Chapter 14: Greenhouse Gas Emissions and Climate Change

A. INTRODUCTION

This chapter evaluates the greenhouse gas (GHG) emissions that would be generated by the construction/renovation and operation of developments that may occur as a result of the Proposed Project and the consistency of the Proposed Project with the citywide GHG reduction goals (Section B). This chapter also evaluates the resilience of the Proposed Project developments to climate conditions throughout their lifetimes (Section C).

As discussed in the 2014 *City Environmental Quality Review* (*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 in the City. 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.

PRINCIPAL CONCLUSIONS

GREENHOUSE GAS EMISSIONS

The building energy use and vehicle use associated with the Proposed Project buildings operation would result in up to approximately 184 thousand metric tons of carbon dioxide equivalent (CO_2e) emissions per year. Additional emissions of 54 thousand metric tons of CO_2e would be associated with renovation and construction, equivalent to ~~approximately 3 to 4~~less than 1 year~~s~~ of operational emissions.

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 the new buildings, the Applicant is required at a minimum to achieve the energy efficiency requirements of New York City's building code. In 2016, as part of the City's implementation of strategies aimed at achieving the OneNYC GHG reduction goals, the City adopted a more stringent building energy code, which substantially increased the energy efficiency required of new buildings. Therefore, the Proposed Project would support the goal identified in the *CEQR Technical Manual* of building efficient buildings.

The Proposed Project would support some of the other GHG goals by virtue of its proximity to public transportation, commitment to construction air quality controls, the reuse of existing

buildings, 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 Project supports the GHG reduction goal.

Therefore, the Proposed Project overall would be consistent with the City's emissions reduction goals, as defined in the *CEQR Technical Manual*.

RESILIENCE TO CLIMATE CHANGE

A portion of the Project Area is within the 1 percent annual chance floodplain (Zone AE) and a smaller portion of the Project Area is within a wave impact zone (Coastal A Zone) in the flood hazard area, and all project buildings would be within the 1 percent annual chance floodplain by the 2050s. Redevelopment of existing buildings would incorporate both wet and dry flood protection measures wherever possible to protect against potential flood hazards in future projected conditions. This would include activities such as the installation of aluminum shielding and flood gates upland of 1st Avenue (i.e., dry flood protection) and limiting the use of Building 24's ground floor to temporary uses that could be relocated in the event of flooding (i.e., wet flood protection). Critical infrastructure in each building, where appropriate and practicable, would be raised approximately 3 feet above the ground floor elevation.

The potential for climate change to affect the Proposed Project has been considered and measures and adaptive management strategies have been incorporated to increase climate resilience and to account for potential changes in environmental conditions resulting from climate change.

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.

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.

N_2O and methane 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.

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[1] 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 14-1**.

Table 14-1
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). While the IPCC has since published updated GWP values, the emissions of GHGs other than CO_2 represent a very minor component of the emissions. The original values were retained to maintain consistency in GHG reporting.
Source: 2014 *CEQR Technical Manual*

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

Because of the growing consensus that GHG emissions resulting from human activity have the potential to profoundly impact the Earth's climate, countries around the world have undertaken efforts to reduce emissions by implementing both global and local measures addressing energy consumption and production, land use, and other sectors.

The U.S. Environmental Protection Agency (EPA) is required to regulate GHGs under the Clean Air Act and has begun preparing and implementing regulations. In coordination with the National Highway Traffic Safety Administration (NHTSA), EPA currently regulates GHG emissions from newly manufactured on-road vehicles. In addition, EPA regulates transportation fuels via the Renewable Fuel Standard program, which will phase in a requirement for the inclusion of renewable fuels increasing annually up to 36.0 billion gallons in 2022.

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.[2] The State is now seeking to achieve some of the emission reduction goals via local and regional planning and projects through its Cleaner Greener

[1] *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.

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

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).

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 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.

Under the Regional Greenhouse Gas Initiative (RGGI) nine northeastern and Mid-Atlantic states (including New York State) 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.

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").[3] 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.

In December 2009, the New York City Council enacted four laws addressing energy efficiency in large new and existing buildings, in accordance with PlaNYC. The laws require owners of existing buildings larger than 50,000 square feet to conduct energy efficiency audits and retro-commissioning every 10 years, to optimize building energy efficiency, and to "benchmark" the building energy and water consumption annually, using an EPA online tool. By 2025, commercial buildings over 50,000 square feet 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 New York City Energy Conservation Code, which along with the Energy Conservation Construction Code of New York State (as updated in 2016), requires equipment installed during a renovation to meet current efficiency standards.

