2.12-1 INTRODUCTION

As discussed in the ~~2010~~ *New York City Environmental Quality Review (CEQR) Technical Manual* (January 2012), 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, New York 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] In addition, New York City Mayor's Executive Order 109 of 2007 mandates formulation of a GHG reduction plan to reduce city building and operational emissions by 30 percent below Fiscal Year 2006 levels by 2017.

The analysis presented in this section of Chapter 2 evaluates the consistency of Project 1, Shaft and Bypass Tunnel Construction with the above goals, as presented in the *CEQR Technical Manual*. As detailed later, there would be negligible operational GHG emissions associated with the operation of the bypass tunnel. However, given the scale and duration of activity associated with the construction of the shafts and bypass tunnel (Project 1), and the connection of the tunnel to the Delaware Aqueduct (Project 2B), GHG emissions from construction have been quantified, and a GHG consistency assessment is provided.

GHG and energy differ from other environmental areas of concern in that the impact of energy use and emissions is a cumulative global one, and therefore generally not associated with the geographic location of the activity or the precise time when the emissions occur (generally, global climate change is measured on a scale of decades to centuries). Therefore, this section combines the energy use, GHG emissions, and GHG emission reduction measures for all construction phases at both the west and east connection sites, including for Project 1 and the portion of Project 2B involving the connection of the bypass tunnel (collectively referred to as Project in this section).

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

This section is organized as follows:

- Section 2.12-2, "Greenhouse Gases of Concern," describes the GHG effect and the gases included.
- Section 2.12-3, "Policy, Regulations, Standards, and Benchmarks for Reducing GHG Emissions," describes the need for this analysis, and the regulatory and policy context.
- Section 2.12-4, "Methodology," describes how the analysis was conducted.
- Section 2.12-5, "Projected GHG Emissions from the Project," describes the projected GHG emissions.
- Section 2.12-6, "Assessment of Consistency with the GHG Reduction Goal," analyzes the consistency of the Project with relevant policies.
- Section 2.12-7, "Conclusions," presents the conclusions of the analyses.

2.12-2 GREENHOUSE GASES OF CONCERN

GHGs are those gaseous constituents of the atmosphere, both natural and anthropogenic (resulting from human activity), 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 (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 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 Section 2.11, "Air Quality").

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

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

Methane and N_2O also play an important role since the removal processes for these compounds are limited and since 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, N_2O, methane, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). This analysis focuses mostly on CO_2, N_2O, and methane. There would be no significant direct or indirect sources of HFCs, PFCs, or SF_6 associated with the Project, since these pollutants are associated mostly with non-combustion sources such as refrigeration and industrial sources.

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 2.12-1**.

Table 2.12-1
Global Warming Potential (GWP) for Major GHGs

Greenhouse Gas	Common Sources	100-Year Horizon GWP
Carbon dioxide (CO_2)	Fossil fuel combustion, forest clearing, cement production, iron and steel production	1
Methane (CH_4)	Landfills, production and distribution of natural gas and petroleum, anaerobic digestion, rice cultivation, fossil fuel combustion	21
Nitrous oxide (N_2O)	Fossil fuel combustion, fertilizers, nylon production, manure	310
Hydrofluorocarbons (HFCs)	Refrigeration gases, aluminum smelting, semiconductor manufacturing	140 to 11,700
Perfluorocarbons (PFCs)	Aluminum production, semiconductor manufacturing	6,500 to 9,200
Sulfur hexafluoride (SF_6)	Electrical transmissions and distribution systems, circuit breakers, magnesium production	23,900
Source: New York City, *CEQR Technical Manual*, Table 18-1, January 2012.		

2.12-3 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 United States has not ratified the international agreements that set emissions targets for GHGs, in a step toward the development of national climate change regulation, the United States 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.[2] Without legislation focused on this goal, the U.S. Environmental Protection Agency (EPA) is required to regulate GHGs under the Clean Air Act (CAA), and has already begun issuing regulations. In May 2010, EPA 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, EPA 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, 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

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

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[3]). The 2009 New York State Energy Plan[4] 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 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 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.

