systems for the proposed buildings on the Development Site and Museum Site would utilize high-efficiency heating, ventilation, and air conditioning (HVAC) systems, with many components designed to reduce energy consumption. The proposed building on the Development Site would also be designed to facilitate daylight harvesting by admitting more daylight than solar heat. Additionally, in order to meet New York City requirements, rooftop photovoltaic solar panels may also be installed on both buildings.

In order to reduce the contribution to the urban heat-island effect from both buildings, ~~green~~ landscaped roofs are likely to be implemented. In addition, high-albedo roofs are being considered for the proposed building on the Development Site. Motion sensors for lighting at both buildings would be incorporated in all areas controlled by the core and shell design (e.g., back of house, stairwells, amenity spaces) resulting in efficient energy consumption.

The Applicant would implement additional lighting controls within the design of the proposed building on the Development Site. Efficient lighting in all areas within the building will be controlled by the core and shell design, daylight harvesting in areas where practicable, and elevators with regenerative breaking would be installed to reduce electricity consumption. Exterior lighting would be energy efficient and directed. Large tenants would be provided with submeters for electricity allowing tenants to track and optimize their electricity use. Third-party fundamental and enhanced building energy systems commissioning would be undertaken upon completion of construction to ensure energy performance. The Applicant would also provide sustainable design guidelines to tenants for build-out.

Water conserving fixtures, meeting New York City's stringent building code requirements, would be installed at the proposed building on both the Development Site and Museum Site. Water-efficient landscaping would be selected to reduce water consumption, indirectly reducing energy consumption associated with potable water production and delivery. Storage and collection of recyclables would be incorporated in building design. Electricity would be sub-metered. Storage and collection of recyclables would be designed explicitly.

The estimated GHG emissions associated with the building energy use were conservatively estimated for the proposed buildings on both the Development Site and Museum Site using the 2008 citywide average emission intensities. The emissions would fall below the immediate carbon intensity limits established by the City, and with the implementation of the above measures, the ~~Proposed Project~~previously proposed project would be in line with the City's energy efficiency measures, renewable energy, and carbon emission reduction goals. GHG emissions associated with the electricity consumption at both buildings would continue to decrease in future years as the carbon intensity associated with grid electricity is expected to decrease as New York State and New York City target 100 percent renewable electricity by 2040.

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

USE CLEAN POWER

While the use of clean power would not be specifically required, the proposed buildings on both the Development Site and Museum Site would, as detailed in Chapter 12, "Air Quality," use natural gas, a lower carbon fuel, for the normal operation of the heat and hot water systems. It is also possible that local renewable power production (e.g., geothermal, solar, wind) would be considered while reviewing options for LEED, EPA Energy Star, and achieving the above efficient building goal.

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

TRANSIT-ORIENTED DEVELOPMENT AND SUSTAINABLE TRANSPORTATION

The ~~Proposed Project~~previously proposed project is located within walking distance from the Fulton Street and Brooklyn Bridge-City Hall subway stations, and it is supported by numerous bus routes including the M15. In addition, the ~~Proposed Project~~previously proposed project is located near dedicated bike lanes within the East River Greenway, and two Citi Bike stations are located within several blocks. Furthermore, an additional Citi Bike station would be located at the Development Site.

REDUCE CONSTRUCTION OPERATION EMISSIONS

Construction specifications would include an extensive diesel emissions reduction program, as described in detail in Chapter 17, "Construction," including diesel particle filters for large construction engines 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.

USE BUILDING MATERIALS WITH LOW CARBON INTENSITY

Recycled steel may be used for most structural steel since the steel available in the region is mostly recycled. Some cement replacements such as fly ash and/or slag may also be used, and concrete content would be optimized to the extent feasible.

The use of local, rapidly renewable, or certified sustainable wood, and recycled build-out materials would be considered. Construction waste would be diverted from landfills to the extent practicable by separating out materials for reuse and recycling.