In April 2019, New York State enacted the Climate Leadership and Community Protection Act 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

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

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.

In May 2019, the New York City Council enacted Local Law 97 of 2019—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.

A number of benchmarks for energy efficiency and green building design have also been developed (green building design considerations include factors such as material selection, which affects GHG emissions associated with materials extraction, production, delivery, and disposal.) For example, the Leadership in Energy and Environmental Design (LEED) system is a benchmark for the design, construction, and operation of high-performance green buildings that includes energy efficiency components. EPA's Energy Star is a voluntary labeling program designed to identify and promote the construction of new energy efficient buildings, facilities, and homes and the purchase of energy efficient appliances, heating and cooling systems, office equipment, lighting, home electronics, and building envelopes.

METHODOLOGY

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 project or action can help decision makers identify practicable opportunities to reduce GHG emissions and ensure consistency with policies aimed at reducing overall emissions. While there are no established thresholds or standards for assessing the significance of a project's contribution to climate change, 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 and identifies measures that would be implemented and measures that are still under consideration to limit emissions. Note that this methodology differs from most other technical areas in that it does not account for only the increment between the condition with and without the Proposed Project.

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 from the Proposed Project buildings 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 Project. Since the Density-Dependent Scenario would have the highest energy density, this scenario was analyzed as the reasonable worst-case. GHG emissions that would result from construction are discussed as well. As per the guidance, analysis of building energy is based on the average carbon intensity of electricity in 2008. This analysis does not consider potential future reductions in GHG emissions related to increases in the fraction of electricity generated from renewable sources; potential future decreases in vehicular emission factors as vehicle engine efficiency increases and emissions standards continue to decrease,; or 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. In addition, since as mentioned earlier there are no established thresholds or standards for assessing the significance of a project's contribution to climate change, this methodology does not take credit for the GHG emissions that would have been produced under the No Action condition.

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

BUILDING OPERATIONAL EMISSIONS

Estimates of emissions due to building electricity and fuel use 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 analysis year (2027). Estimates of emissions due to hotel electricity and fuel use were prepared using building carbon intensity data calculated from the 2014 local law 88 benchmark data,[4] representing recent citywide averages for hotels (carbon intensity for hotels is not available in the *CEQR Technical Manual*.) Future emissions 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. In addition, the City has introduced carbon intensity limits for most buildings over 25,000 sf that would reduce GHG emissions over time and result in much lower carbon intensities than in 2008.

MOBILE SOURCE EMISSIONS

The number of annual weekday and Saturday vehicle trips by mode (cars, taxis, and trucks) that would be generated by use type by the 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 18-6 and 18-7 and associated text of the *CEQR Technical Manual* were used in the calculations of annual vehicle miles traveled by cars, taxis, and trucks. Table 18-8 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.

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 14-2**.

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

Table 14-2
Vehicle Miles Traveled per Year – Proposed Project

Roadway Type	Passenger	Taxi	Truck
Local	6,638,329	479,912	6,050,057
Arterial	14,483,628	1,047,080	13,200,124
Interstate/Expressway	9,052,267	654,425	8,250,077
Total	**30,174,224**	**2,181,416**	**27,500,257**

CONSTRUCTION EMISSIONS

A description of construction activities is provided in Chapter 18, "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 construction was calculated using the assumptions developed for the analysis and presented in Chapter 18, "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 of 25.3 miles (based on the average trip to work distance for the New York Metropolitan Area)[5] for construction workers in the New York City Region 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. Table 18-8 of the *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.

The Proposed Project would result in construction worker travel of 2.5 million VMT. Additionally, the Proposed Project would result in construction truck trips totaling 2.7 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 from non-road construction engines have been estimated based on specific estimates of construction activity and fuel consumption data from EPA's NONROAD emissions model. A detailed schedule for the use of non-road construction engines was developed, as described in Chapter 18, "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 NONROAD model to estimate total fuel consumption throughout the duration of the construction activities. Non-road construction engines are estimated to require approximately 97 thousand 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.[6]

[5] 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.

[6] EPA. *Emission Factors for Greenhouse Gas Inventories*. 19 November 2015.

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 Action.

The construction is estimated to require 27,558 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 non-energy process emissions for cement production.[7] The precise origin of cement for this project is unknown at this time.

