Chapter 12: Greenhouse Gas Emissions and Climate Change

A. INTRODUCTION

This chapter evaluates the greenhouse gas (GHG) emissions that would be generated by the proposed Lenox Hill Hospital (LHH) Redevelopment project (the Proposed Project) and its consistency with the citywide GHG reduction goals (Section B). Per the 2021 *City Environmental Quality Review* (*CEQR) Technical Manual,* evaluation of GHG emissions serves as a proxy for evaluating the Proposed Project's potential impact on climate change.

As described in Chapter 1, "Project Description," Lenox Hill Hospital (the Applicant) is requesting a series of discretionary actions from the City Planning Commission (CPC) to facilitate the enlargement and modernization of the existing LHH on Block 1411, Lots 1 and 113 (Projected Development Site 1), bounded by Park and Lexington Avenues and East 76th and East 77th Streets in Manhattan. The Proposed Project would include a new building fronting on Lexington Avenue, as well as additions and modifications to portions of the existing hospital complex on Projected Development Site 1 and connections between the new hospital building and the renovated buildings. Two building envelopes are proposed, each of which would accommodate the Proposed Project's program. Envelope 1 would include a new approximately 771,000-gross-square-foot (gsf) building on Lexington Avenue and 56,000 gsf of additions to the existing hospital. Envelope 2 would include a new approximately 867,000-gsf building and 8,000 gsf of additions to the existing hospital. With the existing buildings to remain, the overall gross floor area of the Proposed Project on Projected Development Site 1 would be approximately 1.4 million gsf with either envelope. The program, project population (staff, patients, visitors), site access, zoning actions, and construction duration would be the same for both Envelope 1 and Envelope 2.

This Environmental Impact Statement (EIS) also considers the as-of-right development of a building with hospital support functions at 111-115 East 77th Street between Lexington and Park Avenues (Block 1412, Lots 9, 10, and 11) (Projected Development Site 1a) as part of the Proposed Project. It would be connected to Projected Development Site 1 by a utility tunnel under East 77th Street. In addition, the Applicant proposes to provide improvements to the 77th Street subway station of the Lexington Avenue (No. 6) line, providing Americans with Disabilities Act (ADA) access to the downtown platform and improving sidewalk conditions in the immediate area.

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 (NYC's) sustainable development policy, as outlined in the *PlaNYC: Getting Sustainability Done* and *OneNYC* sustainability plans, 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 Emissions and Climate Change assessment be undertaken for any project preparing an EIS expected to result in 350,000 square feet (sf) or more of development and other energy-intense projects. The Proposed Project would result in approximately 1.4 million gsf of developed floor area on the Projected Development Sites under the With Action condition. Accordingly, a GHG assessment is provided.

PRINCIPAL CONCLUSIONS

The building energy use and vehicle use associated with the Proposed Project are projected to result in up to approximately nine thousand metric tons of carbon dioxide equivalent (CO_2e) emissions per year with the Proposed Project in the 2036 analysis year based on the conservative methodology described in this chapter. The Proposed Project would be designed with fully electrified heating, cooling, and hot water systems for the new space. Air source heat pumps would be utilized to provide heating and hot water to the proposed hospital, while cooling would be provided using cooling towers and water-cooled chillers. These systems would generally be more energy efficient than their fossil fuel-fired counterparts. Furthermore, the Proposed Project would include additional energy efficiency measures in its design to reduce energy consumption in line with the City's goals to reduce carbon emissions and applicable local laws, such as the immediate carbon intensities established in Local Law 97 and the energy consumption reporting in Local Law 84.

To provide reliable building systems, the Proposed Project is anticipated to utilize Con Edison steam to provide heating for the Proposed Project in the event of a loss of utility power. In addition, a distillate oil-fired boiler system may be installed to be used as a back-up in the unlikely event of an interruption of both electrical and utility steam services simultaneously. These systems would only be used in an emergency condition, and the boilers would be operated periodically for very limited periods of time for testing outside of an actual emergency. Therefore, emissions from these systems are not included.

Furthermore, New York State and NYC require that 70 percent of electricity be generated from renewable energy sources by 2030 and that 100 percent be generated from renewable electricity by 2040, which would result in a significant reduction of emissions associated with the buildings' electricity consumption. However, this analysis conservatively uses emissions from the NYC electric grid expected for 2030. The total GHG emissions associated with the Proposed Project construction, including direct emissions and upstream emissions associated with construction materials, would be an additional 19,108 metric tons.

