5.0 Environmental Consequences

5.1 Introduction

This section presents the environmental consequences that would result from the construction and operation of any of the four Build Alternatives, which are all proposed to be a cable-stayed design. To provide a comparison and to identify those impacts or conditions that would exist if the Proposed Project was not to be implemented, the No-Build Alternative has also been evaluated. The descriptions of the anticipated environmental impacts along with the methodologies and data sources that were used to determine the extent and magnitude of the impacts are also described and discussed. Specifically, the following environmental disciplines are addressed in this section:

- Land Use and Zoning
- Socioeconomics
- Environmental Justice
- Community Facilities
- Parklands and Recreational Facilities
- Historic Resources
- Archaeological Resources
- Visual Quality
- Topography, Geology and Soils
- Water Resources
- Floodplains
- Biotic Communities
- Coastal Zone Management
- Navigation and Airspace
- Solid Waste
- Infrastructure
- Contaminated Materials
- Energy
- Traffic and Transportation
- Air Quality
- Human Health Air Quality
- Noise and Vibration
- Construction Impacts
- Indirect and Cumulative Impacts

Most of the environmental resources discussed in this section are also discussed in Section 4.0 in terms of existing conditions; however, some other resources that are primarily impact-based considerations are this only addressed in this section. As in Section 4.0, this section has been subdivided into separate sections based on each of the above environmental disciplines. These sections are further organized, as appropriate, into subsections that provide an introduction, a description of the methodology and data and resources used for evaluating impacts, and a description of the impacts for each resource. Mitigation is also discussed for those resources for which mitigation has been determined to be an appropriate compensatory measure to offset project impacts, and to satisfy applicable regulatory agency requirements.

For many of the environmental resources, the potential impacts are discussed in terms of the anticipated time of construction completion (2014) and/or the anticipated design year (2034). As described in more detail in Section 3.0, the four Build Alternatives include:

- *New Alignment South* - a single-span bridge replacement in an alignment directly south of the existing Goethals Bridge;
- *New Alignment North* - a single-span bridge replacement in an alignment directly north of the existing Goethals Bridge;
- *Existing Alignment South*– a single-span bridge replacement in an alignment within and extending south of the existing Goethals Bridge alignment; and
- *Existing Alignment North* - a single-span bridge replacement in an alignment within and extending north of the existing Goethals Bridge alignment.

Throughout this section, several methods of grouping the Build Alternatives have been used for discussion purposes, as appropriate. For instance, the Build Alternatives can be grouped for discussion either by geographical location or by alignment type, depending on which grouping is most suitable for

presentation of a particular impact. In the case of grouping by geographical location, "Southern Alternatives" is the term used to collectively refer to the *New Alignment South* and the *Existing Alignment South* while the term "Northern Alternatives" refers collectively to the *New Alignment North* and the *Existing Alignment North*. In the case of grouping by alignment type, "New Alignment Alternatives" is the term used to collectively refer to the *New Alignment North* and the *New Alignment South* while the term "Existing Alignment Alternatives" refers collectively to the *Existing Alignment North* and the *Existing Alignment South*.

While the New Alignment South has been identified as the Preferred Alternative, all four Build Alternatives have been evaluated and are presented equally for the purpose of full disclosure in the NEPA process.

5.2 Land Use and Zoning

5.2.1 Introduction

Guidelines established by the National Environmental Policy Act (NEPA) require the assessment of two types of land use and zoning impacts – direct and indirect. Direct impacts refer to the actual lands to be acquired for the Proposed Project. Indirect impacts include: (1) possible changes to current or proposed land uses, such as induced or accelerated development, that would likely occur as a result of the Proposed Project; (2) changes, as a result of the Proposed Project, that are inconsistent with the policies and objectives of the adopted plans; and (3) changes to zoning patterns, including specific zoning categories which may be lost due to land acquired for the Proposed Project and incompatibilities with adjacent land that is zoned for a specific use.

5.2.2 Methodology, Approach and Data Sources

This section identifies and evaluates the potential impacts to land use, zoning, related policies and planned development projects that could result from the construction and operation of the Proposed Project within the Goethals Bridge Study Area. In most cases, reference to the Study Area in this section refers to the Goethals Bridge Study Area, which encompasses both the Primary and Secondary Study Areas (as previously defined in Section 4.2), or unless indicated otherwise. Because of the different political jurisdictions and land use characteristics, this section separates the Goethals Bridge Study Area into the New Jersey side, which is comprised of portions of the cities of Elizabeth and Linden, and the New York side, which is completely within the Borough of Staten Island.

The evaluation of potential direct impacts to land use was conducted by overlaying the conceptual design drawings of each Build Alternative over the geo-referenced basemaps for existing land use and tax-based parcel boundaries. As part of the reasonably foreseeable future conditions of the No-Build Alternative, the programmed/committed developments and planning initiatives previously identified within the Goethals Bridge Study Area and its environs (as listed in Section 4.4.5), were also considered in this section in order to serve as the future baseline against which the Build Alternatives were assessed for direct, indirect and cumulative impacts. The characterization of existing conditions and policies and future development projections was based on interviews with agency representatives from Elizabeth, Linden, New York City and transportation providers within the region; field surveys; and from a review of New York Metropolitan Transportation Council's (NYMTC) and North Jersey Transportation Planning Authority's (NJTPA) Transportation Improvement Programs (TIPs), as well as other available project-related reports, studies, maps, and planning documents.

In light of the land use impact evaluation, several assumptions were considered. A 50-foot buffer/right-of-way was assumed on either side of the Build Alternatives. Port Authority properties are not included in this assessment, as the use of such parcels is not considered a property impact for the purpose of

constructing a Port Authority facility, with the exception of the New York Container Terminal (NYCT) at Howland Hook, which is leased to a private entity by the Port Authority.

For commercial property impacts, two separate considerations were made between partial and full property acquisitions. On one hand, a partial take (i.e., encroachment) of a commercial parcel is considered to occur if an alignment alternative's right-of-way would encroach on some portion of the parcel without affecting the ability of the business to continue operation at that location, and regardless of the degree/amount of encroachment. On the other hand, a full take of a commercial parcel is considered to occur if the business operations or structure/building would be permanently affected by the alignment alternative's right-of-way. As a special case for this impact analysis, the former and now vacant site of the Borne Chemical Company (currently owned by the City of Elizabeth) is considered as an active commercial property, given Jay Cashman's committed project on the property for the construction of a Dredged Material Processing Facility (see Section 4.4.5); this project is assumed to be constructed and in operation before the 2014 Build Year.

For residential property impacts, a full take of a residential parcel is systematically considered to occur if an alignment alternative's right-of-way falls within that property, whether or not the actual residential structure or building (if any) would be affected. Likewise, a full take of a mixed-use parcel (i.e., a building with a ground-floor business with residential apartments above) is systematically considered to occur if an alignment alternative's right-of-way falls within that property, whether or not the structure or building would be affected. For the purpose of this land use evaluation, the identification of a specific parcel (whose boundaries are originally defined by tax maps) as a residential parcel was not only based on the presences of any residential buildings, but also based on whether such parcel was somehow used for residentially-related purposes. For example, several parcels along Bay Way and Krakow Street in Elizabeth have been identified as a residential land use, even though they only contain a driveway, a detached garage, a tenant's parking lot, a garden, and/or an abandoned house, rather than an active residential structure.

For transportation, communication and utilities (TCU) impacts, an easement into a TCU parcel is considered to occur if the alignment alternative's right-of-way and piers would not preclude the safe and reliable operation of that parcel; otherwise, a partial take or full take is considered to occur for a TCU parcel depending on the degree/amount of encroachment and impact to the operations of that parcel. As previously defined in Section 4.4 and given the extent of Staten Island's natural resources, unoccupied and unused parcels were differentiated between undeveloped lands (e.g., wetlands) and vacant lands (that were once developed but currently inactive). With the exception of already existing TCU land uses, it is assumed that all property impacts (either partial or full property acquisitions) to any other land uses will be classified as TCU land uses since they will be part of the new bridge's right-of-way for transportation purposes. For the purpose of performing a conservative impact analysis, none of the already Port Authority-owned parcels along the existing Goethals Bridge's right-of-way would be sold or transferred, even if a specific parcel was no longer part of the new bridge's right-of-way.

5.2.3 Land Use

5.2.3.1 No-Build Alternative

Despite the number of programmed and committed projects within the Goethals Bridge Study Area and its environs (see Section 4.4.5, *Planned Future Development*), it is anticipated that future land development would proceed pursuant to current commercial and industrial zoning, as well as approved plan and redevelopment initiatives. Once implemented prior to the 2034 design year of the Proposed Project, these projects and initiatives (primarily transportation and commercial in nature) would ultimately serve to intensify the area's predominant industrial, transportation and commercial land uses in the Study Area, with the exception of the small mixed-use residential and commercial neighborhood located in Elizabeth between Krakow Street and Bay Way, which would remain isolated in relation to its

surrounding M-2 manufacturing zoning district. As previously presented in Figure 4.4-3 and Table 4.4-1 in Section 4.4, the largest transportation and land development projects that are proposed within the Goethals Bridge Study Area and that are committed to be implemented by 2034, would include: (1) the Arthur Kill Channel Deepening Program; (2) the West Shore Expressway Corridor/Service Road Improvements; (3) the Jay Cashman Dredged Material Processing Facility on the former Borne Chemical Site; (4) the NYCT's Howland Hook Redevelopment Program; and (5) the undetermined as-of-right development of the 675-acre vacant industrial land of the former GATX Terminal.

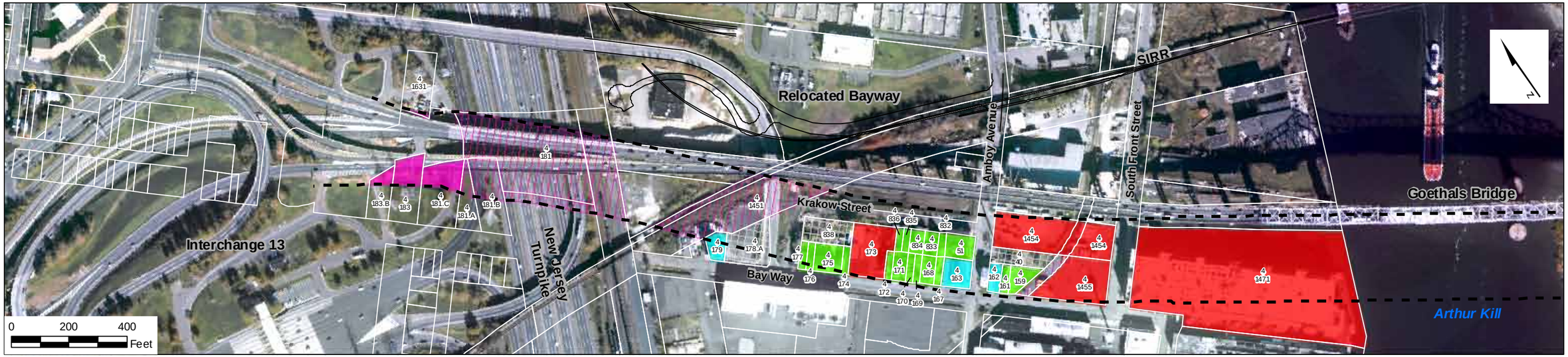
Therefore, existing land use patterns and zoning in the Goethals Bridge Study Area are not expected to change substantially by the year 2034 since all planned developments are expected to conform to existing zoning regulations on both sides of the Arthur Kill. In Staten Island, the 676-acre site of the former GATX Terminal is the largest tract of vacant land in the Goethals Bridge Study Area. Absent definitive plans for this site, an as-of-right development for such M3 and M2 zoning districts was used for assessing future land use patterns. As such, it is assumed that by 2034 the former GATX site would include approximately 270,000 gross square feet (gsf) of retail space and 2.6 million gsf of industrial space under an as-of-right development scheme which is considered as a conservative worst-case approach with regard to customary land development in the City of New York. Such an as-of-right development would then maintain existing zoning regulations, though changing the existing land use from a vacant to an active industrial site.

5.2.3.2 Build Alternatives

Permanent Impacts

The most obvious impacts to land use would occur during the acquisition of properties required to site and construct the new bridge structures. The construction of any of the four Build Alternatives would require the acquisition of several properties, either partial take (i.e., encroachment) or full take, along with a few easements into existing transportation rights-of-way, most notably in New Jersey. Most of the properties susceptible to be encroached upon or fully taken are currently vacant and undeveloped, or occupied by residential and commercial buildings, auxiliary commercial parking/storage, utilities, and scrap yards. No land uses classified as industrial would be impacted by any of the proposed Build Alternatives. While Figures 5.2-1 through 5.2-4 graphically depict the potential land use impacts for each Build Alternative, Table 5.2-1 also presents a detailed summary of the types and total acreages of impacted land uses, including actively-used properties and inactive land parcels, in both New Jersey and Staten Island.

The acquisition of non-TCU land uses for right-of-way associated with any of the Build Alternatives would result in a conversion of these land uses to transportation purposes (i.e., TCU), and would range from 21.1 acres (New Alignment North) to 30.0 acres (New Alignment South) (see Table 5.2-1). In addition, for all four Build Alternatives, the western ends of each NJ Approach Span would require various easements and partial acquisitions into several transportation and utility rights-of-way, including most notably, the NJ Turnpike (operated by the New Jersey Turnpike Authority), the Chemical Coast Secondary Line Railroad (operated by Conrail Shared Assets Operations - CSAO), the Staten Island Railroad (a.k.a. SIRR operated by CSX Transportation, Inc.), as well as PSE&G's rights-of-way for the two 138-kV overhead transmission lines near Turnpike Interchange 13. These overpass easements would range between approximately 4.9 and 6.0 acres, depending on the particular alignment alternative, while partial property acquisitions would range between 0.6 and 0.7 acre. In turn, those easement and partial property acquisitions to TCU parcels would not preclude the safe and reliable operation of those existing land uses. While detailed information on the displacements of the actively-used properties (notably commercial and residential) within the Goethals Bridge Study Area is provided in Section 5.3, the



NEW JERSEY

NEW YORK

Legend

Proposed 50-foot Right-of-Way (ROW)

Proposed realigned Gulf Avenue and its 15-foot limit-of-disturbance

1852 Block
1 Lot

Parcel Impacts

- COMMERCIAL (FULL TAKE)
- COMMERCIAL (PARTIAL TAKE)
- MIXED USE (FULL TAKE)
- RESIDENTIAL (FULL TAKE)
- TRANSPORTATION, COMMUNICATION AND UTILITIES (PARTIAL TAKE)
- TRANSPORTATION, COMMUNICATION AND UTILITIES (EASEMENT)
- VACANT & UNDEVELOPED (PARTIAL OR FULL TAKE)
- NO IMPACT*

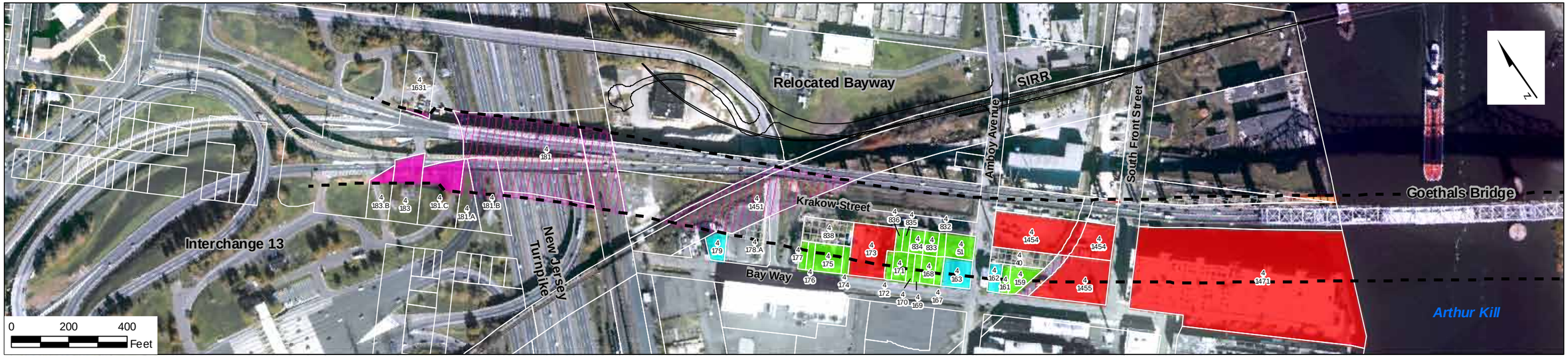
*Port Authority parcels are not included in this assessment since the use of such parcels is not considered a property impact for the purpose of constructing a Port Authority facility

Source: Basemapping: Port Authority of New York and New Jersey, 2002.
Parcel Data: Union County, NJ 2005. Richmond County, NY, 2005
Design: HNTB, 2009.
Data: Berger, 2009.

Goethals Bridge Replacement EIS

FIGURE 5.2-1
Land Use Impacts for the New Alignment South

United States Coast Guard



NEW JERSEY

NEW YORK

Legend

- Proposed 50-foot Right-of-Way (ROW)
- Proposed realigned Gulf Avenue and its 15-foot limit-of-disturbance

1852 Block
1 Lot

Parcel Impacts

- COMMERCIAL (FULL TAKE)
- COMMERCIAL (PARTIAL TAKE)
- MIXED USE (FULL TAKE)
- RESIDENTIAL (FULL TAKE)
- TRANSPORTATION, COMMUNICATION AND UTILITIES (PARTIAL TAKE)
- TRANSPORTATION, COMMUNICATION AND UTILITIES (EASEMENT)
- VACANT & UNDEVELOPED (PARTIAL OR FULL TAKE)
- NO IMPACT*

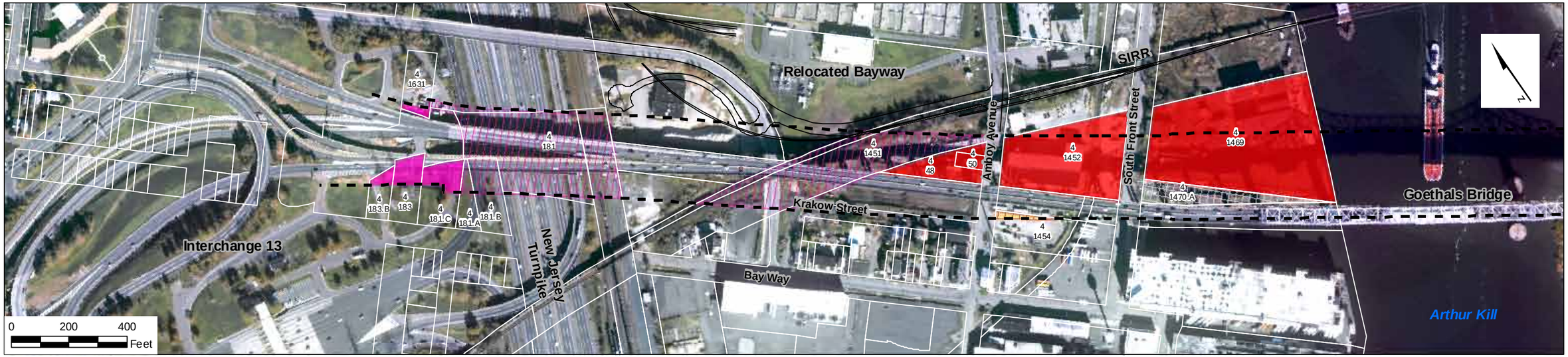
*Port Authority parcels are not included in this assessment since the use of such parcels is not considered a property impact for the purpose of constructing a Port Authority facility

Source: Basemapping: Port Authority of New York and New Jersey, 2002.
Parcel Data: Union County, NJ 2005. Richmond County, NY, 2005
Design: HNTB, 2009.
Data: Berger, 2009.

Goethals Bridge Replacement EIS

FIGURE 5.2-2
Land Use Impacts for the Existing Alignment South

United States Coast Guard



NEW JERSEY

NEW YORK

Legend

Proposed 50-foot Right-of-Way (ROW)

Proposed relocated Goethals Road North and its 15-foot limit-of-disturbance

1852 Block
1 Lot

Parcel Impacts

- COMMERCIAL (FULL TAKE)
- COMMERCIAL (PARTIAL TAKE)
- MIXED USE (FULL TAKE)
- RESIDENTIAL (FULL TAKE)
- TRANSPORTATION, COMMUNICATION AND UTILITIES (PARTIAL TAKE)
- TRANSPORTATION, COMMUNICATION AND UTILITIES (EASEMENT)
- VACANT & UNDEVELOPED (PARTIAL OR FULL TAKE)
- NO IMPACT*

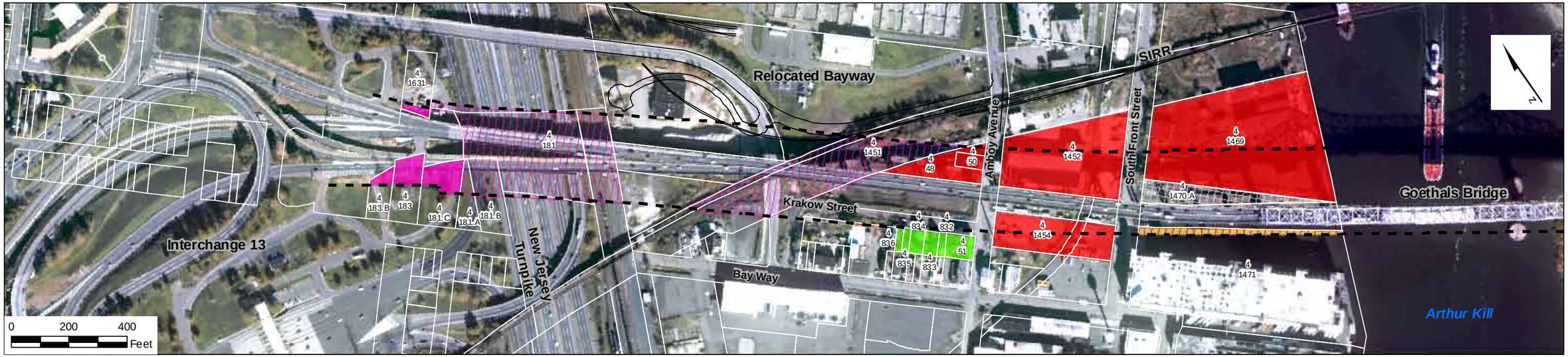
*Port Authority parcels are not included in this assessment since the use of such parcels is not considered a property impact for the purpose of constructing a Port Authority facility

Source: Basemapping: Port Authority of New York and New Jersey, 2002.
Parcel Data: Union County, NJ 2005. Richmond County, NY, 2005
Design: HNTB, 2009.
Data: Berger, 2009.

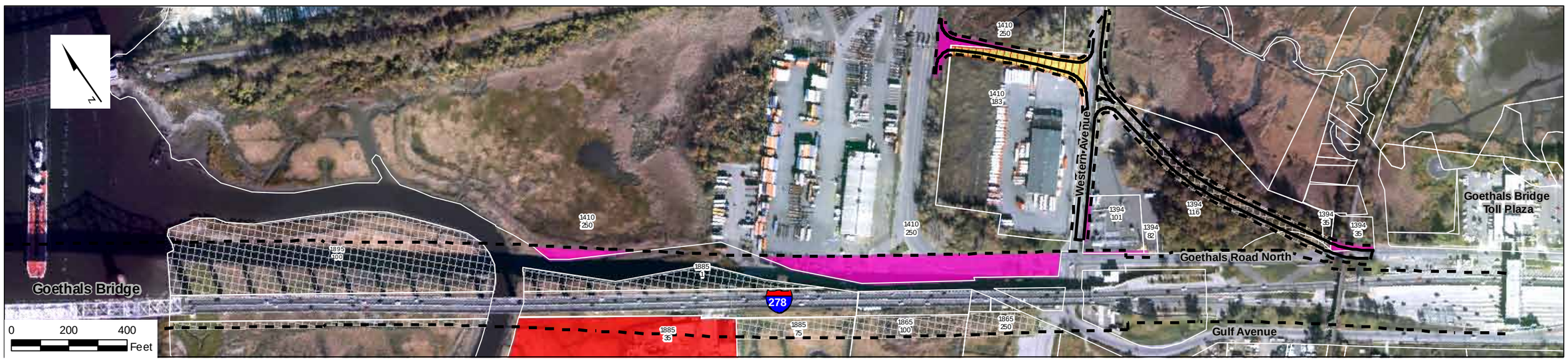
Goethals Bridge Replacement EIS

FIGURE 5.2-3
Land Use Impacts for the New Alignment North

United States Coast Guard



NEW JERSEY



NEW YORK

Legend

Proposed 50-foot Right-of-Way (ROW)

Proposed relocated Goethals Road North and its 15-foot limit-of-disturbance

1852 Block
1 Lot

Parcel Impacts

- COMMERCIAL (FULL TAKE)
- COMMERCIAL (PARTIAL TAKE)
- MIXED USE (FULL TAKE)
- RESIDENTIAL (FULL TAKE)
- TRANSPORTATION, COMMUNICATION AND UTILITIES (PARTIAL TAKE)
- TRANSPORTATION, COMMUNICATION AND UTILITIES (EASEMENT)
- VACANT & UNDEVELOPED (PARTIAL OR FULL TAKE)
- NO IMPACT*

*Port Authority parcels are not included in this assessment since the use of such parcels is not considered a property impact for the purpose of constructing a Port Authority facility

Source: Basemapping: Port Authority of New York and New Jersey, 2002.
Parcel Data: Union County, NJ 2005. Richmond County, NY, 2005
Design: HNTB, 2009.
Data: Berger, 2009.

Goethals Bridge Replacement EIS

FIGURE 5.2-4
Land Use Impacts for the Existing Alignment North

United States Coast Guard

TABLE 5.2-1
LAND USE IMPACT SUMMARY

Type of Land Use	New Alignment South					Existing Alignment South					New Alignment North					Existing Alignment North				
	Acquisition			Easement		Acquisition			Easement		Acquisition			Easement		Acquisition			Easement	
	PT	FT	Acres	E	Acres	PT	FT	Acres	E	Acres	PT	FT	Acres	E	Acres	PT	FT	Acres	E	Acres
NEW JERSEY																				
Commercial	0	4	8.7	0	0.0	2	4	8.7	0	0.0	1	4	8.0	0	0.0	2	5	9.4	0	0.0
MXD	0	3	0.5	0	0.0	0	3	0.5	0	0.0	0	0	0.0	0	0.0	0	0	0.0	0	0.0
Residential	0	18	1.6	0	0.0	0	18	1.6	0	0.0	0	0	0.0	0	0.0	0	6	0.5	0	0.0
TCU	4	0	0.6	6	4.9	4	0	0.6	6	5.1	4	0	0.7	6	6.0	4	0	0.7	6	6.0
Undeveloped	0	0	0.0	0	0.0	0	0	0.0	0	0.0	0	0	0.0	0	0.0	0	0	0.0	0	0.0
Vacant	0	3	1.1	0	0.0	0	4	1.5	0	0.0	0	1	0.7	0	0.0	1	1	0.7	0	0.0
TOTAL Parcels/Acreages Impacted	**4**	**28**	***12.5***	**6**	***4.9***	**6**	**29**	***12.9***	**6**	***5.1***	**5**	**5**	***9.4***	**6**	***6.0***	**7**	**12**	***11.3***	**6**	***6.0***
Acreages Converted to TCU			***11.9***					***12.3***					***8.7***					***10.6***		
NEW YORK																				
Commercial	2	1	6.3	0	0.0	2	1	6.3	0	0.0	4	0	0.8	0	0.0	3	1	6.9	0	0.0
MXD	0	0	0.0	0	0.0	0	0	0.0	0	0.0	0	0	0.0	0	0.0	0	0	0.0	0	0.0
Residential	0	0	0.0	0	0.0	0	0	0.0	0	0.0	0	0	0.0	0	0.0	0	0	0.0	0	0.0
TCU	0	0	0.0	0	0.0	1	0	0.4	0	0.0	4	0	4.0	0	0.0	3	0	2.5	0	0.0
Undeveloped	4	0	10.2	0	0.0	6	0	7.7	0	0.0	6	2	11.2	0	0.0	9	1	10.6	0	0.0
Vacant	2	0	1.6	0	0.0	2	0	0.7	0	0.0	2	0	0.4	0	0.0	2	0	0.5	0	0.0
TOTAL Parcels/Acreages Impacted	**8**	**1**	***18.1***	**0**	***0.0***	**11**	**1**	***15.1***	**0**	***0.0***	**16**	**2**	***16.4***	**0**	***0.0***	**17**	**2**	***20.5***	**0**	***0.0***
Acreages Converted to TCU			***18.1***					***14.7***					***12.4***					***18.0***		
GRAND TOTAL (Both NY and NJ Combined)																				
Commercial	2	5	15.0	0	0.0	4	5	15.0	0	0.0	5	4	8.8	0	0.0	5	6	16.3	0	0.0
MXD	0	3	0.5	0	0	0	3	0.5	0	0	0	0	0	0	0	0	0	0	0	0
Residential	0	18	1.6	0	0	0	18	1.6	0	0	0	0	0	0	0	0	6	0.5	0	0
TCU	4	0	0.6	6	4.9	5	0	1.0	6	5.1	8	0	4.7	6	6.0	7	0	3.2	6	6.0
Undeveloped	4	0	10.2	0	0.0	6	0	7.7	0	0.0	6	2	11.2	0	0.0	9	1	10.6	0	0.0
Vacant	2	3	2.7	0	0.0	2	4	2.2	0	0.0	2	1	1.1	0	0.0	3	1	1.2	0	0.0
TOTAL Parcels/Acreages Impacted	**12**	**29**	***30.6***	**6**	***4.9***	**17**	**30**	***28.0***	**6**	***5.1***	**21**	**7**	***25.8***	**6**	***6.0***	**24**	**14**	***31.8***	**6**	***6.0***
Acreages Converted to TCU			***30.0***					***27.0***					***21.1***					***28.6***		

Source: Berger/PB, 2008.

Notes/Acronyms:
PT = Number of Parcels Partially Taken (i.e., encroached)
FT = Number of Parcels Fully Taken
E = Number of Parcels Eased
MXD = Mixed-Use Commercial and Residential
TCU = Transportation, Communication and Utilities

prominent differences in discrete land use impacts between the four Build Alternatives are discussed below.

New Alignment South

The New Alignment South would require 29 full parcel acquisitions and 12 partial acquisitions totaling approximately 30.0 acres of existing land uses to be converted to transportation purposes. Overall, proposed acquisition of residential, business, and mixed-use properties in both New Jersey and Staten Island would result in a reduction of approximately 1.6 acres, 15.0 acres, and 0.5 acres of these land uses, respectively; these reductions are not considered to be significant at a borough, city or regional level.

On the New Jersey side of the Study Area, the entire residential neighborhood totaling approximately 2.1 acres along Bay Way and Krakow Street in Elizabeth, including 18 residential parcels and three mixed-use parcels, would be fully acquired. In addition, seven commercial parcels totaling approximately 9.2 acres (including commercial and mixed-use parcels) would be acquired in their entirety, resulting in the displacement of six businesses: (1) Bayway Industrial Center (two parcels for the warehouse and employee parking); (2) Paley, Lloyd & Donahue; (3) Waste Management, Inc (only the parcel with its weigh station); and (4-6) three entertainment establishments (Anchor Tavern, Flo Bar, and Jersey Girls Men's Club - all three located within mixed-use parcels). A total of three vacant parcels (1.1 acres) would also be fully acquired.

On the New York side, 1.6 acres of vacant and 10.2 acres of undeveloped land parcels in Staten Island would be partially acquired. In addition, a total 6.3 acres of commercial parcels would be converted to transportation uses including one full acquisition (R.T. Baker & Son Machinery Dismantlers) and two partial acquisitions (about 0.1 acre or 13% of the F. Liquori Plumbing & Heating, Inc., and less than 0.1 acre or 0.01% of The Hylan Group, Inc.). The two partial acquisitions totaling slightly more than 0.1 acre would actually be incurred as a result of the re-alignment of Gulf Avenue rather than by the bridge alignment.

Existing Alignment South

The Existing Alignment South would require 30 full parcel acquisitions and 17 partial acquisitions, totaling approximately 27.0 acres of existing land uses to be converted to transportation purposes. Overall, proposed acquisition of residential, business, and mixed-use properties in both New Jersey and Staten Island would result in a reduction of approximately 1.6 acres, 15.0 acres, and 0.5 acres of these land uses, respectively; these reductions are not considered to be significant at a borough, city or regional level.

On the New Jersey side of the Study Area, the entire residential neighborhood totaling approximately 2.1 acres along Bay Way and Krakow Street in Elizabeth, including 18 residential parcels and three mixed-use parcels, would be fully acquired. Seven commercial parcels totaling approximately 9.2 acres (including commercial and mixed-use parcels) would also be acquired in their entirety, resulting in the displacement of seven businesses: (1) Bayway Industrial Center (two parcels for the warehouse and employee parking); (2) Paley, Lloyd & Donahue; (3) Waste Management, Inc (only the parcel with its weigh station); and (4-6) three entertainment establishments (Anchor Tavern, Flo Bar, and Jersey Girls Men's Club - all three located within mixed-use parcels). In addition, the northern edge of the 50-ft ROW would slightly encroach onto the southeast corners of two commercial parcels resulting in the partial take of two business properties including: (1) Waste Management, Inc (less than 0.01% encroachment into the parcel with its main recycling facility); and (2) Jay Cashman, Inc. (1% encroachment into the parcel with the proposed dredged materials processing facility). A total of four vacant parcels (1.5 acres) would also be fully acquired.

On the New York side of the Study Area, most acquisitions, either partial or full, would include 0.7 acres of vacant land and 7.7 acres of undeveloped land parcels while one commercial parcel of 6.2 acres (R.T. Baker & Sons Machinery Dismantlers) would be fully acquired. In addition, two partial acquisitions to commercial parcels totaling slightly more than 0.1 acre (about 0.1 acre or 13% of the F. Liquori Plumbing & Heating, Inc., and less than 0.1 acre or 0.01% of The Hylan Group, Inc.) would be incurred as a result of the re-alignment of Gulf Avenue rather than by the bridge alignment. This alignment alternative's right-of-way would also result in a small 0.4-acre encroachment (or 0.18%) on the TCU parcel of the New York Container Terminal (NYCT).

New Alignment North

The New Alignment North would require 7 full parcel acquisitions and 21 partial acquisitions, totaling approximately 21.1 acres of existing land uses to be converted to transportation purposes. Overall, neither residential nor mixed-use parcels would be acquired, and the proposed business acquisitions in both New Jersey and Staten Island would result in a reduction of approximately 8.8 acres of commercial land uses; this reduction is not considered to be significant at a borough, city or regional level.

On the New Jersey side of the Study Area, four commercial parcels, totaling approximately 8.0 acres, would be fully acquired, resulting in the displacements of two existing businesses and one proposed business: (1) Bayway Metals (two parcels); (2) Waste Management, Inc (the parcel with its main

recycling facility); and (3) Jay Cashman Dredge Material Processing Facility (given its assumed construction before 2014 Build Year). One vacant parcel (totaling 0.7 acre) would also be fully acquired.

On the New York side of the Study Area, most acquisitions, either partial or full, would include 0.4 acre of vacant land and 11.2 acres of undeveloped land parcels while four commercial parcels (approximately 0.6 acre or 8% of the Coca-Cola distribution center property, 0.1 acre or less than 1% of the R.T. Baker & Sons Machinery Dismantlers property, about 0.1 acre or 13% of the F. Liquori Plumbing & Heating, Inc., and less than 0.1 acre or 0.01% of The Hylan Group, Inc.) would have to be partially acquired. Four TCU parcels, totaling approximately 4.0 acres, would also have to be partially acquired. The direct encroachment impacts to four utilities include: (1) less than 0.01 acre or 3% of the KeySpan Corporation's gas metering station; (2) 0.05 acre or 6% of the Texas Eastern Transmission LP's gas metering station; (3) less than 0.1 acre or 21% of the City-owned parcel where the bridge footing of SIRR Travis Branch is located but would not be impacted; and (4) 3.9 acres or 2% of the NYCT's property with the potential displacements of its main truck entrance and a portion of the employee parking of the Maintenance and Repair (M&R) Building. Infrastructure impacts due to the direct encroachments to the KeySpan/Texas Eastern gas metering stations are further discussed in Section 5.17. It should be noted that the above land use impacts in Staten Island would result from the combination of the main bridge alignment as well as from the proposed relocation of Goethals Road North and re-alignment of Gulf Avenue.

Existing Alignment North

The Existing Alignment North would require 14 full parcel acquisitions and 24 partial acquisitions, totaling approximately 28.6 acres of existing land uses to be converted to transportation purposes. Overall, proposed acquisition of residential and commercial properties in both New Jersey and Staten Island would result in a reduction of approximately 0.5 acre and 16.3 acres of these land uses, respectively; these reductions are not considered to be significant at a borough, city or regional level. No mixed-use parcels would be impacted under this alignment alternative.

On the New Jersey side of the Study Area, the residential properties fronting Krakow Street in Elizabeth, including six residential parcels totaling approximately 0.5 acres, would be fully acquired since the proposed bridge's right-of-way would actually occupy the entire street, thereby eliminating access to those residential parcels. In addition, seven commercial parcels, totaling approximately 9.4 acres, would be partially or fully acquired, resulting in direct impacts to four existing businesses and one proposed business: (1) Bayway Industrial Center (0.4 acre or 6% encroachment within boat slip basin next to the warehouse); (2) Paley, Lloyd & Donahue (0.01 acre or 2% encroachment); (3) Waste Management, Inc (full take of two parcels with both weigh station and recycling building); (4) Bayway Metals (two parcels); and (5) Jay Cashman, Inc. (full take, given its assumed construction before 2014 Build Year). As a result, the Existing Alignment North would preclude the future land development opportunity of Jay Cashman, Inc. from proceeding.

On the New York side of the Study Area, acquisitions would include 0.5 acre of vacant and 10.6 acres of undeveloped parcels in Staten Island. The entire commercial parcel of R.T. Baker & Sons Machinery Dismantlers (1.0 acre) would be fully acquired while the parcel of Coca-Cola distribution center would be encroached by 0.6 acre or 8% by the bridge alignment. In addition, two other partial acquisitions to commercial parcels totaling slightly more than 0.1 acre (about 0.1 acre or 13% of the F. Liquori Plumbing & Heating, Inc., and less than 0.1 acre or 0.01% of The Hylan Group, Inc.) would be incurred as a result of the re-alignment of Gulf Avenue rather than by the bridge alignment. Three TCU parcels, totaling approximately 2.5 acres, would be partially acquired, resulting in some direct encroachment impacts to three utilities including: (1) 0.03 acre or 3% of the Texas Eastern's gas metering station; (2) less than 0.1 acre or 21% of the City-owned parcel where the bridge footing of SIRR Travis Branch is located but would not be impacted; and (3) 2.4 acres or 1% of the NYCT's property with the potential displacements of its main truck entrance and employee parking of the Maintenance and Repair (M&R) Building.

Encroachment impacts to the Texas Eastern gas metering station are further discussed in Section 5.17. The land use impacts in Staten Island would result from the combination of the main bridge alignment as well as from the proposed relocation of Goethals Road North and re-alignment of Gulf Avenue.

Temporary Impacts

In addition to the above permanent impacts, all other potential construction impacts are expected to be temporary and relatively similar for all four Build Alternatives. These include localized indirect impacts on several land uses (principally residential and commercial) as a result of increased traffic, as well as roadway closures, fugitive dust, noise and vibration from the various construction phases, types of construction vehicles and equipment used. Although adverse, these impacts are not anticipated to have a long-term significant impact on existing and surrounding land use patterns within the Goethals Bridge Study Area and its environs. In New Jersey, the residential neighborhood between Bay Way and Krakow Street in Elizabeth is anticipated to experience temporary construction impacts related to traffic, noise and visual effects with only either of the Northern Alternatives, since the same residences would actually be acquired for either of the Southern Alternatives.

During the construction of the approach spans in either New Jersey or New York, some short-term road closures may be required for the placement of structural members. Those temporary street closures would be limited to Amboy Avenue and South Front Street in Elizabeth, as well as Western Avenue, Goethals Road North and Gulf Avenue in Staten Island. The proposed realignment of Gulf Avenue (for all four Build Alternatives) and relocation of Goethals Road North (for the Northern Alternatives only) would be constructed before the removal of the existing pavement and in a manner to prevent long-term road closures and to maintain vehicle access to all businesses and residences of the Goethals Garden Homes community.

5.2.4 Zoning

Since the Proposed Project would replace the existing bridge structure on or close to its existing alignment, none of the proposed Build Alternatives would result in any unanticipated changes to existing or planned zoning in either New Jersey or New York. The Proposed Project is considered to be consistent with existing zoning regulations in the Goethals Bridge Study Area and no unanticipated zoning changes or amendments to local zoning are anticipated.

Since the Proposed Project, regardless of its particular bridge alignment, is the replacement of an existing bridge and is considered to be compatible with existing and planned land uses and zoning policies in both New Jersey and New York, no impacts or conflicts with local land use and zoning policies are anticipated. Additionally, and as stated in Section 4.4.6, the Proposed Project would be consistent with the land use and transportation policies and objectives specified in the adopted statewide and local plans evaluated in Appendix D.1. Additionally, and as discussed in Section 5.14, the Proposed Project is considered to be consistent with the coastal zone policies of both states and the City of New York.

5.2.5 Potential for Induced Development

The potential for induced or accelerated development resulting from a proposed transportation improvement would be considered an indirect impact of that project. In light of the Proposed Project within such a dense metropolitan area, it is anticipated that no single induced or accelerated development would particularly result from the Proposed Project. On the contrary, any induced-growth within the Goethals Bridge Study Area and its environs would also be dictated by several other market and supply factors such as population and employment growth, land availability, parcel configuration and environmental suitability, municipal infrastructure availability, adopted plans and policies, and/or local politics. Those factors would contribute to the already existing development trends which would continue

independently of the Proposed Project. The Proposed Project is intended to address already existing and foreseeable traffic congestion problems so that it can be clearly categorized as a growth-serving type of transportation project rather than a growth-inducing type of transportation project. Therefore, the Proposed Project would not result in further land use or zoning changes related to induced- or accelerated-growth. For a more detailed discussion of the analysis conducted regarding the potential for induced development within the Goethals Bridge Study Area, see Section 5.24.

5.2.6 Mitigation of Impacts

Since the Proposed Project is not expected to result in any adverse impacts to current and future land use and zoning policies, no extraordinary mitigation measures would be required. The potential indirect impacts related to construction activities (e.g., traffic, noise, vibration, fugitive dust) would be minimized through the implementation of best management practices (BMPs) and standard procedures such as watering, dust covers for trucks, and protective barriers and equipment that minimize sound, vibration, and air emissions. Additionally, appropriate scheduling during daytime hours for the noisiest construction activities (e.g.., pile driving, blasting) would be implemented to particularly avoid disruptive effects to nearby residences between Krakow Street and Bay Way, in the case of either of the Northern Alternatives, which would not require acquisition of those properties. A construction traffic management plan would also be proposed in order to provide appropriate signage and advanced warning during the few local street closures, maintain access to active land uses, and to avoid traffic peak hours especially during the movement phases of large structures or construction equipment.

