Chapter 13: Greenhouse Gas Emissions

A. INTRODUCTION

This chapter addresses the greenhouse gas (GHG) emissions that would be generated by the construction and operation of buildings on both the proposed project site and projected development site 2. In addition to the GHG emissions estimate, measures that would be implemented to limit those emissions are discussed and evaluated.

There is general consensus in the scientific community that the global climate is changing as a result of increased concentrations of GHGs in the atmosphere. GHGs are those gaseous constituents of the atmosphere, from both natural and anthropogenic emission sources (i.e., resulting from the influence of human beings), that absorb infrared radiation (heat) emitted from the earth's surface, the atmosphere, and clouds. This property causes the general warming of the earth's atmosphere, or the "greenhouse effect."

As discussed in the *CEQR Technical Manual*, climate change is predicted to have wide-ranging effects on the environment, including rising sea levels, increases in temperature, and changes in precipitation levels. Although this is occurring on a global scale, the environmental effects of climate change are also likely to be felt at the local level. Through PlaNYC, the City has established sustainability initiatives and goals for greatly reducing GHG emissions and for adapting to climate change in the City.

Per the *CEQR Technical Manual,* the citywide 2030 GHG reduction goal is currently the most appropriate standard by which to analyze a project under CEQR. The *CEQR Technical Manual* recommends that a GHG consistency assessment be conducted for any project resulting in 350,000 square feet (sf) or more of development and other energy-intense projects. The proposed project would result in 1.2 million gross square feet (gsf) of developed floor area on the proposed project site, and is assumed to result in an additional 117,000 gsf on development site 2. Accordingly, a GHG consistency assessment is provided.

This analysis conservatively assumes construction and operation of the Mixed-Use Reasonable Worse Case Development Scenario (RWCDS) 2, since it would use more energy and therefore have a greater potential to result in GHGs ~~be more energy-intense~~ than RWCDS 1 (the proposed project). In addition, RWCDS 2 is expected to generate a higher number of vehicular trips compared to RWCDS 1 (See Chapter 11, "Transportation".)

PRINCIPAL CONCLUSIONS

As discussed in the following sections, the building energy use and vehicle use associated with ~~the proposed actions~~ RWCDS 2 would result in up to approximately 24,400 metric tons of carbon dioxide equivalent (CO_2e) emissions per year. The estimated GHG emissions from RWCDS 1 would be even lower. The above result does not include the incorporation of additional building energy reduction measures, which would reduce GHG emissions as compared to buildings designed to meet the minimum building code energy requirements.

The *CEQR Technical Manual* defines five goals through which a projects consistency with City's emissions 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, and intends to either earn the Energy Star from Environmental Protection Agency (EPA) under EPA's *Energy Star Qualified Multifamily High Rise Buildings* program or achieve certification under the Leadership in Energy and Environmental Design (LEED) rating system. To qualify for the Energy Star or LEED, the building would be required to exceed the energy requirements of the building code and ASHRAE 90.1-2007, so as to reduce energy expenditure by at least 10 percent for LEED, or 15 percent for Energy Star, as compared to a baseline building designed to meet the minimum building code requirements. The project's commitment to building energy efficiency, exceeding the building code energy requirements, ensures consistency with the CEQR Efficient Buildings goal.

The project would support the other GHG goals by virtue of its nature and location: the project's proximity to public transportation, its reliance and natural gas, its commitment to construction air quality controls (which will be reflected in the Restrictive Declaration to be recorded), and the fact that as a matter of course, construction in New York City uses recycled steel and includes cement replacements all demonstrate that the project supports the GHG reduction goal.

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

B. POLLUTANTS OF CONCERN

GHGs are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds. This property causes the general warming of the Earth's atmosphere, or the "greenhouse effect." Water vapor, carbon dioxide (CO_2), nitrous oxide, methane, and ozone are the primary greenhouse gases in the Earth's atmosphere.

There are also a number of entirely anthropogenic (resulting from human activity) greenhouse gases in the atmosphere, such as the halocarbons and other chlorine- and bromine-containing substances, which also damage the stratospheric ozone layer (contributing 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 project-related GHG assessments for most projects. Although ozone itself is also a major greenhouse gas, it does not need to be assessed as such at the project level since it is a rapidly reacting chemical and efforts are ongoing to reduce ozone concentrations as a criteria pollutant (see Chapter 12, "Air Quality").

Similarly, water vapor is of great importance to global climate change, but is not directly of concern as an emitted pollutant since the negligible quantities emitted from anthropogenic sources are inconsequential.