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

As for efficient buildings, the Applicant is required at a minimum to achieve the energy efficiency requirements of the NYC 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 NYC 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 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 90.1-2016 energy standard as a benchmark. The NYCECC also aligns with NYStretch Energy Code 2020, developed by the New York State Energy Research and Development Authority (NYSERDA). The Proposed Project would comply with the NYCECC. The Proposed Project would use fully electric heating, cooling, and hot water systems

for the new space. The Applicant is also evaluating potential energy efficiency measures and design elements, such as certification under the Leadership in Energy and Environmental Design (LEED) Building Design and Construction for healthcare. Therefore, the Proposed Project would support the goal identified in the *CEQR Technical Manual* of building efficient buildings.

The Proposed Project would also support the other GHG reduction goals by virtue of its location in an area well supported by low carbon utilities, proximity to public transportation, and commitment to construction air quality controls.[1] Additionally, the Proposed Project would be designed to use low-carbon alternatives where practicable. While designs are currently being evaluated, the Proposed Project would target for up to 75 percent of steel and 25 percent of cement to utilize low-carbon alternatives. These alternatives may include recycled steel (that may utilize electric arc furnaces for processing scrap metal) and cement replacements (such as slag, fly-ash, silica fume, calcined clay, and interground limestone). All of these factors demonstrate that the Proposed Project supports the GHG reduction goals as defined in the *CEQR Technical Manual*.

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 10, "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

[1] Chapter 16, "Construction," identifies construction air quality controls that would be implemented as project components related to the environment (PCREs) to reduce air pollutant emissions and avoid the potential for significant adverse air quality impacts during construction. All project commitments would be memorialized in a Restrictive Declaration that would be recorded against the Projected Development Sites to ensure PCREs and mitigation measures are implemented.

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.

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). GWP accounts 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 12-1**.

Table 12-1
GWP for Major GHGs

GHG	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 GWPs 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: 2021 *CEQR Technical Manual*

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

NATIONAL POLICIES

Because of the growing consensus that human activity resulting in GHG emissions has the potential to profoundly impact the Earth's climate, countries around the world have undertaken efforts to reduce emissions by implementing both global and local measures addressing energy consumption and production, land use, and other sectors. Although the U.S. has not ratified the

[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.

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] While the U.S. initially exited the agreement on November 4, 2020, the President of the United States signed an executive order on January 20, 2021 to bring the U.S. back into the Paris Agreement and formally rejoined on February 19, 2021.

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. This includes regulations on GHG emissions from newly manufactured on-road vehicles, transportation fuels via the Renewable Fuel Standard (RFS) program, and 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.

REGIONAL AND NEW YORK STATE POLICIES

There are also regional and local efforts to reduce GHG emissions. In 2009, Governor Paterson issued Executive Order No. 24, establishing a goal of reducing GHG emissions in New York State by 80 percent, compared with 1990 levels, by 2050, and creating a Climate Action Council (CAC) tasked with preparing a climate action plan outlining the policies required to attain the GHG reduction goal; an interim draft plan was later published.[5] Subsequently, New York State enacted the Climate Leadership and Community Protection Act (CLCPA) in 2019 to establish new long-term goals to reduce statewide GHG emissions. The CLCPA established requirements that 70 percent of the State's electricity be generated from renewable energy sources by 2030 and increased to 100 percent renewable electricity by 2040, in order to ensure that increased building electrification would allow the State to achieve its statewide GHG emission limits as more buildings are electrified.

The legislation charges the CAC with establishing statewide GHG emission limits that would meet a GHG emissions reduction of 40 percent by 2030 and 85 percent by 2050, compared with 1990 levels. The CAC is also charged with providing recommended 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 CAC prepared and approved a scoping plan on December 19, 2022 that outlined recommendations for attaining the GHG emission limits and reduction goals.

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

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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.

Furthermore, New York State has 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.

NEW YORK CITY POLICIES

Many local governments worldwide, including NYC, 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. NYC's long-term comprehensive plan for a sustainable and resilient NYC, which began as *PlaNYC 2030* in 2007 and continued to evolve as *OneNYC*, includes more ambitious GHG emissions reduction goals, many specific initiatives that can result in emission reductions, and initiatives aimed at adapting to future climate change impacts. In April 2023, NYC published *PlaNYC: Getting Sustainability Done ("PlaNYC 2023")*—the latest outline of the City's strategies to achieve its sustainability goals. 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 NYC 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 2050* and continued in *PlaNYC 2023*, the City 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.