The construction is estimated to require 16,535 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,[8] and 0.65 metric tons of CO_2e per metric ton of steel product produced for non-energy process emissions associated with iron and steel production were applied.[9]

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 solid waste generation, transportation, treatment, and disposal are not quantified.

PROJECTED GHG EMISSIONS

BUILDING OPERATIONAL EMISSIONS

The building floor area, emission intensity, and resulting GHG emissions from each of the Proposed Project's uses are presented in detail in **Table 14-3**. Note that emissions for the new buildings—Buildings 11, 21, and Gateway—are overestimated since they would meet current building code. Artisanal manufacturing and academic uses are both assumed to have the same energy intensity as industrial uses; this is likely highly conservative (increasing the total building emissions by approximately 25 percent), and was applied since the academic use is intended to support the industrial uses, and since specific information regarding artisanal manufacturing was not available. As described above, emissions associated with electricity (applied to all uses) would also be lower in the future.

Table 14-3
Annual Building Operational Emissions – Proposed Project

Source Use	Building Area Inc. Common Space (gsf)	GHG Intensity[(1)] (kg CO_2e/gsf/year)	Annual GHG Emissions (metric tons CO_2e)
Manufacturing	2,017,831	23.18	46,773
Artisanal Manufacturing	1,008,916	23.18	23,387
Office	1,008,916	9.43	9,514
Food Store	43,074	9.43	406
Academic	675,911	23.18	15,668

[7] The Portland Cement Association. *Life Cycle Inventory of Portland Cement Manufac*ture. 2006.

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

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

Hotel	292,493	9.00[(2)]	2,631
Local Retail	189,795	9.43	1,790
Destination Retail	736,296	9.43	6,943
Event Space	46,308	9.43	437
Brooklyn Nets Training Facility	80,574	9.43	760
Indoor Parking	166,000	1.24[(2)]	206
TOTAL:			**108,515**

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 future analysis year (2027). Future emissions are expected to be lower.
Representative emission intensity for existing buildings are higher than new and future construction—emissions from Building 11, Building 21, and the Gateway Building are overestimated.
Artisanal manufacturing and academic uses are both assumed to have the same energy intensity as industrial uses. This is likely highly conservative, and was applied since the academic use is intended to support the industrial uses, and since specific information regarding artisanal manufacturing was not available.
Indoor parking area was conservatively estimated as the total lot areas for Buildings 11 and 21 under the assumption that parking would be a site-wide single floor with stackers.
Sources:
(1) 2014 *CEQR Technical Manual*
(2) AKRF, 2017, based on *Local Law 84 Benchmarking Data Disclosure* (for 2015 disclosure, 2014 data)

Furthermore, as detailed above New York City recently enacted Local Law 97 of 2019, which introduces annual carbon emission intensity limits that would apply to most buildings above 25,000 gsf beginning in 2024. These limits would be further reduced in 2029 and 2034. When compared to Local Law 97 limits, the emission intensities specified in the *CEQR Technical Manual* and the GHG emissions estimates presented in **Table 14-3** are conservatively high and would not be in compliance with all emission intensity limits. However, each building included in the Proposed Project (both existing and new buildings) would be required to demonstrate annual compliance with Local Law 97 emission intensity limits. Therefore, the Proposed Project would result in lower emissions in future years.

MOBILE SOURCE EMISSIONS

The mobile-source-related GHG emissions from the Proposed Project are presented in detail in **Table 14-4**.

Table 14-4
Annual Mobile Source Emissions – Proposed Project
(metric tons CO_2e, 2027)

Use	Passenger Vehicle	Taxi	Truck	*Total*
Innovation Economy	3,128	42	39,226	*42,396*
Food Store	1,879	54	1,808	*3,740*
Academic	696	111	1,776	*2,583*
Hotel	930	176	2,406	*3,512*
Local Retail	227	236	1,442	*1,904*
Destination Retail	9,145	383	10,562	*20,090*
Event Space	494	69	365	*928*
Total	**16,499**	**1,070**	**57,585**	***75,153***

CONSTRUCTION EMISSIONS

The estimated GHG emissions from construction of the Proposed Project are presented in **Table 14-5**. These represent the total emission by component for the duration of construction of all Proposed Project construction and renovation activities.

Table 14-5
GHG Emissions from Construction
(metric tons CO_2e)

	Total
Nonroad Construction Equipment	1,108
On-Road Vehicles	6,953
Construction Materials:	
Cement	25,573
Steel	20,598
Total	54,232

SUMMARY

A summary of operational GHG emissions by source type is presented in **Table 14-6**. 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.