Compensation for the acquired parcels, partial or full, within the Proposed Project's right-of-way is presented in Section 5.3, *Socioeconomics*. In the instance of the New Alignment alternatives (either South or North) and following the demolition of the existing Goethals Bridge, the use of remaining and available right-of-way for any displaced auxiliary uses to an affected commercial property may be considered on a case-by-case basis with the Port Authority, as appropriate. Efforts to minimize property acquisitions related to the Proposed Project will also be further explored during the final design phase, as appropriate.

5.2.7 Summary

Under the No-Build Alternative, the existing land use patterns and zoning in the Goethals Bridge Study Area and its environs are not expected to change substantially by the year 2034. All currently planned land development projects are expected to conform to existing zoning regulations on both sides of the Arthur Kill. Many of those planned projects would actually reactivate some pre-existing but dormant facilities and uses which would ultimately intensify the predominant industrial, transportation and commercial patterns in the Goethals Bridge Study Area. Those future projects would include the redevelopment of the former Borne Chemical site with the Jay Cashman Dredged Material Processing Facility in Elizabeth, the reactivation of Port Ivory and Arlington Rail Yard as part of the NYCT's Redevelopment Program in Staten Island, and the as-of-right redevelopment of the former GATX site in Staten Island. In Elizabeth, the small mixed-use residential and commercial neighborhood located along Bay Way and Krakow Street within a zoned M-2 manufacturing district would continue to be the only use that is not consistent with existing zoning.

Overall, the potential impacts related to the four proposed Build Alternatives would be relatively similar in a sense that neither the two Southern Alternatives nor the two Northern Alternatives would significantly alter existing land uses and zoning within the Goethals Bridge Study Area and its environs. Given the dominant commercial, industrial and transportation land uses which generally characterize the vicinity of the project site, the Proposed Project would conform to local zoning regulations and would have no operational impacts to nearby land uses. During the construction phase of any of the Build Alternatives, several easements to existing transportation and utility facilities would be required for the construction of the approach spans, notably over the NJ Turnpike and PSE&G transmission lines in New

Jersey, as well as several railroads including Staten Island RR, Travis Branch RR and Chemical Coast RR. Additionally, several parcel acquisitions (either partial or full) would be required from currently unoccupied lands and actively-used properties of various types (i.e., residential, commercial, transportation and utility). Compensation and fiscal impacts for the acquired parcels within the Build Alternatives' rights-of-way are presented in Section 5.3. While the range of total property acquisitions (all land use types combined) varies between 25.8 and 30.6 acres for all Build Alternatives, the conversion of existing land uses to transportation purposes would range between 21.1 acres and up to 30.0 acres for any of the Build Alternatives' rights-of-way. Actually, the New Alignment North would have the lowest acreage with 21.1 acres in land use changes (or conversion to transportation), followed by the Existing Alignment South with 27.0 acres, the Existing Alignment North with 28.6 acres, and then the New Alignment South with 30.0 acres (see Table 5.2-1). In turn, conversions of existing land uses into transportation purposes would not result in a substantial loss of such uses. In comparing all four Build Alternatives, the New Alignment North would have the least impacts (8.8 acres) to existing commercial properties and no residential impacts, followed by the two Southern Alternatives which both have 15.0 and 1.6 acres in commercial and residential impacts, respectively. The Existing Alignment North has the largest commercial impacts with 16.3 acres and moderate residential impacts with 0.5 acre. It should be noted however that both Northern Alternatives would have the most direct impacts to transportation, communications and utility (TCU) parcels, including encroachment on the port activities of NYCT property (up to 3.9 acres) and on the KeySpan/Texas Eastern gas metering station (see Section 5.17 for more details); this alignment alternative would also require a full take of the former Borne Chemical site in Elizabeth, thereby resulting in the preclusion of the committed Jay Cashman project for a Dredged Material Processing Facility.

5.3 Socioeconomics

5.3.1 Introduction

This section presents the potential socioeconomic impacts associated with the Proposed Project. Such impacts include those related to residential displacements, neighborhood disruption, economic effects of construction activity, business displacements, and fiscal impacts associated with acquisition of ratable land. The analysis evaluates both benefits and adverse impacts associated with the Proposed Project that may affect socioeconomic and community characteristics, either temporarily during construction or permanently during operation.

5.3.2 Methodology, Approach and Data Sources

Following the identification of potential land use impacts for each Build Alternatives (see Section 5.2), detailed information on the occupancy and/or commercial activity of those affected parcels was first identified and quantified through the review of municipal tax maps and records, and then confirmed through field visits and interviews with the local population. Upon review of the latest 2000 U.S. Census data, population characteristics (including average household size) were also compiled for each of the fully acquired residential parcels in order to estimate the number of potentially displaced residents within the affected dwellings. The number of dwellings per residential parcel was also confirmed during the field visits by counting either the active mailboxes or electrical meters, or even review of building rosters on front doors. It should be noted that only active parcels (whether residential, commercial or mixed-use) were considered for the evaluation of potential socioeconomic impacts. For example, a residential parcel containing no active residential dwellings, but containing a driveway, garage, parking lot, abandoned structure, etc. has not been considered herein. This is the opposite of the manner used for analyzing parcels for the land use study (see Section 5.2).

Similarly, local tax records were consulted for current tax rates and assessed values in order to evaluate the potential loss of tax revenues of the commercial and residential properties to be either partially or

fully acquired. The assessed value (including both land and physical improvement values) of each property to be acquired was calculated by estimating the affected portion of each parcel and applying that percentage to the assessed value of the entire parcel. The analysis assumed that the loss of tax revenue is proportional to the percentage of the land and improvements taken from the parcel. In other words, if 10 percent of the land is acquired from a parcel, the value of the land (and, by extension, the property tax revenue) is assumed to be reduced by 10 percent. While the analysis does not include commercial properties with negligible loss of land, residential parcels are assumed to be acquired in their entirety, regardless of the extent of the property acquisition (same assumption as stated in Section 5.2.2 for residential land uses).

The evaluation of neighborhood cohesion impacts involved three tasks: (1) identifying residential neighborhoods within the Goethals Bridge Study Area; (2) profiling the characteristics of each neighborhood through available data sources (i.e., U.S. Census data); and (3) assessing the level of neighborhood cohesion within those neighborhoods. The classification of a residential area as a "neighborhood" was based on patterns of development characterized by predominant housing types, the physical configuration of housing into subdivisions, community facilities and the makeup of community-based associations.

An input-output model developed by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA) has been used to quantify the economic effects for each alignment alternative considered. The model provides the basic methodology for the assessment of potential economic impacts, with modifications to produce multipliers specific to the region. Quantification of the effects of material purchases, during both the construction and the operational phases of the project, is based upon the following:

- *Estimates of Material Expenditures:* Projected material expenditures were derived from preliminary engineering estimates.
- *Determination of Specific Goods and Services Required:* The particular goods and services needed for construction of the proposed improvements were evaluated through analysis of "use" vectors for other roadway improvements in the region.
- *Estimates of Local Purchases:* A location quotient analysis was conducted to project the degree to which materials are likely to be purchased in the local region. The location quotients were calculated to reflect the degree to which particular goods are likely to be available within the region.
- *Application of Multipliers to Evaluate Potential Project Impacts on the Regional Economy:* Output multipliers derived from the BEA input-output model were used to evaluate indirect and induced impacts on the local economy. These output multipliers indicate the total increase in output that occurs in the local economy with each dollar of project expenditures, including re-spending of income derived by local businesses and individuals from direct project-related purchases. Similar employment multipliers were applied to analyze total job creation in the local area resulting from project-related direct expenditures.

Quantification of the effects of payroll-related impacts relies upon the following:

- *Estimates of the Payroll Expenditures:* These are based on typical Bureau of Labor Statistics and Davis-Bacon wage rates for road construction projects in the region. Estimates reflect current wage rates as wage rates are revised periodically and may be different when construction commences.
- *Adjustments for Fringe Benefits, Taxes and Other Payroll Deductions:* Average fringe benefits for road construction workers in the Study Area were determined by using Bureau of Labor Statistics and Davis-Bacon wage rates for construction trades.

- *Adjustment for Employment of Non-Local Labor:* Journey-to-work data were utilized to determine the percentage of construction employees present within the region. It was assumed that only construction employees living permanently in the region would contribute to the local economy. Construction workers temporarily relocated into the region were assumed to continue making their major purchases in their home communities. Although they would make contributions to the local community through expenditures for temporary housing, meals and other temporary living expenses, these expenditures are relatively small and short-lived.
- *Application of an Appropriate Multiplier to Determine Total Impacts on the Local Economy:* Multipliers applied to this aspect of the analysis are derived from the BEA model, modified to generate regional multipliers relevant to the area.

For this analysis, the 17-county Port Authority region was used as the impact area for material purchases and payrolls. The 17-county region includes nine counties in New York and eight New Jersey counties. The Port Authority defines the 17-county area spanning the five counties of New York City, the New York suburbs of Nassau, Rockland, Suffolk and Westchester, and the eight Northern New Jersey counties of Bergen, Essex, Hudson, Middlesex, Morris, Passaic, Somerset and Union. Payroll impacts, in particular, are likely to occur within the 17-county region, given the area's size and the Proposed Project's location within the region.

A labor-to-materials expenditure ratio of 40/60; i.e., 40 percent of the total project/construction budget is assumed to be expended on labor and 60 percent on materials, was based on U.S. Bureau of Economic Analysis statistics on highway construction.[1]

According to the U.S. Department of Labor, Wage and Hour Division, prevailing wage rates for construction workers in the 17-county area average approximately $87,000 per year.[2] This includes benefits and assumes a 40-hour work week as well as 48 weeks of annual employment.

Since the input-output model developed by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA) has not been updated since 2005, the anticipated construction cost for each Build Alternative (in 2007 U.S. dollars as presented in Section 3.0) have been price-adjusted to the 2005 Base Year before running the model. Such adjustment was necessary as the input-output model measures the indirect economic effects based on increases in "real" spending (i.e., increases in amount of the good, not the good's price). The use of 2007 prices into the model would provide an overstated amount of economic activity by capturing the cost of inflation along with the "real" cost of materials, labor, and so on. For example, consider the cost of copper and copper alloy wire & cable which has increased by 60% since 2005 according to the Bureau of Labor Statistics' Producer Price Index. While the amount of copper wire used for a specific project would not change between 2005 and 2007, the cost of the commodity has grown due to the increasing raw material costs. Therefore, instead of measuring the economic impact of purchasing $1 million of copper (the 2005 price for 800 feet of wiring), the model would use $1.6 million (the 2007 price for 800 feet of wiring). Using the 2007 dollar amount would artificially add $0.6 million (the 60% increase) to the cost. In reality that $0.6 million would not produce any new economic activity or employment since only the price of the good and not the amount needed has increased. No new workers are needed since the "real" production of copper did not increase (still 800 feet of wiring).

5.3.3 No-Build Alternative

Under the No-Build Alternative, the Proposed Project would not be undertaken and the Goethals Bridge would remain in its current configuration. No land would be acquired for project purposes. Consequently,

[1] U.S. Bureau of Economic Analysis, *1997 Benchmark Input-Output Accounts,* Industry Code: 230230: Highway, street, bridge, and tunnel construction.

[2] Bureau of Labor Statistics, 2006. U.S. Department of Labor.

there would be no residential or business displacements, nor physical disruption to neighborhoods bordering the existing bridge, nor any local fiscal impacts.

5.3.4 Build Alternatives

5.3.4.1 New Alignment South

The property displacements associated with the New Alignment South, both in New Jersey and New York, are presented in Figure 5.3-1 where only the displaced buildings/structures of active residential, commercial, and mixed-use properties are depicted based on the land use impacts (partial or full acquisitions) identified in Section 5.2.

New Jersey

Residential Displacements

The New Alignment South would result in the displacement of an estimated 17 residential buildings[3], including an estimated 51 residential units in Elizabeth. In turn, those displacements would require the relocation of an estimated 130 persons. Table 5.3-1 provides a breakdown of the residential displacements by location, block and lot, census tract, household size and estimated persons to be displaced.

Neighborhood Disruption

The residential neighborhood along Bay Way and Krakow Street in Elizabeth accounts for all of the remaining residential parcels within Census Tract 306 and Census Blocks 4011, 4019, and 4020, as presented in Table 5.3-1. Since this already isolated neighborhood would be entirely eliminated as a result of this alignment alternative, there would be no further neighborhood disruption.

Business Impacts

A total of up to seven active businesses in Elizabeth would be displaced as result of full property acquisitions under the New Alignment South, including three businesses in Building A of the Bayway Industrial Center, the offices/warehouse of Paley, Lloyd & Donahue, and three entertainment establishments. In addition, three other commercial structures or elements would be displaced, including the employee parking lot of the Bayway Industrial Center (serving Buildings A-D), the weigh station of the solid waste transfer station (operated by Waste Management of New Jersey), and a commercial billboard on the vacant Block 4/Lot 40. However, those structural impacts are not anticipated to result in any lost employment since they could be easily relocated in-situ without interrupting its respective business operations. Overall, the commercial displacements would result in an estimated loss of 93 jobs. The potential direct business impacts and the estimate of jobs lost due to the displacement of businesses are presented in Table 5.3-2.

Fiscal Impacts

All the taxable properties to be either partially or fully acquired would amount to a loss of assessed value totaling approximately $1,821,000, which is approximately 0.2 percent of the city's total ratable base. As a result, and assuming the 2007 Tax Rate of 17.844% for the City of Elizabeth, an annual loss of property

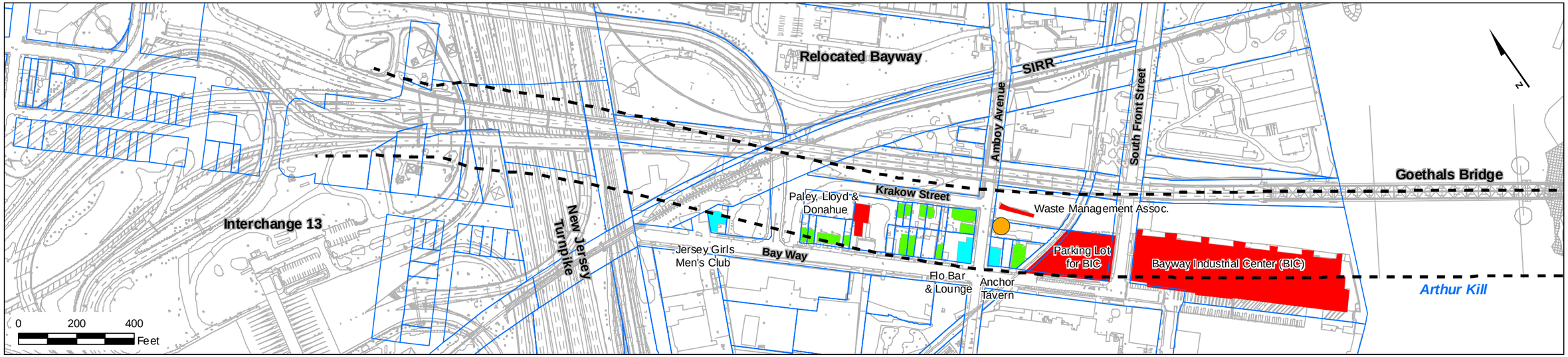
[3] While this number seems counterintuitive to the 18 residential and 3 mixed-use (MXD) parcels depicted as full takes in Table 5.2-1 (under Section 5.2, *Land Use and Zoning*, it should be noted that several of those 21 parcels are actually used for either driveways or parking lots (with no actual residential dwelling). As a result, only 17 actual residential dwellings occupy those 21 parcels as depicted in Table 5.3-1.

TABLE 5.3-1
RESIDENTIAL DISPLACEMENTS – NEW ALIGNMENT SOUTH (NEW JERSEY)

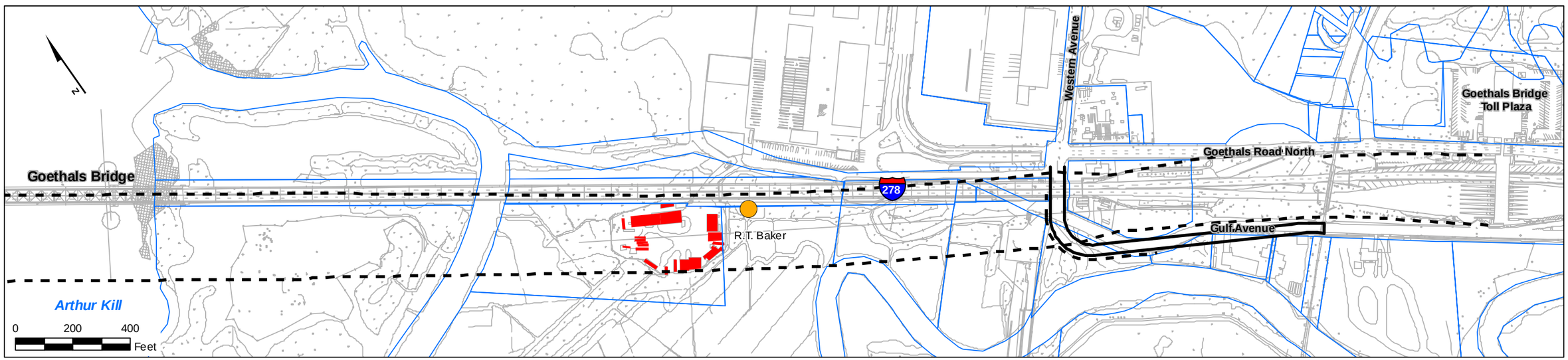
Municipality	Tax Block, Lot	Street Address	Census Tract, Block	Avg Household Size (1)	Displaced Residential Dwelling			
					# of Bldg	# of Unit	Description	Estimated Persons
Elizabeth	4, 159	89 BAYWAY	306, 4019	2.4	1	8	Multi-family dwelling	19.2
Elizabeth	4, 161	91 BAYWAY	306, 4019	2.4	--		Residential parking lot	--
Elizabeth	4, 162	93-95 BAYWAY	306, 4019	2.4	1	7	Mixed-use building (Anchor Tavern)	16.8
Elizabeth	4, 163	101-107 BAYWAY	306, 4020	2.5	1	4	Mixed-use building (Flo Bar & Lounge)	10.0
Elizabeth	4, 167	109 BAYWAY	306, 4020	2.5	1	2	Multi-family dwelling	5.0
Elizabeth	4, 168	111-113 BAYWAY	306, 4020	2.5	--		Residential parking lot and garage sheds	--
Elizabeth	4, 169	115 BAYWAY	306, 4020	2.5	--		Residential parking lot	--
Elizabeth	4, 170	117 BAYWAY	306, 4020	2.5	1	2	Multi-family dwelling	5.0
Elizabeth	4, 171	119-121 BAYWAY	306, 4020	2.5	1	1	Single-family dwelling	2.5
Elizabeth	4, 172	123 BAYWAY	306, 4020	2.5	--		Private garden to adjacent residence	--
Elizabeth	4, 174	135 BAYWAY	306, 4020	2.5	1	1	Single-family dwelling	2.5
Elizabeth	4, 175	137-143 BAYWAY	306, 4020	2.5	1	8	Multi-family dwelling	20.0
Elizabeth	4, 176	145 BAYWAY	306, 4020	2.5	1	2	Multi-family dwelling	5.0
Elizabeth	4, 177	147 BAYWAY	306, 4020	2.5	1	1	Multi-family dwelling (*one abandoned floor*)	2.5
Elizabeth	4, 179	165-167 BAYWAY	306, 4011	3.5	1	4	Mixed-use building (Jersey Girls Men's Club)	14.0
Elizabeth	4, 832	108 KRAKOW ST	306, 4020	2.5	--		Residential driveway.	--
Elizabeth	4, 833	110-112 KRAKOW ST	306, 4020	2.5	1	1	Single-family dwelling	2.5
Elizabeth	4, 384	114-116 KRAKOW ST	306, 4020	2.5	1	0	Single-family dwelling (*abandoned*)	0
Elizabeth	4, 835	118 KRAKOW ST	306, 4020	2.5	1	1	Single-family dwelling	2.5
Elizabeth	4, 836	120 KRAKOW ST	306, 4020	2.5	1	1	Single-family dwelling	2.5
Elizabeth	4, 51	659-663 AMBOY AVE	306, 4020	2.5	2	8	Multi-family dwelling (x2)	20.0
				Total	**17**	**51**	**Total**	**130**

Source: 2000 U.S. Census of Population and Housing

(1) Average Household Size - Data obtained from SF1 Tables of the 2000 U.S. Census of Population and Housing



NEW JERSEY



NEW YORK

Legend

- Proposed 50-foot Right-of-Way (ROW)
- Proposed realigned Gulf Avenue and its 15-foot limit-of-disturbance
- Parcel Boundary

Building or Structure to be Displaced

- Business
- Mixed Use
- Residential
- Transportation Communication and Utilities
- Proposed Business
- Billboards

Source: Basemapping: Port Authority of New York and New Jersey, 2002.
Parcel Data: Union County, NJ 2005. Richmond County, NY, 2005
Design: HNTB, 2009.
Data: Berger, 2009.

Goethals Bridge Replacement EIS

FIGURE 5.3-1
Active Building and Structural Displacements for the New Alignment South

United States Coast Guard

TABLE 5.3-2
COMMERCIAL DISPLACEMENTS – NEW ALIGNMENT SOUTH (NEW JERSEY)

Municipality	Tax Block, Lot	Location	Business Name/Description	Floor Area (SF)	Estimate of Jobs Lost
Elizabeth	4, 40	660-662 AMBOY AVE	Commercial Billboard on Vacant Land	--	--
Elizabeth	4, 162	93-95 BAYWAY	Anchor Tavern (bar in mixed-use building with upstair residences)	600	3.0
Elizabeth	, 163	101-107 BAYWAY	Flo Bar & Lounge (bar in mixed-use building with upstair residences)	2,000	10.0
Elizabeth	4, 173	125-133 BAYWAY	Paley, Lloyd, & Donahue (manufacturing supplies) (Office/Warehouse)	6,200	12.4
Elizabeth	4, 179	165-167 BAYWAY	Jersey Girls Men Club (go-go bar in mixed-use building with upstair residences)	2,200	11.0
Elizabeth	4, 1454	651-659 S FRONT ST	Weigh Station for WMNJ (also used for Equipment storage)	--	--
Elizabeth	4, 1455	661-671 S FRONT ST	BIC's Employee Parking Lot	--	--
Elizabeth	4, 1471	666-686 S FRONT ST	Building A(*) of Bayway Industrial Center (BIC), including: - Babb Warehouse (storage warehouse) - Cory Home Delivery (furniture warehouse & delivery) - Matrix Management Office, and - 3 add'l empty spaces.	315,000	56.3
				Total	**93**

Source: Berger/PB, 2008.

Notes: Job losses were estimated using the following rates -

Retail/Commercial - 1 FTE employee per 400 square feet (sf)
Office - 1 FTE employee per 250 sf
Restaurant - 1 FTE employee per 200 sf
Manufacturing - 1 FTE employee per 500 sf
Warehousing - 1 FTE per 2,400 sf

(*) Only the multi-story Building A with an overall floor area of 315,000 SF. As per a Nov'07 News Release from Matrix Development Group, the current availability for Building A consists of 180,000 SF.

BIC = Bayway Industrial Center

WMNJ = Waste Management of New Jersey

tax revenue is estimated to be $325,000, which represents a negligible 0.2 percent of the city's total tax levy.

New York

Residential Displacements

Although the New Alignment South would require the acquisition of additional right-of-way on the New York side, this would not involve any residential properties.

Neighborhood Disruption

Since there are no residential displacements in Staten Island associated with the New Alignment South, nor will this alignment alternative result in any population changes, no neighborhood impacts or impacts to neighborhood cohesion are anticipated. This proposed alignment alternative is also not expected to create any physical barriers or create isolated groups or neighborhoods.

Business Impacts

One business in Staten Island would be displaced as a result of full property acquisitions under this alignment alternative; the R.T. Baker and Son Machinery Dismantlers would result in an estimated loss of 17 jobs. In addition, one commercial structure, a billboard on the undeveloped Block 1885/Lot 75, would be displaced. The potential business impacts and the estimated job loss due to the displacement of businesses are presented in Table 5.3-3.

TABLE 5.3-3
COMMERCIAL DISPLACEMENTS – NEW ALIGNMENT SOUTH (NEW YORK)

Municipality	Tax Block, Lot	Location	Business Name/Description	Floor Area (SF)	Estimate of Jobs Lost
Staten Island	1885, 35	250 GOETHALS ROAD NORTH	R.T. Baker & Son Machinery Dismantlers (Warehouses/Trailers)	8,500	17.0
Staten Island	1885, 75	FOREST AVENUE	Commercial Billboard on Undeveloped Land	--	--
				Total	**17**

Source: Berger/PB, 2008.

Notes: Job losses were estimated using the following rates -

Retail/Commercial - 1 FTE employee per 400 square feet (sf)
Office - 1 FTE employee per 250 sf
Restaurant - 1 FTE employee per 200 sf
Manufacturing - 1 FTE employee per 500 sf
Warehousing - 1 FTE per 2,400 sf

It should also be noted that two commercial properties would be partially acquired by the proposed re-alignment of Gulf Avenue, including the Hylan Group (less than 0.1% encroachment to Block 1855/Lot 3) and the F. Liquori Plumbing & Heating Inc. (13% encroachment to Block 1865/Lot 89). In turn, those partial acquisitions would not result in either business displacement or lost employment since those two businesses would be able to continue their operation without any interruption. Coordination with NYCDOT would be required ahead of the proposed bridge construction activities in order to avoid any direct business disruptions or indirect access impacts along Gulf Avenue.

Fiscal Impacts

All the taxable properties, to be either partially or fully acquired, would amount to a loss of assessed value totaling approximately $442,000, which represents a negligible amount when compared to the borough's total ratable base. As a result and assuming the 2007 Tax Rate of 10.997% for Class 4 properties in Staten Island, an annual loss of property tax revenue is estimated to be $49,000, which represents a negligible amount when compared to the city-wide total tax levy.

Economic Effects of Construction Activity

In determining the economic impacts of this alignment alternative, a total construction budget of approximately $623 million in 2005 dollars was assumed.[4] The total construction cost includes $492 million toward the initial capital cost of construction and $131 million toward contingency and overhead/profit costs. It should be noted that the initial capital cost of construction includes $10 million towards the replacement of Travis Branch Bridge, $20 million towards the demolition of the existing bridge, $3.7 million towards the improvements to the Goethals Bridge Toll Plaza, and $7.5 million towards the construction of permanent access roads. This total construction cost does not include property acquisition costs, but it does include mitigation plans and costs.

Construction and demolition of the existing bridge under the New Alignment South is estimated to generate approximately 2,258 person-years of construction employment over a 56-month period, or an annual average of 484 jobs (see Table 5.3-4). Some of these jobs may be provided to laborers that may reside outside the 17-county region. The Proposed Project is also estimated to generate total industry sales for construction materials, subcontractors and other goods and services of $297 million. Payroll expenses from the Proposed Project are estimated to be $196 million. After adjusting for non-local sales and leakages for non-local labor, the Proposed Project is estimated to create approximately $872 million in direct sales, $224 million in direct earnings, and 5,567 jobs within the region.

5.3.4.2 Existing Alignment South

The property displacements associated with the Existing Alignment South in both New Jersey and New York are presented in Figure 5.3-2, where only the displaced buildings/structures of active residential, commercial, and mixed-use properties are depicted based on the land use impacts (partial or full acquisitions) identified in Section 5.2.

New Jersey

Residential Displacements

Similar to the New Alignment South alternative, the Existing Alignment South alternative would also result in the displacement of an estimated 17 residential buildings (see Table 5.3-5)[5], including 51 residential units in Elizabeth. In turn, those displacements would require the relocation of approximately 130 persons. Table 5.3-5 provides a breakdown of the residential displacements by location, block and lot, census tract, household size and estimated persons to be displaced.

Neighborhood Disruption

The residential neighborhood along Bay Way and Krakow Street in Elizabeth accounts for all of the remaining residential parcels within Census Tract 306 and Census Blocks 4011, 4019, and 4020, as presented in Table 5.3-5. Since this already isolated neighborhood would be entirely eliminated as a result of this alignment alternative, there would be no further neighborhood disruption.

[4] As discussed in Section 5.3.2, 2005 dollars for the construction budget, instead of updated prices, were used for this analysis and that for the other alternatives since the input-output model used has not been updated since 2005.

[5] While this number seems counterintuitive to the 18 residential and 3 mixed-use (MXD) parcels depicted as full takes in Table 5.2-1 (under *Land Use and Zoning*); it should be noted that several of those 21 parcels are actually used for either driveways or parking lots (with no actual residential dwelling). As a result, only 17 residential dwellings do occupy those 21 parcels as depicted in Table 5.3-5.

TABLE 5.3-4
CONSTRUCTION EMPLOYMENT AND INCOME GENERATION - NEW ALIGNMENT SOUTH
(2005 U.S. Dollars*)

	Total		
Direct Effect			
Construction Budget (Proposed)	$623,351,000		
- Construction Materials and Services Purchases	$296,969,858		
- Payroll	$195,797,814		
- Contingency, Indirect Business Taxes, Profits	$130,583,328		
Total Construction Jobs	2,258		
Construction Period (months)	56		
Annual Construction Jobs	484		
Total Local Multiplier Effect	**Sales**	**Earnings**	**Jobs (Person Years)**
Initial Change (Direct)	$431,850,445	$117,073,737	2,032
Multiplier Effect	$440,370,857	$106,697,334	3,535
Total Local Impacts	$872,221,302	$223,771,071	5,567
Annual Local Impacts			
Initial Change (Direct)	$92,539,000	$25,087,000	435
Multiplier Effect	$94,365,000	$22,864,000	757
Total Local Annualized Impacts	$186,904,000	$47,951,000	1,193

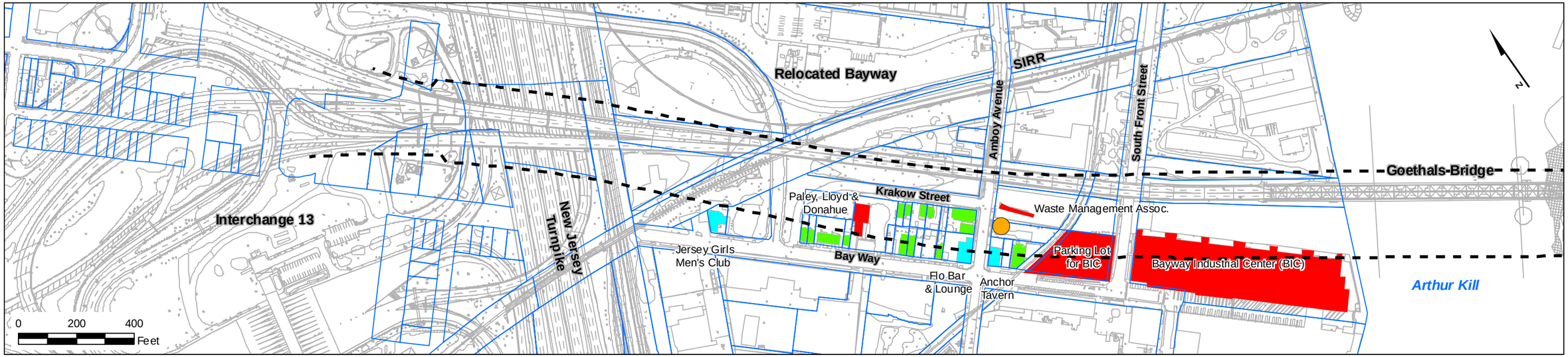
Source: Berger/PB, 2008

***** All anticipated constructions have been price-adjusted to 2005 U.S. Dollars since it is the base-year for the current version of the input-output model developed by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA).

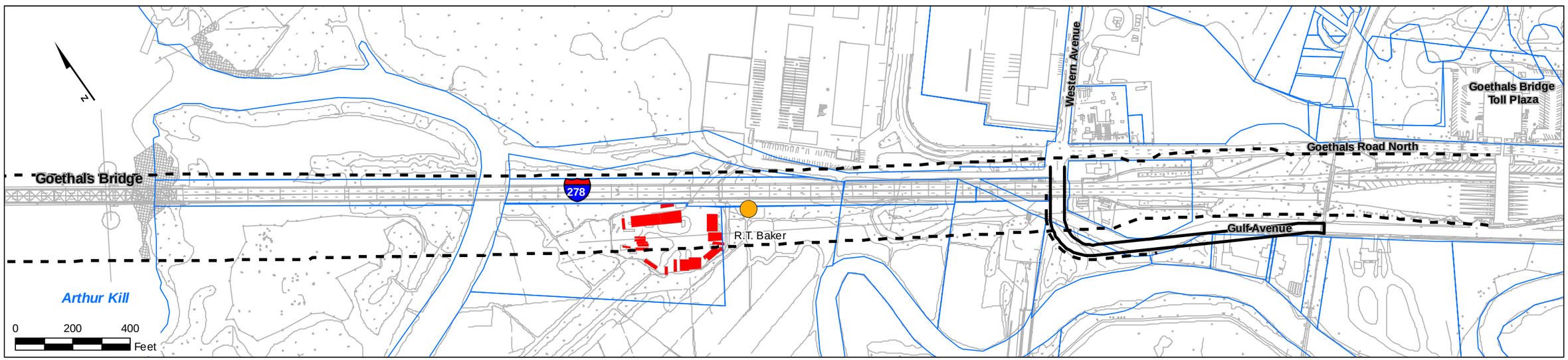
Business Impacts

Similar to the New Alignment South alternative, a total of up to seven active businesses in Elizabeth would be displaced as a result of full property acquisitions under the New Alignment South, including three businesses in Building A of the Bayway Industrial Center, the offices/warehouse of Paley, Lloyd & Donahue, and three entertainment establishments. In addition, three other commercial structures or elements would be displaced, including the employee parking lot of the Bayway Industrial Center (serving Buildings A-D), the weigh station of the solid waste transfer station (operated by Waste Management of New Jersey), and a commercial billboard on the vacant Block 4/Lot 40. However, those structural impacts are not anticipated to result in any lost employment since they could be easily relocated in-situ without interrupting its respective business operations. Overall, the commercial displacements would result in an estimated loss of 93 jobs. The potential direct business impacts and the estimate of jobs lost due to the displacement of businesses are presented in Table 5.3-6

Two additional commercial properties would also experience some partial encroachments that would not affect their future business operations; these properties are the waste transfer station (less than 0.1% encroachment to Block 4/Lot 1452 operated by Waste Management of New Jersey) and the City of Elizabeth property (former Borne Chemical site) to be developed into a dredged material processing facility (1% encroachment to Block 4/Lot 1469 proposed to be operated by Jay Cashman Inc.).



NEW JERSEY



NEW YORK

Legend

- Proposed 50-foot Right-of-Way (ROW)
- Proposed realigned Gulf Avenue and its 15-foot limit-of-disturbance
- Parcel Boundary

Building or Structure to be Displaced

- Business
- Mixed Use
- Residential
- Transportation Communication and Utilities
- Proposed Business
- Billboards

Source: Basemapping: Port Authority of New York and New Jersey, 2002.
Parcel Data: Union County, NJ 2005. Richmond County, NY, 2005
Design: HNTB, 2009.
Data: Berger, 2009.

Goethals Bridge Replacement EIS

FIGURE 5.3-2
Active Building and Structural Displacements for the Existing Alignment South

United States Coast Guard

TABLE 5.3-5
RESIDENTIAL DISPLACEMENTS – EXISTING ALIGNMENT SOUTH (NEW JERSEY)

Municipality	Tax Block, Lot	Street Address	Census Tract, Block	Avg Household Size (1)	Displaced Residential Dwelling			
					# of Bldg	# of Unit	Description	Estimated Persons
Elizabeth	4, 159	89 BAYWAY	306, 4019	2.4	1	8	Multi-family dwelling	19.2
Elizabeth	4, 161	91 BAYWAY	306, 4019	2.4	--		Residential parking lot	--
Elizabeth	4, 162	93-95 BAYWAY	306, 4019	2.4	1	7	Mixed-use building (Anchor Tavern)	16.8
Elizabeth	4, 163	101-107 BAYWAY	306, 4020	2.5	1	4	Mixed-use building (Flo Bar & Lounge)	10.0
Elizabeth	4, 167	109 BAYWAY	306, 4020	2.5	1	2	Multi-family dwelling	5.0
Elizabeth	4, 168	111-113 BAYWAY	306, 4020	2.5	--		Residential parking lot and garage sheds	--
Elizabeth	4, 169	115 BAYWAY	306, 4020	2.5	--		Residential parking lot	--
Elizabeth	4, 170	117 BAYWAY	306, 4020	2.5	1	2	Multi-family dwelling	5.0
Elizabeth	4, 171	119-121 BAYWAY	306, 4020	2.5	1	1	Single-family dwelling	2.5
Elizabeth	4, 172	123 BAYWAY	306, 4020	2.5	--		Private garden to adjacent residence	--
Elizabeth	4, 174	135 BAYWAY	306, 4020	2.5	1	1	Single-family dwelling	2.5
Elizabeth	4, 175	137-143 BAYWAY	306, 4020	2.5	1	8	Multi-family dwelling	20.0
Elizabeth	4, 176	145 BAYWAY	306, 4020	2.5	1	2	Multi-family dwelling	5.0
Elizabeth	4, 177	147 BAYWAY	306, 4020	2.5	1	1	Multi-family dwelling (*one abandoned floor*)	2.5
Elizabeth	4, 179	165-167 BAYWAY	306, 4011	3.5	1	4	Mixed-use building (Jersey Girls Men's Club)	14.0
Elizabeth	4, 832	108 KRAKOW ST	306, 4020	2.5	--		Residential driveway.	--
Elizabeth	4, 833	110-112 KRAKOW ST	306, 4020	2.5	1	1	Single-family dwelling	2.5
Elizabeth	4, 384	114-116 KRAKOW ST	306, 4020	2.5	1	0	Single-family dwelling (*abandoned*)	0
Elizabeth	4, 835	118 KRAKOW ST	306, 4020	2.5	1	1	Single-family dwelling	2.5
Elizabeth	4, 836	120 KRAKOW ST	306, 4020	2.5	1	1	Single-family dwelling	2.5
Elizabeth	4, 51	659-663 AMBOY AVE	306, 4020	2.5	2	8	Multi-family dwelling (x2)	20.0
				Total	**17**	**51**	**Total**	**130**

Source: 2000 U.S. Census of Population and Housing

(1) Average Household Size - Data obtained from SF1 Tables of the 2000 U.S. Census of Population and Housing

TABLE 5.3-6
COMMERCIAL DISPLACEMENTS – EXISTING ALIGNMENT SOUTH (NEW JERSEY)

Municipality	Tax Block, Lot	Location	Business Name/Description)	Floor Area (SF)	Estimate of Jobs Lost
Elizabeth	4, 40	660-662 AMBOY AVE	Commercial Billboard on Vacant Land	--	--
Elizabeth	4, 162	93-95 BAYWAY	Anchor Tavern (bar in mixed-use building with upstair residences)	600	3.0
Elizabeth	4, 163	101-107 BAYWAY	Flo Bar & Lounge (bar in mixed-use building with upstair residences)	2,000	10.0
Elizabeth	4, 173	125-133 BAYWAY	Paley, Lloyd, & Donahue (manufacturing supplies) (Office/Warehouse)	6,200	12.4
Elizabeth	4, 179	165-167 BAYWAY	Jersey Girls Men Club (go-go bar in mixed-use building with upstair residences)	2,200	11.0
Elizabeth	4, 1454	651-659 S FRONT ST	Weigh Station for WMNJ (also used for Equipment storage)	--	--
Elizabeth	4, 1455	661-671 S FRONT ST	BIC's Employee Parking Lot	--	--
Elizabeth	4, 1471	666-686 S FRONT ST	Building A(*) of Bayway Industrial Center (BIC), including: - Babb Warehouse (storage warehouse) - Cory Home Delivery (furniture warehouse & delivery) - Matrix Management Office, and - 3 add'l empty spaces.	315,000	56.3
				Total	**93**

Source: Berger/PB, 2008.
Notes: Job losses were estimated using the following rates:
Retail/Commercial - 1 FTE employee per 400 square feet (sf)
Office - 1 FTE employee per 250 sf
Restaurant - 1 FTE employee per 200 sf
Manufacturing - 1 FTE employee per 500 sf
Warehousing - 1 FTE per 2,400 sf
(*) Only the multi-story Building A with an overall floor area of 315,000 SF. As per a Nov'07 News Release from Matrix Development Group, the current availability for Building A consists of 180,000 SF.
BIC = Bayway Industrial Center
WMNJ = Waste Management of New Jersey

Fiscal Impacts

All the taxable properties to be either partially or fully acquired would amount to an approximate $1,845,000 loss of assessed value, which is approximately 0.2 percent of the city's total ratable base. As a result, and assuming the 2007 Tax Rate of 17.844% for the City of Elizabeth, an annual loss of property tax revenue is estimated to be $329,0000, which represents a negligible 0.2 percent of the city's total tax levy.

New York

Residential Displacements

Although the Existing Alignment South would require the acquisition of additional right-of-way on the New York side, this would not involve any residential properties.

Neighborhood Disruption

Since there are no residential displacements in Staten Island associated with the Existing Alignment South, nor will it result in any population changes, no neighborhood impacts or impacts to neighborhood cohesion are anticipated. This alignment alternative is also not expected to create any physical barriers or create isolated groups or neighborhoods.

Business Impacts

Similar to the New Alignment South alternative, one business in Staten Island would be displaced as a result of full property acquisitions under this alignment alternative; the R.T. Baker and Son Machinery Dismantlers would result in an estimated loss of 17 jobs. In addition, one commercial structure, a billboard on the undeveloped Block 1885/Lot 75, would be displaced. The potential business impacts and the estimated job loss due to the displacement of businesses are presented in Table 5.3-7

TABLE 5.3-7
COMMERCIAL DISPLACEMENTS – EXISTING ALIGNMENT SOUTH (NEW YORK)

Municipality	Tax Block, Lot	Location	Business Name/Description	Floor Area (SF)	Estimate of Jobs Lost
Staten Island	1885, 35	250 GOETHALS ROAD NORTH	R.T. Baker & Son Machinery Dismantlers (Warehouses/Trailers)	8,500	17.0
Staten Island	1885, 75	FOREST AVENUE	Commercial Billboard on Undeveloped Land	--	--
				Total	**17**

Source: Berger/PB, 2008.

