A. INTRODUCTION

As discussed in the *City Environmental Quality Review (CEQR) Technical Manual* (January 2012 Edition), increased concentrations of greenhouse gases (GHGs) in the atmosphere are changing the global climate, resulting in 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 both greatly reducing GHG emissions and adapting to climate change in the City. 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").[1] The *CEQR Technical Manual* recommends that a project resulting in 350,000 square feet of development or more and other energy-intense projects quantify project-related GHG emissions and assess the project's consistency with the citywide GHG reduction goal.

The Proposed Actions would result in the development of approximately 2.5 million gross square feet (gsf) of new uses in the Proposed Development Area and Commercial Overlay Area by 2031. Accordingly, a GHG consistency assessment is provided. The GHG emissions that would be generated as a result of the Proposed Actions—and measures that would be implemented to limit those emissions—are presented in this chapter, along with an assessment of the Proposed Actions' consistency with the citywide GHG reduction goal.

B. PRINCIPAL CONCLUSIONS

The Proposed Actions would result in a mixed use development that is energy efficient, utilizes low-carbon power sources, and is highly supportive of transit and non-motorized commuting. The proposed project's design includes many features aimed at reducing energy consumption and GHG emissions, and would be consistent with the City's citywide GHG reduction goal.

This conclusion is based on a review of the proposed project's design. As per NYU's development policy,[2] NYU intends to attain a score of 80 or higher under the US Environmental Protection Agency (USEPA) *Energy Star*'s Target Finder, and to meet the requirements for the United States Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) Silver certification for all development in the Proposed Development Area. Currently LEED requires a minimum of 10 percent less energy as compared with the baseline building designed to code. The public school[3] would be built to achieve a LEED certified or higher rating and would require a minimum of 20 percent less energy as compared with the

[1] Administrative Code of the City of New York, §24-803.
[2] NYU, 2011, *NYU Design Standards and Guidelines* available online at: http://www.nyu.edu/sapd/pdf/design_standards_apr_2011.pdf
[3] If by 2025 the New York City School Construction Authority (SCA) does not exercise its option to build the public school, NYU would build and utilize the 100,000-square-foot space for its own academic purposes.

baseline building designed to code. The project site is also well served by many public transportation options. Overall, the building energy use and vehicle use associated with the proposed project would result in approximately 19 thousand metric tons of carbon dioxide equivalent (CO_2e) emissions per year. Since not all efficiency measures could be accounted for at this time, this emissions estimate may be conservatively high.

C. 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 GHGs in the Earth's atmosphere.

There are also a number of entirely anthropogenic (resulting from human activity) GHGs 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, they are not addressed in project-related 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 15, "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.

Carbon dioxide (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 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 Actions.

To present a complete inventory of all GHGs, component emissions are added together and presented as CO_2 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 16-1**.

Table 16-1
Global Warming Potential (GWP) for Major GHGs

Greenhouse Gas	100-year Horizon GWP
Carbon Dioxide (CO_2)	1
Methane (CH_4)	25
Nitrous Oxide (N_2O)	298
Hydrofluorocarbons (HFCs)	124 to 14,800
Perfluorocarbons (PFCs)	7,390 to 12,200
Sulfur Hexafluoride (SF_6)	22,800

Source: IPCC, Climate Change 2007—The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report, Table 2-14, 2007.

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

Countries around the world have undertaken efforts to reduce emissions by implementing both global and local measures addressing energy consumption and production, land use, and other sectors. Although the U.S. has not ratified the international agreements that set emissions targets for GHGs, in 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 U.S. Environmental Protection Agency (USEPA) is required to regulate GHGs under the Clean Air Act (CAA), and has already begun issuing regulations. In May 2010, USEPA issued a final rule (effective August 2010) to tailor the applicability criteria for stationary sources subject to permitting requirements under CAA, setting thresholds for GHG emissions that define when permits are required for new and existing industrial facilities under the New Source Review Prevention of Significant Deterioration (PSD) and Title V Operating Permit programs.