CO_2 is the primary pollutant of concern from anthropogenic sources. Although not the GHG with the strongest effect per molecule, CO_2 is by far the most abundant and, therefore, the most influential GHG. CO_2 is emitted from any combustion process (both natural and anthropogenic), from some industrial processes such as the manufacture of cement, mineral production, metal production, and the use of petroleum-based products, from volcanic eruptions, and from the decay of organic matter. CO_2 is removed ("sequestered") from the lower atmosphere by natural processes such as photosynthesis and uptake by the oceans. CO_2 is included in any analysis of GHG emissions.

Methane and nitrous oxide also play an important role since the removal processes for these compounds are limited and they have a relatively high impact on global climate change as compared to an equal quantity of CO_2. 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 an EIS: CO_2, nitrous oxide (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 carbon dioxide equivalent (CO_2e) emissions—a unit representing the quantity of each GHG weighted by its effectiveness using CO_2 as a reference. This is achieved by multiplying the quantity of each GHG emitted by a factor called global warming potential (GWP). GWPs account for the lifetime and the radiative forcing of each chemical over a period of 100 years (e.g., CO_2 has a much shorter atmospheric lifetime than SF_6, and therefore has a much lower GWP). The GWPs for the main GHGs discussed here are presented in **Table 13-1**.

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

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

Source: 2012 *CEQR Technical Manual*
Note: The GWPs presented above are based on the Intergovernmental Panel on Climate Change's (IPCC) Second Assessment Report (SAR) to maintain consistency in GHG reporting. The IPCC has since published updated GWP values that reflect new information on atmospheric lifetimes of GHGs and an improved calculation of the radiative forcing of CO_2. In some instances, if combined emission factors were used from updated modeling tools, some slightly different GWP may have been used for this study. Since the emissions of GHGs other than CO_2 represent a very minor component of the emissions, these differences are negligible.

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

As a result of the growing consensus that human activity resulting in GHG emissions has the potential to profoundly impact the earth's climate, countries around the world have undertaken efforts to reduce emissions by implementing both global and local measures addressing energy consumption and production, land use, and other sectors. Although the U.S. has not ratified the international agreements which set emissions targets for GHGs, in a step toward the development of national climate change regulation, the U.S. has committed to reducing emissions to 17 percent lower than 2005 levels by 2020 and to 83 percent lower than 2005 levels by 2050 (pending legislation) via the Copenhagen Accord.[1] Without legislation focused on this goal, the EPA is required to regulate greenhouse gases under the Clean Air Act (CAA), and has already begun preparing and implementing regulations. For example, on March 27, 2012, EPA proposed a Carbon Pollution Standard for New Power Plants that would, for the first time, set national limits on the amount of carbon pollution that power plants can emit. EPA expects to expand this program in the future to limit emissions from additional stationary source. In coordination with the National Highway Traffic Safety Administration (NHTSA), EPA has also begun to regulate 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, state, 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 to 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 (that effort is currently under way[2]). The 2009 New York State Energy Plan[3] outlines the state's energy goals and provides strategies and recommendations for meeting those goals (a new plan will be published in the spring of 2014). The state's goals include:

- Implementing programs to reduce electricity use by 15 percent below 2015 forecasts;
- Updating the energy code and enacting product efficiency standards;
- Reducing vehicle miles traveled by expanding alternative transportation options; and
- Implementing programs to increase the proportion of electricity generated from renewable resources to 30 percent of electricity demand by 2015.

New York State has also developed regulations to cap and reduce CO_2 emissions from power plants to meet its commitment to the Regional Greenhouse Gas Initiative (RGGI). Under the RGGI agreement, the governors of 10 northeastern and Mid-Atlantic States have committed to regulate the amount of CO_2 that power plants are allowed to emit, gradually reducing emissions to 10 percent below the 2009 levels by 2018. The 10 RGGI states and Pennsylvania have also announced plans to reduce GHG emissions from transportation, through the use of biofuel, alternative fuel, and efficient vehicles.

Many local governments worldwide, including New York City, are participating in the Cities for Climate Protection™ (CCP) campaign and have committed to adopting policies and implementing quantifiable measures to reduce local GHG emissions, improve air quality, and enhance urban livability and sustainability. New York City's long-term sustainability program, PlaNYC 2030, includes GHG emissions reduction goals, 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 was codified by Local Law 22 of 2008, known as the New York City Climate Protection Act (the "GHG reduction goal").[4] The City has also announced a longer-term goal of reducing emissions to 80 percent below 2005 levels by 2050, and is currently engaged in the preparation of a plan to achieve that

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[1] Todd Stern, U.S. Special Envoy for Climate Change, letter to Mr. Yvo de Boer, UNFCCC, January 28, 2010.