Notes: Job losses were estimated using the following rates -
Retail/Commercial - 1 FTE employee per 400 square feet (sf)
Office - 1 FTE employee per 250 sf
Restaurant - 1 FTE employee per 200 sf
Manufacturing - 1 FTE employee per 500 sf
Warehousing - 1 FTE per 2,400 sf

It should also be noted that two commercial properties would be partially acquired by the proposed re-alignment of Gulf Avenue, including the Hylan Group (less than 0.1% encroachment to Block 1855/Lot 3) and the F. Liquori Plumbing & Heating Inc. (13% encroachment to Block 1865/Lot 89). In turn, those partial acquisitions would not result in either business displacement or lost employment since those two businesses would be able to continue their operation without any interruption. Coordination with NYCDOT would be required ahead of the proposed bridge construction activities in order to avoid any direct business disruptions or indirect access impacts along Gulf Avenue.

Fiscal Impacts

All the taxable properties, to be either partially or fully acquired would amount to a loss of assessed value totaling approximately $332,000, which is approximately 0.01 percent of the borough's total ratable base. As a result and assuming the 2007 Tax Rate of 10.997% for Class 4 properties in Staten Island, an annual loss of property tax revenue is estimated to be $36,000, which represents a negligible amount when compared to the city-wide total tax levy.

Economic Effects of Construction Activity

In determining the economic impacts of this alignment alternative, a total construction budget of approximately $660 million in 2005 dollars was assumed. The total construction cost includes $522 million toward the initial capital cost of construction and $138 million toward contingency and overhead/profit costs. It should be noted that the initial capital cost of construction includes $10 million toward the replacement of Travis Branch Bridge, $20 million toward the demolition of the existing bridge, $3.7 million toward the improvements to the Goethals Bridge Toll Plaza, and $7.5 million toward the construction of permanent access roads. This total construction cost does not include property acquisition costs, but it does include mitigation plans and costs.

Construction of the proposed alignment alternative and demolition of the existing bridge is estimated to generate approximately 2,392 person-years of construction-related employment over a 70-month period, or an annual average of 410 jobs (see Table 5.3-8). Some of these jobs may be provided to laborers that may reside outside the 17-county region. The Proposed Project is also estimated to generate total industry sales for construction materials, subcontractors and other goods and services of over $314 million. Payroll expenses from the Proposed Project are estimated to be $208 million. After adjusting for non-local sales and leakages for non-local labor, the Proposed Project is estimated to create approximately $924 million in direct sales, $237 million in direct earnings, and 5,899 jobs within the region.

TABLE 5.3-8
CONSTRUCTION EMPLOYMENT AND INCOME GENERATION - EXISTING ALIGNMENT SOUTH
(2005 U.S. Dollars*)

	Total		
Direct Effect			
Construction Budget (Proposed)	$660,529,000		
- Construction Materials and Services Purchases	$314,439,250		
- Payroll	$207,718,016		
- Contingency, Indirect Business Taxes, Profits	$138,371,734		
Total Construction Jobs	2,392		
Construction Period (months)	70		
Annual Construction Jobs	410		
Total Local Multiplier Effect	**Sales**	**Earnings**	**Jobs (Person Years)**
Initial Change (Direct)	$457,607,384	$124,056,388	2,153
Multiplier Effect	$466,635,980	$113,061,104	3,746
Total Local Impacts	$924,243,364	$237,117,492	5,899
Annual Local Impacts			
Initial Change (Direct)	$78,447,000	$21,267,000	369
Multiplier Effect	$79,995,000	$19,382,000	642
Total Local Annualized Impacts	$158,442,000	$40,649,000	1,011

Source: Berger/PB, 2008

Notes: ***** All anticipated constructions have been price-adjusted to 2005 U.S. Dollars since it is the base-year for the current version of the input-output model developed by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA).

5.3.4.3 New Alignment North

The property displacements associated with the New Alignment North, both in New Jersey and New York, are presented in Figure 5.3-3 where only the displaced buildings/structures of active residential, commercial, and mixed-use properties are depicted based on the land use impacts (partial or full acquisitions) identified in Section 5.2.

New Jersey

Residential Displacement

No residential properties in Elizabeth would be acquired under this alignment alternative.

Neighborhood Disruption

The New Alignment North would not result in the reduction of any population that is an integral component of the community along Krakow Street and Bay Way in Elizabeth. This alignment alternative is also not expected to create any physical barriers or isolated groups or neighborhoods.

Business Impacts

A total of up to three businesses in Elizabeth would be displaced as a result of full property acquisitions under the New Alignment North, including the two active businesses of Bayway Metals and the waste transfer station operated by Waste Management of New Jersey, as well as the future dredged material processing facility of Jay Cashman Inc. currently under permit review and to be developed on the vacant City of Elizabeth property (Block 4/Lot 1469), which is the site of the former Borne Chemical Company. In addition, two commercial structures (commercial billboards) would be displaced, including one located on vacant land (Block 4/Lot 40) and one on commercial land owned by Waste Management of New Jersey (Block 4/ Lot 1452). While the losses of these commercial billboards would result in a loss of advertisement revenue, they are not anticipated to result in any lost employment. Since the billboards could perhaps be relocated in-situ to another parcel along the proposed bridge alignment alternative, the loss of advertisement revenue may also be temporary. Overall, the commercial displacements would result in an estimated loss of 60 jobs. The potential direct business impacts and the estimate of jobs lost due to the displacement of businesses are presented in Table 5.3-9.

While the Waste Management property (Block 4/Lot 1454) adjoining its main waste transfer station would be partially encroached upon by approximately 9% of its total size, it is likely that the use of the weigh station would be disrupted unless it is used at another nearby facility or temporarily during the bridge construction activities.

Fiscal Impacts

All the taxable properties, to be either partially or fully acquired would amount to a loss of assessed value of approximately $927,000, which is approximately 0.1 percent of the city's total ratable base. As a result and assuming the 2007 Tax Rate of 17.844% for the City of Elizabeth, an annual loss of property tax revenue is estimated to be $165,000, which represents a negligible 0.1 percent of the city's total tax levy.

TABLE 5.3-9
COMMERCIAL DISPLACEMENTS – NEW ALIGNMENT NORTH (NEW JERSEY)

Municipality	Tax Block, Lot	Location	Business Name/Description	Floor Area (SF)	Estimate of Jobs Lost
Elizabeth	4, 48	637-647 AMBOY AVE	Bayway Metals (Scrap Iron & Metal Waste Material Recycling)	2,300	4.6
Elizabeth	4, 50				
Elizabeth	4, 67.4		Commercial Billboard on Port Authority's Property	--	--
Elizabeth	4, 1452	629-647 S FRONT ST	Waste Management of NJ (WMNJ) - Transfer Station for Disposal Services + Commercial Billboard	27,500	55.0
Elizabeth	4, 1469	632-650 S FRONT ST	**SPECIAL CASE** This site is currently vacant but will be developed by Jay Cashman Inc. into a dredged material processing facility (currently under permit review)	unknown	unknown
				Total	**60**

Source: Berger/PB, 2008.

Notes:
Retail/Commercial - 1 FTE employee per 400 square feet (sf)
Office - 1 FTE employee per 250 sf
Restaurant - 1 FTE employee per 200 sf
Manufacturing - 1 FTE employee per 500 sf
Warehousing - 1 FTE per 2,400 sf

New York

Residential Displacements

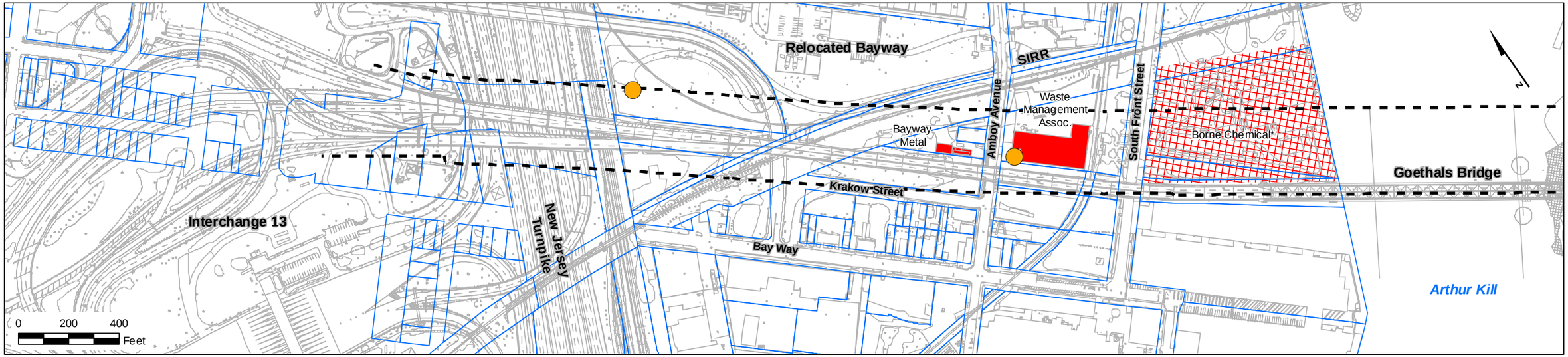
No residential properties would be acquired in Staten Island under this alignment alternative.

Neighborhood Disruption

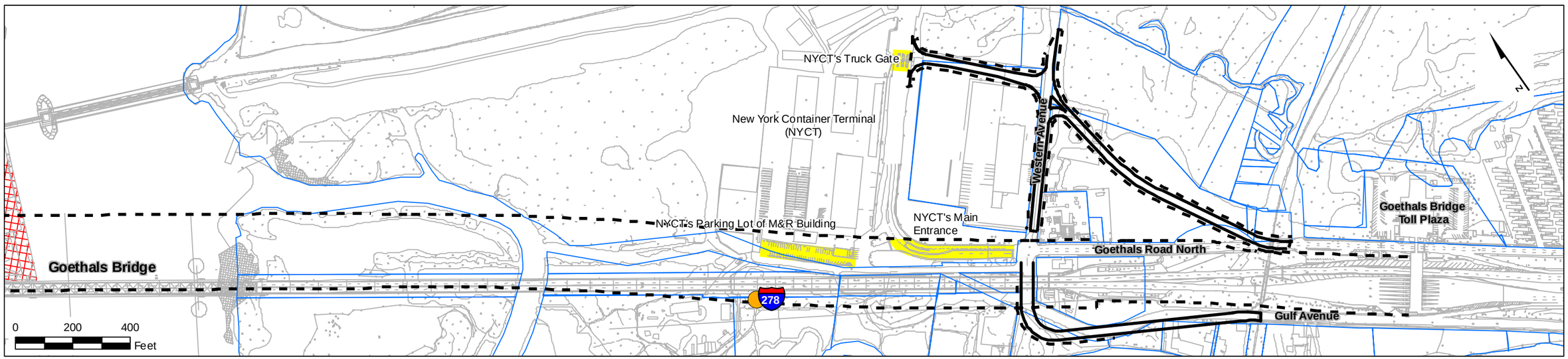
The New Alignment North would not result in the reduction of any population that is an integral component of the community on Staten Island. This alignment alternative is also not expected to create any physical barriers or create isolated groups or neighborhoods.

Business Impacts

No active business would be displaced in Staten Island under the New Alignment North, and no jobs are anticipated to be lost. Only one commercial billboard located on the City's undeveloped land (Block 1885/Lot 75) would be displaced but could perhaps be relocated elsewhere in order to avoid loss of advertisement revenue. Two business properties would be partially encroached upon, including the R.T. Baker & Son Machinery Dismantlers property (0.9% encroachment to Block 1885/Lot 35) and the Coca-Cola's warehouse distribution center (8% encroachment to Block 1410/Lot 183). The latter encroachment is solely due to the required relocation of Goethals Road North. In turn, these partial acquisitions would not result in any lost employment since the two businesses would be able to continue their operation without any interruption.



NEW JERSEY



NEW YORK

Legend

- Proposed 50-foot Right-of-Way (ROW)
- Proposed relocated Goethals Road North and its 15-foot limit-of-disturbance
- Proposed realigned Gulf Avenue and its 15-foot limit-of-disturbance
- Parcel Boundary

Building or Structure to be Displaced

- Business
- Mixed Use
- Residential
- Transportation Communication and Utilities
- Proposed Business
- Billboards

Note: Borne Chemical property to be entirely redeveloped. Therefore the entire property was treated as a Proposed Business Property
Source: Basemapping: Port Authority of New York and New Jersey, 2002.
Parcel Data: Union County, NJ 2005. Richmond County, NY, 2005
Design: HNTB, 2009.
Data: Berger, 2009.

Goethals Bridge Replacement EIS

FIGURE 5.3-3
Active Building and Structural Displacements for the New Alignment North

United States Coast Guard

The business operations at the New York Container Terminal (NYCT), even though a designated transportation land use, would be altered by the combination of the proposed bridge's right-of-way/foundations and the proposed relocation of Goethals Road North. More precisely, and as depicted in Figure 5.3-3, the New Alignment North alternative would require the displacement of the Terminal's Main Entrance, employee parking lot of the Maintenance & Repair (M&R) Building, and the Truck Gates, which would need to be relocated within the same Block 1410/Lot 250. While the NYCT parcel would actually suffer a minor 2% encroachment and would not result in any loss of employment, coordination with NYCT and the NYCDOT would be required ahead of the proposed bridge construction activities in order to avoid any direct business disruptions or indirect access impacts along Goethals Road North.

It should also be noted that two commercial properties would be partially acquired by the proposed re-alignment of Gulf Avenue, including the Hylan Group (less than 0.1% encroachment to Block 1855/Lot 3) and the F. Liquori Plumbing & Heating Inc. (13% encroachment to Block 1865/Lot 89). In turn, those partial acquisitions would not result in either business displacement or lost employment since those two businesses would be able to continue their operation without any interruption. Coordination with NYCDOT would be required ahead of the proposed bridge construction activities in order to avoid any direct business disruptions or indirect access impacts along Gulf Avenue.

The proposed bridge right-of-way would result in up to 6% encroachment on the Key Span/Texas Eastern gas metering station in Staten Island (Block 1394/Lot 82 and Block 1394/Lot 101, respectively) but would not result in any business disruption or loss of employment. Further information regarding this particular utility is discussed in Section 5.17.

Fiscal Impacts

All the taxable properties, to be either partially or fully acquired would amount to a loss of assessed value of approximately $203,000, which represents a negligible amount when compared to the borough's total ratable base. As a result and assuming the 2007 Tax Rate of 10.997% for Class 4 properties in Staten Island, an annual loss of property tax revenue is estimated to be $22,000, which represents a negligible amount when compared to the city-wide total tax levy.

Economic Effects of Construction Activity

In determining the economic impacts of this alignment alternative, a total construction budget of approximately $622 million in 2005 dollars was assumed. The total construction cost includes $491 million toward the initial capital cost of construction and $130 million toward contingency and overhead/profit costs. It should be noted that the initial capital cost of construction includes $10 million towards the replacement of Travis Branch Bridge, $20 million towards the demolition of the existing bridge, $3.7 million towards the improvements to the Goethals Bridge Toll Plaza, and $7.5 million towards the construction of permanent access roads. This total construction cost does not include property acquisition costs, but it does include mitigation plans and costs.

Construction of this alignment alternative and demolition of the existing bridge is estimated to generate approximately 2,253 person-years of construction-related employment over a 56-month period, or an annual average of 483 jobs (see Table 5.3-10). Some of these jobs may be provided to laborers that may reside outside the 17-county region. The Proposed Project is also estimated to generate total industry sales for construction materials, subcontractors and other goods and services of over $284 million.

TABLE 5.3-10
CONSTRUCTION EMPLOYMENT AND INCOME
NEW ALIGNMENT NORTH
(2005 U.S. Dollars*)

	Total		
Direct Effect			
Construction Budget (Proposed)	$622,067,000		
- Construction Materials and Services Purchases	$284,276,759		
- Payroll	$207,475,821		
- Contingency, Indirect Business Taxes, Profits	$130,314,420		
Total Construction Jobs	2,253		
Construction Period (months)	56		
Annual Construction Jobs	483		
Total Local Multiplier Effect	**Sales**	**Earnings**	**Jobs (Person Years)**
Initial Change (Direct)	$430,961,140	$116,832,648	2,028
Multiplier Effect	$439,464,006	$106,477,614	3,528
Total Local Impacts	$870,425,147	$223,310,262	5,555
Annual Local Impacts			
Initial Change (Direct)	$92,349,000	$25,036,000	435
Multiplier Effect	$94,171,000	$22,817,000	756
Total Local Annualized Impacts	$186,520,000	$47,853,000	1,190

Source: Berger/PB, 2008.

Notes: ***** All anticipated constructions have been price-adjusted to 2005 U.S. Dollars since it is the base-year for the current version of the input-output model developed by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA).

Payroll expenses from the Proposed Project are estimated to be over $207 million. After adjusting for non-local sales and leakages for non-local labor, the Proposed Project is estimated to create approximately $870 million in direct sales, $223 million in direct earnings, and 5,555 jobs within the region.

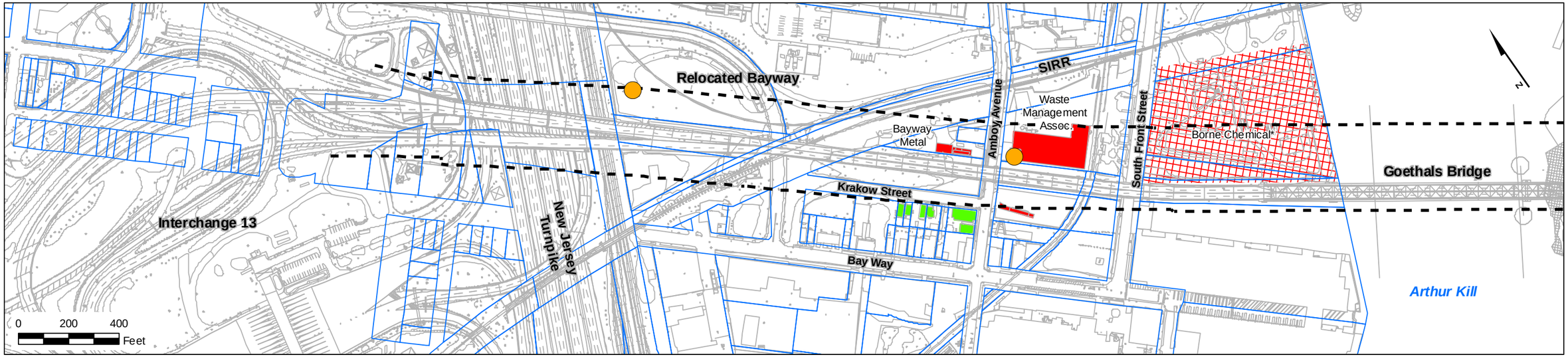
5.3.4.4 Existing Alignment North

The property displacements associated with the Existing Alignment North, both in New Jersey and New York, are presented in Figure 5.3-4 where only the displaced buildings/structures of active residential, commercial, and mixed-use properties are depicted based on the land use impacts (partial or full acquisitions) identified in Section 5.2.

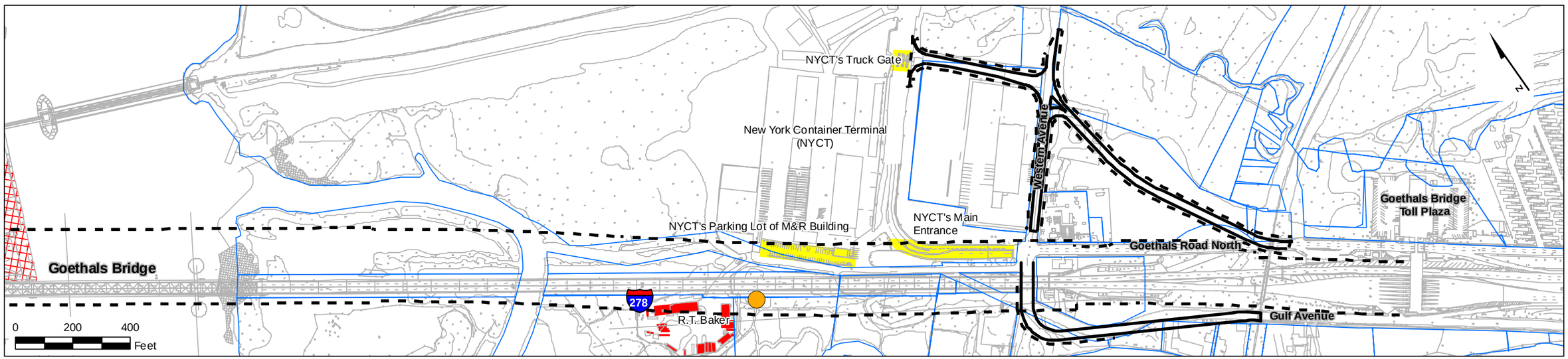
New Jersey

Residential Displacements

The Existing Alignment North would result in the displacement of six residential buildings in Elizabeth, including an estimated 11 individual residential units. In turn, those displacements would require the relocation of approximately 28 persons. Table 5.3-11 provides a breakdown of the residential displacements by location, block and lot, census tract, household size and estimated number of persons to be displaced.



NEW JERSEY



NEW YORK

Legend

- Proposed 50-foot Right-of-Way (ROW)
- Proposed relocated Goethals Road North and its 15-foot limit-of-disturbance
- Proposed realigned Gulf Avenue and its 15-foot limit-of-disturbance
- Parcel Boundary

Building or Structure to be Displaced

- Business
- Mixed Use
- Residential
- Transportation Communication and Utilities
- Proposed Business
- Billboards

Note: Borne Chemical property to be entirely redeveloped. Therefore the entire property was treated as a Proposed Business Property.
Source: Basemapping: Port Authority of New York and New Jersey, 2002.
Parcel Data: Union County, NJ 2005. Richmond County, NY, 2005
Design: HNTB, 2009.
Data: Berger, 2009.

Goethals Bridge Replacement EIS

FIGURE 5.3-4
Active Building and Structural Displacements for the Existing Alignment North

United States Coast Guard

TABLE 5.3-11
RESIDENTIAL DISPLACEMENTS – EXISTING ALIGNMENT NORTH (NEW JERSEY)

Municipality	Tax Block, Lot	Street Address	Census Tract, Block	Avg Household Size (1)	Displaced Residential Dwelling			
					# of Bldg	# of Unit	Description	Estimated Persons
Elizabeth	4, 832	108 KRAKOW ST	306, 4020	2.5	--		Residential driveway.	--
Elizabeth	4, 833	110-112 KRAKOW ST	306, 4020	2.5	1	1	Single-family dwelling	2.5
Elizabeth	4, 384	114-116 KRAKOW ST	306, 4020	2.5	1	0	Single-family dwelling (*abandoned*)	0
Elizabeth	4, 835	118 KRAKOW ST	306, 4020	2.5	1	1	Single-family dwelling	2.5
Elizabeth	4, 836	120 KRAKOW ST	306, 4020	2.5	1	1	Single-family dwelling	2.5
Elizabeth	4, 51	659-663 AMBOY AVE	306, 4020	2.5	2	8	Multi-family dwelling (x2)	20
				Total	**6**	**11**	**Total**	**28**

Source: 2000 U.S. Census of Population and Housing

(1) Average Household Size - Data obtained from SF1 Tables of the 2000 U.S. Census of Population and Housing

Neighborhood Disruption

The residential displacements in Elizabeth are concentrated in the area fronting Krakow Street due to the elimination of access by the proposed alignment alternative. In turn, the displacement of 28 persons, or 21% of the neighborhood's entire population along Bay Way and Krakow Street (Census Tract 306 and Census Blocks 4011, 4019, 4020) would further reduce the area's population and further isolate the already-isolated neighborhood. On the other hand, such residential acquisitions would not bisect the remaining neighborhood, and therefore would not result in any significant neighborhood cohesion impacts.

Business Impacts

A total of up to three active businesses would be displaced as a result of full property acquisitions under the Existing Alignment North. These businesses include Waste Management of New Jersey, Bayway Metals, and Paley, Lloyd and Donahue (see Table 5.3-12). The displacement of these businesses would result in the loss of an estimated 60 jobs.

This alignment alternative would also require the acquisition of an existing vacant parcel owned by the City of Elizabeth (Block 4, lot 1469) that is proposed as a dredged material facility (see Table 5.3-12). At the present time, the future operators of the site are awaiting permits from NJDEP. One commercial parcel would also be partially acquired under this alignment alternative. The parcel, which contains the Bayway Industrial Center, would lose a portion of the boat slip adjacent to the warehouse. Future operation of the warehouse and its current business tenants would remain unaffected.

Similar to the New Alignment North alternative, a total of three businesses in Elizabeth would be displaced as a result of full property acquisitions under the Existing Alignment North, including the two active businesses of Bayway Metals and the entire waste transfer station (including the weigh station on Block 4/Lot 1454) operated by Waste Management of New Jersey, as well as the future dredged material processing facility of Jay Cashman Inc. currently under permit review and to be developed on the vacant City of Elizabeth property (Block 4/Lot 1469), which is the site of the former Borne Chemical Company.

TABLE 5.3-12
COMMERCIAL DEVELOPMENTS – EXISTING ALIGNMENT NORTH (NEW JERSEY)

Municipality	Tax Block, Lot	Location	Business Name/Description	Floor Area (SF)	Estimate of Jobs Lost
Elizabeth	4, 48	637-647 AMBOY AVE	Bayway Metals (Scrap Iron & Metal Waste Material Recycling)	2,300	4.6
Elizabeth	4, 50				
Elizabeth	4, 67.4		Commercial Billboard on Port Authority's Property	--	--
Elizabeth	4, 1452	629-647 S FRONT ST	Waste Management of NJ (WMNJ) - Transfer Station for Disposal Services + Commercial Billboard	27,500	55.0
Elizabeth	4, 1454	651-659 S FRONT ST	Weigh Station for WMNJ (also used for Equipment storage)		
Elizabeth	4, 1469	632-650 S FRONT ST	**SPECIAL CASE** This site is currently vacant but will be developed by Jay Cashman Inc. into a dredged material processing facility (currently under permit review)	unknown	unknown
				Total	**60**

Source: Berger/PB, 2008.

Notes: Job losses were estimated using the following rates -

Retail/Commercial - 1 FTE employee per 400 square feet (sf)
Office - 1 FTE employee per 250 sf
Restaurant - 1 FTE employee per 200 sf
Manufacturing - 1 FTE employee per 500 sf
Warehousing - 1 FTE per 2,400 sf

** As the Jay Cashman Inc. facility is currently under environmental permitting review, its number of employees could not be estimated at this time.

In addition, two commercial billboards would be displaced, including one on vacant land (Block 4/Lot 40) and one on commercial land owned by the Waste Management of New Jersey (Block 4/ Lot 1452). While the losses of these commercial billboards would result in a loss of advertisement revenue, they are not anticipated to result in any lost employment. Since the billboards could perhaps be relocated in-situ to another parcel along the proposed bridge alignment alternative, the loss of advertisement revenue may also be temporary. Overall, the commercial displacements would result in an estimated loss of 60 jobs. The potential direct business impacts and the estimate of jobs lost due to the displacement of businesses are presented in Table 5.3-12.

Two other commercial properties would experience some partial encroachments without any impacts to their future business operations; these include the property of Paley, Lloyd & Donahue (2% encroachment to Block 4/Lot 173) and the boat slip of the Bayway Industrial Center (6% encroachment to Block 4/Lot 1471).

Fiscal Impacts

All the taxable properties, to be either partially or fully acquired would amount to a loss of assessed value of approximately $1,088,000, which represents a negligible amount when compared to the city's total ratable base. As a result and assuming the 2007 Tax Rate of 17.844% for the City of Elizabeth, an annual loss of property tax revenue is estimated to be $194,000, which represents a negligible amount when compared to the city's total tax levy.

New York

Residential Displacements

No residential properties would be directly impacted by the Existing Alignment North.

Neighborhood Disruption

This alignment alternative is not expected to result in any physical barriers between residential neighborhoods or the displacement of any residents. This alignment alternative is also not expected to create any physical barriers or create isolated groups or neighborhoods.

Business Impacts

Similar to the two Southern Alternatives, one business in Staten Island would be displaced as a result of full property acquisitions under the Existing Alignment North alternative; the R.T. Baker and Son Machinery Dismantlers would result in an estimated loss of 17 jobs. In addition, one commercial structure, a billboard on the undeveloped Block 1885/Lot 75, would be displaced. The potential business impacts and the estimated job loss due to the displacement of businesses are presented in Table 5.3-13. The required relocation of Goethals Road North with this alignment alternative would result in a partial encroachment to the Coca-Cola's warehouse distribution center (8% encroachment to Block 1410/Lot 183). In turn, this partial acquisition would not result in any lost employment since business operations would continue uninterrupted.

However, similar to the New Alignment North alternative, the business operations at the New York Container Terminal (NYCT), even though a designated transportation land use, would be altered by the combination of the proposed bridge's right-of-way/foundations and the proposed relocation of Goethals Road North. More precisely and as depicted in Figure 5.3-4, the New Alignment North alternative would require the displacement of the Terminal's Main Entrance, employee parking lot of the Maintenance & Repair (M&R) Building, and the Truck Gates, which would need to be relocated within the same Block 1410/Lot 250. While the NYCT parcel would actually suffer a minor 1% encroachment and would not result in any loss of employment, coordination with NYCT and the NYCDOT would be required ahead of the proposed bridge construction activities in order to avoid any direct business disruptions or indirect access impacts along Goethals Road North.

TABLE 5.3-13
COMMERCIAL DISPLACEMENTS – EXISTING ALIGNMENT NORTH (NEW YORK)

Municipality	Tax Block, Lot	Location	Business Name/Description	Floor Area (SF)	Estimate of Jobs Lost
Staten Island	1885, 35	250 GOETHALS ROAD NORTH	R.T. Baker & Son Machinery Dismantlers (Warehouses/Trailers)	8,500	17
Staten Island	1885, 75	FOREST AVENUE	Commercial Billboard on Undeveloped Land	--	--
				Total	**17**

Source: Berger/PB, 2008.

Notes: Job losses were estimated using the following rates -

Retail/Commercial - 1 FTE employee per 400 square feet (sf)
Office - 1 FTE employee per 250 sf
Restaurant - 1 FTE employee per 200 sf
Manufacturing - 1 FTE employee per 500 sf
Warehousing - 1 FTE per 2,400 sf

It should also be noted that two commercial properties would be partially acquired by the proposed re-alignment of Gulf Avenue, including the Hylan Group (less than 0.1% encroachment to Block 1855/Lot 3) and the F. Liquori Plumbing & Heating Inc. (13% encroachment to Block 1865/Lot 89). In turn, those partial acquisitions would not result in either business displacement or lost employment since those two businesses would be able to continue their operation without any interruption. Coordination with NYCDOT would be required ahead of the proposed bridge construction activities in order to avoid any direct business disruptions or indirect access impacts along Gulf Avenue.

The proposed bridge right-of-way would result in up to 6% encroachment upon the Key Span/Texas Eastern gas metering station in Staten Island (Block 1394/Lot 82 and Block 1394/Lot 101, respectively) but would not result in any business disruption or loss of employment. Further information regarding this particular utility is discussed in Section 5.17.

Fiscal Impacts

All the taxable properties, to be either partially or fully acquired would amount to a loss of assessed value of approximately $499,000, which represents a negligible amount when compared to the borough's total ratable base. As a result and assuming the 2007 Tax Rate of 10.997% for Class 4 properties in Staten Island, an annual loss of property tax revenue is estimated to be $55,000, which represents a negligible amount when compared to the city-wide total tax levy.

Economic Effects of Construction Activity

In determining the economic impacts of this alignment alternative, a total construction budget of approximately $661 million in 2005 dollars was assumed. The total construction cost includes $522 million toward the initial capital cost of construction and $139 million toward contingency and overhead/profit costs. It should be noted that the initial capital cost of construction includes $10 million towards the replacement of Travis Branch Bridge, $20 million towards the demolition of the existing bridge, $3.7 million towards the improvements to the Goethals Bridge Toll Plaza, and $7.5 million towards the construction of permanent access roads. This total construction cost does not include property acquisition costs, but it does include mitigation plans and costs.

Construction of this alignment alternative and demolition of the existing bridge is estimated to generate approximately 2,395 person-years of construction-related employment over a 70-month period, or an annual average of 411 jobs (see Table 5.3-14). Some of these jobs may be provided to laborers that may reside outside the 17-county region. This alignment alternative is also estimated to generate total industry sales for construction materials, subcontractors and other goods and services of over $315 million. Payroll expenses from the proposed alignment alternative are estimated to be $208 million. After adjusting for non-local sales and leakages for non-local labor, this alignment alternative is estimated to create approximately $925 million in direct sales, $237 million in direct earnings, and 5,906 jobs within the region.

5.3.5 Mitigation

5.3.5.1 Mitigation of Long-Term Impacts

As noted in the previous sections, the four Build Alternatives would result in direct impacts on various private properties, including acquisition and displacement residential and commercial properties. As a

TABLE 5.3-14
CONSTRUCTION EMPLOYMENT AND INCOME GENERATION ASSOCIATED WITH THE EXISTING ALIGNMENT NORTH
(2005 U.S. Dollars*)

	Total		
Direct Effect			
Construction Budget (Proposed)	$661,300,000		
- Construction Materials and Services Purchases	$315,049,000		
- Payroll	$207,718,000		
- Contingency, Indirect Business Taxes, Profits	$138,533,000		
Total Construction Jobs	2,395		
Construction Period (months)	70		
Annual Construction Jobs	411		
Total Local Multiplier Effect	**Sales**	**Earnings**	**Jobs (Person Years)**
Initial Change (Direct)	$458,141,569	$124,201,204	2,156
Multiplier Effect	$467,180,705	$113,193,085	3,750
Total Local Impacts	$925,322,273	$237,394,289	5,906
Annual Local Impacts			
Initial Change (Direct)	$78,539,000	$21,292,000	370
Multiplier Effect	$80,088,000	$19,405,000	643
Total Local Annualized Impacts	$158,627,000	$40,697,000	1,012

Source: Berger/PB, 2008.

result, mitigation would be required for displacement impacts on private properties required for right-of-way for construction of the ultimately selected alignment alternative for the Proposed Project. The recommended mitigation measure for this impact is compensation of the private property owners in accordance with, and to the extent provided by, the applicable law identified below. Meanwhile, it should be noted that such mitigation effort will take place subsequent to the NEPA process and upon the Port Authority's internal Project Authorization.

The legislatures of the States of New York and New Jersey have determined that the Port Authority shall be deemed to be performing an essential government function in undertaking the acquisition, construction, improvement, maintenance and operation of Bridges and Tunnels and in carrying out the provisions of the related law. In connection with Bridges and Tunnels, the Port Authority has been authorized by the States of New Jersey and New York to exercise the power of eminent domain, which is the power of the state to take private property for use. Both the federal and state constitutions require payment of just compensation for private property taken for a public purpose.

The Port Authority's Bridges and Tunnels legislation statute, found in New Jersey Statutes Annotated Section 32:1-132; and 65 McKinney's Unconsolidated Laws of New York Section 6516, provides for the procedures the Port Authority may follow when it exercises the right of eminent domain by condemnation to acquire real property for Bridges and Tunnels purposes. It is anticipated that the Port Authority, after authorization by the Port Authority's Board of Commissioners, would acquire the real property interests necessary to effectuate the Proposed Project by negotiation and/or the exercise of the right of eminent domain by condemnation.

5.3.5.2 Mitigation of Short-Term Construction Impacts

In coordination with local police, fire, EMS and other essential services, a Maintenance and Protection of Traffic (MPT) plan will be prepared prior to the commencement of construction activities. The plan would serve to advise the local businesses of road closures and alternate routes. Construction activities would be phased and scheduled to minimize potential impacts to business operations, particularly along Bay Way, South Front Street, Amboy Avenue and Relocated Bayway Avenue[6] in the City of Elizabeth and along Goethals Road North, Forest Avenue and Gulf Avenue in Staten Island.

Adequate staging and signage will be established, and coordination will be maintained with local authorities and the media in order to adequately inform businesses and motorists of detours or construction-impacted areas. Construction areas will be graded at driveways and other access points to allow vehicle passage throughout the construction period.

5.3.6 Summary

In New Jersey, both Southern Alternatives would result in the displacement of an estimated 51 residential units and approximately 130 persons, while the Existing Alignment North would require the displacement of an estimated 11 residential units and approximately 29 persons. The New Alignment North would not require the displacement of any residences. No residential displacements are anticipated on the New York side under any of the proposed alignment alternatives.

Both Southern Alternatives would result in the displacement of up to eight active businesses for an estimated employment loss of 110 jobs, while the Northern Alternatives would result in fewer impacts, with up to three active businesses (or 60 jobs) for the New Alignment North and up to four active businesses (or 77 jobs) for the Existing Alignment North. Overall, the degree of adverse commercial impacts is more prominent in the New Jersey portion of the Study Area for any Build Alternatives; however, both Northern Alternatives have more temporary business operational impacts in New York, most notably, the structural relocations within the New York Container Terminal (NYCT).

Due to the additional property conversion from taxable to tax-exempt transportation right-of-way, the potential loss of tax revenues would be up to $329,000 for the City of Elizabeth and up to $55,000 for the Borough of Staten Island. In turn, those local fiscal impacts would be negligible compared to the respective city's total tax levies (i.e., no more than 0.2% in Elizabeth and a negligible percentage in the City of New York).

Overall, the losses in employment and in property tax revenues would be offset by the beneficial economic effects from the construction activities, since an estimated 410 to 484 construction jobs are anticipated to be generated on an annual basis over a 56- to 70-month period from the Proposed Project's construction budget. In addition, the Proposed Project is expected to indirectly generate an estimated range of 5,555 to 5,906 total jobs in the region during the construction period. A summary of the key socioeconomic impacts between all four Build Alternatives is presented in Table 5.3-15. In comparing all four Build Alternatives, the New Alignment North would appear to have the least long-term impacts with no residential displacements and the least business impacts, followed by the Existing Alignment North and then both Southern Alternatives. However, the two Northern Alternatives would result in the greatest short-term business operational impacts with the required relocation of several structures within the New York Container Terminal in Staten Island.

[6] With the recent completion in 2007 of the Staten Island Railroad (SIRR) Reactivation for Freight Rail and the associated construction of the Northern Rail Connector, the old alignment of Bayway Avenue has been modified to now connect direct to Amboy Avenue, north of the existing Goethals Bridge. For the purpose of this study, this roadway segment is defined as the "Relocated Bayway Avenue".

TABLE 5.3-15
SUMMARY OF KEY SOCIOECONOMIC IMPACTS FOR EACH BUILD ALTERNATIVE

Southern Alternatives	
New Alignment South	***Existing Alignment South***
Estimated Residential Impacts (*all in NJ*) 51 dwellings to be displaced 130 residents to be relocated	
Commercial Impacts - 8 displaced businesses New Jersey (93 jobs): 1. Babb Warehouse (in BIC's Bldg A) 2. Cory Home Delivery (in BIC's Bldg A) 3. Matrix Management Office (in BIC's Bldg A) 4. Paley, Lloyd & Donahue 5. Anchor Tavern 6. Flo Bar & Lounge 7. Jersey Girls Men's Club New York (17 jobs): 1. R.T. Baker & Sons Machinery Dismantlers **Estimated Employment Loss – 110 jobs**	
Business Operational Impacts – 4 relocated structures New Jersey: 1. Commercial Billboard 2. Weigh Station of WMNJ 3. BIC's Employee Parking Lot New York: 1. Commercial Billboard	
Northern Alternatives	
New Alignment North	***Existing Alignment North***
Estimated Residential Impacts None.	**Estimated Residential Impacts (*all in NJ*)** 11 dwellings to be displaced 28 residents to be relocated
Commercial Impacts - 3 displaced businesses New Jersey (60 jobs): 1. Bayway Metals 2. Waste Management of New Jersey (a.k.a. J&J Recycling) 3. J. Cashman Inc. (future development). New York - None **Estimated Employment Loss – 60 jobs**	**Commercial Impacts - 4 displaced businesses** New Jersey (60 jobs): 1. Bayway Metals 2. Waste Management of New Jersey (a.k.a. J&J Recycling) 3. J. Cashman Inc. (future development). New York (17 jobs): 1. R.T. Baker & Sons **Estimated Employment Loss – 77 jobs**
Business Operational Impacts – 6 relocated structures New Jersey: 1. Commercial Billboard 2. Commercial Billboard New York: 1. Commercial Billboard 2. NYCT's Main Entrance 3. NYCT's Employee Parking Lot 4. NYCT's Truck Gates	
Source: Berger/PB, 2008.	BIC = Bayway Industrial Center NYCT = New York Container Terminal

5.4 Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, directs federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Presidential Memorandum that accompanied the Executive Order recognizes the importance of procedures under NEPA to identify and address environmental justice concerns. The memorandum states that each federal agency shall analyze the environmental effects, including human health, economic and social effects, of federal actions, including effects on minority and low-income communities.

Given the identification of "populations of concern" within the Goethals Bridge Study Area (see Section 4.5.6), an Environmental Justice assessment was conducted to determine if a disproportionate share of the Proposed Project's adverse environmental impacts would be borne by low-income and/or minority populations. As presented in Appendix D.4, this review examined the extent to which populations of concern concentrated in or immediately adjacent to the Proposed Project would experience disproportionately high and adverse environmental impacts as a result of the Proposed Project. Despite the residential displacements that would occur within the City of Elizabeth's neighborhood located between Krakow Street and Bay Way, the assessment concluded that the Proposed Project would not result in any disproportionate adverse impacts to minority and/or low-income residents. Temporary minor disturbances to some residents living within the broader Goethals Bridge Study Area may occur during construction.

5.5 Community Facilities

5.5.1 Introduction

This section examines the potential impacts related to community facilities that could result from the operation of a new bridge under any of the four Build Alternatives. The section also evaluates the potential for impacts that could result from the demolition of the existing bridge and the construction of a new bridge and the continued provision of services during these activity periods, including, where appropriate, beneficial impacts resulting from the operation of the new bridge. The community facilities that are evaluated in this section are defined separately in Section 4.6.

5.5.2 Methodology, Approach and Data Sources

Impacts to a community facility occur if there is a recognizable change in its function, operation and intended use during the construction of the new bridge or as a result of the operation of the new bridge. The types of changes that could occur and which have been evaluated include:

- Displacement of the facility;
- Disruption to the physical boundaries of the facility;
- Change in access;
- Changes to the service area;
- Noise or visual intrusion that affects services or operations;
- Increased noise levels and air quality; and
- Effect on facility user groups, particularly in those areas where residential displacement has occurred.

Each facility was identified with respect to the potential impacts listed above. If the impact required expansion of services such as those provided by police, fire or emergency medical services, these were noted accordingly, as were any prospective changes in response times for emergency vehicles.