2.12-4 METHODOLOGY

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 section of Chapter 2 presents the total GHG emissions potentially associated with

[3] http://www.nyclimatechange.us/

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

the Project 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 Project is based on the methodology presented in the ~~2010~~ *CEQR Technical Manual*, with some additional methods and assumptions described below to address the details of construction emissions not addressed explicitly in the *Manual*. Emissions of GHGs associated with the Project have been quantified, including on-site emissions from non-road and on-road engines, and off-site emissions associated with on-site use of electricity, materials production, and vehicle use attributable to the Project. The reduction in carbon sequestration associated with the necessary tree removal is 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 projects. GHG emissions for gases other than CO_2 are included where practicable. The various GHG emissions are added together and presented as metric tons of CO_2e emissions per year (see section 2.12-2 above, “Greenhouse Gases of Concern”).

2.12-4.1 NON-ROAD CONSTRUCTION ENGINES

A detailed schedule for the use of non-road construction engines was developed, as described in Section 2.11, “Air Quality.” The detailed data, including the number, type, power rating, and hours of operation for all construction engines at both the west and east connection sites was coupled with fuel consumption rate data from EPA’s NONROAD model to estimate total fuel consumption throughout the duration of the construction activities. Non-road construction engines are estimated to require 778 thousand gallons of fuel throughout the duration of construction. In addition, on-site electricity generation would be required for early phases of construction, prior to obtaining a connection to the electricity transmission grid, requiring approximately 738 thousand gallons of diesel. The total quantity of fuel (approximately 1.5 million gallons) was then multiplied by an emission factor of 10.15 kilograms CO_2e per gallon of diesel.[5] The tunnel boring machine (TBM) and electric equipment use on-site would operate on electric power supplied by the electricity transmission grid once available; see section 2.12-4.3, “Electricity Use.”

2.12-4.2 ON-ROAD VEHICLES

The total number of construction worker trips was estimated using the construction schedule. The total number of worker-days, 396,256, was then divided by an average vehicle occupancy of

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[5] Energy Information Administration, Documentation for Emissions of Greenhouse Gases in the United States 2005, DOE/EIA-0638 (2005), October 2007, Tables 6-1, 6-2, 6-4, and 6-5.

1.2 and multiplied by an average round-trip distance of 33.0 miles[6] to obtain a total personal vehicle miles traveled of 10.92 million. An average combined emission factor of 378 grams CO_2e per mile was applied; this was derived from the "mobile GHG emissions calculator" provided in the *CEQR Technical Manual*[7] while applying the distribution by roadway type for the Project area—11 percent local, 24 percent arterial, and 65 percent freeway.[8]

Concrete and general deliveries (fuel, potable water, and other miscellaneous materials) were assumed to travel 50 miles round-trip (ready-mix concrete needs to be delivered within a short time, and other materials are available locally). Some concrete would be delivered from the on-site batching plant at the west connection site to the east connection site—a distance of 12.5 miles in each direction. Other truck trips, including raw material delivery, such as steel and materials for on-site concrete batching, and muck removal would travel to/from unknown sites. It is estimated that these trips could range from 25 to 150 miles in each direction. Since these trips represent 56 to 89 percent of the total estimated truck VMT, emissions associated with these trips were calculated for round trip distances of 50 and 300 miles, and the range of results is presented. The trips, distances, and resulting total VMT are presented in **Table 2.12-2**. An average combined emission factor of 1,201 grams CO_2e per mile was applied; this was derived from the EPA MOVES emission model, using the emission factors applied in the *CEQR Technical Manual* and assuming a roadway classification breakdown of 10 percent local roads, 10 percent arterial roads, and 80 percent freeway or interstate.

EPA estimates that the well-to-pump GHG emissions of gasoline and diesel are approximately 22 percent of the tailpipe emissions.[9] 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, as per the *CEQR Technical Manual* guidance, the well-to-pump emissions are not considered in the analysis for the Project.

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[6] A one-way average commuting distance in the Poughkeepsie area of 16.5 miles was obtained from—Oak Ridge National Laboratory, 2001 National Household Travel Survey, New York Add-On—Poughkeepsie MPO, May 2004.