Since 2009, the City has targeted achievement of the GHG emission reduction goals through local laws. In December 2009, the New York City Council enacted four laws addressing energy efficiency in large new and existing buildings, in accordance with *PlaNYC*. The laws require owners of existing buildings larger than 50,000 sf to conduct energy efficiency audits and retro-commissioning every 10 years, to optimize building energy efficiency, and to "benchmark" the building energy and water consumption annually, using an EPA online tool. By 2025, commercial buildings over 50,000 sf 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 created a local NYCECC, which along with the Energy Conservation Construction Code of New York State (as updated in 2020), requires equipment installed during a renovation to meet current efficiency standards.

In May 2019, the New York City Council enacted the Climate Mobilization Act (CMA)—including Local Law 97 of 2019 (LL97), targeting GHG emissions associated with building energy consumption. For most buildings that exceed 25,000 gsf (excluding electricity/steam generation facilities, rent-regulated accommodations, places of public worship, and City-owned properties), the City established annual building emission limits that began in 2024 and require the owner of a covered building to submit annual reports demonstrating that the building is in compliance with the current GHG emission limits. For buildings not covered under the GHG emissions limits,

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

owners may either demonstrate compliance with the current limits or implement specified energy conservation measures where applicable. In 2023, the New York City Department of Buildings (DOB) adopted maximum carbon intensity factors for buildings through 2050 by Energy Star Portfolio Manager (ESPM) property type.[7] Under the 2023 rule, a building's emissions limit would be estimated using the appropriate carbon intensity factor for each property type and the floor area of that property type. Maximum carbon intensity factors would decrease over time until 2050, where all covered buildings are required to demonstrate that the systems would have no direct GHG emissions.

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

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

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 a project's contributions to GHG emissions is required to determine consistency with the City's reduction goal, which is currently the most appropriate standard by which to analyze a project under CEQR and is therefore applied in this chapter.

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

METHODOLOGY

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 reducing them.

While overall building waste heat from cities has been found to affect local temperatures, the impact to global climate change is primarily driven by the warming effect from GHGs. Furthermore, since climate change is driven by the collective contributions of diverse individual

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

projects to atmospheric conditions, a proposed action's waste heat is unlikely to result in a significant adverse impact to local temperatures.

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 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. The reason for that different approach is that to truly account for the change in only incremental emissions would require speculation regarding where people or businesses would locate in a No Action condition, 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 are based on the methodology presented in the *CEQR Technical Manual*. Estimates of emissions of GHGs from the hospital have been quantified, including off-site emissions associated with use of electricity, on-site emissions from heat and hot water systems and building operations, and emissions from vehicle use associated with the proposed development. GHG emissions that would result from construction are discussed as well.

Analysis of the GHG emissions associated with building energy usage is conservatively based on the carbon intensity of grid electricity for 2030, as established in LL97 and its implementing regulations. Emissions from transportation conservatively apply the emission factors for the 2036 analysis year. Vehicular emission factors will also continue to decrease in future years as vehicle engine efficiency increases and federal emissions standards continue to decrease. Additionally, New York State's adoption of the Advanced Clean Cars Rule and NYC's proposed rulemaking for transitioning the for-hire vehicle fleet to electric vehicles would result in an increase of electric vehicles in the regional vehicle fleet, 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 CO_2e emissions per year (see "Pollutants of Concern," above).

For purposes of analysis, this chapter considers Envelope 1 of the Proposed Project, which would include a new approximately 771,000-gsf building fronting on Lexington Avenue and 56,000 gsf of additions to the existing hospital. Although the With Action condition for the Proposed Project includes a second development scenario (Envelope 2), in which the height of the new hospital building would be reduced along the Lexington Avenue frontage and would extend into the midblock to a taller height than under Envelope 1, the program, project population (staff, patients, visitors), and lot coverage would be the same for both Envelope 1 and Envelope 2. Therefore, Envelope 2 would result in an equivalent energy demand, trip generation, and level of construction as under Envelope 1, and would result in the same effects on the Proposed Project's GHG emissions.