5.5.3 No-Build Alternative

Access to community facilities and their service areas in the cities of Elizabeth and Linden in New Jersey and in the borough of Staten Island in New York would remain unaffected under the No-Build Alternative. Any future relocation of these facilities that would occur would be independent of the Proposed Project.

Based on consultations with local planners and local government officials, construction of one new fire station is proposed to be constructed on Trumbull Street in Elizabeth. No other community facilities are proposed to be built in the immediate vicinity of the bridge.

5.5.4 Build Alternatives

The impacts to community facilities and services due to the Proposed Project would be generally the same for all of the Build Alternatives being considered in this FEIS.

5.5.4.1 New Jersey

Construction Impacts

No construction-related impacts to community facilities in either Elizabeth or Linden are anticipated as a result of any of the four Build Alternatives. Construction activities would not directly impact any of the community facilities within the Goethals Bridge Study Area, due to their distance from the construction site.

The construction of the new bridge and the demolition of the existing bridge would involve the construction of temporary at-grade roadways in the vicinity of the New Jersey Turnpike and I-278 interchange and the ramps that provide access to and from I-278. To maintain traffic flow, two temporary road closures would be needed. In addition, the Atlantic Avenue westbound ramp from the I-278/Goethals Bridge approach to the local road network in Elizabeth may need to be temporarily closed. This temporary closure may be required to promote safe travel conditions during construction. To carry traffic along the Atlantic Avenue ramp, the Bayway Avenue ramp would be used as an alternate travel route. During construction, the Atlantic Avenue Westbound ramp would be reversed so that vehicles, including emergency vehicles, could access Atlantic Avenue/Bayway Avenue directly from the bridge.

Due to the closure of the ramps along Atlantic Avenue, vehicles coming from Elizabeth to the bridge would have to first travel on I-278 westbound before taking the temporary U-Turn and traveling back on I-278 eastbound to access the bridge. This may result in slightly longer response times for emergency vehicles responding to incidents on the bridge. Coordination between the construction contractor, the NJ Turnpike Authority, the New Jersey Department of Transportation, the Port Authority and emergency services departments in the cities of Linden and Elizabeth will serve to identify the locations, times and duration of all needed detour routes and temporary road closures. This early coordination will also serve to inform local community service groups as well, thus limiting any adverse travel in the Study Area for emergency and community service activities. This coordination will also serve to limit any potential for adverse travel to and from the community facilities that serve the Study Area. As a result, no adverse impacts to community facilities are anticipated during construction.

Operational Impacts

No community facilities would be displaced or physically impacted by the operation of any of the four Build Alternatives. Although the Elizabeth Fire Department engages in training activities at locations along South Front Street, the nearest locations to the existing bridge include those on Front Street and on Bay Way adjacent to the Reichold Chemical property. Based on discussions with Elizabeth Fire Department staff, these sites are considered temporary, and alternate sites are available for these training activities. Therefore, the Proposed Project is not expected to impact the operational capabilities of the Fire Department or any other emergency services in the City of Elizabeth.

Beneficial impacts would be realized through improved travel time across the widened bridge to and from Staten Island. The introduction of ten-foot wide pedestrian and bicycle travel facility along the northern edge of the bridge span and approach roads offer new non-vehicular access to Staten Island from the cities of Elizabeth and Linden. The introduction of a pedestrian and bicycle facility will also serve to provide connectors to existing and future bikeways and pedestrian paths on both sides of the bridge in New Jersey and Staten Island including, but not necessarily limited to, existing and future transit connections. It is anticipated that the design, location and functions of the pedestrian and bicycle facility along the bridge will be developed so as not to preclude access to existing and future planned transit modes and community facilities. In addition, with the widened travel lanes and the introduction of new 12-foot shoulders that could also potentially function as travel lanes for emergency services, response times to incidents on the bridge and mutual aid emergency incidents in Staten Island and between the cities of Elizabeth and Linden could be reduced.

5.5.4.2 New York

Construction Impacts

No impacts to community facilities in Staten Island are anticipated due to construction of any of the four Build Alternatives. As with the cities of Elizabeth and Linden, construction will not impact community facilities or emergency services due to their distance from the construction site. As expected, temporary road closures or detours of existing roadways or ramps in the vicinity of the bridge are not expected to adversely impact existing travel routes to and from community facilities and emergency services that serve the Study Area. Coordination between the construction contractor, the New York State Department of Transportation, the New York City Department of Transportation, the Port Authority, and emergency services department in Staten Island will be conducted similar to that for the New Jersey portion of the Study Area.

Operational Impacts

No community facilities would be displaced or physically impacted by the operation of the Proposed Project. Although the operation of the new bridge under any of the Build Alternatives would not result in any adverse travel, direct or functional impacts to community facilities in Staten Island, beneficial impacts would be realized through improved travel time across the widened bridge to and from Elizabeth or Linden. The introduction of pedestrian and bike travel lanes would also allow new access between the cities of Elizabeth and Linden and Staten Island, which could foster greater use and awareness of the community facilities in these communities. In addition, with the widened travel lanes and the introduction of new 12-foot shoulders that could also potentially function as travel lanes for emergency services, improvements to response times to both incidents on the bridge and mutual aid emergency incidents between the cities of Elizabeth and Linden and Staten Island would be realized.

5.5.5 Mitigation of Impacts

Required right-of-way acquisition for any of the Build Alternatives is not expected to result in a temporary or permanent taking or displacement of any community facilities in the Goethals Bridge Study Area. To maintain traffic flow along the existing bridge during construction, a Maintenance and Protection of Traffic (MPT) plan will be developed. Coordination between the construction contractor, the New Jersey Department of Transportation (NJDOT), New Jersey Turnpike Authority (NJTA), the New York State Department of Transportation (NYSDOT), the New York City Department of Transportation (NYCDOT), the Port Authority and traffic control officials in the cities of Elizabeth and Linden, as well as the borough of Staten Island will serve to limit the potential long term adverse travel during construction. This coordination will also include input into the MPT by these various groups and individuals. The MPT will identify work zones, detours and alternate routes and provide advanced information regarding road closures. All efforts will be taken to maintain the response times of emergency service providers during the construction phase of the project. Coordination between the design engineer, construction contractors, Port Authority officials and emergency response officials during construction will serve to identify appropriate and acceptable traffic control and traffic maintenance procedures and plans that will ensure that emergency response times and access are maintained at current levels.

5.5.6 Summary

As discussed above, none of the community facilities identified in the project corridor are expected to be directly impacted by the Proposed Project. The displacement of residential properties and the associated relocation of households are not anticipated to alter the user groups of the identified facilities. The Proposed Project is also not expected to result in any changes in access or service area to the existing facilities.

5.6 Parklands and Recreational Facilities

5.6.1 Introduction

This section examines the potential for impacts related to parklands and recreational facilities that could result from the construction and operation of a new Goethals Bridge, as well as the demolition of the existing bridge.

5.6.2 Methodology, Approach and Data Sources

For this analysis, the construction and operation plans for each of the four Build Alternatives were applied to the inventory of parkland and recreational facilities. Applicable legal and regulatory documents as well as guidance documents were also reviewed and considered to identify any relevant local, state, and federal compliance requirements pertaining to the acquisition or use of parklands and recreation facilities.

5.6.3 No-Build Alternative

Under the No-Build Alternative, the Proposed Project would not be undertaken and the existing Goethals Bridge would remain. As a result, parklands and recreational facilities would not be affected in any manner.

5.6.4 Build Alternatives

None of the Build Alternatives would require the acquisition or use of any parklands or recreational facilities for the siting of structures or for construction staging areas. While the proposed NYSDEC's Old Place Creek Site Access, just south of the Goethals Bridge Toll Plaza and along Gulf Avenue, is

scheduled for completion in mid- to late-2008, it would not be impacted by the Proposed Project since any improvements at the Toll Plaza would remain within its current right-of-way. In addition, the re-alignment of Gulf Avenue would not extend this far so that access to the NYSDEC site would continue uninterrupted. During construction, access to this recreational site may be interrupted due to temporary roadway closures and construction detour routes, notably along Gulf Avenue. Coordination of the location, timing and extent of the temporary roadway closures and construction detour routes, as noted in Section 5.5, will attempt to limit any long term adverse travel or access impacts to parklands and recreational facilities in the Study Area.

In light of recreational vessel use on the Arthur Kill and, as noted in Section 5.15, some short-duration channel closures are expected to occur during construction of the new bridge and demolition of the existing one. Such channel closures in the Arthur Kill would be coordinated with the USCG to minimize navigation conflicts and allow for the appropriate timing of releases of a Local Notice to Mariners (LNM), including to those recreational vessels coming from the City of Elizabeth Marina, located approximately 0.9 miles north of the bridge. As for potential concerns to recreational use in Old Place Creek, which is currently limited to kayaks and canoes due to the existing 4.9-foot clearance above MHW at the GATX vehicular bridge, any temporary access restrictions on Old Place Creek during the construction phases of either the new main span or the NY approach span and during the demolition of the existing bridge would be limited to only a few days at the most; these temporary restrictions will be well publicized and coordinated with the USCG in order to avoid the risk of human injuries. In addition, the permanent access road trestle over Old Place Creek would be designed in a way that provides feasible vertical clearance for kayakers and canoeists during the operation phase of the Proposed Project.

No other direct or indirect impacts from the construction or operation of any of the four Build Alternatives are anticipated to occur to any existing or planned parklands or recreational facilities in the Goethals Bridge Study Area.

5.7 Historic Resources

5.7.1 Introduction

As previously discussed in Section 3.0, the consideration for a historic resource rehabilitation as defined under the *Secretary of Interior's Standards for Rehabilitation* (Title 36 CFR 67), thereby including either the rehabilitation of the existing bridge or the construction of a new parallel bridge adjacent to the existing rehabilitated bridge under the Proposed Project, had also been evaluated during the early EIS stages of alternatives screening analyses. However and pursuant to agency inputs and public involvement (as per 36 CFR 800.6 for the *Resolution of Adverse Effects*), those two alternatives had then been dismissed due to their inability to fully achieve the purpose and need of the Proposed Project, as well as to meet the project goals. [7] Consequently, those two alternatives were not advanced for detailed evaluation in the EIS, and they are then not discussed in this section below.

As a result of the architectural resource investigations conducted in the New York and New Jersey APEs in 2007 and subsequent consultation with the state historic preservation offices (SHPOs) in each state, a total of 90 properties were either previously identified or evaluated as part of the current EIS process (see Section 4.8 and Appendices E.1, E.2 and E.3). The studies identified eleven of these resources listed in or eligible for listing in the National Register of Historic Places. The effects of the Proposed Project on these 11 historic properties have been evaluated pursuant to Section 106 of the National Historic Preservation Act and associated implementing regulations found in Title 36 CFR 800. The complete effects assessment is contained in Appendix E.5. Based on the results of the effects assessment, the Proposed Project will have an adverse effect on three historic properties within architectural APEs; the

[7] For more details on those two specific alternatives that have been evaluated in consultation with both SHPOs, see Appendix E.6 which contains the *Historic Bridge Alternatives Analysis Report* submitted to both SHPOs in August 2008.

Goethals Bridge, the Staten Island Railroad Historic District, and the Staten Island Railway Lift Truss Bridge over Arthur Kill.

5.7.2 Methodology, Approach, and Data Sources

Section 106 of the National Historic Preservation Act requires federal agencies to consult with agencies, such as the respective SHPOs, to ensure that the effects of an undertaking on historic properties are taken into account in project planning. Agencies are required to assess the undertaking's effects on the listed or eligible National Register historic properties and to avoid, minimize, or mitigate any adverse effects on historic properties.

After the eligible and listed historic properties within a project area are identified and reviewed by SHPO, the next step in the Section 106 process is to apply criteria of effect and adverse effect (specified in 36 CFR 800.9) to determine if an undertaking will affect historic resources and whether any effects will be adverse. Application of the criteria of effect and adverse effect will yield one of three findings: no effect, no adverse effect, or adverse effect. Under 36 CFR part 800.5 (1) Criteria of Adverse Effect, *an adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location design, setting, materials, workmanship, feeling, or association*. Effects may also include visual/aesthetic effects, which result in a change in aesthetic values or views resulting from additions to historic properties, alteration in highway design, and other types of construction.

5.7.3 No-Build Alternative

Under the No-Build Alternative, the Proposed Project would not be undertaken and the Goethals Bridge would remain in its current location and configuration. As a result, it would have no impact on potentially eligible or listed historic properties within either the New Jersey or the New York architectural APEs.

5.7.4 Build Alternatives

The historic architectural study identified a total of 11 historic architectural properties that were identified as eligible for or listed on the National Register of Historic Places (see Table 5.7-1 and Figure 5.7-1). Each of these historic properties has been evaluated according to the criteria of adverse effect to determine whether or not the Proposed Project would alter the characteristics of the historic properties that qualify them for inclusion in or eligibility for the National Register. The full Effects Assessment is contained in Appendix E.5 and a summary of the report findings is presented below.

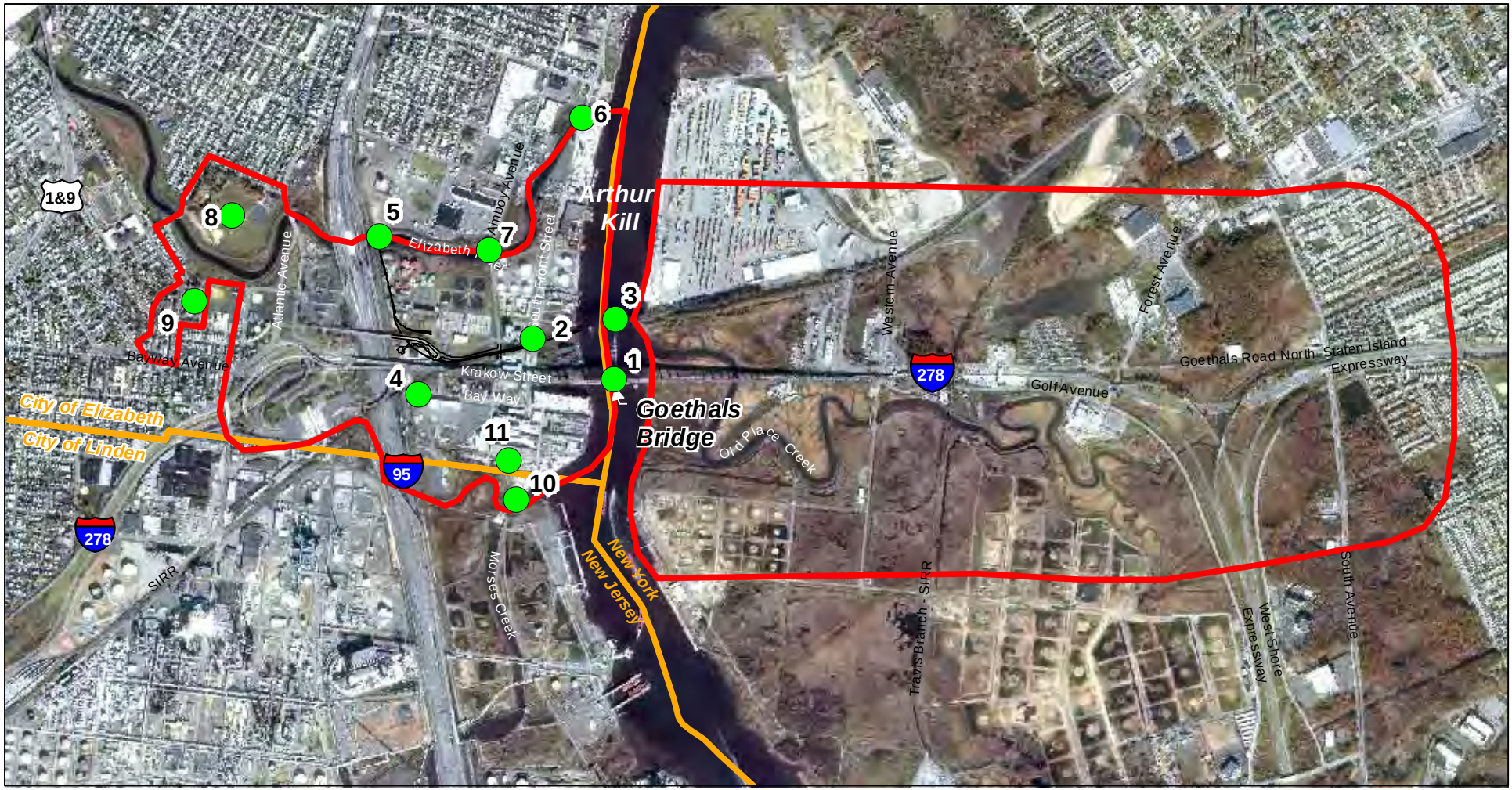
5.7.4.1 Goethals Bridge, Elizabeth, New Jersey and Staten Island, New York

The Goethals Bridge, completed in 1928, is a four-lane cantilever truss bridge that carries Interstate 278 over the Arthur Kill between Elizabeth, New Jersey, and Staten Island, New York. The Proposed Project would have an adverse effect on the National Register eligible Goethals Bridge. Under the four proposed alignment alternatives of the Proposed Project (i.e., New Alignment South Alternative; New Alignment North Alternative; Existing Alignment South Alternative; Existing Alignment North Alternative), the historic Goethals Bridge would be replaced and the historic structure removed in its entirety. The Proposed Project would cause the physical demolition of the bridge and therefore, result in an adverse effect to the Goethals Bridge.

TABLE 5.7-1
HISTORIC ARCHITECTURAL RESOURCES WITHIN THE NEW JERSEY ARCHITECTURAL APE

No	Resource Name/Address	Block/ Lot	Date Built	Eligibility Status	Effects Assessment
1.	Goethals Bridge	N/A	1928	- SHPO Opinion Eligible: 2/14/1995 (NJ) 1/25/1995 (NY) - Not eligible for NYCLPC designation (5/28/2008)	Demolition Finding of Adverse Effect
2.	Staten Island Railroad Historic District, Elizabeth	N/A	1889-1959	SHPO Opinions Eligible 6/11/1991 & 2/27/1995	Adverse Visual Impacts Finding of Adverse Effect
3.	Staten Island Railway Lift Truss Bridge over Arthur Kill	N/A	1959	SHPO Opinion Eligible 6/11/1991 (NJ) 6/4/2008 (NY)	Adverse Visual Impacts Finding of Adverse Effect
4.	Perth Amboy and Elizabethport Branch of the Central Railroad of New Jersey (CNJ), Elizabeth	N/A	1871	SHPO Opinion Eligible 8/30/2000	Visual Impacts No Adverse Effect
5.	Elizabeth River Bridge, Central Railroad of New Jersey (CNJ), Elizabeth	N/A	ca. 1912	SHPO Opinion Eligible 4/9/1990	Visual Impacts No Adverse Effect
6.	South Front Street over Elizabeth River, Elizabeth Bridge # 2004001	N/A	1920	SHPO Opinion Eligible 5/21/2008	Visual Impacts No Adverse Effect
7.	South First Street over Elizabeth River, Elizabeth	N/A	1908	SHPO Opinion Eligible 3/23/1998	Visual Impacts No Adverse Effect
8.	Mattano Park, Elizabeth (Union County Park System)	4-59 5/453.B 5/1262 7/968	1921-1964	SHPO Opinion Eligible 5/21/2008	Visual Impacts No Adverse Effect
9.	Mravlag Manor Housing Project 635-681 & 640-664 Clarkson Avenue	4/361	1939	SHPO Opinion Eligible 5/21/2008	Visual Impacts No Adverse Effect
10.	Sound Shore Branch over Morses Creek, Linden	586/10	ca. 1920	SHPO Opinion Eligible 5/21/2008 as Contributing Resource, Sound Shore Railroad	See Sound Shore Railroad
11.	Sound Shore Railroad		ca. 1895	SHPO Opinion Eligible 5/21/2008	Visual Impacts No Adverse Effect

Source: Berger/PB, 2008.



Legend

Area of Potential Effect

Historical Resource

Source:
Basemapping: Port Authority of New York and New Jersey, 2002.
Data: The Louis Berger Group, 2004.

Goethals Bridge Replacement EIS

Figure 5.7-1

Historic Architectural Resources within the APE

United States Coast Guard

5.7.4.2 Staten Island Railroad Historic District, Elizabeth, New Jersey

The Staten Island Railroad extends 26.5 miles from Cranford Junction, New Jersey to St. George, Staten Island. The historic district applies to the approximately 6.5 miles from the vertical lift bridge over the Arthur Kill west to Cranford Junction. The Proposed Project would have an adverse visual effect on the National Register-eligible Staten Island Railroad Historic District. At present, the Goethals Bridge approach viaduct spans the Staten Island Railroad east of the New Jersey Turnpike and Interchange 13 at the Relocated Bayway Avenue. The proposed Build Alternatives would not: 1) cause physical destruction or damage to the historic district; 2) alter the historic district or move the location of the railroad or any of the character defining features of the railroad, itself; or 3) change the character of the property's use. The project would, however, introduce new physical features within the property's setting and would change the visual elements surrounding and adjacent to the railroad. The proposed Goethals Bridge would be wider than the current structure due to an increase from four lanes to six lanes and the alignment would be moved south of the present location under two of the alignment alternatives, thus having the potential to alter the scale and relationship of the bridge as it relates to the railroad. The Proposed Project would also have the potential to contrast with the existing elements of the historic railroad in form, color, and texture. Views of the Staten Island Railroad and the views from the railroad would be altered. Given the close spatial relationship between the bridge and the railroad, the proposed removal of and replacement of the Goethals Bridge would have an adverse visual effect on the Staten Island Railroad Historic District.

5.7.4.3 Staten Island Railway Lift Truss Bridge over Arthur Kill, Elizabeth, New Jersey

The Staten Island Railway Lift Truss Bridge (1959 Vertical Lift Bridge) was constructed by the Baltimore and Ohio Railroad in 1959 and carries a single track of the Staten Island Railroad over the Arthur Kill from Elizabeth, New Jersey to Staten Island, New York. The Proposed Project would have an adverse visual effect on the Staten Island Railway Lift Truss Bridge. The Staten Island Railway Lift Truss Bridge, located approximately 550 feet north of the Goethals Bridge, is adjacent to the Goethals Bridge. Both these historic structures are prominent features of the landscape. The proposed alignment alternatives would not: 1) cause physical destruction or damage to the railroad bridge; 2) alter the railroad bridge or move the location of the railroad bridge or any of the character defining features of the railroad bridge; or 3) change the character of the property's use. However, the Proposed Project would alter the physical features within the property's setting, and introduce and/or change the visual elements adjacent to the Staten Island Railway Lift Truss Bridge. Visually, the two bridges are closely linked to the views experienced at these crossings. The Proposed Project would create significant changes in the overall setting and views, and therefore, the proposed removal of and replacement of the Goethals Bridge would have an adverse visual effect on the Staten Island Railway Lift Truss Bridge.

5.7.4.4 Perth Amboy and Elizabethport Branch of the Central Railroad of New Jersey (CNJ), Elizabeth, New Jersey

The Perth Amboy and Elizabethport Branch of the CNJ extends 12.06 miles between the CNJ Main Line in Elizabeth to Perth Amboy on the north side of the Raritan Bay. The Proposed Project would have no adverse effect on the Perth Amboy and Elizabethport Branch of the Central Railroad of New Jersey. The Goethals Bridge approach viaduct spans the Perth Amboy and Elizabethport Branch of the CNJ east of the New Jersey Turnpike and Interchange 13 at the Relocated Bayway Avenue. None of the proposed alignment alternatives would 1) physically encroach on the railroad; 2) cause physical destruction or damage to the historic district; or 3) alter the historic railroad or move the actual alignment of the railroad or any of its character defining features of the railroad. The Proposed Project would introduce and/or change the visual elements surrounding and adjacent to the railroad. The Proposed Project would be wider than the current structure due to an increase from four lanes to six lanes, and would be moved south

of the present alignment under two of the alignment alternatives. The area immediately surrounding the railroad has had a number of intrusions added to the setting since the late 1940s, such as the construction of the adjacent New Jersey Turnpike and realignment of Bayway Avenue. Providing that the form, color and scale of the new bridge are compatible with the existing setting, the change in visual elements adjacent to the railroad would not diminish the integrity of the property's significant historic features. Therefore, the Proposed Project would have a visual effect, but would not have an adverse effect on the Perth Amboy and Elizabethport Branch of the Central Railroad of New Jersey.

5.7.4.5 Elizabeth River Bridge, Central Railroad of New Jersey (CNJ), Elizabeth, New Jersey

The Elizabeth River Bridge, Central Railroad of New Jersey, is a Scherzer-type, single-leaf bascule bridge constructed circa 1912. The bridge carries the two tracks of the Perth Amboy and Elizabethport Branch of the Central Railroad over the Elizabeth River. The Proposed Project would have no adverse effect on the Elizabeth River Bridge, Central Railroad of New Jersey. The Elizabeth River Bridge is located adjacent to the New Jersey Turnpike, over 1,500 feet north of the Goethals Bridge approach viaduct and over 3,000 feet from the main bridge spans. The proposed alignment alternatives would not physically alter the railroad bridge or any of the character defining features of the railroad bridge. The Proposed Project would create a different visual element, the impact of which would be minimal due to the distance between the Elizabeth River Bridge and the Goethals Bridge and the presence of visual obstructions. Therefore, the Proposed Project would have no adverse effect on the Elizabeth River Bridge, Central Railroad of New Jersey.

5.7.4.6 South Front Street [Bridge] over Elizabeth River, Elizabeth, New Jersey

The South Front Street [Bridge] over Elizabeth River, constructed in 1920, is a skewed Strauss heel trunnion bridge with a Warren through truss moveable span. The project would have no adverse effect on the South Front Street [Bridge] over Elizabeth River. This bridge carries South Front Street over the Elizabeth River a short distance from the mouth of the Elizabeth River in a low-lying industrial area along the Arthur Kill. Located approximately 3,470 feet north of the Goethals Bridge, the visual setting from the South Front Street Bridge, south toward the Goethals Bridge, includes natural and manmade features such as the Arthur Kill, the Staten Island Railway Lift Truss Bridge, the Staten Island Railroad Historic District, and the Goethals Bridge. View of the Goethals Bridge from South Front Street at the South Front Street Bridge is partially obstructed by the nearby industrial buildings. The proposed alignment alternatives would not result in any physical alteration of the bridge. The project would introduce and/or change the visual elements relating to setting and feeling of the Bayway industrial area surrounding the Goethals Bridge. However, the visual changes from this bridge are not sufficient to cause an adverse visual effect.

5.7.4.7 South First Street [Bridge] over Elizabeth River, Elizabeth, New Jersey

The South First Street [Bridge] over Elizabeth River carries South First Street over the river in an industrial area of Elizabeth. The bridge, constructed in 1908, is a Straus overhead articulated counterweight bridge, 80 feet in length. The project would not have an adverse effect on the South First Street [Bridge] over Elizabeth River. The bridge is approximately 1,850 feet north of the Goethals Bridge main spans over the Arthur Kill and approximately 1,550 feet from the approach viaduct at Amboy Avenue (South First Street). The visual setting from the South First Street Bridge, southeast toward the Goethals Bridge, includes manmade features such as the Staten Island Railway Lift Truss Bridge, the Staten Island Railroad Historic District, and the Goethals Bridge. The proposed alignment alternatives would not cause physical destruction to or any of the character defining features of the bridge. As with the South Front Street Bridge, the project would introduce and/or change the visual elements and the overall setting; however, the change in visual elements would not diminish the integrity of the property's

significant historic features and therefore would have no adverse effect on the South First Street [Bridge] over Elizabeth River.

5.7.4.8 Mattano Park, Elizabeth, New Jersey

Mattano Park, which dates from the 1950s, is a 39.7-acre park situated along the Elizabeth River, northeast of the New Jersey Turnpike. The Proposed Project would have no adverse effect on Mattano Park. At its closest point, the park is approximately 4,400 feet from the main spans of the Goethals Bridge. The area of greatest use is further from the bridge.

The proposed alignment alternatives would not physically alter the park or any of the character-defining features of the park. As a public landscape with prominent views of the Goethals Bridge, the project would introduce and/or change the visual elements, including the scenic view, which visually and aesthetically contributes to the park experience. Providing that the proposed replacement of the Goethals Bridge is in keeping with the scale, materials, composition, and overall visual context of the current structure, the Proposed Project would have no adverse effect on Mattano Park.

5.7.4.9 Mravlag Manor Housing Project, 688 Maple Avenue, Elizabeth, New Jersey

The 423-unit Mravlag Manor Housing Project, constructed in 1939, is sited on approximately 15 acres opposite Mattano Park and the Elizabeth River. The property is bounded by Carteret and Clifton Streets, Clarkson Avenue, Bayway Avenue, and Maple Avenue. The apartments are contained in 15 three-story buildings, six of which are on the southeast side of Clarkson at Clifton Street, opposite Mattano Park. The remaining nine buildings, the administration building and former social center, and a new community center are sited on the northwest side of Clarkson Avenue. Mravlag Manor consists of modified C-plan and L-plan buildings situated around an inner courtyard. The Proposed Project would have no adverse effect on the Mravlag Manor Housing Project. Those apartments at the Mravlag Manor Housing Project located on Clifton Street, opposite Mattano Park and the Elizabeth River, have the potential to be within the viewshed of the Proposed Project; however, the buildings are approximately 5,100 feet from the main spans of the Goethals Bridge with limited views. The project would not physically alter the Mravlag Manor Housing Project or any of the character-defining features of the site. Although the Proposed Project would introduce and/or change the visual skyline, views of the bridge from the Mravlag Manor Housing are minimal, and limited or no views exist from associated courtyards and outdoor open spaces of this property; therefore, the Proposed Project would have no adverse effect on Mravlag Manor Housing Project.

5.7.4.10 Sound Shore Railroad, Elizabeth and Linden, Union County, New Jersey (Including Sound Shore Branch over Morses Creek, Linden)

The Sound Shore Railroad is a single track railroad that extends approximately 6 miles between Bayway Avenue in the City of Elizabeth in Union County to Chrome in the Borough of Carteret in Middlesex County. Evaluation of the railroad also includes one associated feature located within the architectural APE, i.e., the Sound Shore Railroad Bridge over Morses Creek. The Proposed Project would have no adverse effect on the Sound Shore Railroad. The Sound Shore Railroad is located southwest of the existing Goethals Bridge alignment in the industrial Bayway area. The railroad is over 1,300 feet from the main spans of the Goethals Bridge and approximately 875 feet at its closest point to the approach spans. The Proposed Project would not physically alter the Sound Shore Railroad or any of the character defining features associated with the Sound Shore Railroad. Although the Proposed Project would alter the area visually, the introduction of a new visual element would not diminish the integrity of the property's significant historic features and therefore, the Proposed Project would have no adverse effect on Sound Shore Railroad.

5.7.5 Mitigation of Impacts

As noted above, the Proposed Project, with any of its four Build Alternatives, would have an adverse effect on three historic properties that are eligible for listing on the National Register including the Goethals Bridge, the Staten Island Railroad Historic District, and the Staten Island Railway Lift Truss Bridge over Arthur Kill. None of the other eight historic resources identified as eligible for or listed on the National Register would be impacted as a result of the proposed demolition and replacement of the historic structure. SHPOs' concurrences on the USCG determination of adverse effect were received from NJHPO on May 21, 2008 and from NYSOPRHP on July 11, 2008 (see Appendix E.7). Upon the SHPOs' concurrence with the Finding of Adverse Effect, the USCG notified the Advisory Council on Historic Preservation (ACHP) on May 13, 2009 and formally invited the ACHP into the ongoing consultations pursuant to 36 CFR § 800.6(a)(1) (see Appendix E.7). The ACHP concluded on June 2, 2009 that Appendix A, *Criteria for Council Involvement in Reviewing Individual Section 106 Cases*, of "Protection of Historic Properties" (36 CFR Part 800), did not apply to this undertaking, and that ACHP's participation in the consultation to resolve adverse effect is not needed (see Appendix E.7).

As part of the Section 106 process, mitigation of adverse effects has been addressed in consultation between the NJHPO, NYSOPRHP, USCG and the Port Authority. These four agencies will become signatories of the Memorandum of Agreement (MOA) for the GBR Project. While other potential consulting and interested parties have been invited to participate in the Section 106 consultation process since January 4, 2008 (see Appendix E.7) and the concurrent NEPA process, they have also been offered the opportunity to review the draft MOA, pursuant to 36 CFR 800.2(d) and 800.6(a). It should be noted that the Finding of Adverse Effect was publicly presented during the project's public outreach effort of October 2008, when a series of agency/stakeholder meetings and public open houses were held in both states (see Section 6.0 for more details).[8] This finding was also presented during the project's formal public meetings held in July 2009, following the publication and release of the DEIS. The USCG has continuously updated the list of consulting and interested parties in order to identify any additional entities that may request to become active participants in the MOA development and/or finalization.

Pursuant to 36 CFR 800.2(d) and 800.6(a), the draft MOA has been made available to the public for a 30-day review period, including online on the project web site (www.goethalseis.com) and directly mailed to all consulting and interested parties. Upon closure of the public comment period on July 2, 2010, three written comments had been received, incorporated into the final MOA and distributed to both SHPOs.[9] At this time of FEIS publication and release to the public, the final MOA is being circulated to all signatory parties for its execution. Following its execution, a signed copy of the MOA will be attached to the USCG's Record of Decision (ROD) at the end of the NEPA process. The current version of the MOA and its list of consulting and interested parties are included in Appendix E.8 of this FEIS, which provides more details on the following five mitigation measures to be implemented:

- Project Design Consultation.
- Documentation and Curation of Original Documents.
- Historic American Engineering Record (HAER).
- Goethals Bridge Publication.
- Documentary Film and Lesson Plans.

[8] Also in accordance with 36 CFR § 800.8 for "*Coordination With the National Environmental Policy Act*".

[9] Those three comments, from the US Army Corps of Engineers (USACE), the New York City Landmark Preservation Commission (NYCLPC), and the Tribal Historic Preservation Officer (THPO) for the Mohican Nation, were minor in nature and did not affect the original stipulations presented in the draft MOA.

5.7.6 Summary

With the consideration of rehabilitation as defined under the *Secretary of Interior's Standards for Rehabilitation*, neither the rehabilitation of the existing bridge nor the construction of a new parallel bridge adjacent to the existing rehabilitated bridge would fully achieve the purpose and need of the Proposed Project. Therefore and pursuant to agency inputs and public involvement (as per 36 CFR 800.6 for the *Resolution of Adverse Effects*), they both have been dismissed in the early EIS stages of alternatives screening analyses (see Section 3.0 or Appendix E.6 for more details), and were then not advanced for detailed evaluation in the EIS.

Consequently, an evaluation of the effects of the four Build Alternatives under consideration for the Proposed Project on the 11 historic properties in the architectural APE was conducted in March 2008. The Proposed Project would have a Finding of Adverse Effect on three historic properties, i.e., the Goethals Bridge, the Staten Island Railroad Historic District, and the Staten Island Railway Lift Truss Bridge over Arthur Kill. Although eight resources would have some degree of visual effect, these effects are not sufficient to diminish the integrity of the properties' significant historic features or setting and, as a result, do not alter the characteristics of the historic properties that qualify them for inclusion in or eligibility for listing in the National Register of Historic Places. These eight properties will not be adversely affected by the Proposed Project. Visual effects to historic properties not recommended as adverse effects, such as the South Front Street [Bridge] over Elizabeth River, South First Street [Bridge] over Elizabeth River, and Mattano Park would result in a change to the scenic, visual, and/or aesthetic experience, but would not result in an adverse effect. Pursuant to 36 CFR 800.6(a)(1) and upon the SHPOs' concurrence on the USCG determination of adverse effect and notification to the Advisory Council on Historic Preservation (ACHP), the ACHP has declined its active participation in the development of Memorandum of Agreement (MOA) for the GBR Project (see Appendix E.7 of this FEIS).

Given the findings of adverse effect on three historic properties and need for appropriate mitigation related to the Proposed Project, a MOA has been developed in consultation between the four signatory agencies (i.e., the USCG, the Port Authority, the NJHPO and the NYSOPRHP), as well as other consulting and interested parties, as per Section 106 of the National Historic Preservation Act. Ongoing execution of the MOA by the four signatory agencies will be completed prior to the USCG's Record of Decision (ROD) at the end of the NEPA process.

5.8 Archaeological Resources

5.8.1 Introduction

This section presents an evaluation of the potential impacts to archaeological resources within the archaeological Area of Potential Effect (APE) as defined in Section 4.9.2. Detailed discussions and evaluations for all identified archaeological resources are presented in Appendix E.5.

5.8.2 Methodology, Approach, and Data Sources

To evaluate potential impacts, a predictive model for archaeological sensitivity was developed which stratified the archaeological potential of both the New Jersey and New York sections of the APE into areas of potential and "no potential" for archaeological resources. The model was based on an assessment of the locations of the four Build Alternatives, all of which are located within the defined boundaries of the archaeological APE. Supplemental background research was conducted between September and December of 2004 to update the archaeological resource sensitivity models that had been developed in 1992 and further refined as part of the Staten Island Bridges Program (SIBP) EIS in 1997.

5.8.3 No-Build Alternative

Under the No-Build Alternative, the Proposed Project would not be undertaken and the Goethals Bridge would remain in its current location and configuration. As a result, it would have no impact on potentially eligible or listed archaeological resources within either the New Jersey or the New York archaeological APEs.

5.8.4 Build Alternatives

The results of the background research and field reconnaissance stages of the Phase I archaeological survey in the New Jersey archaeological APE indicated that there are no archaeological sites documented within the archaeological APE and that much of the archaeological APE had been previously impacted by grading activities.

As discussed in Section 4.9, the results of the background research and field reconnaissance stages of the Phase I archaeological survey in the New York archaeological APE indicated that eight prehistoric sites and six historic archaeological sites have been previously documented within a one-mile radius of the archaeological APE. One of the prehistoric archaeological sites and the six historic archaeological sites were once located within the archaeological APE, but subsequent construction of roadways and buildings have substantially impacted these resources.

Subsurface testing conducted within the New Jersey archaeological APE revealed evidence of filling and grading associated with the construction of Interchange 13 of the New Jersey Turnpike and the Goethals Bridge approaches. Additionally, subsurface testing within the New Jersey archaeological APE did not identify any prehistoric archaeological resources. Moreover, no significant or recommended National or State Register-eligible historic archaeological deposits were recovered from within the New Jersey archaeological APE. Given these findings, it is concluded that the New Jersey archaeological APE does not contain any significant or recommended National or State Register-eligible prehistoric or historic archaeological resources that would be impacted by any of the four Build Alternatives being considered. The New Jersey Historic Preservation Office (NJHPO) has concurred on the USCG determination that no further archaeological investigations are recommended within the New Jersey archaeological APE (NJHPO September 28, 2007) (see Appendices E.5 and E.7).

The results of the subsurface testing within the New York archaeological APE revealed fairly undisturbed soils underlying approximately 1 to 2 feet of fill and a scatter/intermixing of historic artifacts throughout most of the archaeological APE. In addition, seven prehistoric artifacts were identified within five distinct loci (i.e., locations). No archaeological features, however, were discovered within the archaeological APE. The recovered historic artifacts were found in fill and non-feature natural soil contexts and do not represent significant archaeological deposits, and therefore are not recommended as eligible for the National or State Registers. The prehistoric artifacts were recovered from within non-feature natural stratified soil contexts with little or no overlying fill and were used to define distinct areas of sensitivity within the following archaeologically tested areas of the New York archaeological APE: Areas A, B, C, G, and H, all of which may be related to a single, larger site, identified historically as the Old Place Creek Site (NYSM #7215; NYSOPRHP #s A085-01-2366 and A085-01-0134), the boundaries of which have never been completely defined. Subsurface testing in the vicinity of these isolated finds within the New York archaeological APE yielded no prehistoric features or dense prehistoric artifact deposits. As a result, the few scattered prehistoric materials discovered within the New York archaeological APE do not represent significant prehistoric archaeological deposits and are therefore not recommended as eligible for the National or State Registers. The NYSOPRHP concurred on the USCG determination that no National Register Eligible Archaeological Resources were identified within the areas investigated within the New York archaeological APE (NYSOPRHP November 16, 2007 and December 18, 2007) (see Appendices E.5 and E.7).

Given these findings, the tested portions of the New York archaeological APE do not contain any significant or recommended National or State Register-eligible prehistoric or historic archaeological resources that would be impacted by the two Southern Alternatives. Although the shovel test pit transects that were excavated are representative of where the ground disturbances would occur, the areas of the proposed relocation of Goethals Road North that is associated with both of the Northern Alternatives, were not investigated. As such, the NYSOPRHP has required that additional archaeological testing be conducted along the proposed route of the relocation of Goethals Road North, if either of the Northern Alternatives is selected as the preferred alignment alternative, in order to determine if other National Register eligible archaeological resources could be impacted by the relocation of the roadway (NYSOPRHP December 18, 2007) (see Appendix E.7). However, such additional archaeological field testing is no longer necessary now that the New Alignment South has been identified as the Preferred Alternative in this FEIS.

5.8.5 Mitigation of Impacts

Since the tested portions of the New Jersey and the New York archaeological APEs do not contain archaeological resources that have been listed or are recommended eligible for the National or State Registers, alternatives for avoidance or mitigation associated with the two Southern Alternatives is not required. If, however, one of the Northern Alternatives is ultimately selected, both of which include a proposed relocation of Goethals Road North on the New York side and neither of which included a previous archaeological investigation of the area where the relocated road would be placed, then that area would require an archaeological assessment and/or investigation. Consultation with the NYSOPRHP will be required to determine if National Register eligible archaeological resources are present within the area of the proposed roadway relocation. If eligible resources exist within the area of the relocation of Goethals Road North, then further consultation with the NYSOPRHP would be required to identify appropriate measures to avoid, minimize, or mitigate impacts to the resource(s). If no National Register eligible archaeological resources are present within the area of the relocation of Goethals Road North, then it would not be necessary to consider any alternatives for avoidance or mitigation of impacts to archaeological resources associated with the two Northern Alternatives (NYSOPRHP December 18, 2007).

Any proposed staging/work areas beyond the limits of the New Jersey or New York archaeological APE for which final design plans are not currently available have not been investigated for the presence of archaeological resources. As such, these areas may also require an archaeological assessment and/or investigation as well as continued consultation with the SHPOs if any work is performed outside of the respective archaeological APE that has been investigated to date.

5.8.6 Summary

The tested portions of the New Jersey and the New York archaeological APEs do not contain any National or State Register-listed or recommended eligible prehistoric or historic archaeological resources that would be impacted by the four Build Alternatives. As a result, it is not necessary to consider any alternatives for avoidance or mitigation of impacts to archaeological resources associated with the two Southern Alternatives. SHPOs' concurrence on the USCG determination of no adverse effect was received on September 28, 2007 from NJHPO as well as on November 16, 2007 and December 18, 2007 from NYSOPRHP. With the New Alignment South being identified as the Preferred Alternative in this FEIS, additional archaeological field testing and related consultation with NYSOPRHP are no longer required along the area where Goethals Road North would have been relocated if either of the Northern Alternatives had been selected.