[7] The *mobile GHG emissions calculator*, provided in the *CEQR Technical Manual*, is based on emission factors modeled using the EPA MOVES model—EPA's latest approved model for mobile source emissions and the only model capable of providing GHG emissions by speed. For air quality analysis (criteria pollutants), MOBILE6.2 is still used since it is still approved during the transition period and since full assumptions for modeling criteria pollutants with MOVES are not yet available.

[8] NYSDOT, VMT data by county and roadway type, provided by NYSDOT to AKRF.

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

Table 2.12-2
Total Construction Truck Trips and Distances

Type	Number	Distance (round-trip miles)	Vehicle Miles Traveled
Muck trucks out	27,956	50 to 300	1,397,821 to 8,386,925
Raw material trucks In	2,987	50 to 300	149,350 to 896,100
Concrete trucks (external)	1,879	50	93,973
General deliveries	21,344	50	1,067,202
Concrete trucks from west to east connection site	1,183	25	29,575
		Total	**2,737,921 to 10,473,775**

2.12-4.3 ELECTRICITY USE

The total grid-supplied electric power for the Project is estimated at 55 thousand megawatt-hours (MWh) for the duration of construction, including the projected electricity demand for all tunnel boring and other equipment used on-site. Emissions were calculated assuming 0.329 metric tons CO_2e per MWh, representing the average emission factor for New York State from 2007 to 2009.[10]

2.12-4.4 CONSTRUCTION MATERIALS

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

The construction is estimated to require 45,813 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.[11] The precise origin of cement for this project is unknown at this time. Given the uncertainty regarding the origin, additional shipping emissions have not been included.

The construction is estimated to require 18,189 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,[12] 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.[13]

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[10] U.S. Energy Information Administration, New York Electricity Profile, http://www.eia.gov, 2007-2009.

[11] The Portland Cement Association, Life Cycle Inventory of Portland Cement Manufacture, 2006

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

[13] Based on 42.3 teragrams of CO_2e emitted and 65,460 thousand tons produced; EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2009, April 15, 2011.

2.12-4.5 TREE REMOVAL

The west connection site includes approximately 6 acres of early to mature Appalachian oak-hickory forest; approximately 17 acres of scrub/shrub and early successional forest (forests that have been cleared or otherwise disturbed), including a dense understory consisting of young trees and saplings measuring less than 6 inches in diameter; and successional old field area of approximately 6 acres. The east connection site includes approximately 4 acres of Appalachian oak-hickory forest, including an approximately 2-acre early mature, mixed hardwood parcel (although the more disturbed portions of this forest resemble an early successional forest), and approximately 2 acres of mature, mixed hardwood. A detailed description of these ecological communities can be found in sections 2.8-3.1 and 2.8-4.1 in "Natural Resources and Water Resources."

A combined total of approximately 643 trees would be removed from the west and east connection sites, with a small number of trees being replanted as part of the restoration of both connection sites after completion of the Project. Given the high uncertainty regarding the precise net reduction in carbon sequestration resulting from tree removal, this item is discussed qualitatively.

2.12-5 PROJECTED GHG EMISSIONS FROM THE PROJECT

The detailed emissions estimates are presented in **Table 2.12-3.** Overall, the Project is estimated to result in the emission of 114,000 metric tons of CO_2e. This is roughly equivalent to the emissions from the combustion of 250,000 barrels of oil.[14] The largest contributions are associated with the use of cement and steel, grid-provided electricity, and on-site electricity generation. Note that given the uncertainty regarding the origin of the special cement required for the Project, emissions could be considerably higher if the cement needs to be shipped from a distant supplier.