In addition, USEPA has published regulation regarding geological sequestration of CO_2, a GHG reporting rule to collect information on GHG emissions, and has also established various voluntary programs to reduce emissions and increase energy efficiency. The American Recovery and Reinvestment Act of 2009 (ARRA, "economic stimulus package") funds actions and research that can lead to reduced GHG emissions.

The Energy Independence and Security Act of 2007 includes provisions for increasing the production of clean renewable fuels, increasing the efficiency of products, buildings, and vehicles, and for promoting research on GHG capture and storage options. The regulations regarding renewable fuel standards (February 2010) required 12.95 billion gallons of renewable fuels to be produced in 2010, increasing annually up to 36.0 billion gallons in 2022. The renewable fuel standards regulations also set volume standards for specific categories of renewable fuels including cellulosic, biomass-based diesel, and total advanced renewable fuels,

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

and specify lifecycle GHG reduction thresholds ranging from 20 percent for renewable fuel to 60 percent for cellulosic biofuel (as compared to the baseline gasoline or diesel replaced).

In March 2009, the U.S. Department of Transportation (USDOT) set combined corporate average fuel economy (CAFE) standards for light duty vehicles for the 2011 model year (MY). In June 2009, USEPA granted California a previously denied waiver to regulate vehicular GHG emissions, allowing 19 other states (representing 40 percent of the light-duty vehicle market, including New York) to adopt the California mobile source GHG emissions standards. In April 2010, USEPA and USDOT established the first GHG emission standards and more stringent CAFE standards for MY2012 through MY2016 light-duty vehicles. The two agencies have continued these efforts by adopting regulations for MY2014 through 2018 medium- and heavy-duty vehicles and proposing further regulations for MY2017 to MY2025 light-duty vehicles. These regulations will all serve to reduce vehicular GHG emissions over time.

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 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[1]). The 2009 New York State Energy Plan,[2] outlines the state's energy goals and provides strategies and recommendations for meeting those goals. 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. The regional emissions cap for power plants will be held constant through 2014, and then gradually reduced to 10 percent below the initial cap through 2018. Each power source with a generating capacity of 25 megawatts or more must purchase a tradable CO_2 emission allowance for each ton of CO_2 it emits. The ten 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 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 targeted at adaptation to climate change impacts. For certain projects subject to CEQR, an analysis of the project's GHG emissions and an assessment of the project's consistency with the City's citywide emission reduction goal is required.

[1] http://www.nyclimatechange.us/
[2] New York State, *2009 New York State Energy Plan*, December 2009.

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 square feet to conduct energy efficiency audits every ten years, to optimize building energy efficiency, and to "benchmark" the building energy and water consumption annually, using a USEPA 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 Code, which 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.

USEPA'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.

E. METHODOLOGY

Although the contribution of any single project to climate change is infinitesimal, the combined GHG emissions from all human activity are believed to have a severe adverse impact on 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. As directed by the *CEQR Technical Manual*, this chapter presents the total GHG emissions potentially associated with the Proposed Actions and identifies the measures that would be implemented and measures that are still under consideration to limit the emissions.

The analysis of GHG emissions that would be generated by the proposed project is based on the methodology presented in the *CEQR Technical Manual*. Emissions of GHGs associated with the Proposed Actions have been quantified, including off-site emissions associated with on-site use of electricity and steam, on-site emissions from heat and hot water systems, and emissions from vehicle use attributable to the Proposed Actions. GHG emissions that would result from construction and renovation associated with the Proposed Actions are discussed as well. The analysis focuses on the Proposed Actions' development within the Proposed Development Area, because the projected conversion of spaces in the Commercial Overlay Area would have a very minor impact on energy, materials, and transportation, exchanging the GHG emissions associated with the current uses for similar emissions from commercial uses. Although this may result in very minor increases in emissions if the commercial uses are more energy-intensive than the current uses, these changes would be very small overall (the floor space associated with these uses represents less than 1 percent of the development that would result from the Proposed Actions) and are not quantified in the analysis.

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 Section B, "Pollutants of Concern").