Table 14-6
Summary of Annual GHG Emissions
(metric tons CO_2e)

Use	Building Operations	Mobile	*Total*
Retail	9,139	25,735	34,874
Events	437	928	1,364
Storage/Warehousing	0	0	0
Innovation Economy	79,674	42,396	122,070
Brooklyn Nets Training Facility	760	NA	760
Hotel	2,631	3,512	6,143
Academic	15,668	2,583	18,251
Parking	206	0	206
Total	**108,515**	**75,153**	**183,668**

Note that if new buildings were to be constructed elsewhere to accommodate the same uses, similar operational emissions from the use of electricity, energy for heating and hot water, and vehicle use would occur but would differ from those estimated for the Proposed Project, depending on their location, access to transit, building type, energy efficiency design, and incorporation of renewable energy. It is likely that new buildings would be more energy efficient than existing buildings. The new buildings (Buildings 11, 21, and Gateway) would meet the building energy code requirements, similar to any new building in New York City.

The total emission do not represent the potential for emission reduction since much of these emissions are associated with uses that would not change or that have already been recently renovated.

In addition to operational emissions, the total emissions associated with construction throughout the construction period, including both direct energy and emissions embedded in materials (extraction, production, and transport) would be approximately 54,232 metric tons CO_2e. The construction emissions would be equivalent to approximately 3 to 4 years of operational emissions. The construction of new buildings elsewhere to accommodate the same uses provided for by the Proposed Project would be greater since the reuse of existing buildings is more energy efficient and requires less materials.

The Proposed Project are not expected to fundamentally change the City's solid waste management system, and therefore emissions associated with solid waste are not presented.

ELEMENTS THAT WOULD REDUCE GHG EMISSIONS

The Proposed Project would include a number of sustainable features which would, among other benefits, result in lower GHG emissions. In general, reuse of existing buildings and infill development, and dense, mixed-use development with access to transit and existing roadways are 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*. Following the approach defined in the *CEQR Technical Manual*, the Proposed Project would result in development that is consistent with the City's emissions reduction goal as implemented to date.

BUILD EFFICIENT BUILDINGS

The existing Industry City leasing office is certified LEED CI Silver and hopes to continue to encourage energy efficiency and sustainable buildout by new tenants. Industry City is participating in the New York City Carbon Challenge, an effort to substantially reduce building-based emissions in order to advance the City's ambitious goal of reducing citywide greenhouse gas emissions by 80 percent by 2050. As part of the challenge, Industry City has pledged to voluntarily reduce its building-based emissions by 30 percent over the next decade and has implemented a retrofit program to upgrade the energy infrastructure based on increasing electricity reliability and reducing the campus' carbon footprint. The energy infrastructure upgrades and sustainability measures include LED lighting replacements in common spaces, window replacements, cool roofs, on-site waste management, and modern heat distribution systems—as well as the adaptive reuse of underutilized buildings and materials. Approximately half of the windows within Industry City have been replaced with better insulated glazing, increasing the energy efficiency of the buildings. Industry City roofs have been treated with solar-reflective membranes reducing the urban heat island effect and potentially increasing the energy efficiency of the buildings during the cooling season. Some existing materials such as dumpsters and windows have been repurposed on-site, reducing the use of new materials during renovations. Some interior renovations have used repurposed, recycled, and renewable materials. It should be noted that many of these upgrades are already taking place in the existing condition and would continue in the future With Action condition.

For the new buildings, the Applicant is required at a minimum to achieve the energy efficiency requirements of New York City's building code. In 2016, as part of the City's implementation of strategies aimed at achieving the OneNYC GHG reduction goals, the City adopted the 2016 New York City Energy Conservation Construction Code, which substantially increased the stringency of the building energy efficiency requirements and adopted the ASHRAE 90.1-2013 standard as a benchmark. In 2016, the City also published the findings of the Buildings Technical Working

Group convened by the City to identify the pathway to achieving the GHG reduction goals in the building sector.[10] ~~Should the measures identified by the Buildings Technical Working Group or other measures not yet implemented be adopted by the City in the future, they may apply to the Proposed Project similar to any new building (if prior to building approval) or existing building (after construction). The Proposed Project would implement any measures required under such programs as legally applicable.~~As detailed above, in 2019 the City adopted Local Law 97, which requires most buildings over 25,000 gsf to meet specified GHG emission intensity limits beginning in 2024. The Proposed Project would be required to implement energy conservation and emission reduction measures in order to demonstrate compliance with the applicable emission intensity limits. Each building included in the Proposed Project would be required to submit annual reports to the New York City Department of Buildings demonstrating compliance. At such time that the proposed new buildings would be developed, the Applicant would reevaluate the state of current technology and follow best practices for energy efficiency. Therefore, the Proposed Project would support the goal identified in the *CEQR Technical Manual* of building efficient buildings.