[2] http://www.dec.ny.gov/energy/80930.html

[3] New York State, *2009 New York State Energy Plan*, December 2009.

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

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

In December 2009, the New York City Council enacted four laws addressing energy efficiency in 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 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 creates a local New York City Energy Code, which along with the New York State Energy Conservation Code (as updated in 2010), requires equipment installed during a renovation to meet current efficiency standards.

A number of benchmarks for energy efficiency and green building design have also been developed. For example, the LEED system is a benchmark for the design, construction, and operation of high performance green buildings that includes energy efficiency components. EPA's Energy Star is a voluntary labeling program designed to identify and promote the construction of new energy efficient buildings, facilities, and homes and the purchase of energy efficient appliances, heating and cooling systems, office equipment, lighting, home electronics, and building envelopes. The applicant is currently evaluating the specific energy efficiency measures and design elements which will be implemented, and intends to either earn the Energy Star or achieve certification under the LEED rating system.

D. METHODOLOGY

Although the contribution of any single project's emissions to climate change is infinitesimal, the combined GHG emissions from all human activity are severely impacting global climate. While the increments of criteria pollutants and toxic air emissions are assessed in the context of health-based standards and local impacts, there are no established thresholds for assessing the significance of a project's contribution to climate change. Nonetheless, prudent planning dictates that all sectors address GHG emissions by identifying GHG sources and practicable means to reduce them. Therefore, this chapter presents the total GHG emissions potentially associated with the proposed project and identifies measures that would be implemented and measures that are still under consideration to limit emissions.

The analysis of GHG emissions that would be associated with the proposed actions is based on the methodology presented in the *CEQR Technical Manual*. Estimates of emissions of GHGs from the proposed actions have been quantified, including off-site emissions associated with use of electricity and steam, on-site emissions from heat and hot water systems, and emissions from vehicle use associated with the proposed actions. GHG emissions that would result from construction are discussed as well.

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

BUILDING OPERATIONAL EMISSIONS

Emissions due to electricity and fuel oil use were developed using projections of energy consumption developed specifically for the proposed project by the project engineers and the emission factors referenced in the 2011 inventory of GHG emissions for New York City.[5] The proposed project is estimated to require 12.7 gigawatt-hours per year (GWh/yr) of electricity for general building use, 25.7 GWh/yr for tenant use, 0.65 GWh/yr for garage system, and 2.0 GWh/yr for retail space, and a total of 50.6 million standard cubic feet (scf) of natural gas. In order to estimate energy use for the hotel use and alternative uses under RWCDS 2, energy and emissions were estimated based on the ratio of square footage by use type, and the ratio of energy intensity by use type developed using survey data from the U.S. Department of Energy's Energy Information Administration.[6] Note that these estimates conservatively do not include additional energy efficiency measures which are still being evaluated for the proposed actions (see Section F.)

Since the energy intensity of hotels and medical facilities is generally higher than that for residential uses, the RWCDS 2 scenario was used as the reasonable worst-case for this analysis. While retail uses (which would be greater in RWCDS 2 than in RWCDS 1) generally have lower energy intensity than residential uses (which would be greater in RWCDS 2 than in RWCDS 1), the ~~reduced~~ lower energy intensity associated with ~~the~~ residential uses when compared to retail would be more than offset by the increase associated with hotel and medical uses assumed under RWCDS 2. Overall, RWCDS 2 would use more energy than RWCDS 1 and is therefore used in this analysis.

GHG emission factors for natural gas and grid supplied electricity were taken from New York City's greenhouse gas inventory. The energy consumption and the emission factors used are detailed along with the results (**Table 13-3** below).

MOBILE SOURCE EMISSIONS

The number of annual weekday vehicle trips by mode (cars, taxis, and trucks) that would be generated under RWCDS 2 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 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 18-4 of the *CEQR Technical Manual* were used in the calculations of annual vehicle miles traveled by cars, taxis, and trucks. The average truck trip was assumed to be 38 miles, as per the *CEQR Technical Manual*. Table 18-6 of the *CEQR Technical Manual* was used to determine the percentage of vehicle miles traveled by road type and the mobile

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[5] The City of New York Mayor's Office of Long-Term Planning and Sustainability, *Inventory of New York City Greenhouse Gas Emissions*, December 2012.

[6] EIA, 2009, 2005 Residential Energy Consumption Survey, Consumption and Expenditure Tables SH10, SH12, US1, and US12; and

EIA, 2008, 2003 Commercial Energy Consumption Survey, End-Use Consumption Tables for Non-Mall Buildings E6 and E8.