BUILDING OPERATIONAL EMISSIONS

Emissions associated with electricity, steam, and fuel use for the proposed project were estimated using projections of energy consumption developed using energy modeling and data specific to the NYU energy systems. The modeling included the existing cogeneration facility underneath the Mercer Plaza Area which will be used to power and heat portions of the proposed project. The emissions were estimated using an emission factor of 692.2 pounds of CO_2e per megawatt-hour for electricity production in New York City (as referenced in the 2009 inventory of GHG emissions for New York City), and 53.2 kg per million Btu for natural gas combustion.[1] The data include some energy efficient design measures aimed at achieving at least 10 percent reduction as compared to a baseline designed to meet the current New York City energy code, and a 20 percent reduction for the public school, to meet the requirements in the New York City School Construction Authority guidance *NYC Green Schools Guide* (New York City School Construction Authority, revised May 2009, or updated guidance applicable at the time), as required by local law 86 of 2005. However, since not all detailed energy efficiency measures could be accounted for at this time, this estimate may be conservatively high.

A summary of the projected energy consumption for the proposed project is presented in **Table 16-2**. In some instances, where details were not fully known, the estimate does not include all benefits of the cogeneration of heat and power, resulting in a conservatively high consumption estimate. The average rates calculated for NYU's central systems were 7,711 British thermal units (Btu) per kilowatt-hour (kWh) for electricity produced by the cogeneration system, 9,410 Btu per ton-hour for thermal cooling provided by natural gas duct burners, and 0.81 kWh per ton for electric cooling (power provided by Con Edison).

Table 16-2
Annual Building Energy Consumption

Building	Fuel (MMBtu)	Electricity (kWh)
Zipper Building (except Hotel Tower)	61,474	1,968,036
Zipper Hotel Tower	23,805	3,944,019
Bleecker Building	21,713	3,282,612
Mercer Building	50,833	2,291,648
Laguardia Building	10,607	770,877
Total	**168,432**	**12,257,191**

Notes:
Fuel is almost entirely natural gas, with rare occasional use of oil. This includes fuel used for heating, cooling, and electricity generation in the cogeneration plant.
Electricity includes only grid-supplied electricity. Electricity supplied by the cogeneration plant is included as fuel.
Below-ground spaces are included with the respective buildings; the energy consumption estimate for the below-ground space between the Mercer and LaGuardia Buildings is included within the Mercer Building.
Sources: Vanderweil Engineers and AKRF, Inc.

[1] *Inventory of New York City Greenhouse Gas Emissions*, Mayor's Office of Long-Term Planning and Sustainability, PlaNYC2030, September 2010.

The Illustrative Program that was analyzed includes a hotel and other uses in the southern-most tower in the Zipper Building (Zipper Hotel Tower). It is assumed that the Zipper Hotel Tower would require autonomous systems, and therefore would not be connected to NYU's central systems for heating, cooling, or electricity. This results in a slightly conservative estimate since that space would not benefit from the central system's efficiency.

Note that only a small amount of the building heat included here is provided as a byproduct of the cogeneration system; this is because that heat is assumed to be used by the existing buildings on campus (as it is in the existing condition). Some of the heat produced by the cogeneration system, used for existing buildings, would result from the production of electricity for the proposed project, so the full benefits of the proposed project are not reflected in these numbers.

The proposed project's total combined energy intensity is 84,961 Btu per square foot. This is substantially lower than the average intensities in New York City:[1] 65 percent lower than average institutional uses, 60 percent lower than average commercial uses, and 30 percent lower than large residential uses. These efficiencies result from building design and the proximity of the project site to NYU's cogeneration facility, allowing NYU to use that facility to supply steam, hot water, cooling and electricity to the proposed project.

MOBILE SOURCE EMISSIONS

The number of annual weekday motorized vehicle trips by mode (cars, taxis, trucks) that would be generated by the proposed project was calculated using the transportation planning assumptions developed for the analysis presented in Chapter 14, "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. Travel distances shown in Table 18-4 of the *CEQR Technical Manual* were used in the calculations of annual vehicle miles traveled by cars and trucks. An average one way taxi trip of 2.32 miles was used, based on regional modeling for taxi trips with either Manhattan as the trip origin and/or destination.[2] The average one-way 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 GHG emissions calculator was used to obtain an estimate of car, taxi, and truck GHG emissions attributable to the Proposed Actions.