BUILDING OPERATIONAL EMISSIONS

The Proposed Project would be designed with fully electrified heating, cooling, and hot water systems for the new space. Electric-powered equipment (air source heat pumps) would be utilized to provide heating and hot water to the proposed hospital, while cooling would be provided using cooling towers and water-cooled chillers. These systems would generally be more energy efficient than their fossil fuel-fired counterparts. Furthermore, the Proposed Project would include additional energy efficiency measures in its design to reduce energy consumption in line with the City's goals to reduce carbon emissions. Consequently, the analysis assumes electricity usage for all uses (space heating and cooling, ventilation, water heating, lighting, refrigeration, equipment, and computing) in all spaces in the With Action condition, including existing, renovated, and new spaces.

GHG emissions for the development's fully electric heat and hot water systems were prepared in this analysis using the Proposed Project's estimated annual electricity consumption—based on the Energy Information Administration's (EIA's) annual electricity consumption survey data for inpatient healthcare.[8] The 2030–2034 GHG coefficients for grid electricity established in the Rules of New York City,[9] which implement LL97, were then used to project the emissions associated with electricity generation.

While the 2030 GHG coefficient for grid electricity does account for the 70 percent renewable grid expected by 2030, it does not account for the 100 percent renewable grid expected by 2040. Consequently, the analysis results in a conservatively high estimate of GHG emissions. Therefore, the Proposed Project's GHG emissions in 2040 and beyond are anticipated to be much less than those presented in this analysis as the emissions attributable to the regional electric grid decrease over time.

To provide reliable building systems, the Proposed Project is anticipated to utilize Con Edison steam to provide heating for the Proposed Project in the event of a loss of utility power. In addition, a distillate oil-fired boiler system may be installed to be used as a back-up in the unlikely event of an interruption of both electrical and utility steam services simultaneously. These systems would only be used in an emergency condition, and the boilers would be operated periodically for very limited periods of time for testing outside of an actual emergency. Therefore, emissions from these systems are not included.

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 was calculated using the transportation planning assumptions developed for the analysis and presented in Chapter 10, "Transportation." The assumptions used in the calculation include average daily person trips and delivery trips by proposed use, the percentage of vehicle trips by mode, and the average vehicle occupancy. Travel distances shown in Table 18-5 and 18-6 and associated text of the *CEQR Technical Manual* were used in the calculations of annual vehicle miles traveled by cars, taxis, and trucks. Table 18-7 of the *CEQR Technical Manual* was used to determine the percentage of vehicle miles traveled by

[8] EIA. Commercial Building Energy Consumption Survey Data. Table E-4.

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

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.

Based on the latest fuel lifecycle model from Argonne National Laboratory,[10] 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 NYC 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 12-2**.

Table 12-2
Vehicle Miles Traveled per Year

Roadway Type	Passenger	Taxi	Truck
Local	509,927	80,638	85,411
Arterial	1,112,568	175,938	186,352
Interstate/Expressway	695,355	109,961	116,470
Total	**2,317,849**	**366,537**	**388,234**

Notes:
Totals may not sum due to rounding.

CONSTRUCTION EMISSIONS

A description of construction activities is provided in Chapter 16, "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's construction was calculated using the assumptions developed for the analysis and presented in Chapter 16, "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 NYC Region of 25.3 miles (based on the average trip to work distance for the New York Metropolitan Area area)[11] 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 18-7 of the *CEQR Technical Manual* was used to determine the percentage of vehicle miles

[10] Based on GREET 1 2022 rev1 model from Argonne National Laboratory.

[11] New York State Department of Transportation (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.

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 5,852,927 VMT over the nine years of construction, with a maximum annual distance traveled of 1,461,765 VMT in 2027—less than 0.1 percent of the annual VMT for light duty vehicles in Manhattan. Similarly, construction truck trips would result in a total of 1,901,034 VMT over the construction duration, with a maximum annual distance traveled of 373,387 VMT in 2027—also less than 0.1 percent of the annual VMT for combination vehicles in Manhattan. 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 EPA's MOVES model. A detailed schedule for the use of non-road construction engines was developed, as described in Chapter 16, "Construction." The detailed data, including the number, type, power rating, and hours of operation for all construction engines, were 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 were estimated to require approximately 304,669 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.[12]

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 would also 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.

The construction is estimated to require 20,623 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.[13] The precise origin of cement for this project is unknown at this time.

Construction is estimated to require 7,730 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,[14] 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.[15]

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

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

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

[15] 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.