C. RESILIENCE TO CLIMATE CHANGE

The Waterfront Revitalization Program (WRP)[15] addresses climate change and sea-level rise. The WRP requires consideration of climate change and sea-level rise in planning and design of development within the defined Coastal Zone Boundary. The Project Area is within that 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 review. The proposed projects' consistency with WRP policies is described in Chapter 2, "Land Use, Zoning, and Public Policy," and **Appendix B, "Waterfront Revitalization Program Consistency Assessment**."

Since the Project Area is near the East River waterfront, the potential effects of global climate change on the ~~Proposed Project~~previously proposed project have been considered and measures that would be implemented as part of the ~~Proposed Project~~previously proposed project to improve resilience to climate change have been 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.[16] The recommendations are to provide more protective standards for coastal development, wetlands protection, shoreline armoring, and post-storm recovery; to 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.[17] New York State's Community Risk and Resiliency Act (CRRA)[18] requires that applicants for certain State programs demonstrate that they

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

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

[17] NYSERDA. New York State Climate Action Plan Interim Report. November, 2010.

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

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 (DEC) to establish official State sea-level rise projections. In February 2017, DEC adopted a rule (6 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. In 2020, DEC published, in consultation with the Department of State, recommended flood-risk management guidance incorporating potential future conditions.[19]

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 Resilience and Recovery, 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. NPCC 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 as "extremely likely," but there is uncertainty regarding the probability the various levels projected and timescale. Intense hurricanes are characterized 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 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.

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[19] New York State Department of Environmental Conservation. *New York State Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act*. August, 2020.

[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.

The New York City Green Code Task Force also has 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 on 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 and sea-level rise in planning and design of waterfront development. As set forth in more detail in the City's *CEQR Technical Manual*, the provisions of the WRP are applied by city agencies when conducting environmental review, and are described in detail in Chapter 2, "Land Use, Zoning, and Public Policy," and **Appendix B**.

Climate change considerations and measures that would be implemented to increase climate resilience are discussed below. Additional climate change considerations may be incorporated into state and/or local laws prior to the development of the ~~Proposed Project~~previously proposed project, and any development would be constructed to meet or exceed the codes in effect at the time of construction.

RESILIENCE OF THE PREVIOUSLY PROPOSED PROJECT TO CLIMATE CHANGE

According to current flood hazard projections,[25] the current 1-in-100 coastal storm surge could reach elevations of 12 feet NAVD88 at both the Development Site and the Museum Site. Therefore, the official design flood elevation per the New York City building code would be one foot above these elevations at each site. Resilience considerations are accounted for throughout the lifetime of the use being evaluated. Residential buildings have a projected lifetime of 80 years or more, and therefore the furthest available projections (end of century) are considered here. According to the above cited NPCC data, by the 2050s, the 1-in-100 flood levels could reach 30 inches higher due to sea-level rise (per NPCC "High" scenario), to approximately 14.5 feet NAVD88 at the Development Site and the Museum Site. By the end of the century, the 1-in-100 flood levels could reach 75 inches higher (per NPCC "High" scenario), to approximately 18 feet NAVD88 at both the Development Site and the Museum Site.

Note that these flood areas and elevations are likely conservatively high and may be revised in the near future. On October 17, 2016, the Federal Emergency Management Agency (FEMA) and New York City Mayor 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. While revised flood maps have not yet been produced, the appeal generally identified potential reductions

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

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

[25] FEMA. *Preliminary Flood Insurance Rate Map*. Panel 3604970203G. Release Date: 12/05/2013.

of 1.5 to 2.0 feet in the area of the ~~Proposed Project~~previously proposed project. 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.