Any construction staging areas beyond the limits of the New Jersey or New York archaeological APE have not been assessed for archaeological potential or investigated for the presence of archaeological

resources and may require an archaeological assessment and/or investigation as well as continued consultation with the SHPOs.

5.9 Visual Quality and Shadow Impacts

5.9.1 Introduction

A visual impact assessment and shadow impact analysis were conducted for the four cable-stayed Build Alternatives under consideration (the conceptual design is more fully described in Section 3.0). It should be noted that the design and bridge renderings presented in this section do not necessarily represent the bridge's ultimate design, shape, or dimensions, but do reflect the details of the current level of design.

5.9.2 Methodology, Approach and Data Sources

The visual impact assessment presents the predicted visual conditions of the future No-Build Alternative and the four Build Alternatives (summarized in Section 5.9.3 below). While representative simulated views are presented in the following section, a full set of simulated views for all four Build Alternatives is provided in Appendix F.1.

To present the magnitude of visual impacts and to compare alignment alternatives, relative ratings were assigned to each visual impact. The ratings range from low to high and are described as follows:

- Low Visual Impact - Describes a slight change in visual resources with no change to key visual resources or views. New visual elements are generally compatible with future No-Build views. Little or no response to change in visual resources is expected.
- Moderate Visual Impact - Describes a slight change in visual resources resulting in a high level of viewer response, or an extensive change in visual resources resulting in little viewer response. New visual elements are somewhat incompatible with future No-Build views.
- High Visual Impact - Describes extensive change to visual resources, or change to key visual resources or views. New views or new visual elements are not compatible with future No-Build views. A high level of viewer response to the change in visual resources can be expected.

5.9.3 No-Build and Build Alternatives

5.9.3.1 No-Build Alternative

Under the No-Build Alternative, new transportation and mixed-use projects are expected to develop in the Goethals Bridge Study Area by 2034. While some consist of expanded service on existing infrastructure and facilities, others entail new construction (see Section 4.4.5). The following discussion considers future developments and their potential modifications to the existing visual environment by state, with New Jersey discussed first, followed by New York.

New Jersey

In Elizabeth, the most significant proposed development in the future without the project, is the redevelopment of the former Borne Chemical site north of the Goethals Bridge into a facility that would process dredged material from the proposed Arthur Kill channel deepening project. This proposal conforms to the City of Elizabeth's South Front Street Redevelopment Plan which intends to transform the area's underutilized properties into active light manufacturing warehouse distribution facilities or other trucking-related businesses. Under this plan, buildings would have a height limit of 80 feet, to maintain the current scale of the area. With the plan in place, there would be increased truck and car

activity in the area. This would likely have a minor effect on the visual environment, given the generally low visual quality of this mostly industrial and vacant area.

Reactivating the Staten Island Railroad (SIRR) line could potentially reduce the visibility of the lift bridge over the Arthur Kill from the New Jersey portion of the Study Area when the main span is lowered, though the towers would continue to be visible from many locations near the waterfront. With the re-activated rail service, there would be an increased presence of rail traffic, underneath and near the Goethals Bridge. This is not expected to affect the existing visual environment.

The No-Build Alternative would result in the continued presence of three visually-dominant and visually-connected elements within the Study Area that are all eligible for listing on the National Register of Historic Places: 1) the Goethals Bridge; 2) the Staten Island Railway Lift Truss Bridge over Arthur Kill (also referred to as the Arthur Kill Lift Bridge); and 3) the Staten Island Railroad Historic District in Elizabeth. These historic resources and their visual relationship to each other are described in greater detail in Section 5.7.

New York

Development of the proposed 38-acre intermodal yard on property east of the New York Container Terminal (NYCT) at Howland Hook would entail minimal new building construction, although additional cranes would be installed there, introducing new vertical elements (standing approximately 200 to over 300 feet tall) into the immediate landscape. However, this development would not be expected to significantly alter the future visual environment around the bridge. Some lesser physical/visual changes would also be expected; for instance, expansion of operations at the Howland Hook terminal site would increase the presence and visibility of ships on the Kill Van Kull and, to a lesser degree, the Arthur Kill, and of trucks and automobiles on the area's roadways.

The as-of-right development on the 675-acre site (former GATX Terminal) south of the Goethals Bridge could potentially include approximately 270,000 gsf of retail space and 2.6 million gsf of industrial use.

There are other proposed physical improvements programmed for the area, including: the West Shore Expressway Corridor/Service Road Improvements and the Arthur Kill Channel Deepening Program. While the former could result in newly reconstructed interchanges and park-and-ride lots, neither project would be expected to affect significant changes to the existing visual environment, given the area's intense transportation/infrastructure orientation.

5.9.3.2 Southern Alternatives

Construction Impacts

Visual impacts related to construction activities associated with either the New Alignment South or the Existing Alignment South would be temporary in nature and variable over the 4.5- to 6-year construction schedule. During different phases, construction activities and the emerging new bridge structures would be visually intrusive to varying degrees at different locations. The most notable visual impacts would occur on Krakow Street in Elizabeth, New Jersey, as construction of the approach span for either Southern Alternative would require the displacement of a substantial number of residential buildings in this vicinity. Given the generally low visual sensitivity of the Study Area, these would be the only notable impacts.

Operational Impacts

In order to assess the potential operational impacts of the proposed alignment alternatives, including their relationship to the landscape and built environment, computer renderings were prepared based on the preliminary conceptual bridge designs and alignments currently under consideration for this environmental review. Three perspectives are shown for the New Alignment South alternative[10] to illustrate typical views from the identified viewer groups: i.e., from Staten Island southeast of the bridge; from the New Jersey Turnpike southwest of the bridge; from the Arthur Kill; and from the bridge itself. Views of each alignment alternative from Mattano Park, located one mile northwest of the bridge in Elizabeth, are discussed, although no renderings have been included due to their restricted nature.

The three renderings (see Figures 5.9-1 through 5.9-3) are conceptual in nature and portray the visual environment with the New Alignment South alternative in place, as they would be experienced by the key viewer groups identified in Section 4.10. In both the New York and New Jersey portions of the Study Area, the largest viewer group likely to be affected by either of the Southern Alternatives would be motorists, including those on the NJ Turnpike, the bridge itself, the Staten Island Expressway (SIE) and other nearby roadways. Other viewer groups that would potentially be affected by all of the alignment alternatives include: workers on the Staten Island and Elizabeth waterfronts; residents of the Krakow Street neighborhood in Elizabeth and the Goethals Park Garden Homes in Staten Island (the Krakow Street residents being the most sensitive); and park users in Elizabeth. Visitors to Veteran's Memorial Waterfront Park in Elizabeth have a more direct view of the Arthur Kill and its crossings than from Mattano Park in Elizabeth, where views are obstructed by transmission towers and other intervening structures. Recreational boaters on the Arthur Kill would also have clear views of the new crossing, but this viewer group is very small in number.

The cable-stayed bridge design ultimately selected for this crossing would create a monumental gateway to New York City without obscuring views of the working waterfront, particularly views of the historic Arthur Kill Lift Bridge.

As mentioned above, the visual analysis as presented in this section is related to impacts related to various viewer groups. As a result, the visual impacts related to a purely historic perspective are not specifically addressed in this section, even though there would be a significant visual effect on adjacent historic resources that are eligible for the National Register of Historic Places (i.e., the Arthur Kill Lift Bridge and the Staten Island Railroad Historic District in Elizabeth). This historic-resources-based visual assessment is presented in Section 5.7.

The two Southern Alternatives are described below in terms of their conceptual scale and relative distance to the sensitive visual resources previously identified in the Study Area. The magnitude of the potential visual impact (as defined in Section 5.9.2) is presented at the end of each discussion.

New Alignment South

<u>Main Span and Back Span</u>

This alignment alternative, as conceptually designed would potentially consist of an approximate 1,700-foot main span, a 2,700-foot west approach, and a 3,000-foot east approach. The new bridge would be located, at its closest, approximately 15-25 feet south of where the existing bridge now stands.

[10] Since the New Alignment South alternative would be located so close to the Existing Alignment South alternative, only renderings of the former are provided here. No difference in views would be perceived, so the New Alignment South alternative is considered to be representative of both Southern Alternatives.

Because of its location over the Arthur Kill, the new bridge would become one of the dominant visual landmarks in the Study Area, along with the Arthur Kill Lift Bridge (one of the few sensitive visual resources in the area). The new bridge would be visible from many places, such as nearby roadways, along the Arthur Kill, and surrounding areas, though most views are not particularly sensitive. The structure would be designed to minimize potential visual competition with the historic lift bridge to the north. With a considerably longer main span than the 558-foot long lift span, the proposed bridge would

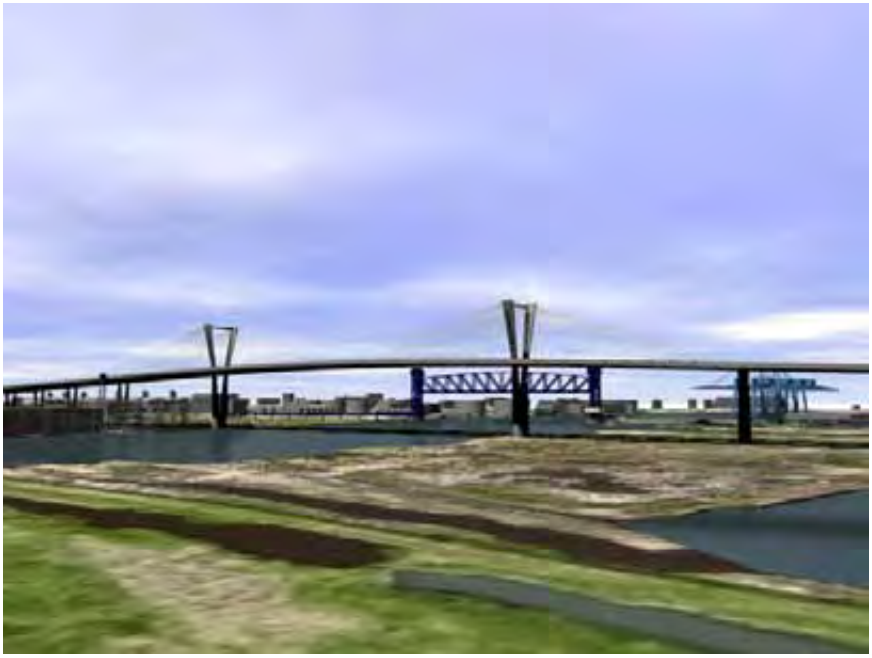


Figure 5.9-1 Conceptual View of New Alignment South: Simulated Northwest View from Staten Island

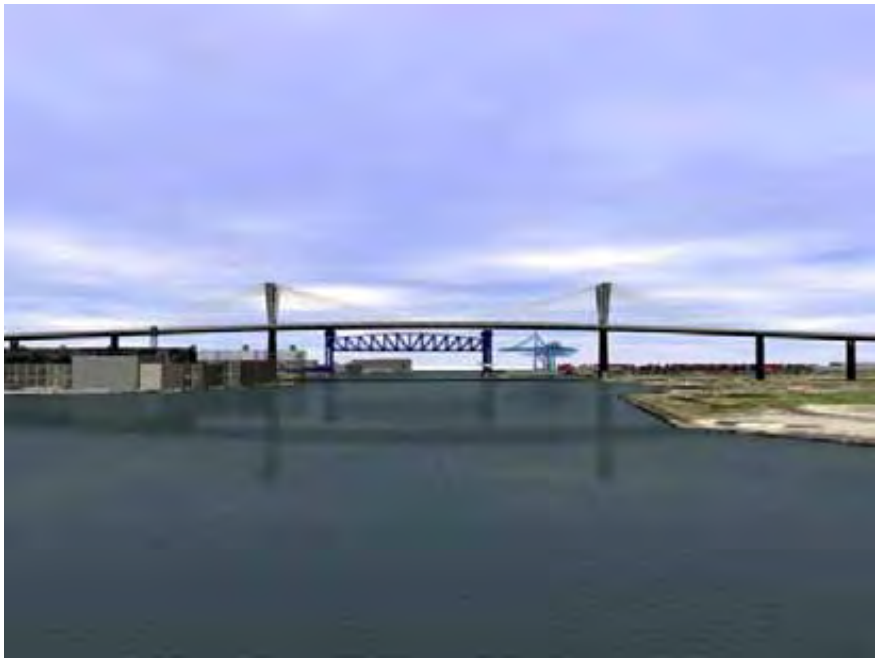


Figure 5.9-2 Conceptual View of New Alignment South: Simulated View North from the Arthur Kill Island

Figure 5.9-3 Conceptual View of New Alignment South: Simulated View Northeast from the NJ Turnpike

offer an open view of the historic lift bridge. (Figure 5.9-1 presents a simulated view from Staten Island, southeast of the bridge.)

The new bridge would be distinct from the mid-20th century Arthur Kill Lift Bridge and would create a new setting for its historic companion. The proposed bridge's superstructure would likely be visually lighter and more transparent than the denser steel truss work of the existing Goethals Bridge. Because of the lighter superstructure and considerably wider span (approximately 210 feet wide compared to 62 feet wide), the deck of the proposed bridge would create a strong, horizontal form across the water in approximately the same location as the existing bridge. While span length, general alignment, and vertical clearance above the water (135 feet) are similar for the existing Goethals Bridge, the proposed bridge design could have fewer piers and taller towers. The new bridge alternatives under consideration show tower heights of approximately 270 feet above mean sea level. Consequently, the overall visual experience of the bridge over the water would be very different from the existing one; however, as the alignment continues to touch down, the overall character would not be changed significantly. The proposed bridge itself would become a major visual element reinforcing the commercial and transportation character of the visual environment, relating to other nearby structures, including the lift bridge and NYCT cranes (up to 300 feet tall) that stand along the Howland Hook waterfront. (Figure 5.9-2 offers a simulated view of the proposed bridge from the Arthur Kill south of the bridge.)

Distant views of the proposed bridge from the Goethals Park Garden Homes (mobile home community), which is located approximately one mile east of the bridge, would be similar to the existing, partially obstructed views and not be considered a significant change or impact.

The view from the new bridge itself would likely be different than the existing Goethals Bridge. The steel truss work of the existing bridge limits visibility, while the new bridge design would likely open up views of the Arthur Kill and beyond. This view would be afforded to motorists, bicyclists and pedestrians as well. The latter two groups, not currently accommodated on the existing structure, would be permitted

on an approximately 10-foot-wide dedicated lane located on the north fascia of the westbound lanes of the new bridge.

Approach Spans

On Staten Island, the R.T. Baker property would be displaced to accommodate the new approach, which would continue eastward until merging with the existing approach near the toll plaza. Displacement of this site would improve the visual atmosphere; the machinery dismantling operation, which is filled with machine parts and metal debris, is located adjacent to Old Place Creek and the associated wetland area. However, the new approaches would affect the visual environment within the Study Area because both the piers and approach roadways would be visible, and the new wider approach would partially reduce the openness of the marshland area just south of the existing bridge, though none of the piers would be placed in Old Place Creek. This minimal reduction of open space would not have a significant impact on visual character of the area.

In Elizabeth, the southern alignment would begin just west of the New Jersey Turnpike. Gradually ascending, it would run parallel to the existing approach, passing over the NJ Turnpike, the Central New Jersey Railroad, the Staten Island Railroad, and other public thoroughfares, including a newly-relocated Bay Way and Krakow Street. The alignment would require the removal of all of the buildings (homes and commercial structures) on the Krakow Street block as well as the two homes located on the east side of Amboy Avenue to accommodate the new bridge approach right-of-way.

Removal of the mixed use residential area would result in a high visual impact since this would be an extensive change to the visual environment; however, with the bridge construction, the sensitive viewer group (residents) would also be removed. Workers and drive-through commuters would remain as the area's key viewer groups, and would not be significantly affected by the change in the environment (see Figure 5.9-3).

The alignment would continue east past South Front Street, over the site of the Bayway Industrial Center Warehouse. The existing warehouse building would be removed to accommodate this conceptual alignment. Because the visual atmosphere of the Study Area is characterized by the existing bridge piers, transportation and shipping activities and the motorist/worker viewer groups have relatively low sensitivity to changes in the visual environment; the bridge would have a marginal and localized effect on the visual character of the industrial waterfront in the immediate vicinity.

The more distant views from the NJ Turnpike and Elizabeth's inland residential neighborhoods and to the north, along the Arthur Kill, would not change significantly with the new bridge, though the new bridge may be more visible. The southeastern view toward the Arthur Kill from Mattano Park is characterized by transmission towers, intervening structures (tanks), highway interchanges, the western Goethals Bridge approach, the Arthur Kill Lift Bridge, and mature trees in the park. The western approach span and superstructure of the new bridge would be visible in the distance. The slight change in placement and introduction of a new (taller) bridge design, compared to the existing bridge, would have a minimal visual impact on this view.

The view from the Veteran's Memorial Waterfront Park, located one mile north of the alignment, on the Arthur Kill would be clearer and less obstructed than the view from Mattano Park, though also would not be considerably changed by a new bridge. The new bridge would serve as a compatible background to the existing working waterfront view from the park, which consists of: cranes, containers, and ships at Howland Hook across the Arthur Kill; the railroad bridge spanning the Arthur Kill; and the South Front Street industries whose wharves, tall cranes and tanks occupy the foreground (see Figure 4.10-9 in Section 4.10). Since there would be only a slight change in the views, the impact on these resources would be considered low.

Existing Alignment South

Main Span and Back Span

The Existing Alignment South Alternative is similar in many design criteria to the New Alignment South Alternative described above. Since the visual difference between these two alignments would be slight, the renderings presented above for the New Alignment South (see Figures 5.9-1 through 5.9-3) are applicable for the Existing Alignment South as well.

As currently conceived, the Existing Alignment South would have similar span dimensions to the New Alignment South Alternative, and would also be a dominant visual landmark in the Study Area, along with the Arthur Kill Lift Bridge (one of few sensitive visual resources in the area). This bridge would also be visible from many places, including nearby roadways, along the Arthur Kill, and surrounding areas, though most views are not particularly sensitive.

Like the existing bridge and the New Alignment South, the Existing Alignment South main span would be considerably longer than the railroad bridge's 558-foot long lift span. The bridge's main span would likely offer a more open view of the lift bridge than the existing Goethals Bridge.

Distant views of the proposed bridge from the Goethals Park Garden Homes (mobile home community), located approximately one mile east of the bridge in Staten Island, would be similar to the existing, partially obstructed views and not be considered a significant change or impact.

The view from the new bridge itself would likely be considerably different than the existing Goethals Bridge. The steel truss work of the existing bridge limits visibility, while the conceptual design would likely open up motorists' views of the Arthur Kill and beyond. This view would also be afforded by motorists, bicyclists and pedestrians crossing the bridge, with the latter two groups of users (not currently accommodated on the existing structure) permitted on a 10-foot-wide dedicated lane located on the north fascia of the westbound lanes.

Approach Spans

The bridge would follow the existing Goethals Bridge alignment more closely than the New Alignment South alternative, but would potentially displace the same properties and would generally result in the same visual impacts as discussed for that alignment alternative. These include ground-level views from Staten Island and Elizabeth, roadway views, and distant views.

5.9.3.3 Northern Alternatives

Construction Impacts

Construction of either of the Northern Alternatives would result in temporary visual impacts similar to the ones described above in Section 5.9.3.2 for the Southern Alternatives.

Operational Impacts

The two preliminary conceptual alternatives evaluated here are similar in concept to the two Southern Alternatives evaluated and presented above, the only difference being that these alternatives would follow alignments north of the Goethals Bridge instead of south of the bridge. The introduction of a bridge following the New Alignment North or Existing Alignment North would result in nearly identical changes to the general visual environment described above in Section 5.9.3.2 for the Southern

Alternatives, since all of the alignments are relatively close to each other. Any one of these new bridges would become dominant visual landmarks in the Study Area, along with the Arthur Kill Lift Bridge.

As for the New Alignment South alternative, three computer-rendered perspectives (see Figures 5.9-4 through 5.9-6) are shown the New Alignment North alternative[11] to illustrate typical views from the identified viewer groups: i.e., from Staten Island southeast of the bridge; from the New Jersey Turnpike southwest of the bridge; from the Arthur Kill; and from the bridge itself. Views of each alignment alternative from Mattano Park, located one mile northwest of the bridge in Elizabeth, are discussed, although no renderings have been included due to their restricted nature.

The perceptible difference in visual impacts between the northern and southern alignments would likely occur at the ground level (particularly in Elizabeth) and not in the more distant views. The Northern Alternatives would take fewer or no residential properties on and near Krakow Street than the Southern Alternatives. As such, resulting visual obstructions would be fewer and the existing built environment would remain largely intact. Potential pier placement on the proposed dredge facility north of the bridge in Elizabeth would not be considered a significant impact to the visual environment, given the absence of significant visual resources or views there. As with the Southern Alternatives, distant views from New York and New Jersey would not be adversely affected with the Northern Alternatives, although the dramatic designs would be more visible from more viewpoints.

As also mentioned previously in the discussion of the Southern Alternatives, the visual analysis as presented in this section is related to impacts related to various viewer groups. As a result, the visual impacts related to a purely historic perspective are not specifically addressed in this section, even though there would be a significant visual effect on adjacent historic resources that are eligible for the National Register of Historic Places (i.e., the Arthur Kill Lift Bridge and the Staten Island Railroad Historic District in Elizabeth). This historic-resources-based visual assessment is presented in Section 5.7.

The two Southern Alternatives are described below in terms of their conceptual scale and relative distance to the sensitive visual resources previously identified in the Study Area. The magnitude of the potential visual impact (as defined in Section 5.9.2) is presented at the end of each discussion.

New Alignment North

<u>Main Span and Back Span</u>

Similar to the Southern Alternatives, this alignment alternative would be an approximately 7,300-foot-long structure, with a 1,700-foot main span, 2,600-foot west approach, and 3,000-foot east approach. Similarly, it would provide navigation clearance at least 135 feet high and 500 feet wide. The dimensions are also identical to the Southern Alternatives described earlier in Section 5.9.3.2. (Figure 5.9-4 presents a simulated view from Staten Island, southeast of the bridge).

The new bridge would be approximately 15 to 25 feet north of, and roughly parallel to, the existing Goethals Bridge alignment, although approximately 150 feet wider. It would therefore be closer to the Arthur Kill Lift Bridge than the existing bridge (see Figure 5.9-5 for a view from the Arthur Kill.)

[11] Since the New Alignment North alternative would be located so close to the Existing Alignment North alternative, only renderings of the former are provided here. No difference in views would be perceived, so the New Alignment North alternative is considered to be representative of both Northern Alternatives.

Figure 5.9-4 Conceptual View of New Alignment North: Simulated Northwest View from Staten Island

Figure 5.9-5 Conceptual View of New Alignment North: Simulated View North from the Arthur Kill

The view from the new bridge itself would be similar to the views described for the Southern Alternatives; however, the motorists, pedestrians and bicyclists would experience the Arthur Kill Lift Bridge more intimately as it would be closer to the bridge, and the closest of all of the alignment alternatives. The steel truss work of the existing bridge limits visibility, while the conceptual design has the potential to dramatically open up views of the Arthur Kill and beyond. Pedestrians and bicyclists would be able to appreciate the view from an approximately 10-foot-wide dedicated lane located on the north fascia of the westbound lanes of the new bridge.

Approach Spans

In Staten Island, the new approaches would affect the general visual environment within the Study Area because both the piers and approach roadways would be more visible (due to their larger dimensions) than the existing bridge. The new approach would partially reduce the openness of the marshland area just north of the existing bridge. This minimal reduction of open space would not have a significant impact on visual character.

On the Staten Island side, a small portion of the NYCT would be affected by this alignment. The main truck entrance to the terminal (at the southern end), a parking lot and a one-story building would likely be relocated to accommodate the bridge piers. A portion of Goethals Road North in this vicinity would also require relocation for the same reason. These direct effects would have a minimal visual impact given the general low-sensitivity of the area and its viewers.

While Goethals Road North serves the Goethals Park Garden Homes (mobile home community), the road's realignment near the terminal would not change access or the visual environment of the residential area. Distant views of the proposed bridge from the community (located approximately one mile east of the bridge in Staten Island) would be similar to the existing, partially obstructed views and not be considered a significant change or impact.

This alignment alternative would likely require the acquisition of several properties in New Jersey and demolition of the buildings on those properties. The new Northern Rail Connector and Relocated Bayway Avenue would also likely be relocated to accommodate proposed pier placement. These modifications would have no effect on significant visual resources or sensitive viewer groups in the area.

No residential properties would be displaced with this alignment alternative, which would eliminate the direct visual impact on Krakow Street caused by the other three conceptual alignment alternatives. An industrial facility (owned by Waste Management) and the proposed J. Cashman Dredge Facility on the Borne Chemical site north of the bridge would also be acquired in Elizabeth for this alignment alternative. Views of the new bridge approaches would be similar to the existing views, although further away from the residences.

Distant views from the NJ Turnpike, Mattano Park and Veterans' Memorial Waterfront Park in northern Elizabeth would resemble those predicted for the Southern Alternatives. Views would not be expected to change dramatically. Even with the increased proximity to the Arthur Kill Lift Bridge, that bridge would not be significantly obstructed from most views, as indicated in the renderings. The view from Mattano Park would be nearly identical to the views predicted for the Southern Alternatives whereby approach spans and superstructure of the new bridge would be visible in the distance. The slight change in placement and introduction of a new (taller) bridge design, compared to the existing bridge, would have a minimal visual impact on this view. (See Figure 5.9-6 for a view from the NJ Turnpike.)

Figure 5.9-6 Conceptual View of New Alignment North: Simulated View Northeast from the NJ Turnpike

The view from the Veteran's Memorial Waterfront Park, located one mile north of the alignment on the Arthur Kill in Elizabeth, would be clearer and less obstructed than the view from Mattano Park, though also would not be considerably changed by the Existing Alignment North Alternative. The new bridge would serve as a compatible background to the working waterfront view available from the park, which includes: cranes, containers, and ships at Howland Hook across the Arthur Kill, the railroad bridge spanning the Arthur Kill, and the South Front Street industries whose wharves, tall cranes and tanks occupy the foreground. Since there would be a slight change in the views, the impact on these resources would be considered low.

Existing Alignment North

Main Span and Back Span

As with the other alignment alternatives, the Existing Alignment North Alternative would become a dominant visual landmark in the Study Area, along with the Arthur Kill Lift Bridge. This bridge would also be visible from many places, including nearby roadways, along the Arthur Kill, and surrounding areas, although most are not particularly sensitive.

Like the other alignment alternatives, the Existing Alignment North Alternative would be considerably longer than the railroad bridge's 558-foot long lift span. The proposed bridge's main span would likely offer a more open view of the lift bridge than the existing Goethals Bridge.

The view from the new bridge itself would be similar to the views described for the New Alignment North; although motorists, pedestrians and bicyclists would experience the Arthur Kill Lift Bridge more intimately from this alignment alternative than from the existing bridge, the views would be slightly less intimate than from the New Alignment North since it would be slightly less close to the lift bridge. The steel truss work of the existing bridge limits visibility, while the conceptual design has the potential to dramatically open up views of the Arthur Kill and beyond. Pedestrians and bicyclists would be able to

appreciate the view from an approximately 10-foot-wide dedicated lane located on the north fascia of the westbound lanes of the new bridge.

Approach Spans

The bridge would follow the existing Goethals Bridge alignment more closely than the New Alignment North alternative, but would potentially displace the same properties and would generally result in the same visual impacts as discussed for that alignment alternative. These include ground-level views from Staten Island and Elizabeth, roadway views, and distant views. One specific difference associated with this alignment alternative, however, includes the potential displacement of several homes and associated structures on Krakow Street, thereby leaving the remaining homes on Bay Way and Amboy Avenue with a diminished context. While existing approach piers already stand in the same general area, visual impacts from the proposed bridge could be substantial because of the loss of the Krakow Street homes.

5.9.3.4 Summary

The Goethals Bridge, its approaches, and its toll plaza are already major visual elements in an area characterized by transportation-related uses, and both of the Southern and Northern Alternatives being considered would be consistent with the existing visual character, opening up views on the river and the bridge itself. Overall, all of the alignment alternatives would be expected to have relatively minimal visual impacts to the various viewer groups within the Study Area, although three of the alignment alternatives would create an adverse visual impact at the Krakow Street area, where many to all of the homes would be taken. From a purely historic-resources perspective, there would also be a significant visual effect on adjacent historic resources that are eligible for the National Register of Historic Places (i.e., the Arthur Kill Lift Bridge and the Staten Island Railroad Historic District in Elizabeth). This historic-resources-based visual assessment is presented in Section 5.7.

5.9.4 Shadow Impacts

5.9.4.1 Methodology, Approach and Data Sources

Shadow diagrams were prepared using existing CAD information for the structures in the Goethals Bridge project area and 3D Max models of the four Build Alternatives being considered in this FEIS[12] and the Arthur Kill Lift Bridge. Buildings were extruded up from the footprints on the CAD base map to approximate their height and volume. Streets were added as well to fill out the area.

After the three-dimensional features were developed, an oblique view was selected, and a light was placed in the modeled scene to represent the sun on four different days of the year and at three times per day. The findings of this exercise are presented below, accompanied by select diagrams which illustrate the times with greatest shadows. A discussion of shadow impacts on nearby biotic communities is provided in Section 5.13.

While some of the most representative shadow diagrams for this impact evaluation are presented below, a full set of shadow diagrams prepared for March 21st (spring equinox), June 21st (summer solstice), September 21st (fall equinox) and December 21st (winter solstice) for all Build Alternatives is provided in Appendix F.2.

[12] As illustrated in the accompanying studies, the deck and piers of the proposed bridge would cast the strongest shadows on the surrounding land while the main span would largely cast shadow on the Arthur Kill.

5.9.4.2 No-Build Alternative

Since the No-Build condition is assumed to consist of minimal new construction and would very closely resemble existing conditions in the Goethals Bridge Study Area, the No-Build Alternative was not modeled for shadows. Refer to Section 4.10.3.2 for a description of the existing shadows cast by the bridge and surrounding structures during different days of the year and different times of day.

5.9.3.3 Build Alternatives

As described above in the visual impact assessment, the four bridge alignment alternatives under consideration would all be considerably wider than the existing Goethals Bridge. As such, the shadows they cast would be wider than the existing shadows and particularly perceptible in the afternoon hours of all days evaluated. However, with the exception of the morning hours in March, June and September, the shadows always would fall north of the bridges and, therefore, would affect only industrial and manufacturing facilities, the Arthur Kill and adjacent wetlands to the north (similar to the current situation, described in Section 4.10).

Except for the small residential enclave on Krakow Street, Bay Way and Amboy Avenue, no sensitive land uses in the area would be affected by the proposed shadows. Both Southern Alternatives would remove all of the homes in the Krakow Street vicinity and the Existing Alignment North would displace the homes fronting only on Krakow Street itself, leaving the others on Amboy Avenue and Bay Way. These remaining homes and yards would be affected in the morning hours by shadows from the Northern Alternatives, particularly the Existing Alignment North Alternative, which would be closer to the homes (and wider) than the existing bridge. Figures 5.9-7 and 5.9-8 illustrate the shadows predicted for the Existing Alignment South and Existing Alignment North, respectively, at 9 a.m. on June 21.

Given the short duration of the predicted shadow in the early morning hours on the north side of the homes, this impact is not considered to be adverse.

No publicly accessible open spaces or parks would be affected by any of the predicted shadows. The Arthur Kill Lift Bridge would experience a longer shadow in the late afternoon with any of the proposed Southern and Northern Alternatives. However, since it would be less visible in its lowered position in the future, and currently experiences a similar (though shorter) shadow from the Goethals Bridge, the new shadows on the Arthur Kill Lift Bridge would not be considered an adverse impact. Figures 5.9-9 and 5.9-10 illustrate the shadows predicted for the New Alignment North at 3 p.m. on September 21 and December 21, respectively (when the longest shadows would be cast northward).

5.10 Topography, Geology and Soils

5.10.1 Introduction

This section describes the potential impacts that the construction and operation of the new bridge and the demolition of the existing bridge would have on topography, geology and soils of the Goethals Bridge Study Area. This assessment assumes that any necessary erosion and sediment control plans are in place and are being practiced.

5.10.2 Methodology, Approach and Data Sources

Potential impacts to topography, geology and soils in the Goethals Bridge Study Area were characterized based on existing data sources, including surveys conducted by the U.S. Department of Agriculture's

Figure 5.9-7 Existing Alignment South: Shadow Study / June 21, 9AM

Figure 5.9-8 Existing Alignment North: Shadow Study / June 21, 9AM

Figure 5.9-9 New Alignment North: Shadow Study / September 21, 3 PM

Figure 5.9-10 New Alignment North: Shadow Study / December 21, 3 PM

Natural Resources Conservation Service, the U.S. Army Corps of Engineers, the U.S. Geologic Survey, and other secondary sources. Project-specific data were also obtained from previous studies conducted for the Staten Island Bridges Program by the Port Authority.

5.10.3 No-Build Alternative

Under the No-Build Alternative, current geologic processes, such as erosion and sedimentation, would continue at a rate comparable to that which currently exists. No impacts to topography, soils or geology are anticipated under the No-Build Alternative.

5.10.4 Build Alternatives

The impacts discussed below apply to all four Build Alternatives that are being considered in this FEIS.

5.10.4.1 Topography

Construction activities would involve varying degrees of clearing, excavation and grading that would slightly reconfigure the existing topography. Appropriate soil erosion and sediment control measures would be implemented to minimize the loss of soil during excavation and grading. Construction activities would also include the excavation of soils for the placement of new pier structures and establishing permanent access roads for construction, maintenance and security access. Demolition of the existing bridge would also require the laying of metal or wooden mat platforms on marsh surfaces to serve as a temporary road for construction vehicles. These activities would result in no impacts to local topography.

5.10.4.2 Geology

During construction, portions of the Study Area would be reconfigured. Construction and excavation are not expected to adversely affect local geologic features. There are no voids, fissures or unusual geologic conditions evidenced which would affect the construction of any of the four Build Alternatives. There are no Sole Source Aquifers located in the Study Area.

According to the U.S. Geological Survey, northeastern New Jersey and Staten Island are in a region susceptible to an earthquake-generated peak acceleration of approximately 0.2g, with a two percent probability of exceedance in 50 years (USGS 2003). However, according to the design seismic criteria from the NYSDOT, the new bridge is required to be designed for two seismic levels: 1) the Functional Evaluation/Design Level Earthquake, 500-year event; and 2) the Safety Evaluation/Level Earthquake, 2,500-year event. The peak ground acceleration for the rock is 0.06g and 0.244g for the 500-year event and 2,500-year event, respectively. However, according to the code, the peak ground acceleration for the design events can also be obtained through site-specific analysis by using the time histories from the New York City Department of Transportation (NYCDOT). In lieu of these conditions, potential liquefaction and movement of the loose to medium dense, marine/glacial sand will be further evaluated based on ground acceleration determined from a site-specific analysis.

5.10.4.3 Soils

Potential impacts involving soils would be in the form of soil losses due to erosion during construction, despite the use of soil erosion and sediment control measures that would be employed. Soil erosion prior to and following construction is negligible compared to soil erosion during construction. Post-construction erosion rates would be equal to the pre-construction rates once the slopes are fully stabilized with vegetation or stone.

Construction activities that would expose soils would include the excavations for the new bridge pier and tower foundations, construction of the new bridge abutments, any necessary modifications to local roadways, and soil falling from work trucks entering and departing the construction staging and work areas. All four Build Alternatives would involve the demolition of the current Goethals Bridge, the demolition of buildings to be acquired for right-of-way, and the relocation of surface roads (notably the re-alignment of Gulf Avenue and/or relocation of Goethals Road North in New York), with potential increases in the erosion of exposed soils during the construction phase of the Proposed Project.

Soils in the New Jersey portion of the Goethals Bridge Study Area consist primarily of Urban Land, where more than 90 percent of the surface is covered by asphalt, concrete, buildings, and other impervious surfaces. While soil erosion and sediment control measures would be in place, some amount of these Urban Land soils exposed during construction and demolition activities would be washed into the Arthur Kill.

Soils in the New York portion of the Goethals Bridge Study Area consist primarily of pavement and buildings, and Ipswich-Pawcatuck-Matunuck mucky peats. The pavement and buildings soil, which is equivalent to New Jersey's Urban Land unit, is defined as areas in which 80 percent or more of the surface is covered by asphalt, concrete, buildings, or other impervious materials. The Ipswich-Pawcatuck-Matunuck mucky peats (marsh soils) are very poorly drained soils inundated by salt water at high tide. While soil erosion and sediment control measures would be in place, some amount of soils exposed due to construction and demolition activities would be naturally transported to the surrounding wetlands, Old Place Creek, and the Arthur Kill via erosion activities.

All four of the Build Alternatives would require construction of a permanent access road across the marshes in New York for construction of the new bridge piers and main tower, as well as long-term maintenance and security of the bridge. The access road would include fingers to each of the approach piers to facilitate the excavation of the pier foundations for construction of the new bridge. This road would be composed of fill embankments over land and wetlands, while a pile-supported trestle would cross over Old Place Creek. The access roadway would be located well above mean sea level to minimize erosion and to provide for operations under extreme tide conditions.

For each of the Build Alternatives, some of the access road fingers would also extend to the existing Goethals Bridge piers and main tower to facilitate its demolition. Upon completion of demolition of the Goethals Bridge, all fingers would be removed and the marsh soils would be restored to their original grade and re-vegetated.

All approach span piers located within wetlands or open water would be constructed within sheet-pile cofferdams in order to keep earth and water from entering the excavation site so that construction work can be performed in dry conditions. Handling of the water pumped from the cofferdams during construction will be coordinated with NJDEP, NYCDEP, and NYSDEC, as appropriate. This water may need to be pumped into storage tanks to allow suspended sediments to settle before being discharged to the Arthur Kill. The need for any pretreatment of cofferdam water prior to discharge would be identified and addressed in the Special Conditions of the SPDES permit. All of the Build Alternatives have the same number of approach span piers, resulting in similar volumes of excavated soil. As soil excavation would be confined within the cofferdam, no accelerated soil erosion would occur. Excavated soils would be trucked from the site and would not be side-cast or otherwise exposed to erosion processes.

For the two Southern Alternatives, several bridge piers and a bridge tower would be placed in the existing interpier basin on the New Jersey side of the Arthur Kill. This construction would also take place within cofferdams, which would be processed to manage sediment discharge, thus minimizing the release of suspended sediment to the Arthur Kill. A pile-supported trestle would extend to bridge piers and pilings in the open water of the interpier basin during bridge construction, and would be removed following

construction. Potential impacts of in-water work on aquatic biota and water quality are addressed in the Essential Fish Habitat Assessment presented in Appendix H.4.

Any excavated marsh soils would be disposed of off-site or in borrow areas to be identified either during final design or by the contractor, except for that portion which can be used as topsoil for re-vegetation purposes. According to the Natural Resources Conservation Service (NRCS) (formerly known as the U.S. Department of Agriculture's Soil Conservation Service), the marsh soils (Ipswich-Pawcatuck-Matunuck mucky peats) are not erodible when saturated, but become very acidic upon exposure to air and have a high oxygen demand, thus increasing their tendency to erode.

5.10.5 Mitigation

In terms of topography, no mitigation other than erosion and sediment control measures and the restoration of marsh contours in preparation for replanting after the removal of temporary construction access road structures are proposed, since only minimal impacts to topography are anticipated. Also, no mitigation measures are proposed for geology since only minimal impacts on geological resources are anticipated.

Each of the Build Alternatives has the potential to increase soil erosion during construction. Appropriate erosion control measures will be implemented to mitigate adverse impacts to erodible soils, which may include a combination of silt fences, hay bales, diversion ditches, temporary grading, and vegetative or other protective coverings for exposed soils. Many of these methods are extremely effective at reducing sediment loss from construction sites. For example, siltation fencing can reduce off-site loss of sediment by 75 percent. All excavations in wetlands and open water would be conducted from within cofferdams, where water within these cofferdams would be pumped out to settling tanks before being discharged.

Final engineering of the bridge will take into account seismic potential and assess foundation needs to satisfy seismic demands. Additionally, techniques to mitigate liquefaction effects, including stone columns, compaction grouting, jet grouting, and deep cement mixing, will be considered during the final design of the bridge.

In New Jersey, a soil erosion and sediment control plan will be prepared and implemented in accordance with the Soil Erosion and Sediment Control Act of 1975, as amended (N.J.S.A. 4:24-39 et. seq.). The plan will meet the standards of the State Soil Conservation Committee (SSCC), which is divided into 16 soil conservation districts. Union County is included in the Somerset – Union Soil Conservation District. Construction in New York would be performed in accordance with standards and specifications for selection, design, and implementation of erosion and sediment control practices in the latest version of *New York State Guidelines for Urban Erosion and Sediment Control*.

Mitigation to protect open waters along the construction, maintenance and security access road will include the use of pile-supported trestles for water crossings. Erosion and sedimentation control measures will also be implemented during the construction of the access road to protect the adjacent wetlands and uplands.

5.10.6 Summary

None of the four Build Alternatives would adversely affect either the local topography or local geology. However, potential impacts to soils would result during the construction phase, as post-construction erosion is comparatively negligible once slopes are fully stabilized with vegetation or stone. Potential impacts to soils are relatively similar, owing to the proximity of all four Build Alternatives and their similarity in the number of bridge piers, the length of construction and maintenance access roads and other project elements. Adherence to soil erosion and sediment control plans and the use of cofferdams for in-water work and in wetlands will serve to minimize the loss of soil in the construction areas.

5.11 Water Resources

5.11.1 Introduction

This section evaluates the potential impacts to water resources that could result from the construction and operation of the Proposed Project. Following the discussion of impacts from the No-Build Alternative, impacts to groundwater and surface water from the construction phase and operational phase for each of the four Build Alternatives are discussed. After the discussions of impacts to project area water resources, a discussion of mitigation measures designed to avoid and/or minimize impacts to water resources from the Proposed Project is presented.

5.11.2 Methodology, Approach and Data Sources

5.11.2.1 Surface Water Quality

The following documents were reviewed to determine the requirements for addressing stormwater impacts during the construction and operational phases of the project: *NYSDEC Standards and Specifications for Erosion and Sediment Control Plans* (NYSDEC August 2005); NYSDEC State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Municipal Separate Stormwater Sewer Systems, Permit No. GP-02-02 (NYSDEC January 8, 2003); *New York State Stormwater Management Design Manual* (NYSDEC August 2003); *NJDEP Highway Agency Stormwater Guidance Document* (NJDEP August 2004); *NJDEP Highway Agency Stormwater Permit* NJPDES#NJG0155861 (August 1, 2004); *NJDEP Stormwater Best Management Practices Manual* (NJDEP April 2004); and *Technical Manual for Stormwater Permitting* (NJDEP 1999). The results of the review of these documents are provided in the sections below.