USEPA estimates that the well-to-pump GHG emissions of gasoline and diesel are approximately 22 percent of the tailpipe emissions.[3] 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 part of the Proposed Actions. As per the *CEQR Technical Manual* guidance, the well-to-pump emissions are not considered in the analysis for the Proposed Actions.

The projected annual vehicle miles traveled, forming the basis for the GHG emissions calculations from mobile sources, are presented in **Table 16-3**.

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[1] CEQR Technical Manual Table 15-1.

[2] Mayor's Office of Long-Term Planning and Sustainability, via email, 2010.

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

Table 16-3
Total Annual Proposed Project Vehicle Miles Traveled

Road Type	Passenger Vehicle	Taxi	Truck
Phase 1			
Local	274,422	150,222	279,402
Arterial	598,738	327,756	609,604
Interstate/Expressway	374,211	204,848	381,002
Phase 2			
Local	166,519	24,495	112,523
Arterial	363,313	53,445	245,505
Interstate/Expressway	227,071	33,403	153,441

Note: Excludes school buses; school bus emissions are based on annual average emissions from the New York City inventory, and not on VMT.

CONSTRUCTION EMISSIONS

Emissions associated with construction have not been estimated explicitly for the proposed project, but other similar analyses 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) would be equivalent to the total emissions from the operation of the buildings over approximately 3 to 10 years.[1]

EMISSIONS FROM SOLID WASTE MANAGEMENT

The Proposed Actions would not 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.

F. PROJECTED GHG EMISSIONS FROM THE PROPOSED PROJECT

The detailed building and on-road emissions estimates are presented in **Table 16-4** and **Table 16-5**, respectively, presenting emissions by building and fuel type for buildings and by roadway type and vehicle type for on-road emissions from each phase (note that Phase 2 emissions are incremental, not including trips associated with the Phase 1 buildings).

A summary of total annual GHG emissions by emission source type and phase, and the total emissions from the proposed project, is presented in **Table 16-6**. Note that these results do not necessarily represent a net increase associated with the Proposed Actions; if buildings were to be constructed elsewhere to accommodate the same activity as the Proposed Actions, the emissions from the use of electricity, energy for heating and hot water, and vehicle use could be similar to or exceed those of the Proposed Actions, depending on their location, access to transit, building type, and energy efficiency measures.

[1] E.g.: New York City Planning Commission, FSEIS for Riverside Center, October 15, 2010;
MTA / New York City Planning Commission, FSEIS for Riverside Center, October 15, 2010;

Table 16-4
Annual Building Emissions
(metric tons CO_2e per year)

Building	Fuel	Electricity	Total
Zipper (except Hotel Tower)	3,270	618	*3,888*
Zipper Hotel Tower	1,266	1,238	*2,505*
Bleecker	1,155	1,031	*2,186*
Mercer	2,704	720	*3,424*
Laguardia	564	242	*806*
Total	**9,534**	**3,556**	***13,089***

Notes:
Fuel is almost entirely natural gas, with rare occasional use of oil. This includes fuel used for heating, cooling, and electricity generation in the cogeneration plant.
Electricity includes only grid-supplied electricity. Electricity supplied by the cogeneration plant is included as fuel.
Below-ground spaces are included with the respective buildings; the emissions estimate for the below-ground space between the Mercer and LaGuardia Buildings is included within the Mercer Building.

Table 16-5
Annual On-Road Emissions
(metric tons CO_2e per year)

Road type	Passenger Vehicle	Taxi	Truck	TOTAL
Phase 1				
Local	317	157	1,0078	*1,482*
Arterial	421	206	1,356	*1,983*
Interstate/Expressway	186	90	649	*925*
School Bus*				*16*
Phase 1 Subtotal	*924*	*454*	*3,012*	*4,406*
Phase 2				
Local	192	26	406	*624*
Arterial	256	34	546	*835*
Interstate/Expressway	113	15	261	*389*
Phase 2 Subtotal	*561*	*74*	*1,213*	*1,848*
TOTAL	**1,485**	**528**	**4,225**	***6,254***

Note:
* School bus emissions are 8.13 metric tons of CO_2e per year, based on the New York City emissions inventory and school bus fleet size.