In the Project Area and the nearby surrounding areas, New York City is currently in the process of planning and approving the Lower Manhattan Coastal Resiliency (LMCR) Project, a flood-proofing and park-building measure that extends from Montgomery Street, one block north of the Project Area, around Lower Manhattan to the north of Battery Park City. The City received funding through the U.S. Department of Housing and Urban Development's (HUD) National Disaster Resilience Competition (NDRC) to initiate LMCR and is in the design phase. In addition, the City is currently designing the East Side Coastal Resiliency (ESCR) project, a similar effort starting at Montgomery Street northward to East 25th Street, and is currently pursuing an alternative that is undergoing environmental review. The City and the HUD have committed $760 million to ESCR. Through these projects the City is proposing to install a flood protection system within City parkland and streets. The flood protection system would include a combination of floodwalls, levees, landscaped berms, and closure structures, and deployable systems with other infrastructure improvements to reduce flooding, and is being designed to accommodate the 1-in-100 flood elevation with 30 inches of sea-level rise—equivalent to the NPCC 2050s "High" scenario.[26]

The new construction for the ~~Proposed Project~~previously proposed project would be designed to provide resilience to the potential conditions projected through the 2050s, and the design would 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:

- The Development Site would be designed using a flood elevation of +13 feet, which is one foot above the base flood elevation, in accordance with the Flood Resistant Construction requirements of Appendix G of the NYC Building Code. The ground floor of the Development Site would be below the 1-percent annual chance flood elevation by the 2050s and beyond. Additionally, some mechanical equipment would be located in the cellar of the building. Therefore, the cellar would be designed to implement dry floodproofed per Appendix G of the NYC Building Code. Flood glazing would be used for all fixed storefront windows that exist at +13 feet NAVD88 or below. Additionally, flood logs would be placed along doors at the time of a flood event. This approach would provide resilience to 1-in-100 flood elevations for all critical infrastructure through the end of the century.
- Similarly, the Museum Site would be designed using a flood elevation of +13 feet NAVD88 and the building would be constructed to conform with all requirements of Appendix G of the NYC Building Code. The ground floor of the existing buildings on the Museum Site at 91-93 South Street and 2-4 Fulton Street is located below the BFE, and would remain below the 1-percent annual chance flood elevation under all scenarios. The second floor of this building is located at an elevation of +14.3 feet and would be below the 1-percent annual chance flood elevation by the 2050s or 2080s under the NPCC High-Scenario or Mid-Scenario projections, respectively. Renovations of buildings and potential construction would incorporate dry

[26] The City of New York. De Blasio Administration Announces Faster, Updated Plan for East Side Coastal Resiliency Project. Presentation, September 28, 2018. ESCR: Project Area One—Conceptual Design Update. Press Release, December 1 and 7, 2016.

floodproofing wherever necessary within the basement and first floors, such as for electrical closets and restrooms. The remainder of these spaces, such as the front lobby areas, would be wet floodproofed and allowed to flood, and would contain waterproof interior material that complies with the requirements of Appendix G of the NYC Building Code. This approach would provide resilience to 1-in-100 flood elevations for all critical infrastructure through the end of the century.

- All new residential units at the Development Site would be located higher than 18 feet NAVD88, protecting residential units from potential 1-in-100 flood events throughout the end of the century.
- Both the Development Site and the Museum Site would be located in Zone AE, beyond the current Limit of Moderate Wave Action (LMWA) and this would not affect flood depth (as wave height is included in the base flood elevation).

By the end of the century, projected flood levels could reach up to approximately 18 feet NAVD88 for both the Development Site and the Museum Site. Should increased flood levels require future enhancement (adaptive measures), each building may be retrofitted with flood protection features as required by the local codes. These measures may include, for example, considerations for stand-alone flood barriers (i.e., flood gates, aluminum shielding). As discussed in Chapter 9, "Natural Resources," the floodplain at the Project Area is affected by coastal flooding, which is controlled by astronomic tides and meteorological forces and is unaffected by occupancy of the floodplain. As such, the ~~Proposed Project~~previously proposed project would not affect the floodplain or result in increased risk of flooding of areas adjacent to the study area. Similarly, the flood resilience measures incorporated into the designs of the ~~Proposed Project~~previously proposed project to address flood risk through the 2050s and any adaptations for end-or-century potential flood elevations at the Development Site and Museum Site would not have the potential to increase flood risk to of adjacent properties. ✶