5.11.2.2 Groundwater Quality

The documents listed above were also used to address groundwater quality, since stormwater that is not being introduced to surface water will most likely infiltrate the pervious areas and impact the groundwater quality.

5.11.3 No-Build Alternative

5.11.3.1 Surface Water Quality

The primary impact associated with the No-Build Alternative would be that the stormwater runoff from the Goethals Bridge and approach roads would continue to be discharged directly into the Arthur Kill and Old Place Creek without treatment. Existing hard paved surface areas associated with the Goethals Bridge, its approaches and the toll plaza within the Study Area totals an estimated 15.5 acres. The current direct stormwater drainage into the Arthur Kill does not provide a reduction of the pollutant loading caused by the steadily increasing number of vehicles that travel on the Goethals Bridge.

Existing stormwater drainage for elevated bridge surfaces (i.e., approaches on both the New York and New Jersey sides and the main bridge span) consists of open scuppers discharging into the open air a short distance below the roadway surface. Runoff from the scuppers dissipates as it drops to the ground, similar to normal rainfall. A short portion of the existing bridge and approach lanes on the New Jersey side also discharges stormwater into the New Jersey Turnpike stormwater system. Stormwater runoff on the New Jersey side also collects in an isolated wetland between the New Jersey Turnpike and the relocated Bayway Avenue (see Section 5.13) beneath the approach span of the existing bridge. This area

currently acts as a sump for localized runoff and contains approximately one acre of seasonally flooded freshwater wetland.

5.11.3.2 Groundwater Quality

The No-Build Alternative would continue to allow untreated runoff from the Goethals Bridge and approach roads to drain into pervious areas and, therefore, infiltrate into the groundwater, carrying pollutants with it.

5.11.4 Southern Alternatives

The Southern Alternatives (i.e., New Alignment South and Existing Alignment South) have the potential to impact the water quality of the Arthur Kill, Old Place Creek, and the groundwater. Construction activities such as clearing, grubbing, excavations, and the creation of equipment staging areas would expose and disturb the soil in the Primary Study Area, potentially leading to soil erosion. In-water construction, blasting and dredging have the potential to re-suspend bottom sediments. The construction of additional impervious surfaces in the Primary Study Area would lead to increased stormwater runoff volumes. Both Southern Alternatives cross over the interpier basin on the New Jersey side of the Arthur Kill, thereby requiring pier placement within the basin and also require temporary placement of a finger trestle over portions of the interpier basin to provide access during construction.

5.11.4.1 Surface Water Quality

The potential surface water quality impacts are an increase of contaminants and sediments entering the Arthur Kill and Old Place Creek surface waters. Contaminants can enter the waters either adsorbed to sediments or in a dissolved state. Dissolved chemicals, such as hydrocarbons, nutrients and road salt, can enter the surface waters as stormwater runoff. Sediments can enter the water column in two ways: erosion from upland and wetland areas or re-suspension of disturbed bottom sediments.

During the construction phase of the Proposed Project, soil erosion and re-suspension of bottom sediments would be expected to cause the greatest impacts to the surface waters. The primary impact associated with the operational phase of the Proposed Project would be expected to be the increase in roadway runoff associated with stormwater discharged from the proposed new bridge structure and roadways. The following sections describe the possible water quality impacts that may result during the construction and operational phases for either of the Southern Alternatives.

Construction Phase

Impacts related to construction would result from suspended solids due to erosion of soil at the construction site and the subsequent sedimentation in the Arthur Kill and Old Place Creek that would occur. Construction activities include dredging contaminated sediments and dewatering of bridge pier foundations, construction of a permanent trestle over Old Place Creek, construction of a temporary access trestle in the interpier basin, placement of fill for temporary and permanent access roads, and demolition of the Goethals Bridge. Construction sites without erosion control or sediment capture structures in place may contribute 35 to 45 tons of sediment per acre per year (Schueler, 1987). Impacts associated with construction would be minimized by restricting work within water bodies to cofferdams and through implementation of the soil erosion and sediment control plan.

The introduction of suspended solids in the water column could result in increased turbidity, decreased dissolved oxygen levels (due to increases in Biochemical Oxygen Demand (BOD)), and decreased photosynthesis due to increased turbidity. Surface water quality in the Arthur Kill and Old Place Creek could also be affected by additional metal or chemical (organic or inorganic) loadings associated with

sediments. Metals, nutrients, and other chemicals may be released into the surrounding waterways during the dredging, dewatering of cofferdams, and movement of construction material, fuels, and lubricants.

There is the potential for bottom sediment to be re-suspended in the Arthur Kill, Old Place Creek, and the interpier basin during project construction. Some disturbance of bottom sediment would result from placement of cofferdams, installation of trestles, and demolition of the existing Goethals Bridge and its pier protective cells. Cofferdams would be used to minimize sediment re-suspension during dredging for both main and approach piers. Demolition and driving of sheet piles and trestle piles would disturb bottom sediments in the immediate project vicinity; however, resultant turbidity levels are not expected to exceed existing levels which are attributable to tidal action and scouring created by vessel traffic. The sediment re-suspension impacts are expected to be minimal due to the small size of the area to be dredged (less than one acre), and the rapid sediment resettlement that would occur.

Contaminants associated with pore water and those released due to sediment suspension could be discharged into the Arthur Kill or Old Place Creek during in-water construction activities. The release of nutrients such as nitrogen and phosphorous in the Arthur Kill could cause excessive biological growth and ammonia toxicity effects. The potential for organics, metals, and other non-organic contaminants to be released into the water column is highly dependent on site-specific conditions and the physical and chemical properties of the contaminant. Most available information on the mobilization of chemical contaminants into the water column due to re-suspension is from dredged material disposal studies (LaSalle et al., 1991). These studies indicate that the mobilization levels are generally low and highly transient (LaSalle et al., 1991).

The standard elutriate test is appropriate for evaluating the potential for excavated sediments to impact the water column (Lee et al., 1991). This test approximates the fraction of chemical constituents that are potentially available for release into the water column, taking into account the pore water (interstitial water) and the loosely bound (easily exchangeable) fraction of contaminants (Lee et al., 1991). While elutriate testing of sediments immediately in the Primary Study Area was not conducted, some elutriate testing data for northern reaches (north of Rahway River) of the Arthur Kill was reported by the USACE (1988). Eight sediment samples (average: 59 percent sand, 28 percent silt, and 13 percent clay) were tested for mercury, cadmium, PCBs, DDT, and petroleum hydrocarbons. Mixing calculations reported by the USACE (1988) indicated that all of the contaminants tested for would be diluted to near ambient concentrations.

The USEPA's Regional Environmental Monitoring and Assessment Plan (REMAP) conducted sediment sampling during two periods – 1993/4 and 1998 – in the NY/NJ Harbor Study Area. REMAP (USEPA, 2003) reported that chemical contamination is pervasive in the Harbor. Data obtained during the REMAP sediment sampling for metals in sediments is provided in Section 4.12. With the exception of mercury and chromium, sediment concentrations at the REMAP station closest to the primary Study Area (NB211, approximately 0.1 mile away) were detected at concentrations higher than the Effects Range-Low (ERL) sediment guidance criteria but lower than the Effects Range-Medium (ERM) sediment guidance criteria (USEPA, 2003). The concentration detected for chromium was below both the ERL and ERM. However, the concentration of mercury detected was greater than six times the ERM.

Data obtained during the REMAP sediment sampling for toxic organic chemicals is provided in Section 4.12. Concentrations fall in between ERL and ERM levels, except for the pesticides DDT and pp-DDE which exceed the ERL and ERM. Additional data on the dioxin levels in sediments likely to be disturbed, removed, or disposed during the construction of any selected Build Alternative would be collected during the permitting phase of the project. The results of these analyses, and the permitting agencies' decisions, would determine the final construction and dredged material disposal options. The volume of sediment to be disposed of is small, equal to the volume of the bridge footings. Nevertheless, any material to be disposed of or to be placed on site during the construction of the Proposed Project will be evaluated and

conducted in compliance with the Clean Water Act Section 404 (b) (1) *Guidelines for Specification of Disposal Sites for Dredged or Fill Material.*

The expected contaminant levels and small area to be dredged make upland placement of the dredged material the most likely disposal option. Depending upon the contamination levels of the material, the dredged material could require processing to stabilize the contaminants. It is anticipated that processing would be required, but this would be dependent upon results of analytical testing and agency requirements. The sediment characterization plan and placement options for the material would be coordinated with and approved by the USACE and the NJDEP prior to project construction. During the construction phase of the Proposed Project, the dredged material would be temporarily stored on a barge and would later be transported to a facility for processing and/or upland placement.

Site-specific aquatic bioassay and elutriate analysis may be required during the permitting process to determine the type and extent of treatment (if necessary) of effluent water during the suspension of sediments and dewatering activities. Restrictions or limitations on dewatering activities would be determined as part of State Pollution Discharge Elimination System (SPDES) permits issued by state regulatory agencies.

Operational Phase

Stormwater runoff from the existing Goethals Bridge and its associated service access roads currently discharges surface water runoff directly to Old Place Creek and the Arthur Kill with no treatment. The Proposed Project would include the implementation of a Stormwater Pollution Prevention Plan (SWPPP) that would direct and treat the runoff prior to discharge into the surface waters.

Existing hard paved surface areas associated with the existing Goethals Bridge, its approaches and the toll plaza totals an estimated 15.5 acres. Taking into consideration the demolition of the existing Goethals Bridge, construction of the New Alignment South would result in the addition of 21.3 acres of new hard paved surface, for a total hard paved surface area of 36.8 acres. Construction of the Existing Alignment South would result in the addition of 21.1 acres of new hard paved surfaces, for a total hard surface area of 36.6 acres.

Stormwater runoff from roadways contains contaminants including de-icing agents, suspended solids, oil and grease, rust, rubber particulates, and engine coolants. Pollutant loadings during the winter contain an increase in conductivity, suspended solids, chlorides and sulfate concentrations due to deicing salts (M. Leget, C. Pagotto, 1999). Highway stormwater runoff typically contains relatively high concentrations of metals and phosphates as compared to other runoff from other urban areas, reflecting the impact of vehicle emissions (Schueler, 1987).

Metals entering surface waters are often associated with particulates in the water column. These particulates tend to accumulate in bottom deposits through sedimentation and may be re-suspended in the water column through tidal actions, storm events and dredging activities. The highest heavy metal concentrations are usually zinc and lead (Legret and Pagotto, 1999). Lead usually enters the water column in particulate form bound to sediment that will deposit on the bottom of the Arthur Kill. However, the zinc, copper and cadmium usually enter the water column in dissolved form, which can be more harmful to the aquatic life in the water (Legret and Pagotto, 1999).

According to both New York and New Jersey regulations on stormwater, runoff quality must be controlled by Best Management Practices (BMPs). New York State requires that stormwater BMPs be used to capture and treat the water quality storage volume (WQ_v) and thereby must provide 80% Total Suspended Solids (TSS) removal and 40% Total Phosphorus (TP) removal. As per New Jersey's Stormwater Management (SWM) Rules pertaining to runoff quality control, the project must be designed to reduce the post-construction Total Suspended Solids (TSS) load by 80% for new impervious areas and

by 50% for redeveloped existing impervious areas for the water quality design storm, which is a two-hour, 1.25" rainfall event.

Long-term impacts associated with the Southern Alternatives would include increases in the volume of stormwater discharged into the Arthur Kill and/or Old Place Creek, due to the construction of new hard surfaces. However, stormwater will be conveyed to detention basins or other filtration methods that will treat the water for TSS and TP, and the Proposed Project may result in a decrease in pollutant loading. Stormwater treatment structures will not be placed in wetlands. While the development of a detailed SWPPP and final design of the stormwater treatment structures and methods will occur during the subsequent permitting process in coordination with the Borough of Staten Island, City of Elizabeth, NYSDEC, NJDEP, and USEPA following issuance of the Record of Decision (ROD) by the USCG.

5.11.4.2 Groundwater Quality

Construction and Operational Impacts

Groundwater quality could be impacted by construction activities through exposure to contaminated soil, spills, and dewatering and excavation. During both construction and operations phases of the project, oil and gasoline residues on roadway pavement and adjacent soils contaminated with roadway de-icing agents create the potential for groundwater contamination. Potential contamination problems are most likely to occur as a consequence of spills and unprotected storage piles over areas of permeable soils and high groundwater tables.

5.11.5 Northern Alternatives

5.11.5.1 Surface Water Quality

The construction and operational impacts attributable to the two Northern Alternatives being considered for this project (i.e., New Alignment North and Existing Alignment North) would be generally similar to those described for the two Southern Alternatives, except that they would not require bridge piers to be placed within the interpier basin on the New Jersey side of the Arthur Kill. Neither of the Northern Alternatives would require placement of a trestle across the interpier basin for construction access. Bridge piers for the New Alignment North would arise from land, while portions of the main tower footing and two piers would extend slightly into the northern edge of the interpier basin under the Existing Alignment North, which would require cofferdam placement.

Existing hard paved surface areas associated with the Goethals Bridge, its approaches and the toll plaza within the Primary Study Area total an estimated 15.5 acres. Taking into consideration the demolition of the existing Goethals Bridge, construction of the New Alignment North would result in the addition of 23.1 acres of new hard paved surface, for a total hard paved surface area of 38.6 acres. Construction of the Existing Alignment North would result in the addition of 24.5 acres of new hard paved surface, for a total hard paved surface area of 40.0 acres.

As in the case of the Southern Alternatives, the development of a detailed SWPPP and final design of the stormwater treatment structures and methods will occur during the subsequent permitting process in coordination with the Borough of Staten Island, City of Elizabeth, NYSDEC, NJDEP, and USEPA following issuance of the ROD by USCG.

5.11.5.2 Groundwater Quality

Impacts to groundwater quality associated with the Northern Alternatives are similar to the impacts associated with the two Southern Alternatives.

5.11.6 Mitigation of Impacts

During the construction phase for any of the four Build Alternatives, impacts due to the increase of Total Suspended Solids (TSS) and turbidity and the release of metals and chemicals from the sediment into the water column would be mitigated through controlling soil movement and minimizing the re-suspension of sediments in the water column. The methods that will be used to achieve this will be specified in the Soil Erosion and Sediment Control Plan that would be developed prior to the initiation of field activities. This plan will specify the BMPs that will be used to minimize the impacts of construction. Control measures that may be used to meet the conditions of the permit include hay bales, silt fences, dikes, swales and cofferdams. In addition, the discharge of dredged material (if necessary for off-site disposal) and/or placement fill material into navigable waters as required for the construction of the Proposed Project, would be performed in compliance with the Clean Water Act Section 404 (b) (1) *Guidelines for Specification of Disposal Sites for Dredged or Fill Material*.

Operational impacts due to the increase of runoff, and thus the increase in pollutant loading, will be minimized through the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP). Pursuant to the stormwater quality requirements of the *Stormwater Management Rules* at N.J.A.C. 7:8, the mitigation measures implemented will provide a reduction of the average annual TSS load by 80 percent and will reduce the average annual nutrient load by the maximum extent feasible. Following the *New York State Stormwater Management Design Manual* (ECL Article 17 of the New York State Conservation Law, Water Pollution Control), the water quality volume (WQ_v) must be captured to treat 90 percent of the average annual stormwater volume. The WQ_v is directly related to the amount of impervious cover at the project site. Stormwater BMPs used to capture and treat the WQ_v must provide 80 percent TSS removal and 40 percent Total Phosphorus (TP) removal.

Based on preliminary design evaluations, it was concluded that a TSS reduction of 80 percent can be achieved through the use of the following BMPs: bioretention system, constructed stormwater wetland, infiltration structures, infiltration basin, sand filter, vegetative filter or wet pond. These BMPs can also be used for nutrient removal, with infiltration basin, bioretention basins and sand filters providing the higher nutrient removal rates.

In addition, the project must comply with the storm drain inlet design standard provided in the *NJDEP Highway Agency Stormwater Guidance* (August 2004) to control solid and floatable material entering the Stormwater inlet. In New York State, the project must comply with standards contained in the *New York State Stormwater Management Design Manual*.

Permits, including compliance with associated mitigation requirements, will be requested for the Proposed Project for various activities in New York State and New Jersey, including the following:

- NYSDEC Joint Permit with the U.S. Army Corps of Engineers, including a Water Quality Certification, Section 404(b)1, New York State ECL Article 15, Title 5 permit for filling and excavating activities in navigable waters;
- NYSDEC – New York State ECL Article 17, Titles 7 and 8: Pollution Discharge Elimination System (PDES) for Stormwater discharges generated during construction activities and post-construction activities. A Notice of Intent (NOI) should be submitted for stormwater discharges associated with construction activities along with an Erosion and Sediment Control Plan and SWPPP that addresses runoff quality. If the SWPPP is certified to have been developed in conformance with the NYSDEC's technical standards, the project may obtain coverage under the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity within five (5) business days after the NYSDEC's receipt of the NOI. However, if the project deviates from the NYSDEC technical standards, 60 days from the

NYSDEC's receipt of the NOI must be allowed before coverage under the general permit can be obtained and additional information may be requested from the NJDEP within this 60 day period;

- NJDEP Land Use Regulation Permits, including a Water Quality Certification and Waterfront Development;
- New Jersey Pollutant Discharge Elimination System, N.J.A.C. 7:14A, including a NJPDES request for Authorization for Stormwater Discharges Associated with Construction Activities, and the NJPDES R-12 Highway Agency Stormwater General Permit regulating stormwater discharges during construction and post-construction, respectively; and
- New Jersey Stormwater Management Rules, N.J.A.C. 7:8 requiring "major development" projects to address runoff quantity, groundwater recharge and runoff quality.

The Port Authority has conducted preliminary SWPPP design coordination with NYSDEC on June 19, 2009,[13] and with NJDEP on December 15, 2009 in order to discuss how the Soil Erosion and Sediment Control Plan and SWPPP would eventually be developed for the construction and operation of the Proposed Project, as follows:

- During the June 2009 meeting, NYSDEC indicated its preference for redirecting stormwater to remote, in-line filters (proprietary devices) or central installations for treatment rather than allowing for free-fall from the new bridge main span in exchange of treating stormwater in other nearby impervious areas that are currently not being treated. Recognizing the design complexities as well as the cost and environmental constraints for efficiently treating the bridge stormwater runoff in an area surrounded by protected wetlands, NYSDEC suggested that Port Authority prepare an Alternatives Analysis for stormwater management systems, evaluating the costs and environmental constraints of a stormwater catchment and treatment system relative to other stormwater management alternatives. NYSDEC further agreed that the Port Authority should conduct this evaluation during the final design and SPDES permitting process.

- In New Jersey, the level of design complexities will be less than in New York given the more urbanized/developed nature of the surrounding environment underneath the NJ Approach Span. To that effect, preliminary design concepts were further advanced and provided to the NJDEP in a Draft Engineering Report that directly discusses and meets the requirements of New Jersey Administrative Code (N.J.A.C.) Title 7; specifically, N.J.A.C. 7:13 – State of New Jersey Flood Hazard Area Control Act Rules and N.J.A.C. 7:8 – State of New Jersey Storm Water Management Rules. In consultation with NJDEP, it was determined that the regulated activities associated with the Proposed Project would not be subject to flood storage volume displacement limits because they would be located in a tidal flood zone (NJAC 7:13-10.4(d).1). In addition, stormwater quantity (i.e., runoff volume) reduction for a new outfall into the Arthur Kill would not be necessary since the water surface elevations are governed by tidal influences, and not by fluvial influences. In regards to stormwater quality, it was also concluded that the SWPPP and its proposed BMPs would actually exceed both TSS-reduction requirements of 80 percent for new impervious areas and of 50 percent for redeveloped existing impervious areas. Therefore, the conceptual SWPPP appears satisfactory (without the need for a waiver) so that the water quality requirement would be met by a series of structural BMPs; specifically, sand filters that are typically considered vegetative and environmentally sound. In order to protect the adjacent properties from potential flooding, those BMPs would also have a design capacity for the NJDEP Water Quality Design Storm

[13] In addition to a meeting on 6/19/09, a subsequent phone conversation was held on 9/17/09 with John Cryan, Regional Permit Administrator for NYSDEC-Region 2.

and would in turn be connected to a drainage channel designed with a flood control system to collect the runoff from the 100-year storm event before emptying into the Arthur Kill.

5.11.7 Summary

Potential impacts during the construction phase of the Proposed Project include soil erosion and re-suspension of sediments in the surface waters. These impacts would be minimized through the development and implementation of a Soil Erosion and Sediment Control Plan, and the use of cofferdams during dredging and in-water construction activities.

Depending on the specific Build Alternative, the Proposed Project would result in an increase of between 21.1 and 24.5 acres of impervious surface to the Primary Study Area, with the New Alignment South (Preferred Alternative) increasing impervious surface by 21.3 acres (see Table 5.11-1). This would result in increased volumes of stormwater discharged into the Arthur Kill and Old Place Creek. Pollutant loadings would increase due to the larger traffic volume and the wear and tear of the motor vehicles using the replacement bridge and its access roads. However, the implementation of a SWPPP and treatment of stormwater runoff from the new bridge (via detention basins or other filtration methods) will ensure that TSS and TP are removed from stormwater prior to discharge, in accordance with applicable New York and New Jersey regulations. Stormwater from the existing Goethals Bridge discharges directly into the surface waters without treatment; thus, the impacts to surface waters, groundwater, and wetlands during the operational phase of the Proposed Project are not only expected to be minimal, but also to be an improvement from current conditions.

TABLE 5.11-1
SUMMARY OF NEW AND REDEVELOPED IMPERVIOUS AREAS

Alternatives	**Increase in Impervious Area** (Acres)	**Total Impervious Areas** (Acres)
No Build Alternative	0	15.5
Existing Alignment South	21.1	36.6
New Alignment South	21.3	36.8
Existing Alignment North	24.5	40.0
New Alignment North	23.1	38.6

Source: Berger/PB, 2008

The Proposed Project would result in the disturbance of greater than one (1) acre; therefore, it is required by the NYSDEC and the NJDEP that coverage under the General Stormwater Permit for each state be obtained, or a NYSDEC State Pollutant Discharge Elimination (SPDES) Permit (New York State ECL Article 17, Titles 7 and 8) and NJPDES R-12 Highway Agency Stormwater General Permit be obtained. In addition, a SWPPP would need to be developed, approved and implemented to prevent and minimize water quality and wetland impacts from stormwater runoff during post-construction activities. The SWPPP would:

- Comply with applicable design and performance standards;
- Ensure long-term operation and maintenance of BMPs;
- Comply with standards to control passage of solids and floatable materials through storm drain inlets; and
- Reduce the discharge of pollutants to the maximum extent possible.

While preliminary stormwater management concepts have been discussed with NYSDEC and NJDEP, final plans for the Soil Erosion and Sediment Control Plan and SWPPP will be developed after the issuance of the Record of Decision and during the New York SPDES permitting process and the New Jersey Waterfront Development permitting.

5.12 Floodplains

5.12.1 Introduction

This section evaluates the potential impacts to floodplains that could result from the Proposed Project. Following the discussion of impacts from the No-Build Alternative, impacts to floodplains from construction of each of the four Build Alternatives including demolition of the existing bridge are herein discussed along with any associated mitigation needs.

5.12.2 Methodology, Approach and Data Sources

Water-surface elevations for flooding along the Arthur Kill and its Staten Island tributaries were calculated and presented in the 1983 and 2006 versions of the Flood Insurance Study (FIS) for New York City (FEMA 2001, 2006). Flood elevations for the City of Elizabeth, New Jersey, were calculated in the 2001 Union County FIS. The impacts of fluvial flooding, coastal flooding caused by hurricane surges, and coastal flooding caused by nor'easters were calculated separately and then combined using probabilistic techniques.

A coastal stillwater analysis was performed by FEMA for the Arthur Kill and all of the adjacent embayments and inlets. Coastal flooding due to hurricanes and nor'easters was simulated by two mathematical models, one to generate surges from hurricanes over the continental shelf and the other to propagate the surge inland through the New York Bight and into the harbor and bays. A different set of models was developed which included a nor'easter wind field algorithm to simulate the characteristics of nor'easters. The models were calibrated and verified using four hurricanes and 13 nor'easters.

The Joint Probability Method was used to develop a function relating stillwater elevation to recurrence interval for a range of storm conditions. Hurricane and nor'easter frequency curves were combined by summing annual exceedance probabilities to develop the 100- and 500-year flood elevations for the Study Area.

5.12.3 No-Build Alternative

Within the Primary Study Area, both shores of the Arthur Kill and the length of Old Place Creek are included in 100-year flood zones. The base flood elevations for these areas vary from eight to nine feet (referenced to the National Geodetic Vertical Datum of 1929). On the New York shore, the 100-year flood area extends back to the existing bridge toll plaza.

Five-hundred year flood levels occur on the higher elevation portions of Old Place Creek, especially along the berm which separates Old Place Creek's channel from the GATX facility property to the south. Under the No-Build Alternative, the Proposed Project would not be undertaken and the Goethals Bridge would remain in its current location and configuration. As a result, no change will occur in flood levels in the vicinity of the bridge, or changes to fill within the floodplains.

5.12.4 Build Alternatives

The replacement of the Goethals Bridge will require construction within the 100- and 500-year floodplains of the Arthur Kill and Old Place Creek. Bridge piers and towers would be constructed in the

floodplains under any of the four Build Alternatives being considered. The placement of these structures will displace some floodplain volume. The change in flooded area associated with each Build Alternative is a function of the change in the footprint areas that would result from the footings of the new bridge towers, as well as fill associated with the construction, maintenance and security access road. The footprint area associated with any of the four Build Alternatives in the floodplain would increase in comparison to the existing bridge and the No-Build Alternative because of the need for larger bridge piers to support the wider bridge decks carrying more traffic lanes than at present, and the need for a permanent access road to the bridge piers and towers. The actual footprint areas within the 100- and 500-year floodplains would vary according to each Build Alternative, and these differences are presented separately below for each Build Alternative. However, since the fill is entirely within tidal water bodies, no impacts to the flood heights are anticipated.

In New Jersey, the Stream Encroachment, Flood Hazard Area Control Act (N.J.A.C. 7:13) Rules apply to development projects within regulated flood hazard areas. The Goethals Bridge spans the Arthur Kill, which is listed in N.J.A.C. 7:13-1.3 as a tidal waterway, and is not regulated under the Flood Hazard Area Control Act. Therefore, a Stream Encroachment Permit is not anticipated to be required for any of the Build Alternatives. Based on preliminary design coordination with NJDEP, a drainage channel (designed to withstand the 100-year storm event) would be built into the proposed Stormwater Pollution Prevention Plan (SWPPP) in order to protect the adjacent properties from potential flooding on the New Jersey side of the Proposed Project (see Section 5.11.6 for more details).

In New York, any proposed activity by state agencies in a floodplain is regulated under Flood Plain Management Criteria for State Agencies (6 NYCRR Part 502). Although the Goethals Bridge is operated by the Port Authority, which is a public authority, the bridge spans the Arthur Kill, which is a tidal waterway; therefore, a Flood Plain Management Variance can be requested stating that the project will not result in increased flood heights.

5.12.4.1 New Alignment South

The total area of new fill within the 100- and 500-year floodplains is anticipated to be approximately 8.0 acres and 8.6 acres, respectively, with the New Alignment South. However, this incremental amount of fill will be reduced by 0.5 – 0.75 acre upon the demolition of the existing bridge and its associated piers.

5.12.4.2 Existing Alignment South

The total area of new fill within the 100- and 500-year floodplains for the Existing Alignment South is anticipated to be approximately 7.0 acres and 8.0 acres, respectively. However, this incremental amount of fill will be reduced by 0.5 – 0.75 acre upon the demolition of the existing bridge and its associated piers.

5.12.4.3 New Alignment North

The total area of new fill within the 100- and 500-year floodplains for the New Alignment North is anticipated to be approximately 6.7 acres and 7.8 acres, respectively. However, this incremental amount of fill will be reduced by 0.5 – 0.75 acre upon the demolition of the existing bridge and its associated piers.

5.12.4.4 Existing Alignment North

The total area of new fill within the 100- and 500-year floodplains for the Existing Alignment North is anticipated to be approximately 6.7 acres and 7.8 acres, respectively. However, this incremental amount

of fill will be reduced by 0.5 – 0.75 acre upon the demolition of the existing bridge and its associated piers.

5.12.5 Mitigation

No mitigation is required for any of the Build Alternatives being considered since the proposed fill is entirely within tidal water bodies and no impacts to the flood heights are anticipated.

5.12.6 Summary

The area of total new fill within the 100- and 500-year floodplains associated with each of the four Build Alternatives is summarized in Table 5.12-1, although the incremental fill for each would likely be reduced by 0.5 – 0.75 acre once the existing bridge is demolished. Due to the fact that the proposed fill in each case would be entirely within tidal water bodies, no impacts are anticipated and no mitigation is required.

TABLE 5.12-1
AREA OF FILL WITHIN THE 100- AND 500-YEAR FLOODPLAINS BY ALIGNMENT ALTERNATIVE

Build Alternatives	100-Year Floodplain (Acres of fill)	500-Year Floodplain (Acres of fill)
New Alignment South	8.0	8.6
Existing Alignment South	7.0	8.0
New Alignment North	6.7	7.8
Existing Alignment North	6.7	7.8

Source: Goethals Bridge Replacement Alternative Design Plans by the Port Authority and HNTB, 2007/2008.

5.13 Biotic Communities

5.13.1 Introduction

This section evaluates the potential impacts to biotic communities that could result from the construction and operation of a new bridge and the demolition of the existing Goethals Bridge. The section discusses potential impacts to aquatic communities, vegetative habitats, regulated wetlands, wetland restoration sites, wildlife, and threatened and endangered species that would occur within these communities. Following the discussion of No-Build Alternative impacts, the Build Alternatives are discussed in terms of general impacts related to each type of biotic community aspect, but which are not specific to each Build Alternative. After the discussions of general impacts, specific impacts for each of the four Build Alternatives are also presented for each type of biotic community aspect, as appropriate.

5.13.2 Methodology, Approach and Data Sources

Impacts were analyzed in relation to their potential duration (i.e., construction and operation). Construction impacts are directly related to project construction and occur prior to completion of construction (2014). Operational impacts are related to the operation effects of the new structure(s) and were analyzed for the project design year (2034). Impacts are presented in terms of direct (e.g., loss of flight ability due to oil/grease, displacement of species, etc.) and indirect (e.g., habitat loss, wetland disturbance, etc.) impacts from construction and operations.

5.13.2.1 Aquatic Communities

A comprehensive literature and data search was used to assess the potential impacts of the proposed bridge replacement construction on aquatic communities in the Study Area. Of particular value to this assessment are the data from ongoing ichthyoplankton and bottom trawl surveys of the Aquatic Biological Monitoring Program performed by the U.S. Army Corps of Engineers (USACE), and various other industry-sponsored entrainment/impingement studies conducted in the Arthur Kill. The Summary of Essential Fish Habitat (EFH) Designation for the NY/NJ Harbor Estuary, various species-specific source documents compiled by the National Oceanic & Atmospheric Administration Marine Fisheries Service (NOAA Fisheries Service) and information collected for the 1997 FEIS for the Staten Island Bridges Program (SIBP) were also used in this assessment. In addition to these primary sources, comments and reviews by various state and federal agencies, primarily the New Jersey Department of Environmental Protection (NJDEP), the New York City Department of Environmental Protection (NYCDEP), the New York State Department of Environmental Conservation (NYSDEC), the U.S. Fish and Wildlife Service (USFWS), and NOAA Fisheries Service have also been incorporated to provide a more complete and accurate assessment of potential impacts to the aquatic resources during the construction and operational phases of the Proposed Project.

5.13.2.2 Vegetative Habitats

Direct impacts on habitat and vegetation, for both construction and operational stages, were estimated using construction and layout dimensions of bridge pilings, cofferdams, and access roadways for each of the Build Alternatives. Plan layouts of temporary (e.g., cofferdams, finger access roads) and permanent (e.g., bridge pilings; construction, maintenance and security access roads; road realignments; etc.) structures were overlaid with existing ecological communities to estimate areas of impact for each Build Alternative.

5.13.2.3 Regulated Wetlands

Impacts to regulated wetlands were identified and quantified by overlaying plans of the four Build Alternatives onto the maps of delineated wetlands and calculating the areas of impact for each wetland area. This was then quantified in a matrix showing a side-by-side comparison of potential wetland impacts for each of the Build Alternatives.

The qualitative methodology used for assessing impacts from shading was conducted using the results of the shadow analysis (Section 5.9.3) and assessing potential impacts using scientific literature as well as the conditions of the wetland vegetation under the existing bridge.

Impacts to wetland functions and values were determined using the amount and type of wetland impacted in conjunction with the length of time the wetland would be impacted (permanent versus temporary). Wetland functions and values identified for each wetland in Section 4.14.5.3 of the *Existing Conditions* were used to first list functions and values for impacted wetlands, and then to perform a qualitative assessment of potential impacts to wetland functions and values related to those wetlands.

5.13.2.4 Existing Wetland Restoration Sites

Impacts to existing wetland restoration sites were identified and quantified by overlaying plans of the four Build Alternatives on the identified wetland restoration sites and calculating the area of impact to each site. As noted in Section 4.14.5.4 of *Existing Conditions*, discussions with NYCDPR staff and additional correspondence with state and federal agencies were conducted to identify any wetland restoration sites within the Primary Study Area (i.e. NYSDEC-Salt Marsh Restoration Team).

5.13.2.5 Wildlife

The potential adverse impacts of the Build Alternatives on the wildlife communities and vulnerable species occurring within the Primary Study Area are described for each of the Build Alternatives being considered. Impacts to wildlife habitat were estimated by overlaying the planned construction footprint on the existing ecological communities and calculating the areas of available habitat temporarily or permanently impacted by each Build Alternative.

Information on wildlife diversity, community composition, and habitat preference within the Primary Study Area (Section 4.14.5.5) was used to assess what species are most vulnerable to construction and operational impacts. Details of the proposed Build Alternatives and construction plans used for this analysis are presented in Sections 3.3 and 3.4 of this FEIS. Scientific literature was reviewed for information related to the potential impacts of bridge construction on the wildlife communities and species residing in the Primary Study Area.

5.13.2.6 Endangered and Threatened Species and Critical Habitats

The USFWS reported no federally endangered species, threatened species, or critical habitat within the Primary Study Area (as of April 2009). As a result, the discussion primarily addresses potential impacts to state-listed species in New Jersey and New York. Persimmon is the only state-listed threatened (NY) plant species existing within the Primary Study Area. Although no State-listed endangered or threatened wildlife species in New Jersey have been identified in the Primary Study Area, the State-listed endangered or threatened wildlife species in New York that have been identified within the Primary Study Area include the persimmon, peregrine falcon, northern harrier, pied-billed grebe and the least bittern (Section 4.14.5.6). Impacts to those species are not likely to differ between the four Build Alternatives, so a general discussion of impacts is presented in Section 5.13.4.6 of this FEIS.

Information on the endangered and threatened species currently or historically residing in the Primary Study Area (Section 4.14.5.6) was used to assess what species are most vulnerable to construction impacts and the most suitable mitigation strategies. Details of the proposed Build Alternatives and construction plans used for this analysis are presented in Sections 3.3 and 3.4 of this FEIS. Impacts to habitat were estimated by overlaying the planned construction footprint on the existing ecological communities and calculating the areas of available habitat temporarily or permanently impacted by each Build Alternative. Available scientific literature was surveyed for information and research related to the potential impacts of the bridge construction on the endangered and threatened species within the Primary Study Area.

5.13.3 No-Build Alternative

5.13.3.1 Aquatic Communities

Recognizing the existing deficiencies of the Goethals Bridge and the need for continued and increasing repair and maintenance of the existing bridge structure, the No-Build Alternative includes future rehabilitation activities in addition to routine repair and maintenance. This work is anticipated to include the replacement of the existing deck as well as various superstructure and substructure maintenance repairs. It is anticipated that the rehabilitation, repair and maintenance work would be conducted on and from the existing decking and superstructure above ground level. As a result, no impacts to the aquatic community are expected, nor are impacts to the special concern species alewife and blueback herring or the candidate species Atlantic sturgeon expected under the No-Build Alternative. No impacts to marine mammals are expected under the No-Build Alternative.

5.13.3.2 Vegetative Habitats

Under the No-Build Alternative, the Goethals Bridge would require future rehabilitation activities in addition to routine repair and maintenance. Although it is anticipated that this work would be conducted on and from the existing decking and superstructure, construction staging areas are also likely to be required. As a result, upland vegetation on and around the construction staging areas could potentially be impacted during such activities.

5.13.3.3 Regulated Wetlands

No impacts to regulated wetlands are anticipated under the No-Build Alternative. Rehabilitation activities as well as routine repair and maintenance on the existing bridge are expected to occur on and from the existing decking and superstructure above ground level. It is anticipated that any required construction staging areas could be located on upland areas, rather than in wetlands. Under the No-Build Alternative, shading impacts to wetlands would be identical to those impacts existing under current conditions. Therefore, no changes in shading impacts would occur to wetlands beneath the bridge. However, minor impacts to wetland functions and values could potentially occur due to accidental fills or spills resulting from rehabilitation activities and bridge repair and maintenance.

5.13.3.4 Existing Wetland Restoration Sites

There would be no impacts to existing wetland restoration sites associated with the No-Build Alternative. Also, under the No-Build Alternative, shading impacts to existing wetland restoration sites would be limited to existing impacts. No additional reduction in sunlight would occur to wetlands beneath the bridge. However, minor impacts to existing wetland restoration sites near the existing bridge could potentially occur due to accidental fills or spills resulting from rehabilitation activities and bridge repair and maintenance.

5.13.3.5 Wildlife

The No-Build Alternative would not result in any wildlife mortality or displacements since construction of bridge piers, construction access roads, and temporary cofferdams would not occur. Required rehabilitation activities and routine repair and maintenance may impact local wildlife communities through visual and noise disturbance, as well as the potential presence of debris due to accidental fills or spills below or adjacent to the existing bridge.

5.13.3.6 Endangered and Threatened Species and Critical Habitats

Under the No-Build Alternative, wetland habitat within the Primary Study Area would not be filled, and would remain as potential foraging habitat for wading birds, including protected species. There would be no impacts to protected aquatic species such as the shortnose sturgeon, sea turtles, or marine mammals.

However, the existing bridge would require periodic rehabilitation activities and routine repairs and maintenance that could potentially cause visual and noise impacts which could deter the peregrine falcon from using the Primary Study Area as foraging, breeding, and nesting habitat.

5.13.4 Build Alternatives

This section presents the impacts to aquatic communities, vegetative habitats, regulated wetlands, existing wetland restoration sites, wildlife and endangered and threatened species that are common to all four Build Alternatives, and as appropriate, that are unique to each Build Alternative.

5.13.4.1 Aquatic Communities

A variety of estuarine aquatic and vegetative habitats have been identified within the Primary Study Area, including a marine intertidal salt marsh system that includes high salt marsh, low salt marsh, mudflats, tidal shallows, and the Arthur Kill (a tidal river). Over the years, the Arthur Kill and its tributaries have been substantially impacted by human industrialization. Considerable wetland acreage has been filled to create dense residential development and heavy industry that includes oil refineries and storage, a large municipal landfill, and transportation infrastructure. Much of the original shoreline has been replaced with bulkheads, rip rap, and docking facilities. The existing aquatic communities in the area are further stressed by heavy loadings of pollutants from municipal wastewater facilities, industrial discharges, landfill leachate, shipping traffic, and stormwater runoff.

Within this existing environment, the proposed construction of the new bridge under any of the four Build Alternatives would add a comparatively limited and temporary impact to the aquatic communities. The following discussions describe how the construction and operational phases of the Proposed Project may cause direct and indirect impacts to the aquatic communities.

Construction Phase

Direct impacts to the aquatic communities may result from marine excavation (i.e., dredging) and blasting associated with the removal of the existing bridge. Indirect impacts to the aquatic communities could result from construction activities that degrade water quality by releasing contaminants and sediments into the water column, and create disturbance within the aquatic habitat. Specific elements of the construction activities that may impact aquatic communities are presented below:

- *Dredging* – The construction of new bridge footings would require some dredging in the New Jersey and New York portions of the Arthur Kill and Old Place Creek. This could cause temporary increases in turbidity and could release contaminants that are present in the river bottom sediments. However, all dredging is proposed to take place within temporary cofferdams that would be placed in the Arthur Kill and Old Place Creek, and tidal wetlands. No open water dredging is proposed. This would minimize the potential for adverse effects to occur, such as silt plumes, re-suspension of contaminants and localized reductions in dissolved oxygen (see Section 5.11). The use of temporary cofferdams also makes it possible to construct the bridge tower footings in a dry environment. Installation of the cofferdam walls, dewatering activities and excavation of the sediments could cause the loss of organisms that are living within the areas occupied by the cofferdam. However, the affected areas are relatively small in the context of the aquatic habitats present within the NY/NJ Harbor Estuary.
- *Demolition of Existing Bridge* – The proposed demolition and removal of the existing bridge has the potential to cause changes in the amount and types of benthic habitat. Removal of existing Pier C and its two protective dolphins in the Arthur Kill would result in the permanent loss of hard attachment surfaces for aquatic biota which require such surfaces. The removal of these structures would allow the natural soft-substrate community to return to this area. Blasting that would be required to remove the existing bridge footings could directly impact the aquatic communities in the vicinity of the bridge. However, in-water components of the Goethals Bridge, including Pier C and its protective dolphins, would be surrounded by cofferdams, demolished and removed in dry conditions in order to minimize impacts to the aquatic community. Removal of the bridge also has the potential to release chemicals, such as lead-based paint, and debris into the Arthur Kill and Old Place Creek, which could cause indirect impacts to the aquatic organisms due to changes in water quality. An analysis of the hazardous materials present in the bridge would be conducted prior to construction, and measures would be taken to avoid any potential releases to the Arthur Kill and Old Place Creek during construction (See Section 5.18). Because most of the construction would occur over water, techniques to avoid spills and limit the amount of debris

falling into the river would be employed. These may include special storage areas for fuel and oil and netting to catch falling debris.