Note that residential data is available for 2009 as well, but since the analysis was a ratio comparison of residential and commercial uses, and the latest commercial data was from 2003, 2005 residential was selected as more appropriate for comparison.

GHG emissions calculator was used to obtain an estimate of car, taxi, and truck GHG emissions attributable to the projects.

EPA estimates that the well-to-pump GHG emissions of gasoline and diesel are more than 20 percent of the tailpipe emissions.[7] Although upstream emissions (emissions associated with production, processing, and transportation) of all fuels can be substantial and are important to consider when comparing the emissions associated with the consumption of different fuels, fuel alternatives are not being considered for the proposed project, and as per the *CEQR Technical Manual* guidance, the well-to-pump emissions are not considered in the analysis. The assessment of tailpipe emissions only is in accordance with the *CEQR Technical Manual* guidance on assessing GHG emissions and the methodology used in developing the New York City GHG inventory, which is the basis of the GHG reduction goal.

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

Table 13-2
Annual Vehicle Miles Traveled per Year

Mode	Passenger	Taxi	Truck
Local	367,390	240,292	260,631
Arterial	801,577	524,273	568,649
Interstate/Expressway	500,986	327,671	355,405
Total	**1,669,952**	**1,092,235**	**1,184,685**

CONSTRUCTION EMISSIONS

Consistent with CEQR practice, emissions associated with construction have not been estimated explicitly for the proposed actions, but analyses of similar projects have shown that construction emissions (both direct and emissions embedded in the production of materials, including on-site construction equipment, delivery trucks, and upstream emissions from the production of steel, rebar, aluminum, and cement used for construction) are equivalent to the total operational emissions over approximately 5 to 10 years.

EMISSIONS FROM SOLID WASTE MANAGEMENT

The proposed actions 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.

E. PROJECTED GHG EMISSIONS FROM THE PROPOSED ACTIONS

BUILDING OPERATIONAL EMISSIONS

The fuel consumption, electricity use, emission factors, and resulting GHG emissions from each of the development components under RWCDS 2 are presented in detail in **Table 13-3**. Most of the emissions would be associated with electricity consumption rather than fuel use. This is a result of the carbon intensity of the electricity delivered in New York City, the selection of the relatively low-carbon natural gas, and the differences in consumption of the two energy sources.

[7] Environmental Protection Agency, *MOVES2004 Energy and Emission Inputs*, Draft Report, EPA420-P-05-003, March 2005.

The overall emissions under RWCDS 1 would be lower, as described above. Note that these estimates do not include additional energy efficiency measures which are still being evaluated for the proposed actions (see Section F.)

MOBILE SOURCE EMISSIONS

The detailed mobile source related GHG emissions from each of the program components in RWCDS 2 are presented in detail in **Table 13-4**.

Table 13-3
Annual Building Operational Emissions (RWCDS 2)

	Natural Gas	Units	Electricity	Units
Annual Consumption:				
Residential	36.1	million scf	28.0	GWh
Retail	4.2	million scf	5.2	GWh
Medical	1.9	million scf	1.4	GWh
Lodging	18.4	million scf	21.2	GWh
Total:	*60.6*	*million scf*	*55.9*	*GWh*
Annual Emissions:				
Emission Factor *	54.70	metric tons/million scf	298.3	metric tons/GWh
GHG Emissions	**3,314**	**metric tons**	**16,671**	**metric tons**
* **Source**: PlaNYC GHG inventory (for 2011)				

Table 13-4
Mobile Source Emissions (metric tons CO_2e)

Roadway Type	Passenger Vehicle	Taxi	Truck	Total
Local	381.39	225.91	886.28	1,493.58
Arterial	506.58	296.53	1,192.89	1,996.00
Interstate/Expressway	223.39	129.51	571.10	924.00
Total	**1,111.36**	**651.94**	**2,650.27**	**4,413.58**

SUMMARY

A summary of GHG emissions by source type is presented in **Table 13-5**. Note that if new buildings were to be constructed elsewhere to accommodate the same number of units and space for other uses, the emissions from the use of electricity, energy for heating and hot water, and vehicle use could equal or exceed those estimated for RWCDS 2, depending on their location, access to transit, building type, and energy efficiency measures. As described in the "Methodology" section above, construction emissions were not modeled explicitly, but are estimated to be equivalent to approximately 5 to 10 years of operational emissions, including both direct energy and emissions embedded in materials (extraction, production, and transport). The proposed actions are not expected to fundamentally change the City's solid waste management system, and therefore emissions associated with solid waste are not presented.