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 uses are presented in detail in **Table 12-3**. The analysis presents the total emissions after construction.

Table 12-3
Annual Building Operational Emissions

Component	Building Area (gsf)	Energy Usage Intensity[1] (kWh / gsf / year)	Annual GHG Emissions[2] (metric tons CO_2e)
Projected Development Site 1	1,398,000	31.53	6,392
Projected Development Site 1a	46,000	31.53	210
		TOTAL:	**6,603**

Notes: Totals may not sum due to rounding.
Totals may not sum due to rounding.
Sources:
[1] Based on EIA Commercial Buildings Energy Consumption Survey Data on electricity consumption for inpatient healthcare.
[2] GHG emissions associated with building electricity usage were estimated using an emission factor of 0.000145 metric tons of CO_2e per kWh as specified within LL97 implementing regulations for the 2030–2034 period.

MOBILE SOURCE EMISSIONS

The mobile-source-related GHG emissions from the Proposed Project are presented in detail in **Table 12-4**.

Table 12-4
Annual Mobile Source Emissions
(metric tons CO_2e)

Use	Passenger Vehicle	Taxi	Truck	Total
Inpatient Staff	388	17	795	1,200
Inpatient Patients/Visitors	566	93	0	659
Ambulatory Care Staff	84	4	1	89
Ambulatory Care Patients/Visitors	125	52	0	178
Total	**1,165**	**165**	**796**	**2,126**

Notes:
Totals may not sum due to rounding.

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 are presented in **Table 12-5**. The total construction emissions—19,108 metric tons CO_2e—would be equivalent to approximately 2.2 years of operational emissions. Emissions for the Proposed Project are approximately proportional to the size of their respective development areas.

Table 12-5
Total Construction GHG Emissions
(metric tons CO_2e)

Use	2027	2028	2029	2030	2031	2032	2033	2034	2035	*Total*
Nonroad	590	1,003	432	145	13	710	62	42	1	*2,998*
Transportation	339	416	555	1,241	884	847	672	549	208	*5,772*
Materials[1]										*10,338*
Total										***19,108***

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 12-6**. Emissions associated with mobile sources represent approximately 24 percent of the total emissions, and building energy emissions represent approximately 76 percent of the total. The Proposed Project is not expected to fundamentally change the City's solid waste management system, and therefore, emissions associated with solid waste are not presented.

Table 12-6
Summary of Annual GHG Emissions
(metric tons CO_2e)

Component	Building Operations	Mobile	*Total*
Projected Development Site 1	*6,392*	*2,126*	*8,518*
Projected Development Site 1a	*210*	-	*210*
Total	**6,603**	**2,126**	***8,728***

Note: Totals may not sum due to rounding.

The operational emissions from building energy use include on-site emissions from electricity use as well as emissions associated with the production and delivery of the electricity to be used on-site. The Applicant is currently evaluating the energy efficiency measures and design elements beyond the commitment for fully electric heat and hot water systems (see the following section).

In addition, total GHG emissions associated with the construction, including direct emissions and upstream emissions associated with construction materials (excluding fuel), would be approximately 19,108 metric tons.

ELEMENTS THAT WOULD REDUCE GHG EMISSIONS

As discussed above, the Proposed Project would be designed with fully electrified heating, cooling, and hot water systems for the new space. Electric-powered equipment (air source heat pumps) would be utilized to provide heating and hot water to the proposed hospital, while cooling would be provided using cooling towers and water-cooled chillers. These systems would generally be more energy efficient than their fossil fuel-fired counterparts. Furthermore, the Proposed Project would include commitments to pursue additional energy efficiency measures in its design to reduce energy consumption in line with the City's goals to reduce carbon emissions, and the Applicant is evaluating additional energy efficient and sustainable design features that could potentially lower building emissions even beyond the current design. If the Applicant pursues LEED certification, the Proposed Project is expected to use less energy than it would if built only to meet the building code.

In general, 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. The Proposed Project would also include upgrades to the 77th Street subway station of the Lexington Avenue (No. 6) line to provide station accessibility and incorporate access within the Project Site.

These features and other measures currently under consideration are discussed in this section, addressing the *PlaNYC*/*OneNYC* goals as outlined in the *CEQR Technical Manual* as well as New York State GHG reduction goals stated in the CLCPA. The implementation of the various design measures and features described would result in development that is consistent with the City's emissions reduction goal, as defined in the *CEQR Technical Manual*.