- *Temporary Construction and Permanent Maintenance Access Roads* – The Proposed Project would require the construction of an access road over wetlands and open water in New York and New Jersey (i.e., trestle over interpier basin) in order to provide temporary access during construction of the replacement bridge and demolition of the existing Goethals Bridge, and later to provide permanent access for long-term maintenance and security. Tidal river, tidal creek, mudflat and salt marsh habitats would be impacted during the construction phase. Acreages of impact vary according to the particular Build Alternative and are discussed after this discussion of impacts common to all Build Alternatives.
- *Land Clearing* – Upland vegetation and existing pavement would be removed from the Primary Study Area during construction, which would expose and disturb the soil. This would increase the potential for soil erosion and runoff into Old Place Creek and the Arthur Kill. Standard techniques to minimize soil erosion would be employed, such as the use of silt fences, bio-stabilization and vegetation plantings to stabilize the soil. The development and implementation of a Soil Erosion and Sediment Control Plan would be coordinated with the NJDEP, NYSDEC and county soil conservation districts, as appropriate.
- *Noise and Vibration* – Pile driving would likely be required to construct bridge piers on the New York side of the Arthur Kill. Noise and vibration during construction could potentially affect wetland and aquatic habitats, and cause indirect impacts to the aquatic communities, such as short-term increases in noise and sediment re-suspension. The placement of cofferdams for construction and removal of in-water structures would require sheet pile driving, but this could be accomplished with vibration-powered drivers rather than impact drivers, thus reducing potential noise generation and impacts to aquatic biota.

Plankton

As discussed in Section 4.14.4, the phytoplankton community within the vicinity of the Goethals Bridge is comprised of marine and estuarine species typical of the Hudson-Raritan complex. These organisms drift on the tidal current exchange between Newark Bay and Raritan Bay. Most phytoplankton would pass through the construction area within minutes, due to the tidal currents which range from 0.8 to 1.8 feet per second in the vicinity of the bridge, thereby avoiding most in-water construction activities, (which would be confined to cofferdams and localized in areas at the edge of the channel). Phytoplankton have short life spans and are able to reproduce quickly. Thus, impacts during construction are not expected to be adverse to the phytoplankton community.

Zooplankton are also transported primarily by currents in the Arthur Kill and its tributaries. Zooplankton distribution, however, is also governed by water temperature and salinity as well as the availability of food (phytoplankton). Most zooplankton would pass through the construction area within minutes, thereby avoiding most in-water construction activities, which would be confined to cofferdams and localized in areas at the edge of the channel. Zooplankton have short life spans and are able to reproduce quickly. Thus, impacts to the zooplankton community during construction are not expected to be adverse.

Benthos and Epibenthos

The benthic and epibenthic communities consist primarily of sessile and slow-moving organisms that would be unable to avoid direct project-related impacts to the sediment surface. These species are vulnerable to the temporary changes to the sediment surface that would occur during construction. Specifically, pile driving, cofferdam placement, and dredging within the cofferdams for bridge construction and demolition may cause such temporary changes to the sediment surface.

Excess suspended sediments that may result from land clearing and in-water construction activities have the potential to clog the gills of sessile suspension feeding benthic and epibenthic organisms. Increased turbidity during construction could likely result in the loss of some of these organisms. Only minimal impacts are expected due to the containment of in-water dredging, construction, and demolition within cofferdams and the implementation of the Soil Erosion and Sediment Control Plan. However, the dredging of bottom sediment and construction of the bridge towers and footings would include some loss of organisms and a disruption to the local benthic habitat (less than 1 acre of habitat).

The use of explosives to remove the existing bridge footings is not expected to have a significant effect on benthic invertebrates in the Primary Study Area. Demolition of in-water structures will be performed within cofferdams in order to protect aquatic biota from pressure-related damage.

The distribution and abundance of epibenthos are coupled with the area of hard surface available for settlement. Submerged portions of the existing bridge pier and tower footings, and pier protective cells provide habitat for a potentially diverse epibenthic community. The removal of these structures would result in the loss of the existing epibenthic community living on and near the bridge. However, the removal of these structures to depths below the surrounding river bottom will allow the natural soft-substrate community to return to this area.

Re-colonization is expected to start after completion of the construction of the new bridge structure and a replacement benthic community would begin to appear within weeks. Various studies in the NY/NJ Harbor Estuary suggest that this temporary removal of habitat would result in only temporary and short-term impacts to the benthic community (NJDEP, 1984; LMS, 1984; EEA, 1989(a); EEA, 1989(b)). Forty-five benthic and epibenthic taxa have been identified in the vicinity of the Goethals Bridge (LBA 1992, LMS 1996). When a new disturbance occurs in a local area, there is a reservoir of individuals within the estuary available to colonize the disturbed habitat. Small, opportunistic polychaetes and oligochaetes, as well as pollution-tolerant bivalves such as *Mulinia* spp. are among the earliest taxa likely to colonize the impacted area during this first succession. These species can provide an important food source for larger fish and crab species returning to the habitat. Although all species would not re-colonize at the same rate, most of the community would likely return within a year of the project's completion.

Fish

Many of the species that occur in the vicinity of the Primary Study Area are transient in nature, whereas others are only seasonal visitors. The special concern species alewife and blueback herring have been caught in and around the Goethals Bridge Study Area (USACE 1999, 2002, 2003a, 2003b, 2005, 2006; LMS, 1996).

Potential direct impacts to the fish community would primarily relate to those construction activities that result in fill and that create underwater disturbances, such as dredging, pile driving, and explosions. Small numbers of fish may be lost as cofferdams are constructed and dewatered.

Construction could result in short-term and minor changes in water turbidity. Small turbidity increases may have minor impacts to some species that are sensitive to water quality fluctuations or rely on sight feeding (i.e., winter flounder, bluefish). However, these species would be able to avoid the area of construction. Upon completion of construction, turbidity levels would return to existing conditions and the local habitats would again be available.

The use of barges (for transporting bridge components and as platforms for cranes) as well as temporary access trestles over the interpier basin (for the two Southern Alternatives in New Jersey) during construction of the bridge span and demolition of the Goethals Bridge would cause shading of aquatic habitats in the Arthur Kill. Shading could in turn impair fish foraging ability, especially for shallow-water aquatic habitats, but barges and access trestles in the interpier basin would only be in place on a

temporary basis, and would only cover a small amount of the available habitat in the project area. Additionally, barges in the Arthur Kill would be moved frequently during construction. As for the open-water area of Old Place Creek directly underneath the access road trestle (either at its stage during or post construction), its aquatic habitat and fish foraging abilities would not be significantly impacted due to the transient nature of the fishes visiting Old Place Creek.

Underwater disturbances that create noise and vibration, such as pile driving and excavation, may also prevent local fish species from using the immediate area of disturbance. However, upon completion of construction, these areas would be available to the fish community.

The use of underwater explosives to demolish the existing bridge footings also has the potential to directly impact local fish communities. Fish can be killed by underwater explosions when their gas-filled swimbladder explodes in response to rapid changes in pressure generated by the shock wave (Wiley et al., 1981). Egg and larval fish life stages can also be killed by underwater explosions, depending on their proximity to the explosion (Kostyuchenko, 1973). In order to minimize impacts to fish from the demolition of the Goethals Bridge, in-water components such as Pier C and the protective dolphins would be contained within cofferdams and demolished and removed in dry conditions. Specific demolition methods would be coordinated with the USACE prior to project construction.

The indirect impacts to the fish community would primarily be associated with the short-term effects to forage species. The benthic and epibenthic communities are the primary source of forage species for juvenile fish. However, these impacts are expected to be minimal. These forage communities can be impacted by degraded water quality conditions associated with increased sediment re-suspension and lower dissolved oxygen levels. However, disturbances to these communities would be highly localized and short-term in nature since natural sedimentation and subsequent benthic colonization is expected to occur within months, but no longer than a year following construction completion.

The special concern species alewife and blueback herring ("river herring") appear to be seasonal visitors to the Arthur Kill and its tributaries. Although no river herring eggs or larvae were identified in studies in and around the Goethals Bridge Study Area, it is likely that the area serves as a limited nursery habitat for these species. Potential direct impacts to these species would be limited to a few months in spring, primarily April and May. Adult migrating river herring are highly mobile fish that can avoid most in-water construction activities. River herring do not feed while moving upriver to spawn, however, as adult river herring are largely planktivorous, increased turbidity in the vicinity of construction could impair feeding by post-spawning adults moving out of the estuary through the Arthur Kill. Because of their pelagic nature and because the Study Area appears to be of only marginal habitat value, impacts to river herring from the Proposed Project are expected to be indirect and short term.

During the DEIS Public Comment Period (and as noted in Section 8.3 of this FEIS), several in-water work window restrictions were requested by NMFS and NJDEP. Per NMFS recommendation (Greene, 7/21/09), in-water work should not be conducted between January 1 and June 30 in order to protect winter flounder early life stages and anadromous fish. Also, as stated in an earlier NMFS recommendation (Gorski, 8/5/09), avoiding in-water work from January 1 to May 31 will minimize impacts to migrating river herring, which are important forage species for juvenile and adult bluefish. In addition, the NJDEP (Joseph Corletto, 7/24/09) recommended that the timing restrictions in New Jersey waters to protect winter flounder runs from January 1 to May 31 and the anadromous timing restriction to protect migrating alewife, blueback herring and American shad runs from March 1 through June 30. Therefore, taking into consideration those different recommended work window restrictions, any work undertaken within tidal areas or the open waters of the Arthur Kill for any of the four Build Alternatives would be performed within cofferdams (in dry conditions), which in turn would only be constructed during the allowable July 1-December 31 work window.

Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act, the Arthur Kill has been designated by the NOAA Fisheries Service as Essential Fish Habitat (EFH) for 17 fish species. A Draft EFH Assessment had been prepared and included in Appendix H.4 of the DEIS of May 2009. Based on comments received from NMFS and other agencies during the DEIS Public Comment Period (see Section 8.3 of this FEIS), and taking into account the identification of the Preferred Alternative, the EFH Assessment has been revised and officially submitted to NMFS on May 28, 2010; at the same time as the USCG Bridge Permit Application. This revised assessment includes a detailed analysis of the direct, indirect and cumulative effects of the Proposed Project on those species and life stages for which EFH has been designated, as well as forage species. At this point, it is anticipated that the USCG will perform its formal consultation with NMFS during its regulatory review of the Bridge Permit Application, pursuant to the Magnuson-Stevens Act Provisions for *Federal Agency Consultation with the Secretary* (50 CFR Part 600.920).

Marine Mammals

Small numbers of bottlenose dolphins, harbor porpoises, and harbor seals are occasionally present in the Arthur Kill. These highly mobile marine mammals typically avoid areas of human activity, so their presence near the Goethals Bridge during construction is unlikely. Any dredging or explosions required for in-water construction of the replacement bridge or demolition of the Goethals Bridge would be performed within cofferdams in dry conditions. Potential impacts to marine mammals and their fish prey during the construction phase of the project would be limited to temporary displacement from a relatively small amount of potential habitat.

Operational Phase

The operational phase of the Proposed Project is not expected to result in direct impacts, while relatively minor impacts are expected to aquatic communities. Impacts to the aquatic communities may result from the change in habitat types and increases in stormwater discharge. Specific elements of the operational phase that may result in impacts to aquatic communities are presented below.

- *Habitat Change* – Indirect impacts would include the changes in underwater habitat that would result from the removal of the existing bridge and the construction of new underwater structures. Bridge towers and pier footings would be constructed at the edge of the Arthur Kill and Old Place Creek for both Northern Alternatives, while the bridge tower and at least two pier footings would be constructed in the interpier basin for both Southern Alternatives on the New Jersey side of the Arthur Kill. These structures would replace estuarine aquatic habitat (tidal river, tidal creek, mudflat and salt marsh communities). However, removal of the existing bridge below the sediment line would compensate for some of the loss of benthic habitat.

  In addition, the shallow depths in the New Jersey interpier basin suggests that it is at or near equilibrium conditions and that little or no additional sedimentation would occur. The bridge tower and at least two pier footings in the interpier basin would alter tidal flushing and reduce water velocities in this area. These changes would, in turn, change the rate of sedimentation in some areas, increasing it at some locations and decreasing it in others, but would result in an overall increase in sedimentation. The bottom type would remain as mud, but there would likely be a redistribution of microhabitats within the basin.

- *New Impervious Surfaces* – The construction of additional areas of impervious surface also has the potential to degrade water quality due to the increase in stormwater that would be discharged into the surface waters. However, stormwater from the existing bridge is presently discharged directly into the surface waters with no treatment. The proposed Stormwater Pollution Prevention Plan (SWPPP) for the Proposed Project would adhere to current state regulations and would

include treatment methods that remove solids and contaminants from the stormwater prior to discharge into surface waters (see Section 5.11). A decrease in pollutant loads from stormwater to surface waters and wetlands is expected as a result of the Proposed Project (see details on TSS reductions in Section 5.11.6 of this FEIS).

Plankton

No adverse impacts to the phytoplankton or zooplankton communities are anticipated as a result of the operational phase of the Proposed Project since the new bridge would not affect the movement or quality of water after construction.

Benthos and Epibenthos

Minor shifts in the composition, distribution and abundance of benthic organisms due to change in habitat type would result from the Proposed Project. The proposed bridge towers and pier footings would replace salt marsh, tidal creek, tidal river and mudflat communities. Placement of the bridge tower and at least two piers in the interpier basin in New Jersey under both Southern Alternatives would reduce tidal flushing in the interpier basin. The reduction of tidal flushing would reduce dissolved oxygen levels and increase sedimentation rates, and alter water temperatures in the interpier basin, thereby degrading benthic habitat quality. However, the removal of the in-water components of the existing Goethals Bridge would allow the natural soft-substrate community to return to areas in the Arthur Kill. Although the Proposed Project would result in a net decrease in natural substrate benthic habitat (permanent wetlands/open water impacts ranging from 5.27 to 5.59 acres, depending on the particular Build Alternative), in-water portions of the new bridge would provide additional hard substrate habitat for epibenthic organisms that serve as a food base for many species of fish.

Fish

No impacts to the fish communities of the Arthur Kill are expected to result from the operation of the Proposed Project. Although losses of marsh habitat available to forage fish are expected, these impacts are not expected to adversely affect the local fish community, as these wetland losses would be mitigated by restoring similar habitats in the area. Placement of a main span pier at the mouth of the interpier basin under both Southern Alternatives would reduce tidal flushing in the interpier basin, resulting in reduced dissolved oxygen levels, increased sedimentation rates, and altered water temperatures in this area. While fish use of the interpier basin appears to be limited to small numbers of just a few species, these water quality and habitat changes would reduce habitat quality of the interpier basin, likely resulting in reduced use of this area by fish, particularly forage fish such as bay anchovy and Atlantic silverside. Minor shifts in the distribution and abundance of forage fish and benthic organisms would not adversely affect fish feeding because fish are highly mobile and can easily accommodate minor shifts in their prey populations. Re-establishment of the natural soft substrate and salt marsh habitats following demolition of the Goethals Bridge, as well as new hard substrate habitat provided by new bridge structures would allow the Primary Study Area to remain a food resource for fish during the operation of the Proposed Project.

Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act, and as noted earlier in the discussion of impact for the *Construction Phase* (in Section 5.13.4.1), the USCG will perform its formal consultation with NMFS during its regulatory review of the Bridge Permit Application for the revised EFH Assessment, which has been officially submitted to NMFS for the Preferred Alternative (i.e., New Alignment South).

Marine Mammals

No adverse impacts to marine mammals are expected to result from the operation of the new bridge. The removal of the Goethals Bridge pier protective cells and bridge pier from the east (Staten Island) side of

the Arthur Kill would result in a minor net gain of water column habitat available to marine mammals and their fish prey. Implementation of a SWPPP and treatment of stormwater runoff from the new bridge would also improve water quality for all aquatic biota in the Arthur Kill.

5.13.4.2 Vegetative Habitats

Temporary impacts to vegetated habitats would include the effects of staging areas for equipment, storage of construction materials, and construction of finger access roads that would be removed after construction of the Proposed Project. Although the precise locations of staging areas for equipment and construction materials have not yet been firmly identified, they would not be located in wetlands.[14] While the habitat in these areas would be altered as a result of construction, it would not be permanently lost. Following construction, these areas would be replanted and the existing wildlife habitat would be expected to return to some extent. A comparison of the four Build Alternatives indicated that any of the Build Alternatives would result in temporary, as well as permanent impacts to terrestrial habitat and habitat loss during construction. Permanent impacts would result from increased areas that would be paved or permanently lost as a result of the new bridge pier footings, the permanent construction, maintenance and security access road, and the proposed security fence. The type and extent of impact varies slightly among the four Build Alternatives. Wildlife habitat associated with terrestrial and wetland communities would be lost and fragmented as a result of bridge construction and operation.

Table 5.13-1 presents number of acres of wetland and upland ecological community types impacted by each Build Alternative, including impacts attributed to construction of the permanent access road, the bridge piers and footings, local roadway relocations, and security fence.[15] Figures 5.13-1 and 5.13-2 depict the locations of wetland and upland ecological community types that would be impacted by each of the four Build Alternatives. Figure 5.13-1 depicts the Southern Alternatives while Figure 5.13-2 depicts the Northern Alternatives. As noted in earlier Section 3.4.5 of this FEIS, the MPT plan for any of the four Build Alternatives would also require the construction of a U-turn in the median of I-278 in Linden in order to maintain some local traffic movement during the entire construction period. As a result, such U-turn would include the permanent loss of 0.08 acres of freshwater emergent wetlands and 1.9 acres of successional shrubland uplands in the median of I-278.[16] These additional ecological impacts are also accounted for in Table 5.13-1.

New Alignment South

The New Alignment South would result in permanent impacts to approximately 5.59 acres of wetlands in the Primary Study Area. The majority of wetland impacts would be to high salt marsh habitat, with 4.15 acres impacted. The high salt marsh habitat in the project area is dominated (approximately 90%) by common reed, which does not provide suitable habitat for most species of fish and benthic invertebrates (D. Raichel, et.al. 2003). Smaller amounts of low salt marsh, mudflat, open water, and freshwater emergent wetland would also be impacted. The New Alignment South would result in the permanent loss of 4.04 acres of upland communities. Nearly the entire upland habitat that would be impacted is comprised of successional shrubland, with a small portion being mowed lawn.

[14] Potential locations for staging areas in either New York or New Jersey are discussed in Section 3.4 of this FEIS; however, their exact locations will not be determined until final design.

[15] Finger access roads that would connect the permanent access road to each new bridge pier during construction and to the Goethals Bridge piers for demolition would actually only exist during the construction/demolition period, as they would be removed upon completion of the Proposed Project. However, these finger access roads are assumed to be in place for more than six months and, therefore, are considered for purposes of this analysis to result in permanent impacts, as presented in the table. This approach is consistent with Section 404 permitting requirements as stated by the USACE.

[16] This impact is considered to be permanent since the wetland fill will be in place for greater than 6 months.

TABLE 5.13-1
ACRES OF WETLAND AND UPLAND ECOLOGICAL COMMUNITY TYPES IMPACTED BY THE GOETHALS BRIDGE REPLACEMENT ALTERNATIVES DURING CONSTRUCTION AND OPERATIONAL ACTIVITIES

Impacted Wetland Community Type (acres)	Southern Alternatives		Northern Alternatives	
	New Alignment	Existing Alignment	New Alignment	Existing Alignment
High Salt Marsh	4.15	3.47	1.85	1.88
Low Salt Marsh	0.76	0.87	2.94	2.49
Mud Flat	0.05	0.05	0.23	0.23
Freshwater Emergent Wetland	0.14	0.20	0.14	0.23
Tidal Creek	0.10	0.10	0.40	0.58
Tidal River	0.39	0.58	0.01	0.13
Wetlands Total **	**5.59**	**5.27**	**5.57**	**5.54**

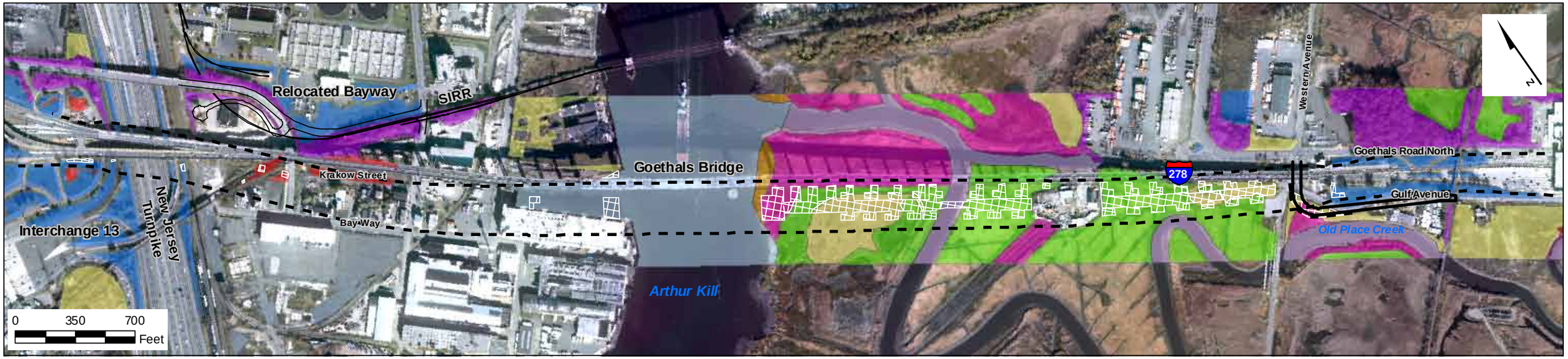
Impacted Upland Community Type (acres)	Southern Alternatives		Northern Alternatives	
	New Alignment	Existing Alignment	New Alignment	Existing Alignment
Mowed Lawn	0.15	0.13	0.15	0.14
Successional Shrubland	3.89	3.08	2.34	2.28
Urban Non-native Forest	0.00	0.00	0.29	0.16
Uplands Total	**4.04**	**3.21**	**2.78**	**2.58**

Total Area	**9.63**	**8.48**	**8.35**	**8.12**

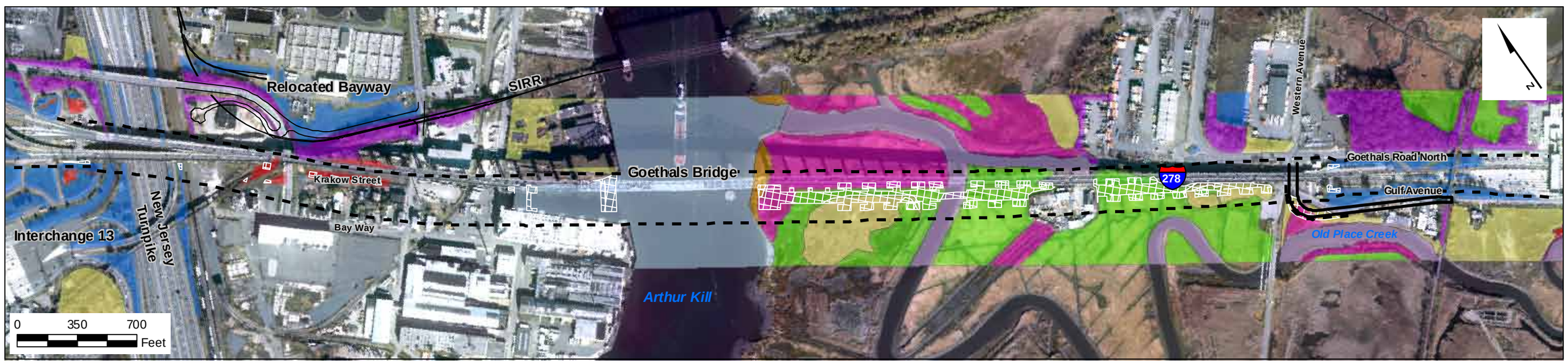
Notes:
Overall, the table includes all areas impacted during the construction and operational periods, including construction of access roads, replacement bridge pilings and piers, relocation/re-alignment of local roadways (i.e., Goethals Road North and/or Gulf Avenue), I-278 U-turn, and security fence.

** The above wetland totals are based on several project elements, including the temporary fingers of the construction access roads, which will be in place for more than six months but which will actually be removed upon project completion. Portions of the wetland totals shown above thus include the following breakdown of acreages specifically related to this non-permanent activity: 1.71 acres for the New Alignment South; 1.09 acres for the Existing Alignment South; 1.58 acres for the New Alignment North; and 1.00 acre for the Existing Alignment North.

Source: Goethals Bridge Replacement Alternative Design Plans by the Port Authority and HNTB, 2007/2008; USACE Jurisdictional Determination-Wetland Delineation by The Louis Berger Group, 2007; additional Field Wetland Delineation within I-278 Median by The Louis Berger Group in November 2009.



New Alignment South Replacement Bridge



Existing Alignment South Replacement Bridge

Legend

- Proposed 50 Foot Right-of-Way
- Proposed realigned Gulf Avenue and its 15-foot limit-of-disturbance
- Ecological Community Impacts - For bridge towers, approach piers, construction access roads, and relocated roadways

Ecological Communities

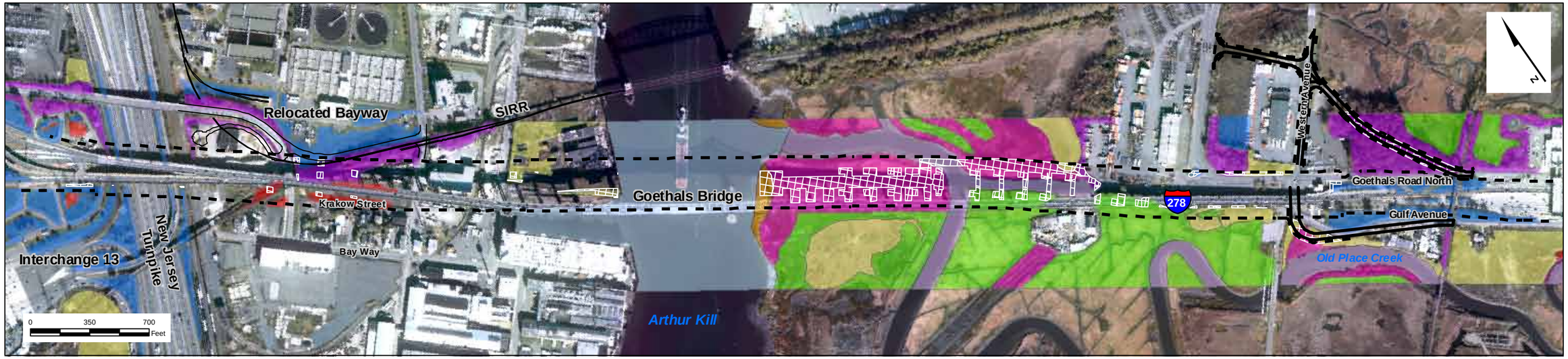
- High Salt Marsh
- Low Salt Marsh
- Mowed Lawn
- Mud Flat
- Reed Grass/Purple Loosestrife
- Successional Shrubland
- Tidal Creek
- Tidal River
- Urban Non-native Forest

Source: Berger/PB, 2006.
Basemapping: Port Authority of New York and New Jersey, 2002.

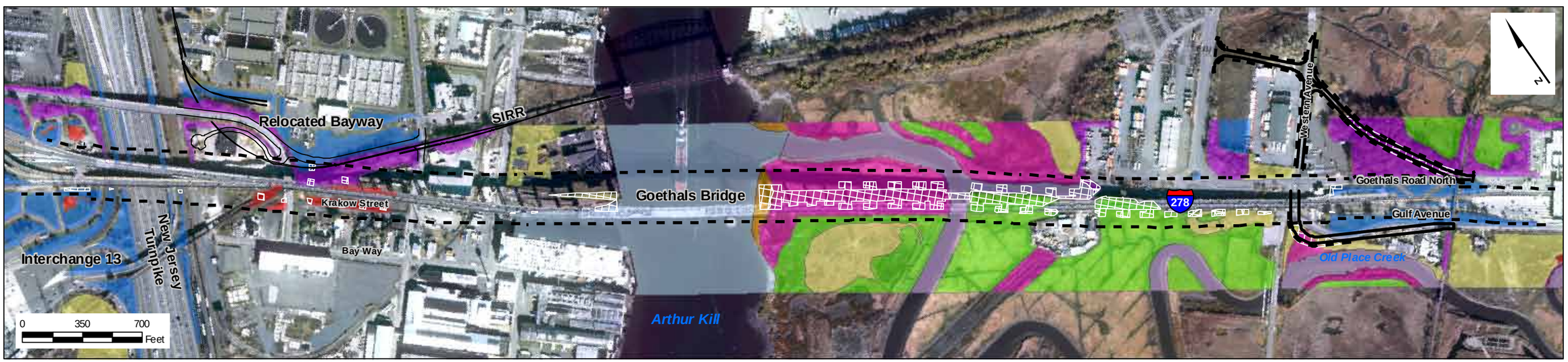
Goethals Bridge Replacement EIS

FIGURE 5.13-1
Ecological Communities Impacts for Southern Alternatives

United States Coast Guard



New Alignment North Replacement Bridge



Existing Alignment North Replacement Bridge

Legend

- Proposed 50 Foot Right-of-Way
- Proposed relocated Goethals Road North and its 15-foot limit-of-disturbance
- Proposed realigned Gulf Avenue and its 15-foot limit-of-disturbance
- Ecological Community Impacts - For bridge towers, approach piers, construction access roads, and relocated roadways

Ecological Communities

- High Salt Marsh
- Low Salt Marsh
- Mowed Lawn
- Mud Flat
- Reed Grass/Purple Loosestrife
- Successional Shrubland
- Tidal Creek
- Tidal River
- Urban Non-native Forest

Source: Berger/PB, 2006.
Basemapping: Port Authority of New York and New Jersey, 2002.

Goethals Bridge Replacement EIS

FIGURE 5.13-2

Ecological Communities Impacts for Northern Alternatives

United States Coast Guard

Existing Alignment South

The Existing Alignment South would result in permanent impacts to approximately 5.27 acres of wetlands in the Primary Study Area. The majority of wetland impacts would be to high salt marsh habitat, with 3.47 acres of impact. Smaller amounts of low salt marsh, mudflat, open water, and freshwater emergent wetland would also be impacted. The Existing Alignment South would result in the permanent loss of 3.21 acres of upland communities. The majority of the upland habitat that would be impacted is comprised of successional shrubland, with the remainder being mowed lawn.

New Alignment North

The New Alignment North would result in permanent impacts to approximately 5.57 acres of wetlands in the Primary Study Area. Low salt marsh would be the most impacted wetland community type, with 2.94 acres of impact. The remaining habitat that would be impacted consists of high marsh, open water, mud flat, and freshwater emergent wetland. Impacts to upland habitat under the New Alignment North would result in the permanent loss of 2.78 acres of upland communities. Upland communities impacted include successional shrubland, urban non-native forest and mowed lawn.

Existing Alignment North

The Existing Alignment North would result in permanent impacts to approximately 5.54 acres of wetlands in the Primary Study Area. Low salt marsh habitat would be the most impacted wetland community with 2.49 acres of total impact. The Existing Alignment North would result in the permanent loss of 2.58 acres of upland communities. Upland communities to be impacted include successional shrubland, urban non-native forest and mowed lawn.

5.13.4.3 Regulated Wetlands

Impacts to wetlands by community type are presented in the preceding discussion (see Section 5.13.4.2). This section provides further discussion of those direct impacts, as well as other indirect impacts (most notably those attributed to wetland habitat fragmentation and shading).

Direct Impacts

Figures 5.13-3 through 5.13-6 depict the type of direct impact to delineated wetlands and regulated open waters associated with each of the four Build Alternatives. In addition, Figure 5.13-7 depicts the total 0.08 acres of impacted freshwater wetlands that would result from the construction of a U-turn in the median of I-278 in Linden in order to maintain some local traffic movement during the entire construction period and for any of the four Build Alternatives (see Section 3.4.5 of this FEIS). Table 5.13-2 also presents the type / source of impact to wetlands in both New Jersey and New York associated with each of the four Build Alternatives, as well as impacts to regulated wetland buffer areas. The temporary impacts included in the tables are those associated with construction of cofferdams, which are anticipated to be in place for less than six months during the construction period for the Proposed Project. Construction staging areas of approximately five acres on each side of the Arthur Kill are required during the entire construction period of the Proposed Project; although the precise locations of these staging areas have not yet been finalized, in no case would regulated wetlands be required for such staging purposes (see Section 3.4.2 of this FEIS).

After construction is complete, total wetland losses would be reduced through the reduction in width of the access road from 36-feet wide to 20-24 feet wide. Further reductions would be gained with the elimination of the access road finger extensions after the demolition of the existing bridge is complete. Table 5.13-2 presents the wetland impacts of each Build alternative by type, source and state.

New Alignment South

As indicated in Figure 5.13-3 and Table 5.13-2, the New Alignment South would permanently impact a total of 5.59 acres of wetlands, including: 1.10 acre from the main bridge alignment (piers and towers); 4.19 acres due to the permanent access road and its associated finger access roads that would be in place for more than six months; 0.19 acre due to the realigned Gulf Avenue; and 0.03 acre due to the right-of-way fence. A U-turn within the median of I-278 would also impact 0.08 acres of freshwater emergent wetlands within drainage ditches for more than 6 months. Temporary impacts would result from the use of cofferdams for less than six months during Proposed Project construction. Temporary wetland impacts associated with the cofferdams would be 0.27 acres. Total combined acreage of permanent and temporary impacts is 5.86 acres.

In addition to the wetlands regulated by the USACE, NYSDEC and NJDEP, regulated wetland buffers by NYSDEC would also be impacted (0.25 acres), as would NJDEP wetland transition areas (1.05 acres).

Existing Alignment South

As indicated in Figure 5.13-4 and Table 5.13-2, the Existing Alignment South would permanently impact a total of 5.27 acres of wetlands, including: 1.18 acres due to the main bridge alignment (piers and towers); 3.80 acres due to the permanent access road and its associated finger access roads that would be in place for more than six months; 0.19 acre due to the realigned Gulf Avenue; and 0.02 acre due to the right-of-way fence. A U-turn within the median of I-278 would also impact 0.08 acres of freshwater emergent wetlands within drainage ditches for more than 6 months. Temporary wetland impacts associated with the use of cofferdams for less than six months during construction would be 0.27 acres. Total combined acreage of permanent and temporary impacts is 5.54 acres.

In addition to wetlands regulated by the USACE, NYSDEC and NJDEP, approximately 0.20 acre of regulated NYSDEC wetland buffers and 1.02 acre of NJDEP wetland transition areas would be impacted.

New Alignment North

As indicated in Figure 5.13-5 and Table 5.13-2, the New Alignment North would permanently impact a total of 5.57 acres of wetlands, including: 0.85 acres due to the main bridge alignment (piers and towers); 4.43 acres due to the permanent access road and its associated finger access roads that would be in place for more than six months; 0.19 acre due to the realigned Gulf Avenue; and 0.02 acre due to the right-of-way fence. A U-turn within the median of I-278 would also impact 0.08 acres of freshwater emergent wetlands within drainage ditches for more than 6 months. Temporary wetland impacts associated with the cofferdams that would be in place for less than six months would be 0.20 acre. Total combined acreage of permanent and temporary impacts is 5.77 acres.

In addition to wetlands regulated by the USACE, NYSDEC and NJDEP, regulated wetland buffers by NYSDEC totaling 0.64 acre and NJDEP wetland transition areas totaling 1.04 acre would be impacted.

Existing Alignment North

As indicated in Figure 5.13-6 and Table 5.13-2, the Existing Alignment North would permanently impact a total of 5.54 acres of wetlands, including: 1.01 acres due to the new bridge structure (piers and towers); 4.24 acres due to the permanent access road and its associated finger access roads that would be in place for more than six months; 0.19 acre due to the realigned Gulf Avenue; and 0.02 acres due to the right-of-way fence. A U-turn within the median of I-278 would also impact 0.08 acres of freshwater emergent wetlands within drainage ditches for more than 6 months. Approximately 0.24 acre of temporary wetland impacts would result from use of cofferdams for less than six months during construction. Total combined acreage of permanent and temporary impacts is 5.78 acres.

NEW JERSEY

NEW YORK

Legend

- Proposed 50-foot Right-of-Way (ROW)
- Proposed realigned Gulf Avenue and its 15-foot limit-of-disturbance
- Construction Access Road Impacts (embankment, trestle or barge)
- Bridge Footing Impacts (approach piers or bridge towers)
- Delineated Wetlands and Regulated Open-Water

Source: Berger/PB, 2006.
Basemapping: Port Authority of New York and New Jersey, 2002.

Goethals Bridge Replacement EIS

FIGURE 5.13-3
Wetland Impacts for the New Alignment South Replacement Bridge

United States Coast Guard

Legend

- Proposed 50-foot Right-of-Way (ROW)
- Proposed realigned Gulf Avenue and its 15-foot limit-of-disturbance
- Construction Access Road Impacts (embankment, trestle or barge)
- Bridge Footing Impacts (approach piers or bridge towers)
- Delineated Wetlands and Regulated Open-Water

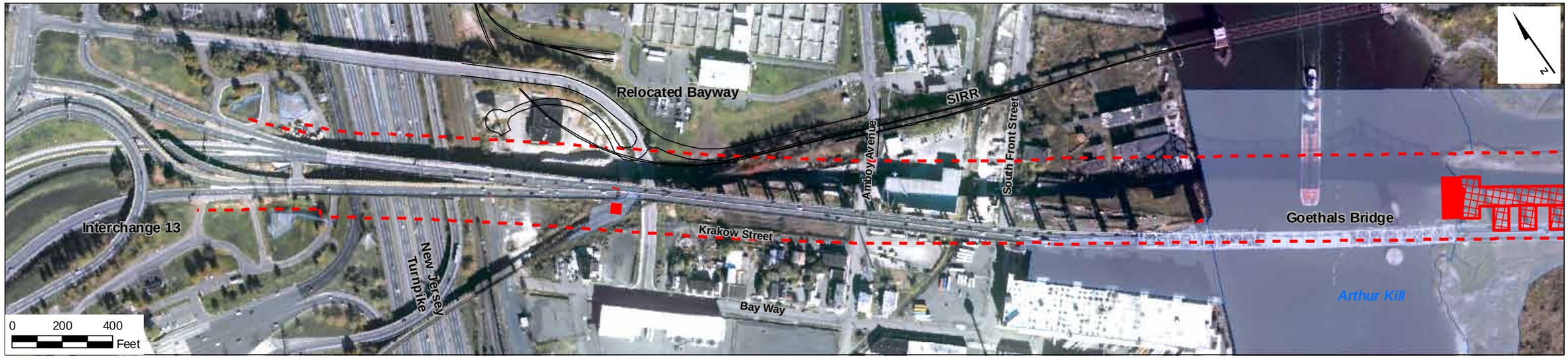
Source: Berger/PB, 2006.
Basemapping: Port Authority of New York and New Jersey, 2002.

Goethals Bridge Replacement EIS

FIGURE 5.13-4

Wetland Impacts for the Existing Alignment South Replacement Bridge

United States Coast Guard



NEW JERSEY

NEW YORK

Legend

- Proposed 50-foot Right-of-Way (ROW)
- Proposed relocated Goethals Road North and its 15-foot limit-of-disturbance
- Proposed realigned Gulf Avenue and its 15-foot limit-of-disturbance
- Construction Access Road Impacts (embankment, trestle or barge)
- Bridge Footing Impacts (approach piers or bridge towers)
- Delineated Wetlands and Regulated Open-Water

Source: Berger/PB, 2006.
Basemapping: Port Authority of New York and New Jersey, 2002.

Goethals Bridge Replacement EIS

FIGURE 5.13-5
Wetland Impacts for the New Alignment North Replacement Bridge

United States Coast Guard

NEW JERSEY

NEW YORK

Legend

- Proposed 50-foot Right-of-Way (ROW)
- Proposed relocated Goethals Road North and its 15-foot limit-of-disturbance
- Proposed realigned Gulf Avenue and its 15-foot limit-of-disturbance
- Construction Access Road Impacts (embankment, trestle or barge)
- Bridge Footing Impacts (approach piers or bridge towers)
- Delineated Wetlands and Regulated Open-Water

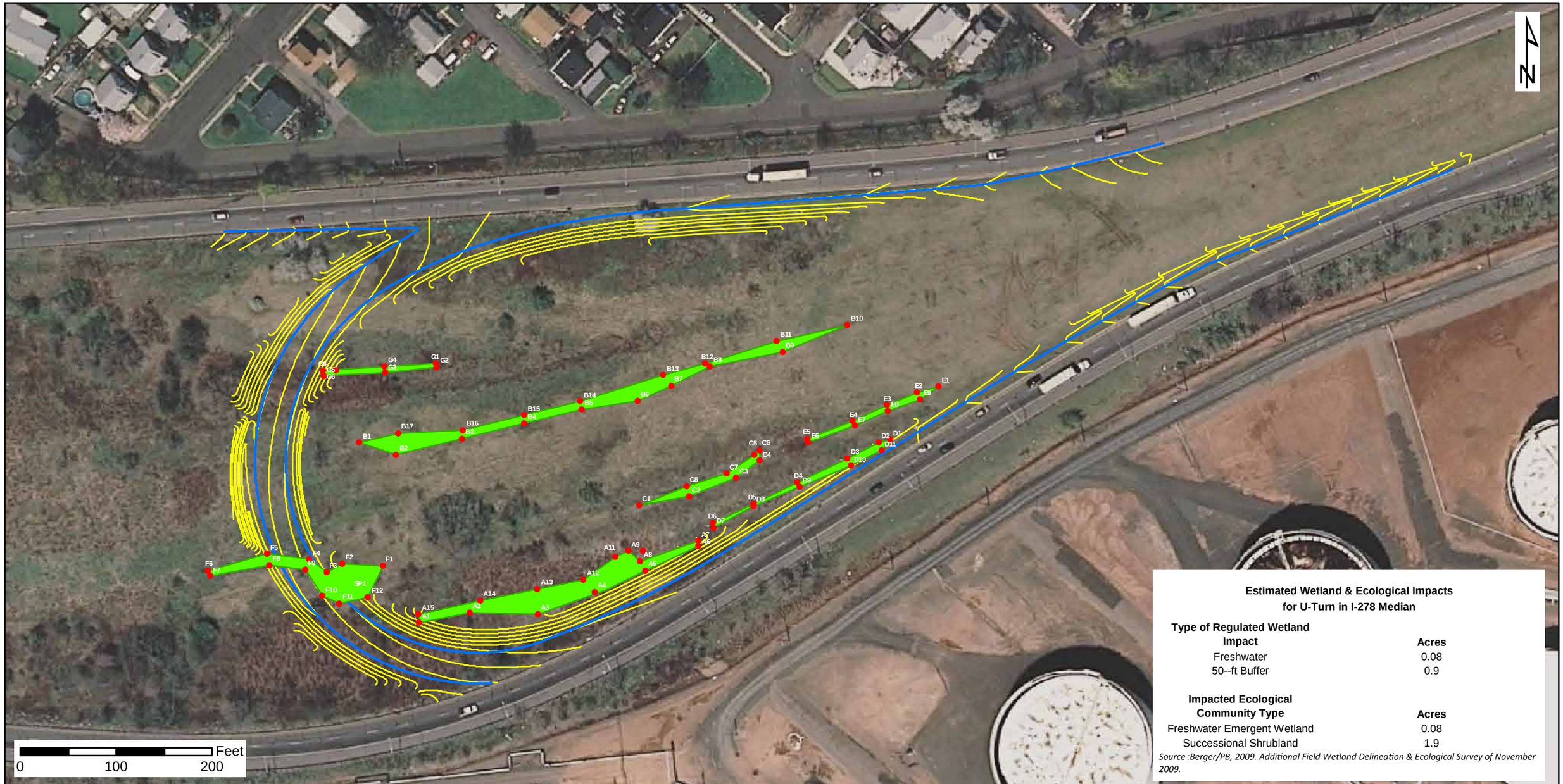
Source: Berger/PB, 2006.
Basemapping: Port Authority of New York and New Jersey, 2002.