In addition to the quantified emissions, the removal of approximately 643 trees, with some tree planting occurring when both connection sites are restored, would result in some net GHG emissions and reduced carbon sequestration. This is expected to be on the order of hundreds of tons CO_2e at most—a relatively small amount compared to the total emissions of the Project. Since some of the wood removed would likely be sold for use as lumber or firewood (replacing other firewood use), not all of the stored carbon would be released to the atmosphere within the timescale of analysis (100 years). Wood used as a product (structural, furniture, etc.) can store carbon for decades and more, and wood disposed of in landfill will also not decompose quickly. Nonetheless, the annual sequestration of carbon on the west and east connection sites would be reduced, since some of the area includes early to mature forest with remaining growth capacity and since some carbon would be sequestered annually by transfer to soils. This capacity would be lost, and only partially replaced.

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[14] EPA Greenhouse Gas Equivalencies Calculator, http://www.epa.gov/cleanenergy/energy-resources/calculator.html, accessed 11/16/2011.

Table 2.12-3
Greenhouse Gas Emissions

Component	Quantity	Units	Emission Factor (metric tons CO_2e/unit)	Total Emissions (metric tons CO_2e)
Materials Embedded				
Cement*	45,800	metric tons	0.928	42,500
Steel	18,200	metric tons	1.25	22,700
Power				
Electricity Use	68,000	MWh	0.329	22,400
On-Site Electricity Generation (diesel)	136,300	gallons	0.0101	1,400
Non-Road Engines (diesel)	845,000	gallons	0.0101	8,600
On-Road Vehicles				
On-Site Idling (diesel) **	8,000	gallons	0.0101	90
Trucks (diesel) ***	10,470,000	VMT	0.00120	12,600
Worker vehicles (gasoline)	10,920,000	VMT	0.00038	4,100
			Total:	**114,000**

Notes: Numbers are presented at analysis precision level. Sums may not add up due to rounding.
* Cement embedded emissions do not include emissions associated with shipping, since the precise origin of the cement is not known at this time.
** On-site idling assumes 45 minutes each per concrete mixer and 5 minutes each for other deliveries. 60 percent of this amount is associated with concrete mixing.
*** Truck emissions presented are based on the high-end assumption of 300-mile round trip distance. The lower-end scenario of 50-mile round trip would result in 3,300 metric tons of CO_2e from truck trips, reducing the total by 9,300 metric tons CO_2e.

2.12-6 ASSESSMENT OF CONSISTENCY WITH THE GHG REDUCTION GOAL

The assessment of consistency with the reduction goal, as defined in the *CEQR Technical Manual*, requires examination of how a project would reduce its carbon intensity, weighed against the considerations listed for five goals: building efficient buildings, using clean power, creating transit-oriented development and sustainable transportation, reducing construction activity emissions, and using building materials with low carbon intensity. Of these goals, efficient buildings and transit-oriented development are not relevant to the Project since no permanent structures are proposed and the Project would have no long-term operational emissions. The sections below review the Project’s efforts to reduce GHG emissions.

2.12-6.1 GOAL: USE CLEAN POWER

No practicable opportunities for on-site renewable power generation (such as hydro, solar, or wind power generation) associated with the operation of the Project were identified. However, the feasibility of using renewable fuels during construction is being investigated. See discussion below.

2.12-6.2 GOAL: REDUCE CONSTRUCTION ACTIVITY EMISSIONS

The construction sites would utilize grid power to the extent practicable, thus reducing potential GHG emissions associated with on-site diesel power generation. Note that grid power produces less GHG emissions than on-site generation due to the efficiency of large-scale generation as well as the incorporation of large amounts of renewable power, such as hydro and wind power, as well as the use of nuclear power, which has no direct GHG emissions. The TBM—the largest single power consumer for Project construction—would operate on grid power. Power would be supplied at the east connection site by a new supply feeder from Central Hudson Gas & Electric (CHG&E) from all stages of construction, and an electric substation, connecting to the existing CHG&E grid, would be built at the west connection site during Phase 1 to provide power during later construction phases on the west connection site.

Construction would also include an extensive diesel emissions reduction program, including diesel particle filters for large construction engines and other measures (see Section 2.11, "Air Quality"). These measures would reduce 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.