BUILD EFFICIENT BUILDINGS

While the Proposed Project's commitment to fully electrified systems would result in much lower emissions compared to a fossil fuel system, the Applicant has also identified several measures beyond the commitment to use fully electric-powered systems that are under consideration and may be implemented in the final design. These measures would further reduce the Proposed Project's GHG emissions (directly or indirectly). Measures that are currently being evaluated and are anticipated to be implemented include the following:

- High efficiency heating, ventilation, and air conditioning (HVAC) systems;
- Window glazing that would incorporate high-performance coatings;
- High-albedo roofing materials;
- Incorporation of efficient, directed exterior lighting as well as maximizing interior daylighting;
- Incorporation of motion sensors for lighting control for back-of-house and support spaces;
- Use of efficient lighting and elevators, exceeding requirements;
- Reduced energy demand using peak shaving/load shifting strategies;
- Incorporation of invert roofing systems to reduce heating/cooling loads;
- Sub-metering of electricity and water to allow tracking and optimizing their use;
- Incorporation of recycled content in some building materials, such as finishes, structural steel, and concrete design if practicable; and

- Third-party building commissioning, which would be undertaken upon completion of construction to ensure energy performance.

Based on the Proposed Project's commitment to use fully electric heat and hot water systems, the estimated GHG emissions associated with the Proposed Project's building energy use would fall below the immediate carbon intensity limits established by the City. GHG emissions associated with the Proposed Project's electricity consumption would continue to decrease in future years as the carbon intensity associated with grid electricity is expected to decrease due to the New York State and NYC target of 100 percent renewable electricity by 2040. Furthermore, the Proposed Project's commitment to a building with fully electric heat and hot water systems would comply with LL154. Consequently, the Proposed Project would be in line with the City's carbon emission reduction goals to lower emissions from buildings. With the implementation of any of the above measures, the Proposed Project would further reduce the building's energy need and lower the demand for utility electricity, which would be in line with the City's energy efficiency and renewable energy goals. As a result, these measures are anticipated to further reduce emissions as well.

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

USE CLEAN POWER

While the use of clean or renewable power would not be specifically required, the Proposed Project would include a commitment to utilize fully electrified systems for the heat, hot water, and cooling systems instead of fossil fuels. Additionally, local renewable power production (e.g., geothermal, solar, wind) would be considered to show compliance with the requirements under LL92 and LL94 to utilize available roof space not dedicated to mechanical equipment for a green or solar roof, while also reviewing options for LEED and/or EPA Energy Star. This would further the Proposed Project's efficient building design.

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

TRANSIT-ORIENTED DEVELOPMENT AND SUSTAINABLE TRANSPORTATION

The Proposed Project is located within a block of the 77th Street subway station and is supported by the M98, M101, M102, and M103 bus routes. In addition, numerous Citi Bike stations are located within several blocks. In addition, the Applicant proposes to provide important improvements to the 77th Street subway station of the Lexington Avenue (No. 6) line, providing ADA access to the downtown platform and improving sidewalk conditions in the immediate area.

Therefore, the Proposed Project would support the goal identified in the *CEQR Technical Manual* of supporting transit-orient development and sustainable transportation.

REDUCE CONSTRUCTION OPERATION EMISSIONS

Construction specifications would include an extensive diesel emissions reduction program, as described in detail in Chapter 16, "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.

Therefore, the Proposed Project would support the goal identified in the *CEQR Technical Manual* of reducing construction emissions.

USE BUILDING MATERIALS WITH LOW CARBON INTENSITY

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 Proposed Project would be designed to use low-carbon alternatives where practicable. While designs are currently being evaluated, the Proposed Project would target for up to 75 percent of steel and 25 percent of cement to utilize low-carbon alternatives. These alternatives may include recycled steel (that may utilize electric arc furnaces for processing scrap metal) and cement replacements (such as slag, fly-ash, silica fume, calcined clay, or interground limestone).

The use of local or certified sustainable wood and recycled build-out materials, as well as diversion of construction waste from landfills by reusing and recycling, would be likely and in accordance with LEED Materials and Resources credit standards. The use of rapidly renewable materials would also be considered.

Therefore, the Proposed Project would support the goal identified in the *CEQR Technical Manual* of using low-carbon building materials.

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