USE CLEAN POWER

Some buildings included in the Proposed Project may or are otherwise required to use natural gas (see Chapter 13, "Air Quality," for further information), a lower carbon fuel, for the normal operation of the heat and hot water systems. The Proposed Project is not currently proposing any renewable energy systems; however, the Applicant is committed to exploring the potential use of renewable energy sources at Industry City and would, where feasible and appropriate, integrate on-site solar battery storage or wind turbine energy generation.

TRANSIT-ORIENTED DEVELOPMENT AND SUSTAINABLE TRANSPORTATION

The Proposed Project is located in an area supported by several transit options (existing bus and subway services in the near vicinity of the project). In addition, the Proposed Project is located within a few-minutes-ride from nearby bike route and bike friendly roadways, accessible via local streets. In addition, the New York City Department of Transportation is leading ongoing efforts to complete the Brooklyn Waterfront Greenway, which would introduce a protected bikeway adjacent to the Proposed Project on 2nd Avenue connecting riders to the entire Brooklyn waterfront to the north and south. Two Citi Bike stations on are located adjacent to the Proposed Project on 2nd Avenue at 36th and 39th Streets.

REDUCE CONSTRUCTION OPERATION EMISSIONS

Construction specifications would include an extensive diesel emissions reduction program, as described in detail in Chapter 18, "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 would most likely 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,

[10] The City of New York. *Technical Working Group Report: Transforming New York City Buildings for a Low-Carbon Future*. 2016.

and concrete content would be optimized to the extent feasible. The reuse of existing buildings would substantially reduce the need for construction materials relative to the construction of new buildings.

C. RESILIENCE TO CLIMATE CHANGE

POLICY TO IMPROVE CLIMATE CHANGE RESILIENCE

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. The Waterfront Revitalization Program (WRP)[11] requires consideration of climate change and sea-level rise in the planning and design of development within the defined Coastal Zone Boundary. 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 Project's consistency with WRP policies is described in in detail in **Appendix A-1**, "Waterfront Revitalization Program."

The resilience of the Proposed Project to future projected climate conditions are discussed below.

PROJECTED CLIMATE CONDITIONS

While other climatic changes such as temperature increases and changes in precipitation are projected to occur, the primary focus of this analysis is on changes in sea level rise and its potential impact future severe storm levels and normal high tide inundation. While changes in the frequency and/or severity of severe storms such as hurricanes and Nor'easters may occur, the best available projections of those changes are currently too uncertain for detailed application. However, damage from severe events in general may be more widespread and severe due to sea level rise, which would result in more frequent flooding in some areas, and that is considered here. Changes in temperature could affect energy consumption (discussed in the GHG analysis above), but would not have an impact requiring planning at the project level.

The New York City Panel on Climate Change (NPCC) has prepared a set of climate change projections for the New York City region[12] which was subsequently updated.[13,14] The NPCC includes leading climatologists, sea-level rise specialists, adaptation experts, and engineers, as well as representatives from the insurance and legal sectors, and therefore the data published by NPCC is considered the best available for the New York City area. NPCC projected that sea levels are likely to increase by up to 10 inches by the 2020s, 30 inches by the 2050s, 58 inches by the 2080s, and up to 75 inches by the end of the century (per NPCC "High" scenario for each period).

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[11] 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.

[12] 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.

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

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

New York City's initial resilience plan[15] did not yet identify an approach for protecting the Proposed Action's coastal area in its Phase 1 Initiatives.

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 of 2.0 to 2.5 feet in the area of the 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. The current FEMA maps also do not consider any future efforts that could be made at the city, State, or federal level to protect the harbor from sea-level rise.

RESILIENCE OF THE PROPOSED PROJECT TO CLIMATE CHANGE

The lifespan of buildings (commercial, industrial, etc.) is generally considered to be about 80 years; mechanical, electrical, and plumbing equipment located within the buildings typically have a lifespan of 50 years. The following sections describe the potential risks to the Proposed Project due to sea level rise and coastal hazards and summarize the resilience measures and adaptive strategies that would be implemented to minimize the potential for climate change to affect the project. **Appendix A-1**, "Waterfront Revitalization Program," discussion of Policy 6.2 provides a detailed discussion of the consideration given to climate change and sea level rise in the planning and design of the project.