DEP is strongly encouraging contractors to include the use of biodiesel blended at a 20 percent level with standard diesel (B20) for construction non-road engines and generators, which would reduce GHG emissions from construction activity on-site, and where biodiesel cannot be used, to explain in detail the practicability limitations. Biodiesel could potentially be used for all engines, subject to technical considerations. Given the current low level of distribution for on-road uses and the wide range of operators and areas in which the construction delivery trucks may be operating, requiring biodiesel for on-road vehicles is not practicable.

Regarding carbon sequestration by trees, once construction is concluded, a limited number of trees would be planted on the connection sites where practicable. At the conclusion of Project 2B, the west connection site shaft itself (i.e., Shaft 5B) would be capped with a concrete cover and soil. In the areas not occupied by the internal roadway and the shaft, the site would be replanted. Similarly, the shaft on the east connection site (i.e., Shaft 6B) would be capped with a concrete cover and soil. The construction offices, storage trailers, and equipment would be removed. Both the lower parking area and the upper parking area and the inundation plug would be removed and areas regraded and replanted. The main site driveway would be retained and would continue to provide access to the Hudson River Pump Station at the lower portion of the site and the Shaft 6 superstructure on the upper portion of the site. The internal driveway providing access to the east connection site shaft area would be retained to allow for any future access to the shaft should it be necessary. A tree replanting program would be completed for portions of the site, but certain areas would be maintained as lawn area to allow for future access. Subsequent to the issuance of the DEIS, DEP has revised its proposed landscaping plan for the west connection site to include more trees and shrubs at the base of the manufactured slope, at the top of the manufactured slope, and, to a limited degree, within the manufactured slope. On the east connection site, areas of steep meadow perennials would be installed on the sloped portions of the site while other areas would be reforested or maintained as lawn area.

The largest potential contribution to on-road GHG emissions would be from trucks carrying excavated material from shaft and tunnel construction for reuse or landfill. These emissions could be minimized by selecting disposal sites near the connection sites. DEP is investigating the use of disposal sites located near the connection sites, where practicable, in order to minimize GHG emissions from this source to the extent practicable.

The reuse of excavated material could offset the need to quarry and/or transport other materials that they would replace. DEP is investigating options for the reuse of excavated material, where practicable, in order to minimize GHG emissions from this source.

2.12-6.3 GOAL: USE BUILDING MATERIALS WITH LOW CARBON INTENSITY

Concrete used in areas other than the tunnel and shaft construction would include fly ash and slag as practicable, reducing the GHG emissions associated with the production of the cement that these materials replace.

Fly ash and slag cannot be used for the portions of the concrete that would come in contact with potable water (in the tunnel and shafts) since there is concern that trace toxic materials that may be found in these post-industrial byproducts could leach into the water. However, DEP is currently investigating the option of maximizing the interground limestone content of cement used for the Project as a whole.

Approximately 93 percent of steel currently used for construction in the United States is recycled from scrap material.[15] DEP is investigating options of requiring the use of recycled steel, where practicable, in order to minimize GHG emissions from this source.

Although cement is produced throughout the United States, the technical specifications for cement used in DEP potable water projects is not currently met by any producers in the United States, and it is expected that the cement for the Project would be imported, although the precise origin is unknown at this time. Other materials will likely originate in the region.

2.12-7 CONCLUSIONS

The construction of Project 1 and the portion of Project 2B involving the connection of the bypass tunnel would include GHG reduction measures where practicable:

- The construction sites would utilize grid power to the extent practicable;
- DEP is strongly encouraging contractors to include the use of biodiesel blended at a 20 percent level with standard diesel (B20) for construction non-road engines and generators; and

[15] Steel Recycling Institute, “2009 The Inherent Recycled Content of Today’s Steel,” 2010.

- Concrete used in areas other than the tunnel and shaft construction would include fly ash and slag, as practicable.

DEP is also currently investigating several additional GHG reduction measures:

- The option of maximizing the interground limestone content of all cement used;
- Requiring the use of recycled steel;
- Disposal of excavated materials at sites located near the connection sites; and
- The reuse of excavated material.

Therefore, the construction of Project 1 and the portion of Project 2B involving the connection of the bypass tunnel would be consistent with New York City's GHG reduction goals. ✷