Table 16-6
Summary of Annual GHG Emissions
(metric tons CO_2e)

Emissions Source	Phase 1	Phase 2	Total
Building Operations	8,579	4,230	*12,809*
Mobile Sources	4,406	1,848	*6,254*
TOTAL	**12,985**	**6,078**	***19,063***

The proposed project's combined building carbon intensity is 5.18 kilograms CO_2e per square foot. This is substantially lower than the average carbon intensity of New York City Buildings:[1] 20 percent lower than average large residential buildings, 55 percent lower than institutional uses, and 45 percent lower than average commercial uses. The lower carbon intensity is due to proposed project's building design and its reliance on NYU's efficient and low-emitting cogeneration facility.

It is important to note that 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, cooling, and steam to be used on-site. It is anticipated that the proposed project would, at a minimum, achieve the energy efficiency level required for certification under the LEED for New Construction and Major Renovations Rating System. To attain LEED certification under current LEED requirements, the Proposed Actions' buildings would need to meet energy efficiency requirements that exceed current code by at least 10 percent. The minimum energy efficiency requirements needed to achieve the LEED rating are mostly included in the estimate of emissions from building operations. However, some details were not yet available, and additional measures are still under consideration. Furthermore, since the production of electricity for the proposed project in the cogeneration plant produces heat as a byproduct, and since that heat is mostly used by existing buildings on campus, there is an additional benefit not included in the emissions analysis quantitatively. Therefore, the estimates presented here are conservatively high.

The analysis assumed the use of natural gas for all on-site fuel use, including the cogeneration plant. The central boilers can run on fuel oil, although oil is generally not used, and its use is limited in the source permit. However, if oil were used it would not substantially change these results. For example, if oil represented 20 percent of the fuel used for the proposed project boiler heat, this would represent only 1.1 percent of the entire fuel consumption. Since GHG emissions from oil per unit of energy are approximately 40 percent higher than from natural gas, this would result in an increase of 40 metric tons CO_2e relative to the results presented in **Table 16-4.**

The cogeneration turbines can also function on oil, but this is not the preferred fuel. Oil is used only in cases of natural gas service interruption, which has occurred in past years ranging from 8 hours to 3 days per year. Barring catastrophic failure of the natural gas supply systems, a reasonable worst-case scenario would be the use of oil for 3 days per year. In this scenario, boilers would supply the heat normally supplied by gas-fired duct burners, and the cogeneration turbines would operate on oil. This would add approximately 31 metric tons CO_2e to the annual emissions, representing 0.2 percent of total building energy emissions.

[1] CEQR Technical Manual, Table 18-3.

The Proposed Actions would limit the emissions associated with electricity consumption and heating through energy-efficient building design and the use of the cogeneration plant, and reduce emissions associated with transportation because of the available alternatives to driving (see Section G, "Assessment of Consistency with the GHG Reduction Goal").

G. CONSISTENCY WITH THE GHG REDUCTION GOAL

The proposed project would include many sustainable design features that would lower GHG emissions. These features are discussed in this section, assessing the consistency of the proposed project with the GHG reduction goal as outlined in the *CEQR Technical Manual*.

NYU is committed to addressing environmental and sustainability issues on its entire urban campus. In 2007 Mayor Michael Bloomberg issued the PlaNYC Climate Challenge, calling for New York City's universities and colleges to reduce their GHG emissions by 30 percent over the next 10 years. NYU has met and surpassed that goal for the existing campus in just four years, with 2010 emissions already 30 percent lower than the 2006 baseline. Through a campus-wide effort that has addressed building operations, renovations, and individual behaviors, the NYU community has taken the equivalent of 41,500 average New York City homes off the grid. Looking to the future, with NYU's new state-of-the-art cogeneration plant beneath Mercer plaza approaching 90 percent efficiency, powering 22 buildings across the campus and providing hot and cold water to 37 buildings around Washington Square,[1] NYU expects to achieve a 50 percent reduction in GHG emissions, as compared to 2006 levels, in the next few years. Described below is the sustainable approach applied by NYU throughout its urban campus which will be continued and implemented in the proposed project.