RISKS DUE TO SEA LEVEL RISE

Under current conditions, portions of the Project Area of the Finger Buildings and the 39th Street Buildings are within the existing 1 percent annual-chance floodplain, with some individual buildings falling entirely within the floodplain. The existing BFE for the majority of the Project Area ranges from +11 to 13 feet NAVD88 and falls within Zone AE (an area of high flood risk subject to inundation by the 1 percent annual-chance flood event). **Appendix A-1**, "Waterfront Revitalization Program," presents the ground floor elevations and projected floodplain elevations relevant to the proposed buildings located in a floodplain (BFE of 11, 12, or 13 feet NAVD88).

With the exception of Building 25, for which the ground floor elevation would remain above all projected floodplain elevations throughout its lifespan, the ground floor elevations of the remaining proposed buildings (new and renovated) would be below projected floodplain elevations by the end of their 80-year lifespan (by around 2100), and any critical equipment in these buildings located on the ground floor would be below projected elevations by the end of its 50-year lifespan (2080s).[16] Similarly, any storage or parking uses on or below the ground floor elevation would also be below projected elevations by the end of the 80-year lifespan of the buildings. The location of these features within the floodplain would result in flooding risks from some storm events, including property damage and loss of commercial and industrial tenant space, and have the potential to discharge hazardous materials. In the event future floodplain elevations rise to an extent that currently anticipated flood proofing measures are determined to be

[15] The City of New York. *A Stronger, More Resilient New York*. June 11, 2013.

[16] Note that the NPCC data represents periods, not specific years. E.g., "2080s" refers to average conditions from 2070 through 2090.

inadequate, the applicant would likely implement additional flood proofing measures to protect critical building infrastructure and affected floors of affected buildings.

SEA LEVEL RISE RESILIENCE MEASURES AND ADAPTIVE STRATEGIES

To account for current flood conditions, new Buildings 11 and 21, both located in the current +12-foot floodplain, have been designed with a Design Flood Elevation (DFE) of +13.0 feet NAVD88, which is about 1 foot above the current BFE (accounting for current conditions, including freeboard). Existing buildings, including Buildings 22/23 and 26 located in the +12-foot floodplain near the waterfront, would be retrofitted with flood protection features at the time of construction to account for potential future conditions. Renovations for the Finger Buildings in the +11-foot and +12-foot BFE floodplains would incorporate dry flood proofing measures in vulnerable locations upland of 1st Avenue to account for potential future conditions. Specific measures may include aluminum shielding and/or flood gates at entryways within the floodplain, and/or other appropriate methods that would be determined at a later point in the design process and incorporated at the time of construction. All proposed new critical infrastructure (i.e., electrical, plumbing, mechanical equipment) would be elevated above the projected future flood levels in each building, and basement uses would be limited to storage and parking only. Elevators would also be flood-proofed. Building 24 is already within the 1 percent annual chance floodplain; as such, specific wet flood proofing measures would be determined at a later point in the design process and incorporated into the renovation. As the ground floor of Building 24 would periodically be subject to flooding, ground floor uses would be substantially limited. Uses proposed for the ground floor of Building 24 would be of temporary nature with the ability to be relocated in the event of flooding.

COASTAL HAZARDS AND RESILIENCE MEASURES

Wave action hazards (i.e., Zone VE) have not been designated for the Project Area. However, the Limit of Moderate Wave Action (LiMWA)[17] does currently encompass portions of Building 25 and Finger Buildings 3 through 8, and all of Building 24, and would reach further inland with sea level rise. The area between Zone VE and the LiMWA, or the Coastal A Zone, is subject to flood hazards associated with floating debris and high-velocity flow.

In order to safeguard the portions of the buildings within the Coastal A Zone, wet and dry flood proofing measures would be incorporated into the renovation at a later point in the design process. The renovations would comply with applicable building codes and would be protective under projected conditions.

CONCLUSIONS

The potential for climate change to affect the Proposed Project has been considered and measures and adaptive management strategies have been incorporated to increase climate resilience and to account for potential changes in environmental conditions resulting from climate change. ✷

[17] Inland limit of the area expected to receive 1.5-foot or greater breaking waves during the 1-percent-annual-chance flood event.