Table 13-5
Summary of Annual GHG Emissions 2015 RWCDS
(metric tons CO_2e)

Source	Emissions
Building Operations	21,156
Mobile	5,839
TOTAL	26,995

The operational emissions from building energy use include on-site emissions from fuel consumption as well as emissions associated with the production and delivery of the electricity to be used on-site. The applicant is currently evaluating the specific energy efficiency measures and design elements that will be implemented (see Section F, below), and intends to either earn the Energy Star from EPA under EPA's *Energy Star Qualified Multifamily High Rise Buildings* program or achieve certification under the LEED rating system. To qualify for the Energy Star or LEED, the buildings would be required to exceed the energy requirements of the building code and ASHRAE 90.1-2007, so as to reduce energy expenditure by at least 10 percent (for LEED) or 15 percent (for Energy Star), as compared to a baseline building designed to meet the minimum building code requirements. The additional energy efficiency measures to achieve those ratings are conservatively not included in the estimate of emissions from building operations presented above; emissions would be lower than those shown.

F. ELEMENTS OF THE PROPOSED PROJECT THAT WOULD REDUCE GHG EMISSIONS

The proposed project would include a number of sustainable design features which would, among other benefits, result in lower GHG emissions. ~~Similar requirements will apply to developments in the remainder of the rezoning area, and to Development Site 1 should that site ultimately be developed with uses other than those proposed~~. Many of the measures that may be included in the proposed project would result in a smaller carbon footprint. In general, in order to earn the Energy Star or as a prerequisite for LEED certification, the proposed project would use considerably less energy than it would if built only to meet the building code. These energy efficiency assumptions were not included in the GHG emissions calculations presented above. In general, dense, mixed-use development with access to transit and existing roadways is consistent with sustainable land use planning and smart growth strategies to reduce the carbon footprint of new development. These features and other measures currently under consideration are discussed in this section, addressing the PlaNYC goals as outlined in the *CEQR Technical Manual*. The implementation of the various design measures and features described would result in development that is consistent with the City's emissions reduction goal, as defined in the *CEQR Technical Manual*.

BUILD EFFICIENT BUILDINGS

The proposed project's buildings would include energy efficient envelope, and the energy systems will utilize high-efficiency heating, ventilation, and air conditioning (HVAC) systems, with many components designed to reduce energy consumption. The energy efficient envelope would feature window glazing designed to optimize the combination of daylighting, heat loss, and solar heat gain, and would maximize interior daylighting due to the high ratio of window area.

The buildings will have high-albedo roofs where possible (roof areas that are not decked) and limited areas of green roof to reduce energy consumption and reduce the buildings' contribution to the urban heat-island effect. Motion sensors for lighting and automated climate control (programmable thermostats) will be incorporated resulting in efficient energy consumption. Efficient lighting, elevators, and Energy Star rated appliances will be installed to reduce electricity consumption. Exterior lighting will be energy efficient and directed for optimal efficiency. Water conserving fixtures, meeting the stringent New York City building code requirements, would be installed and water-efficient landscaping would be selected to reduce water consumption, indirectly reducing energy consumption associated with potable water production and delivery. Storage and collection of recyclables will be incorporated in building design. Electricity will be sub-metered.

The applicant may also consider reusing storm water if onsite retention tanks are needed (90 percent of storm water will be retained on-site) and third-party fundamental building energy systems commissioning upon completion to ensure energy performance.

USE CLEAN POWER

The proposed project would use natural gas, a lower carbon fuel, for the normal operation of the heat and hot water systems.

TRANSIT-ORIENTED DEVELOPMENT AND SUSTAINABLE TRANSPORTATION

The proposed project is located in an area supported by many transit options (bus and existing subway service are all within walking distance of the project). In addition, the proposed project is located next to a major bike route—The Hudson River Greenway—and next to potential future cross-town routes on West 54th and 55th Streets and on West 58th and 59th Streets (two routes, one eastbound and one westbound each). Bicycle storage would be provided within the proposed project building, and Citi Bike stations are currently located nearby on West 59th and 56th Streets. The proposed project would include a limited number of on-site charging stations for electric vehicles. The applicant is also considering the possibility of operating a shuttle bus connecting the proposed development to the subway system to encourage the use of public transportation.

REDUCE CONSTRUCTION OPERATION EMISSIONS

Construction will include an extensive diesel emissions reduction program 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 will 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, and concrete content would be optimized to the extent feasible. The proposed project would likely use some recycled materials for interiors, and may consider materials produced regionally, rapidly renewable materials, and materials that contain recycled content where appropriate. The applicant may also consider requiring wood products to be certified sustainable.

Construction waste would be diverted from landfills to the extent practicable by separating out materials for reuse and recycling. ✷