An important contribution to the emission reductions already realized on the NYU urban campus were achieved through small, practical steps. By retrofitting existing buildings with new lighting; introducing occupancy sensors on heating, cooling, and ventilation units in student residences; adjusting building operations schedules to reduce lighting and heating, cooling, and ventilation operations during unoccupied periods; and encouraging students to play a critical active role by shutting down personal laptops when not in use, installing compact fluorescent lamps, and unplugging power strips to prevent energy leakage, NYU has saved over $10 million annually as compared with the 2006 baseline. NYU's Office of Sustainability reaches out to NYU's incoming students during Welcome Week, encouraging engagement on a wide range of sustainability topics including the University's efforts in recycling, composting, waste reduction, energy savings, and water savings.

In order to achieve higher LEED ratings in its plans to renovate and develop new sustainable spaces on campus, and in addition to the focus on developing energy efficient buildings, NYU has also implemented sustainable construction practices, earning further points towards LEED accreditation. As part of its efforts, NYU has developed sites easily accessible by public transportation, biking, and walking, has been considerate of development density and community connectivity, as well as brownfield redevelopment. Recent examples of NYU's sustainable developments include: the renovation of 22 Washington Square North, rated LEED Silver; the Gallatin school at 1 Washington Place, rated LEED Gold; the completion of Wilf Hall at 139 MacDougal Street, awaiting a potential LEED Platinum rating[2]; and 58 Washington

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[1] The cogeneration system uses what would otherwise be waste heat from electricity production for heat and hot water, thus reducing the need for additional fuel for heating.

[2] Details and more examples can be found at http://www.nyu.edu/sustainability/links.resources/leed.projects.html.

Square South, which is currently under construction and anticipated to be LEED Gold. All of these are located near transit and accessible by walking and biking and have either been redevelopment or renovations. NYU has also aimed to mitigate heat island effects, implemented a construction waste management system that has diverted over 75 percent and up to 96 percent from landfill in recent projects, and used wood certified by the Forest Stewardship council.

NYU has been widely recognized for these achievements:

- NYU received the Clean Air Excellence Award in the Community Action category from the EPA in 2011.
- NYU was awarded a STARS Gold rating from the Association for the Advancement of Sustainability in Higher Education (AASHE) in 2011. NYU achieved the highest score in the Operations category for this comprehensive, transparent assessment system, and AASHE rated the university among the five highest-scoring participants.
- NYU was ranked first for the Green Power Leadership Award by the Environmental Protection Agency in 2008 for having made the largest purchase of renewable energy credits by any university in the country in 2007 and 2008.

OBJECTIVE: BUILD EFFICIENT BUILDINGS

As described above, NYU intends to attain an energy performance score of 80 or higher under the USEPA *Energy Star* program for the proposed project's buildings which would support the efficient buildings objective. A score of 80 indicates that a building performs better than 80 percent of buildings in the same category nationwide. The buildings will also be designed to achieve a LEED Silver certification. LEED certification currently requires, at a minimum, an energy efficiency level that achieves at least 10 percent lower energy consumption than the baseline building designed to code. The school will be designed according to the New York City Green Schools Guide, requiring a minimum of 20 percent less energy as compared with the baseline building designed to code. The analysis above included these minimum energy performance requirements. Even higher energy efficiency may be achieved. To attain the LEED certification, the designs will:

- Provide an energy efficient building envelope to reduce cooling/heating requirements.
- Include high-efficiency HVAC systems, or generators.
- Eliminate or reduce use of refrigerants in HVAC systems.
- Use high-albedo roofing materials.
- Incorporate window glazing to optimize daylighting, heat loss and solar heat gain.
- Incorporate motion sensors and lighting and climate control.
- Use efficient lighting and elevators, and *Energy Star* appliances, if appliances are being installed.
- Use water conserving fixtures that exceed building code requirements.
- Include water-efficient landscaping.
- Provide for storage and collection of recyclables (including paper, corrugated cardboard, glass, plastic and metals) in building design.

Other measures likely to be part of the design include design for maximum interior daylighting, peak shaving or load shifting strategies, super insulation to minimize heat loss, and efficient directed exterior lighting.

NYU will also provide construction and design guidelines to facilitate sustainable design for build-out by commercial tenants, and conduct third party building commissioning to ensure energy performance of the buildings once constructed.

Additional measures that may be further investigated include minimizing energy use through low impact development for stormwater design, reuse of gray water, and/or collection and re-use of rainwater.

OBJECTIVE: USE CLEAN POWER

The proposed project would be heated principally via the existing centralized cogeneration plant, increasing energy efficiency by combining electric power production with heat as a byproduct. If additional heating systems are required, they would be natural gas fired systems; natural gas has lower carbon content per unit of energy than other fuels, and thus reduces GHG emissions.

Some additional measures may be further investigated in the future but they are not part of the Proposed Actions. These include on-site power generation from renewable sources, such as solar or wind; use of renewable fuels such as biodiesel for systems or vehicles; and increased or additional cogeneration capacity.

OBJECTIVE: ENHANCE AND USE TRANSIT-ORIENTED DEVELOPMENT AND SUSTAINABLE TRANSPORTATION

The Proposed Actions strongly support the City’s transit-oriented development and sustainable transportation objective. With the implementation of the Proposed Actions, the expanded NYU Washington Square campus would continue to be supported by many transit options, including many public transit options as well as NYU-operated shuttles. NYU also subsidizes its employees’ transit expenses via Transit Check. In addition to transit use, due to the campus location, approximately 35 percent of the NYU population walks to campus. As a result, the vast majority of NYU students and faculty will continue to commute via transit or non-motorized modes, with approximately only 1 percent commuting in cars or taxis. In comparison, other university campuses in New York City have much higher car and taxi mode shares: in the range of 6 to 12 times higher for students, and 3 to 6 times higher for staff.[1] The Proposed Development Area would also be designed to support walking and bicycling, including multi-use paths, bicycle storage and showers, and NYU will further encourage bicycle commuting via its Bike Share program whereby students and staff have access to short-term use of bicycles for free, conveniently located in dormitory buildings and around campus.

In addition to supporting clean and efficient transit modes, the campus would utilize alternative fuel and efficient vehicles for its maintenance and operational fleets. Parking is included in the proposed project only as required.

Additional measures that may be further investigated include designating on-site parking for alternative vehicles and charging stations for electric vehicles.

OBJECTIVE: 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 will reduce

[1] Compare Table 14-2 in Chapter 14, “Transportation” with: City of New York, 2009, Fordham University Lincoln Center Master Plan EIS, Table 15-5; City of New York, 2007, Proposed Manhattanville in West Harlem Rezoning and Academic Mixed-Use Development FEIS, Table 17-4a.

particulate matter emissions; while particulate matter is not included in the list of standard greenhouse gasses ("Kyoto gases"), recent studies have shown that black carbon—a constituent of particulate matter—may play an important role in climate change.

The use of biodiesel for construction may be investigated and considered if practicable.

OBJECTIVE: USE BUILDING MATERIALS WITH LOW CARBON INTENSITY

Efforts will be made to divert construction waste from landfill to the extent practicable. Precise materials specifications are not available at this time, but it is likely that locally produced wood and/or wood certified in accordance with the Sustainable Forestry Initiative or the Forestry Stewardship Council's Principles and Criteria would be used.

Additional measures that may be further investigated include:

- *Materials*. the use of building materials with recycled content, extracted and/or manufactured within the region, or rapidly renewable materials;
- *Cement*: the use of cement replacements such as fly ash and/or slag, cement produced using low-GHG fuels, and/or optimization of cement content in concrete. ✷