Goethals Bridge Replacement EIS

FIGURE 5.13-6

Wetland Impacts for the Existing Alignment North Replacement Bridge

United States Coast Guard



Estimated Wetland & Ecological Impacts for U-Turn in I-278 Median

Type of Regulated Wetland Impact	Acres
Freshwater	0.08
50--ft Buffer	0.9

Impacted Ecological Community Type	Acres
Freshwater Emergent Wetland	0.08
Successional Shrubland	1.9

Source :Berger/PB, 2009. Additional Field Wetland Delineation & Ecological Survey of November 2009.

Legend

- Wetland Flag
- Wetlands
- Edge of Pavement
- Contour

Source: Berger/PB, 2009. Digital Orthophotos, NJGIN 2009.

Goethals Bridge Replacement EIS

FIGURE 5.13-7

Wetland Impacts for the MPT's Temporary U-Turn within I-278 Median

United States Coast Guard

TABLE 5.13-2
WETLAND IMPACTS BY TYPE, SOURCE AND STATE FOR BUILD ALTERNATIVES

Type of Wetland Impact (acres)		Southern Alternatives				Northern Alternatives			
		New Alignment		Existing Alignment		New Alignment		Existing Alignment	
		Wetland	Buffer	Wetland	Buffer	Wetland	Buffer	Wetland	Buffer
PERMANENT WETLAND IMPACT (more than 6 months)									
Permanent Fill (piers/towers)	**NJ**	0.25	0.15	0.31	0.12	0.03	0.14	0.12	0.15
	NY	0.85	0.25	0.87	0.20	0.82	0.14	0.89	0.17
		1.10	***0.40***	***1.18***	***0.32***	***0.85***	***0.28***	***1.01***	***0.32***
Construction/Maintenance Access Roads	**NJ**	0.15	--	0.30	--	--	--	0.04	--
	NY	4.04	--	3.50	--	4.43	--	4.20	--
		4.19	***--***	***3.80***	***--***	***4.43***	***--***	***4.24***	***--***
Realigned Gulf Avenue	**NY**	***0.19***	***--***	***0.19***	***--***	***0.19***	***--***	***0.19***	***--***
Relocated Goethals Road North	**NY**	***0.00***	***--***	***--***	***--***	***--***	***0.50***	***--***	***0.50***
Security Fence	**NJ**	0.01	--	0.01	--	0.01	--	0.01	--
	NY	0.02	--	0.01	--	0.01	--	0.01	--
		0.03	***--***	***0.02***	***--***	***0.02***	***--***	***0.02***	***--***
I-278 U-Turn	**NJ**	***0.08***	***0.90***	***0.08***	***0.90***	***0.08***	***0.90***	***0.08***	***0.90***
Subtotals	**NJ**	0.49	1.05	0.71	1.02	0.12	1.04	0.25	1.05
	NY	5.10	0.25	4.57	0.20	5.45	0.64	5.29	0.67
		5.59	**1.30**	**5.27**	**1.22**	**5.57**	**1.68**	**5.54**	**1.72**
TEMPORARY WETLAND IMPACTS (less than 6 months)									
Construction Cofferdams	**NJ**	0.07	--	0.07	--	--	--	0.02	--
	NY	0.20	--	0.20	--	0.20	--	0.22	--
Subtotals		**0.27**	**0.00**	**0.27**	**0.00**	**0.20**	**0.00**	**0.24**	**0.00**
ALL COMBINED WETLAND IMPACTS									
GRAND TOTAL		**5.86**	**1.30**	**5.54**	**1.22**	**5.77**	**1.68**	**5.78**	**1.72**

Source: Goethals Bridge Replacement Alternative Design Plans by the Port Authority and HNTB, 2007/2008; USACE Jurisdictional Determination-Wetland Delineation by The Louis Berger Group, 2007; additional Field Wetland Delineation within I-278 Median by The Louis Berger Group in November 2009.

In addition to wetlands regulated by the USACE, NYSDEC and NJDEP, regulated wetland buffers by NYSDEC totaling 0.67 acres, and NJDEP wetland transition areas totaling 1.05 acres would be impacted.

Indirect Impacts

The presence of a transportation corridor through a wetland would result in other indirect impacts and possible impairment of wetland functions. As a result of fill placement into wetlands (i.e., direct impacts discussed above) for any of the four Build Alternatives, the Proposed Project would in turn further impair the functions and values of some of the remaining adjacent wetlands. Such impairments, while caused by different factors, would be similar for all Build Alternatives. The Proposed Project would result in habitat fragmentation and shading impacts to the wetland system of Old Place Creek. Other indirect impacts would result from pier/fill proximity effects and/or increased stormwater runoff.

Proximity effects to wetlands adjacent to the new bridge piers are expected to be similar to those currently-observed around the piers of the existing Goethals Bridge. This impairment would reduce the functions and productivity of wetlands in the immediate vicinity of the piers. Impacts around the piers would include shorter vegetation with occasional areas of discoloration. These observed impacts are likely attributable to a combination of soil compaction, grading, underground debris, shading, and roadway runoff effects. The area of impairment varies in the vicinity of different piers but does not extend more than a few feet into the wetlands.

All bridge alignment alternatives would result in a relatively similar increase in impervious surface (i.e., between 21.1 and 24.5 acres, depending on alternative as presented in Section 5.11). There would be corresponding increases in stormwater runoff, ultimately discharged to the Arthur Kill and Old Place Creek, and adjacent wetlands. However, stormwater will be conveyed to detention basins that will treat the water for TSS and TP, and the Proposed Project would result in a decrease in pollutant loading. Stormwater treatment structures will not be placed in wetlands. The Stormwater Pollution Prevention Plan (SWPPP) and final design of the stormwater treatment structures and methods will be developed in coordination with the Borough of Staten Island, City of Elizabeth, NYSDEC, NJDEP, and USEPA during the subsequent permitting process (see Section 5.11.6 of this FEIS).

Fragmentation of Wetland Habitat

Indirect impact to wetland areas involves the fragmentation of contiguous habitat, especially when a linear development isolates one or more areas of contiguous habitat. The effects of fragmentation can range from the reproductive isolation of subpopulations of affected plants and animals to loss of refuge or breeding habitat associated with habitat interior regions, and disruption in wetland hydrologic connectivity.

Under any of the Build Alternatives, the permanent access road and its contiguous right-of-way security fence would bisect and fragment the currently continuous expanse of tidal wetlands of Old Place Creek beneath the Goethals Bridge. The Proposed Project would then most likely have significant adverse fragmentation impacts, which in turn would significantly impede surface water movement, ground-level wildlife movement, and seed distribution of wetland plants. The temporary finger extensions would have similar effects, but these would only be limited to the period of bridge construction and demolition of the Goethals Bridge.

Shading of Wetland Habitat by Overhead Structure

Shading impacts from the Proposed Project were evaluated for the tidal wetlands along Old Place Creek in New York. A detailed Wetland Habitat Shading Analysis is provided in Appendix H.6, where shadow sweeps for the New Alignment South (i.e., the Preferred Alternative) were rendered at different times of

the day (i.e., 9:00 AM, 12:00 Noon and 3:00 PM) with the sun at summer solstice (June 21st) since such period represents the approximate midpoint of the annual growing season in northern latitudes.

Based on the results of the analysis, a 1,000-foot segment between Gulf Avenue and the RT Baker Site (in New York) would be the shading-critical area of concern. For the New Alignment South, and to a lesser extent for the Existing Alignment South, approximately 500 feet of the shading-critical portion of the Proposed Project would actually cover tidal wetlands. Based on the total width of the replacement bridge, approximately 2.4 acres would be in shadow at any given time during the course of each day, however, the placement of that shadow would vary throughout the day, as depicted in Appendix H.6. In addition and as this shade-impacted area would also coincide with the wetland area already impacted by the permanent access road and its embankment slopes, such additional indirect impact to wetlands due to shading is thus expected to be minimal.

For the Northern Alternatives, the area along this shading-critical segment is almost entirely composed of upland areas, so wetland shading would not be a concern.

As the existing Goethals Bridge would also be removed under any of the Build Alternatives (thus eliminating its existing shadow sweeps as depicted in Appendix H.6), it is anticipated that wetland habitat shading impacts under the Proposed Project would likely be insignificant.

5.13.4.4 Existing Wetland Restoration Sites

All of the Build Alternatives are anticipated to have some level of impact to one or more of the existing wetland restoration sites discussed in Section 4.14.5.4 and depicted in Figure 4.14-6 of this FEIS. The specific impacts in this regard as related to each of the four Build Alternatives are presented below. It is noted that demolition of the existing Goethals Bridge would also impact two wetland restoration sites (i.e., Pier D Wetland Restoration and NYCDPR Old Place Creek Marsh),, but to a lesser extent as both sites would be restored in-kind after demolition.

New Alignment South

Construction of the New Alignment South is not expected to impact the 0.74-acre intertidal wetland area that has been restored in 1994 by the New York City Department of Parks and Recreation's salt marsh restoration team (NYCDPR SMRT) beneath the Goethals Bridge adjacent to the Arthur Kill (i.e., NYCDPR Old Place Creek Marsh as referenced in Figure 4.14-6 of this FEIS). However, approximately 0.45 acres of the Pier D Wetland Restoration site, restored in 2002 as mitigation for the installation of a reinforced concrete jacket around the existing Pier D in 1999, would be impacted by construction.

Although this Build Alternative would be constructed further south of the existing bridge, shading of the restored tidal wetlands along the southern edge of Old Place Creek, north of the existing bridge would occur, though as previously discussed, shading impacts are not expected to be significant.

Existing Alignment South

Construction activities would affect approximately 0.04 acre of the 0.74-acre intertidal wetland area that has been restored in 1994 for the NYCDPR Old Place Creek Marsh. Post construction, permanent impacts to the restored intertidal wetland area would result in the same acreage (0.04 acre) for pier placement. Also, the Pier D Wetland Restoration site, restored in 2002, would be impacted by approximately 0.10 acre due to construction.

Shading of the restored tidal wetlands along the southern edge of Old Place Creek north of the existing bridge would occur. Unlike the New Alignment South discussed above, the westbound lanes proposed as

part of this Build Alternative would be located over the existing Goethals Bridge footprint. Therefore, shading of some restored wetland vegetation along Old Place Creek would occur in the same area where shading from the existing bridge occurs, so shading impacts are not expected to significantly increase.

The functions and values of the impacted portion of the NYCDPR SMRT restored wetlands along Old Place Creek and those areas along the Arthur Kill in association with the Goethals Bridge Pier D restoration would be lost for the duration of the construction period. Permanent loss of wetland functions and values, including those related to Fish and Shellfish Habitat and Wildlife Habitat, would occur with the filling of these wetlands.

New Alignment North

Construction activities related to the New Alignment North would impact approximately 0.13 acre of the 0.74-acre intertidal wetland area that has been restored in 1994 for the NYCDPR Old Place Creek Marsh. Post construction, permanent impacts to the restored intertidal wetland area would result in the same acreage loss (0.13 acre) for pier placement. Also, the Pier D Wetland Restoration site, restored in 2002, would be impacted by approximately 0.01 acre due to construction.

Shading of the restored tidal wetlands along the southern edge of Old Place Creek north of the existing bridge would occur. However, this area is already shaded by the existing Goethals Bridge, so shading impacts are not expected to significantly increase.

The functions and values of the restored wetlands along Old Place Creek would be lost for the duration of the construction period. Permanent loss of wetland functions and values, including those related to Fish and Shellfish Habitat and Wildlife Habitat, would occur with the filling of these wetlands.

Existing Alignment North

Construction activities would impact approximately 0.19 acre of the 0.74-acre intertidal wetland area that has been restored in 1994 for the NYCDPR Old Place Creek Marsh. Also, approximately 0.7 acres of the Pier D Wetland Restoration site would be impacted due to construction.

Shading of the restored tidal wetlands along the southern edge of Old Place Creek north of the existing bridge would occur. Unlike the New Alignment North discussed above, the eastbound lanes proposed as part of this alternative would be located over the existing Goethals Bridge footprint. Therefore, shading of some restored wetland vegetation along Old Place Creek would occur in the same area where shading from the existing bridge occurs.

The functions and values of the restored wetlands along Old Place Creek would be lost for the duration of the construction period. Permanent loss of wetland functions and values, including those related to Fish and Shellfish Habitat and Wildlife Habitat, would occur with the filling of these wetlands.

5.13.4.5 Wildlife

Construction Phase

Direct Impacts

Wildlife may be impacted during the project construction phase as a result of construction vehicular traffic, visual and noise disturbance, excessive vibration, degraded air and water quality, and fluid spills. Wildlife mortality or temporary displacement of individuals to nearby habitat refuges may result from these impacts. Birds and large mammals are more likely to be displaced from the site because of their

mobility while smaller burrowing mammals and slower moving amphibians and reptiles are likely to experience increased mortality.

Displacement of wildlife is likely to be temporary as wildlife will move back into the area once construction has ended and the Primary Study Area has been restored. However, displacement of individuals may increase competition for resources outside of the Primary Study Area. This competition may have adverse impacts on those species that have limited suitable habitat and that must compete for fewer resources.

Wildlife mortality is likely to result from construction vehicle traffic on the permanent access roads that are necessary to be constructed in the wetland communities surrounding the proposed bridge structure. Mortality is likely to be restricted to burrowing species that: utilize underground burrows for a majority of their life cycle; are not able to flee the construction area; and are killed as a result of soil compaction by heavy equipment. The project also requires a large volume of concrete trucks for bridge construction. The increased traffic on the permanent access roads near the wetland communities may result in increased road kills.

Visual (e.g., construction workers and equipment) and noise (e.g., construction traffic, pile driving, etc.) disturbance during the construction phase may cause animals to flee the project site. However, these impacts are likely to be a temporary disturbance to the wildlife communities. Wildlife species currently using the Primary Study Area are exposed to daily noise disturbance and have demonstrated their tolerance of such disturbance by their continued presence around the bridge. Any visual or noise disturbance beyond the tolerable levels of the resident species could impact the feeding, resting, and nesting behavior and result in displacement of individuals.

Vibration from pile driving and construction traffic could impact the wildlife communities. The vibrations could displace individuals to nearby suitable habitat. Impacts could also occur to the amphibian community in the Primary Study Area as they may be susceptible to vibration effects underwater, although the vast majority of aquatic habitats in the Primary Study Area are marine, and do not support amphibians.

Short-term impacts to air and water quality could result from changes in traffic patterns in the Primary Study Area. The need for a large volume of concrete trucks could lead to decreased air quality as trucks idle waiting to make their pours, although the potential use of low sulfur diesel fuel could result in reduced air emissions. The impacts of air quality on the wildlife will depend on the planned route of construction traffic and the timing of the traffic. Construction vehicles and concrete trucks will also require a staging area where they can clean their trucks and dump remnant concrete. This may be likely to impact the water quality of the area which could lead to mortality of aquatic wildlife. Measures will be taken to avoid dumping waste concrete in or near wetlands. Aquatic wildlife species could be impacted through the accumulation of toxic chemicals leading to increased mortality and impacts to feeding and reproductive activities.

With the anticipated level of construction equipment to be used in the Primary Study Area, there is the potential for fluid spills. Fluid spills of toxic substances, including gas, diesel fuel, antifreeze, oils, grease, paints, and other hazardous materials, can impact wildlife. Petroleum products have been found to be carcinogenic to wildlife species, including reptiles and amphibians (Eisler, 1987). Best Management Practices will be employed to minimize impacts to air and water quality from construction equipment and staging areas.

Direct impacts related to wildlife species are discussed below.

- *Amphibians and Reptiles* – The Proposed Project will result in limited direct impacts to amphibians (i.e., frogs, toads, and salamanders) due to the fact that there is little suitable habitat

for such species in the Primary Study Area. Although suitable amphibian habitat is located in the adjacent headwater areas of Old Place Creek and Goethals Bridge Pond, these areas will experience no direct impact from the construction activities as they are outside of the Primary Study Area.

The reptilian community (i.e., snakes, lizards, and turtles) is limited to species adapted to brackish water habitats. The diamondback terrapin was the only species observed during the LMS 2004 wildlife survey. The diamondback terrapin may experience increased mortality from construction vehicles in the Primary Study Area during the nesting period (June-July) when females disperse to the upland areas of tidal marshes searching for suitable nest areas.

- *Birds* – During the 2004 LMS wildlife surveys, 56 species of birds were identified in the Primary Study Area. Many migratory and resident bird species utilize the available wetland habitat in the Primary Study Area for foraging and breeding. Direct impacts to birds may include visual, noise, and vibration disturbance that could cause species to disperse to nearby habitat. This could lead to competition between species and eventually result in bird mortality if individuals do not locate adequate foraging and breeding habitat before they are able to move back to the Primary Study Area.

  Bird species could also potentially be impacted as a result of fluid spills from construction equipment. Individuals can become covered in oil and grease from machinery and lose their flight ability leading to mortality (USDOI, 1996). There is general evidence of peregrine falcons having been observed using construction cranes as perches, becoming covered with grease from the machinery and losing flight ability (USDOI, 1996). Birds can also ingest or feed their young prey items that are contaminated by chemicals.

- *Mammals* – Two species of mammals, the gray squirrel and the meadow vole, were observed in the Primary Study Area during the 2004 LMS wildlife survey. Prior studies of owl pellets indicate a low diversity of small mammals in the Primary Study Area; Norway rats, meadow voles, and house mice skulls were identified in the field (USCG, 1997). The potential direct impacts to the mammalian community may include mortality to individuals that cross the permanent access road and its finger roads that will be constructed in the Primary Study Area. The burrowing mammal species that were identified in the Primary Study Area are likely to experience increased mortality as a result of soil compaction from heavy construction equipment. Fast-moving species that disperse to adjacent suitable habitat may be subject to increased competition for resources.

Indirect Impacts

The loss of suitable foraging, breeding, nesting, and migratory habitat within the Primary Study Area as a result of construction activities could be an important impact to the wildlife communities. Habitat loss is likely to result from the construction of temporary roads, temporary bridges, construction staging areas, and from the demolition of the existing bridge. These activities will require the removal of vegetation, the filling of wetland areas, and the compaction of the soil. However, under both of the Northern Alternatives, the high salt marsh communities that will be impacted to the greatest extent are dominated by the invasive species, common reed. Few species use common reed for nesting and foraging habitat, and many of the species that use *Spartina alterniflora* marshes do not use common reed habitat.

Removal of suitable habitat will cause displacement of individuals to habitat refuges and may increase competition for reproductive, foraging, nesting and migratory habitat. Wildlife mortality may increase if no suitable habitat exists nearby. The degree to which displacement affects the wildlife communities depends on the type of habitat disturbed, the amount of habitat disturbed, the amount of available adjacent habitat, and the timing of the disturbance.

Indirect impacts related to specific types of wildlife species are discussed below.

- *Amphibians and Reptiles* – Goethals Bridge Pond provides the most suitable habitat for amphibian species near the project site. However, this area is outside of the Primary Study Area, and no significant impacts are expected to occur to habitat within or adjacent to the pond.

  There is the potential for impacts to the reptilian community within the Primary Study Area. The diamondback terrapin was observed during the 2004 LMS wildlife survey and is likely to be impacted as a result of the construction of the permanent access road and staging areas. These activities could fragment and remove reproductive and nesting habitat suitable for the species. During the summer, female diamondbacks disperse to upland areas and lay their eggs on sandy soils above the high tide line. The loss of these nesting areas would decrease local recruitment to the population, increase competition for suitable habitat, and increase individual energy expenditure, potentially causing mortality.

- *Birds* – The loss of foraging, breeding, nesting, and migratory habitat within the wetland communities adjacent to the Goethals Bridge may cause adverse impacts during the construction phase of a new bridge and during the demolition phase of the existing bridge. The most common groups of birds observed in the Primary Study Area during the 2004 LMS wildlife survey included passerines, herons, new world vultures, gulls and terns, waterfowl, pigeons and doves, raptors, shorebirds, and woodpeckers (see Table 4.14-16). Species that utilize wetland communities for some portion of their life cycle are more prone to impact.

  The removal of vegetation, dredging and filling of wetlands, and the construction access roads may cause displacement and mortality of individuals. A description of the impacts to selected species and groups of birds most likely to utilize these habitats follows.

  Passerines were the most common group of bird species observed in the Primary Study Area during the 2004 wildlife survey. However, some passerines are prone to disturbance because they have specific habitat requirements. The Primary Study Area provides suitable habitat for two passerines, the saltmarsh sharp-tailed sparrow and seaside sparrow, both listed as birds of conservation concern by the USFWS (2002). Potential impacts to these species include the loss of breeding and foraging habitat. These species both prefer nesting in high and low salt marsh habitats such as those found in the Old Place Creek marsh area.

  Herons observed in the Primary Study Area during the 2004 LMS wildlife survey include the great egret, snowy egret, black-crowned night heron, yellow-crowned night heron, and the glossy ibis. These species were observed foraging along Old Place Creek within the Primary Study Area. Potential impacts to these species would result from loss of suitable foraging habitat in the low salt marsh and tidal creek communities along Old Place Creek. Although direct impacts to the Old Place Creek marsh system would vary slightly by specific Build alternative (addressed quantitatively in Section 5.13.4.2), the system extends well beyond the Primary Study Area. As a result, the impacted area represents only a small fraction of the total habitat available to wildlife within the general area of the bridge.

  The Harbor Herons Bird Conservation Area consists of a total of 111 acres and includes Goethals Bridge Pond, adjoining wetlands, and property along Old Place Creek. The mixture of productive tidal marsh, freshwater marsh, shallow water foraging habitats, and their proximity to suitable nesting habitat in the Arthur Kill is key to the importance of the area for nesting wading birds. While the islands in the Arthur Kill do not currently support nesting wading bird colonies, the presence of abundant and consistently available forage fish and invertebrates in the area is still a significant resource for herons in the NY/NJ Harbor region. Shorebirds also use the mud flats extensively for foraging. Construction of the Proposed Project alternatives is not expected to

impact the Harbor Herons Bird Conservation Area, although relocation of Goethals Road associated with the two Northern Alternatives may encroach on the western portion of it.

Several species of raptors have been observed near the Goethals Bridge since 1990 (see Table 4.14-16 in Section 4.14). The peregrine falcon and northern harrier are the only raptors likely to be impacted from the loss of habitat during the construction phase of the project. The demolition of the existing bridge will remove historic nesting habitat for the peregrine and prey species. A more detailed analysis of the impacts to the peregrine falcon is discussed below in Section 5.13.4.6, *Endangered and Threatened Species and Critical Habitats*. Disturbance to the wetland communities from construction access roads could impact the foraging behavior of northern harriers and limit available prey. However, northern harriers forage over large areas of land and the potential disturbance in the Primary Study Area would represent a small percentage of overall foraging grounds.

- *Mammals* – Indirect impacts to the mammalian community may include the loss of habitat as a result of soil compaction and vegetation removal. Burrowing species (e.g., moles, shrews, mice, etc.) would likely be impacted from the compaction of soil from the permanent access road to be constructed, while individuals that are able to flee the construction area will be displaced. If other suitable areas do not exist, competition for food and cover resources will increase and may result in mortality of individuals.

  The chain link security fence along the entire right-of-way of the bridge and its approaches would result in loss and fragmentation of marsh habitat available to small mammals (i.e., raccoons, muskrats, etc.). The fence would not be a barrier to fish passage and would not be a complete barrier to mammals that use water crossings.

Operational Phase

Direct Impacts

During the operational phase of the project, wildlife communities may be impacted as a result of increased volumes and speed of traffic, as well as changes to noise levels and air quality. Wildlife mortality is expected to increase as a result of road-kill incidents. A wider bridge may make it more difficult for animals to use this area as a corridor for movement, especially where the span joins the upland communities.

Buildings and other tall structures present strike hazards for many species of birds, especially along major migration routes. New York City is situated along the Atlantic Flyway, a route which millions of migratory birds fly twice a year between their tropical Central and South American overwintering grounds and North American nesting grounds. While the Goethals Bridge Replacement is a cable-stayed design, the cables would be approximately one foot in diameter and would be visible to birds from a considerable distance in daylight conditions, so collisions are not expected to occur during the day. Most species of migratory birds generally use the stars to navigate at night, and brightly illuminated buildings, broadcast towers and other tall structures can attract birds, particularly during inclement weather conditions when birds must fly at lower altitudes to seek navigational cues from the landscape. Birds drawn towards brightly illuminated structures often circle them until they succumb to collision or exhaustion (NYCAS, 2007). The potential for such impact may exist with the Proposed Project, although the particular types and levels of brightness of bridge lighting can greatly reduce the risk of bird collisions at night.

During the operational phase, there may also be beneficial impacts to the wildlife communities with changes to noise and air quality. The current condition of the Goethals Bridge requires frequent construction to maintain operational safety levels. The ongoing maintenance has had a lasting impact on

the local noise and air quality. The size of the Goethals Bridge also limits the volume of traffic that can pass at any one time and creates driving conditions prone to accidents. These conditions can create traffic backups, increase traffic idling time, and have adverse impacts on local air quality and noise. A new bridge would increase the speed at which traffic volumes move across the region, limiting noise, and improving air quality. A new bridge would also limit the need for frequent bridge maintenance activities that increase noise in the Primary Study Area and limit the disturbance to the wildlife communities.

Construction of the proposed security fence could impact habitat to aquatic species (turtle species) as well as upland species (medium-sized mammals). Vegetation clearing for the fence and fence posts, and vegetative impacts caused by construction equipment used to install the fence and to transport the fence to the installation area would reduce habitat fractionally within the project area.

Indirect Impacts

During the operational phase of the project, the wildlife communities may be indirectly impacted as a result of loss of habitat, habitat fragmentation, and the presence of a wider bridge. The long-term impact of the loss of habitat to all species is expected to be minimal as the construction area will be restored and wildlife will likely move back into the area. However, there is the potential for a loss of species diversity. Road construction may cause lowered diversity as a result of restricted movements between populations, increased mortality, habitat fragmentation, and the invasion by exotic species (Findlay and Bourdages, 2000).

The replacement bridge structure would potentially provide perching habitat for the peregrine falcon and the northern harrier. The replacement bridge could also provide habitat for peregrine falcon prey species such as pigeons and doves.

The security fence, once established, will become a barrier to passage of some wildlife species from each side of the proposed bridge. Although there will be a trestle over Old Place Creek allowing wildlife access beneath the bridge, as well as along the Arthur Kill, medium and larger sized wildlife that cannot fit through the fence mesh or do not use water crossings would be inhibited from movement to either side of the bridge. The security fence is not expected to be a barrier to avian species or small mammals (i.e. shrews, mice etc.).

As the Proposed Project would result in the permanent losses of wetland and upland ecological communities, ranging from a combined total of 8.12 to 9.63 acres, depending on the Build Alternatives (see Table 5.13-1), it would also indirectly result in the loss of foraging, breeding, and nesting habitats. Most predominantly and of highest habitat value, the high salt marsh and low salt marsh communities of Old Place Creek wetland complex would be the most impacted by the Proposed Project, ranging from 1.85 to 4.15 acres of high salt marsh and 0.76 to 2.94 acres of low salt marsh (see Table 5.13-1). It should actually be noted that the impacts would be the highest for high salt marsh under the Southern Alternatives, and conversely the highest for low salt marsh under the Northern Alternatives. On one hand, the high salt marsh community is dominated by invasive species (e.g., common reed), but it may still provide nesting habitat for the sharp-tailed sparrow and seaside sparrow. On the other hand, the low salt marsh community may provide foraging habitat for these sparrows and for herons and egrets. In any event, all four Build Alternatives would result in the displacement of these species from those two community types to other nearby suitable habitats, which are plentiful within the Old Place Creek complex.

5.13.4.6 Endangered and Threatened Species and Critical Habitats

Two separate stands of common persimmon, a New York threatened plant species, exist in the New York portion of the Primary Study Area (see Section 4.14.5.6). None of the four Build Alternatives include

construction where these stands exist and, therefore, no impacts are anticipated to these trees as a result of the construction and operations of a new bridge.

The peregrine falcon, an endangered species in both New York and New Jersey, has historically utilized the Primary Study Area for foraging, breeding, and nesting activities. Peregrine falcons have been observed in the Goethals Bridge region since 1990 and produced their first nest of hatchlings in 1993. Since then, they have nested on the Goethals Bridge superstructure, nest boxes on the bridge and a tower on the protective dolphin north of the Goethals Bridge, and on the adjacent railroad bridge over the Arthur Kill (Section 4.14.5.6). The nesting falcons used the tower consistently until their nest was predated by a raccoon in 2002, and the falcons have not returned to the tower to nest. By 2004, the center of peregrine activity was the nesting box on the Arthur Kill railroad lift bridge, though nesting has not been successful there, and no activity has occurred since the reactivation of the bridge in 2007. Only one adult peregrine falcon was sighted at the Goethals Bridge in 2008, and no nesting occurred there in 2008 or 2009 (C. Nadareski, NYCDEP, pers. commun 9/11/08; NJDEP 2009). As the peregrine falcon is not currently nesting in the Primary Study Area, construction impacts will be minimal and should not differ between alternatives. The potential impacts to peregrine falcons foraging within the Primary Study Area include noise, visual, and vibration disturbance, contamination by fluids, and loss of foraging habitat. The bridge construction and demolition would require the use of large machinery, pile-driving equipment and controlled explosives that are likely to disturb falcons utilizing the Primary Study Area. Falcons may utilize construction cranes for perching habitat and may come into contact with grease and fluids that impact their flight ability and feeding habits. Impacts to foraging habitat are not expected to be adverse as none of the Build Alternatives would impact a significant percentage of available foraging habitats in the area. The new bridge structure, with higher elevations away from bridge traffic, may serve to replace perching and nesting habitat for peregrine falcons and prey species lost by removal of the existing Goethals Bridge.

The pied-billed grebe is a New York threatened species that has been observed in the New York portion of the Primary Study Area (see Section 4.14.5.6). Goethals Bridge Pond, outside of the Primary Study Area, is the most suitable foraging, breeding, and nesting habitat for this species. No construction or operational impacts are expected to influence the grebe or its preferred habitat, as all of the Build Alternatives being considered avoid impacts to Goethals Bridge Pond.

The least bittern is a New York state threatened species that has been documented within the Primary Study Area. This species typically feeds on insects and small fish in marsh habitat types existing within the Primary Study Area. Goethals Bridge Pond, outside of the Primary Study Area, is the most suitable foraging, breeding, and nesting habitat for this species. Within the Primary Study Area, potential impacts to the least bittern include the loss of foraging and nesting habitat from temporary and permanent wetlands fill. Considering that wetlands mitigation would be conducted locally and in-kind regarding habitat types, any impacts to least bittern foraging and nesting habitat should be minimal.

The northern harrier is a New York state threatened species that has been observed foraging within the Primary Study Area. The northern harrier typically feeds on small mammals and birds within marsh community types existing within the Primary Study Area. Potential impacts to the northern harrier include the loss of foraging habitat from temporary and permanent wetland losses. All Build Alternatives would impact relatively similar amounts of potential northern harrier foraging and nesting habitat (with a total acreages of lost high/low salt marshes ranging from 4.34 to 4.91 acres, as depicted in Table 5.13-1). Considering that wetland mitigation would be conducted locally, and in-kind regarding habitat types, any impacts to northern harrier foraging and nesting habitat should be minimal.

The black skimmer is a New York species of special concern that has been observed foraging within the Primary Study Area and in Goethals Bridge Pond. Breeding populations of the black skimmer are listed as endangered in New Jersey, and non-breeding populations are listed as threatened. The black skimmer is also listed as a species of special concern in New York. No suitable black skimmer nesting habitat

(beaches) exists in the Primary Study Area, but this species apparently forages in the area. The black skimmer forages in shallow-water tidal creeks, inlets, and ponds, skimming small fish from the water with its long, thin bill. As open-water habitat losses resulting from the proposed project are minimal, adverse impacts to this species are not expected.

Rare ecological communities located near the Primary Study Area in New York include maritime post oak forest and red maple-sweetgum swamp, located within an area known as the Magnolia Swamp. The Magnolia Swamp contains persimmon and six other state-threatened or endangered plant species. The Magnolia Swamp is located outside of the Primary Study Area, along both sides of South Avenue in Bloomfield, Staten Island. No project-related impacts to the Magnolia Swamp, its rare plant communities or threatened and endangered plant species are anticipated.

The federally endangered shortnose sturgeon is unlikely to occur in the Arthur Kill and its tributaries, instead preferring the deeper, freshwater tidal reaches of the Hudson River Estuary. Moreover, adults of this species are highly mobile and could easily avoid the area during active construction. Therefore, impact to this species is not anticipated as a result of the Proposed Project.

The federally threatened or endangered loggerhead sea turtle, Kemp's ridley sea turtle, green sea turtle, and leatherback sea turtle could potentially occur in the Primary Study Area. While no sea turtle nesting occurs in the NY/NJ Harbor area, sea turtles may be present seasonally, typically between May and November. The majority of sea turtles regularly caught in commercial fishing gear (pound nets) in this area are loggerhead and Kemp's ridley turtles as well as a few green turtles. Leatherback and green sea turtles are less likely to occur in the relatively low-salinity waters of the Primary Study Area. Overall, sea turtles are not likely to occur in the Primary Study Area except as occasional seasonal transient individuals. If present, they would most likely avoid areas of anthropogenic noise and increased turbidity in favor of less disturbed waters. Any potential impacts to sea turtles from the Proposed Project are expected to be short term and indirect.

5.13.5 Mitigation of Impacts

5.13.5.1 Aquatic Communities

Standard construction practices and/or Best Management Practices (BMPs) would be employed during project construction to avoid and minimize the impacts to aquatic communities. These practices include: the implementation of a Soil Control and Sediment Erosion Plan; the use of temporary cofferdams to contain dredging, construction, and demolition activities; the use of vibration-powered pile drivers rather than impact drivers; and the potential construction of stormwater detention basins to ensure that project-related impacts to aquatic communities are minor. In order to minimize impacts to the aquatic community, all in-water construction and demolition work would be contained within cofferdams in dry conditions. Cofferdam installation and removal may be limited to allowed work windows (thus avoiding restrictions noted in Section 5.13.4.1) in order to protect winter flounder spawning habitat and migrating alewife, blueback herring, and American shad, although such activities in the Arthur Kill will be limited. Unavoidable impacts to the aquatic communities include temporary and permanent changes to the area of habitat types in the Primary Study Area. Between 5.54 and 5.86 acres of aquatic habitat (wetlands/open water) would be temporarily or permanently filled as a result of the Proposed Project, depending on the Build Alternative.

5.13.5.2 Regulated Wetlands/Open Waters/Mudflats

The design of the Proposed Project has been guided by the three-step process used by the USACE, NJDEP and the NYSDEC for projects involving activities in wetlands/open waters/mudflats (US Environmental Protection Agency, 2006; NJDEP, 2006; NYSDEC, 2006). This process requires that the

proponent: first, avoid wetlands/open waters/mudflats; second, minimize impacts to wetlands/open waters/mudflats to the extent practicable; and third, compensate for impacts to wetlands/open waters/mudflats.

Impacts to wetlands/open waters/mudflats cannot be completely avoided due to: 1) the extensive area covered by the Arthur Kill, Old Place Creek and salt marsh locations along the eastern shore of the Arthur Kill; 2) the location of the existing Goethals Bridge amidst this extensive area; 3) the fact that the alignment of the project alternatives is determined, in large part, by operations and engineering considerations of connecting a new bridge crossing with the existing roadway network; and 4) the identified need for a permanent access road for construction, maintenance and security purposes. The western shoreline does not contain wetlands, although impacts to open waters (Arthur Kill and the intertidal basin boat slip on the New Jersey side) would also require mitigation. Thus, in keeping with the three-step process, the impacts to wetlands/open waters/mudflats that cannot be avoided will be mitigated with newly-created, restored and/or preserved areas that include wetlands/open waters/mudflats.

Alternatives that meet the project goals, including those that avoid ecological impacts, were evaluated in the project's preliminary alternatives screening evaluation process. Following selection of the four Build Alternatives evaluated in this FEIS, impacts were minimized by making changes to the project design and construction methods. For example, the locations of bridge support piers were moved so that tidal creeks (open waters) and mudflats were avoided to the extent practicable, and the lengths of bridge spans were maximized to reduce the total number of piers. To minimize direct impacts to surface water quality and indirect effects on aquatic and wetland biota, removal of sediments for the construction of bridge piers is to take place inside temporary cofferdams, eliminating the release of suspended solids to surrounding water. For its permanent state, the maintenance and security access road will be reduced to 20-24 feet in width from its temporary state of 36 feet wide during construction.

In addition, the fingers that radiate out from the construction access roads are proposed to be removed after bridge construction is complete, thus restoring anywhere between 1.00 and 1.71 acres of access roads of salt marsh wetlands, depending on the particular alternative selected. Also, removal of the existing Goethals Bridge piers and pier protection cells would result in the restoration of approximately 0.4 acres of salt marsh wetlands and mudflat habitat.

The wetland/open water/mudflat mitigation plan (Mitigation Plan) makes use of information available from the NYCDPR SMRT concerning its own successful restoration. The Mitigation Plan recognized wildlife and fish habitat use as the most important function for three of the four wetland types in the Old Place Creek complex and focused re-establishment of this function as the focal point of the mitigation method. A key element in wildlife use was the presence of tidal creeks and channels and the presence of both low marsh and high marsh vegetation.

Wetland/Open Water/Mudflat Mitigation Alternatives

Thorough details of Mitigation Plans and final designs will be developed separate from the NEPA process, in compliance with wetland permitting requirements of the USACE, NJDEP and NYSDEC. At this point in time, a number of wetland/open water/mudflat mitigation concepts have been considered as presented below for impacts to aquatic habitats:

- *Impact Minimization and Avoidance Through Modified Project Design* – In a desire to curtail impacts to wetlands/open waters/mudflats, the development of alternative project designs has maximized avoidance and reduction of construction-related impacts to aquatic habitats. A degree of wetland/open water/mudflat impacts is unavoidable; therefore, some level of mitigation is going to be associated with the Proposed Project. Accounting for both New Jersey and New York, total direct impacts to wetlands, open waters and mudflats attributable to both permanent and long-term temporary impacts of greater than six months would range from 5.27 to 5.59 acres,

depending on the particular Build Alternative.[17] This range of wetland impacts to be mitigated (see subtotals for *Permanent Wetland Impact* in Table 5.13-2) does not include those temporary wetland impacts associated with the cofferdams that would be less than six months.

- *Use of a wetland mitigation bank* – Under current federal regulations (USEPA guidance published April 10, 2008), the use of mitigation bank credits can be used after avoidance and minimization. The only wetland mitigation bank in the project's service area is the ProLogis bank in Woodbridge, NJ. The range of anticipated impacts in New Jersey is from 0.12 to 0.71 acres, depending on alternative alignment. This mitigation bank, once fully approved, would sell mitigation credits that translate into 1 credit for 1 acre impacted. If the situation arises where the use of this mitigation bank is no longer an option, then the next option is to look at The Harbor Estuary Program sites in New Jersey, using the methodology described in the following paragraphs.

- *Inter-Agency Wetland Mitigation Group (IMG)* – A multi agency group has been created to identify agency-specific needs for mitigation of aquatic habitat impacts associated with the project. This group has been fashioned after the 1996 Interagency Mitigation Group (IMG) formulated for the previous Staten Island Bridges Program, and includes a series of meetings and/or field visits. To date, several IMG coordination meetings have occurred, as presented in Section 6.3 of this FEIS. Potential aquatic and wetland habitat mitigation options presented within that forum include the following:

  - *Provide in-kind restoration for areas under the temporary fill material for construction* – The access road associated with the new bridge would be permanent, but its required 36-foot width during construction would be reduced to 20-24 feet for its long-term function of providing maintenance and security access. In addition, its fingers would be removed completely. Such fill material, although only used during the construction period, would remain in place for more than six months and would thus require mitigation. In-kind restoration (e.g., high marsh for high marsh) for the area under the temporary fill material is proposed for all marsh disturbances, post construction. The intention is to provide restoration-in-place plus restoration elsewhere (i.e., separate mitigation site) at a ratio of 1 acre restored for each acre of impact (1:1 ratio). For all other temporary impacts with less than six months in duration (from the proposed cofferdams), the intention is to provide restoration-in-place (i.e., return to original grades and replant with appropriate vegetation) with no additional mitigation acreage.

  - *Construction of a wetland mitigation area on-site* – The state and federal environmental agencies usually recommend that on-site mitigation be used if there are no available mitigation banks or in-lieu fee programs available. Based on discussions with the regulatory agencies, it is anticipated that mitigation for permanent impacts could be at a 3:1 ratio. One potential on-site mitigation area is a 3.84-acre dredged material area, located on the NY side, south of the existing bridge, which is now dominated by upland vegetation. The regulatory agencies also noted the R.T. Baker & Sons site as having the potential for on-site mitigation. As this site is a documented hazardous waste site, remediation would be required as part of the mitigation process. In addition, restoration of the area beneath the existing bridge piers would comprise a restoration-in-place proposal of 0.4 acres to wetlands/open waters/mudflats. Deconstruction of the old bridge and restoration of that site would occur following construction of the new bridge.

  - *Wetland mitigation off-site* – Since the on-site areas are not large enough to mitigate for all potential wetland/open water/mud flat impacts in New York, a portion of the impacts

[17] This range accounts predominantly for wetland impacts in New York.

associated with the Proposed Project could be compensated by off-site mitigation. Potential mitigation sites in close proximity to the Goethals Bridge have been identified in coordination with the regulatory agencies. A suitability assessment to identify the best off-site mitigation sites has been underway, including several sites in New York such as: Old Place Creek/Goethals Complex; Saw Mill Creek; Arlington Marsh; Gulfport Marsh / GATX site; Francesco Auto Body site; and Sarnelli Brothers site. Some of these sites have the potential to be administered under an in-lieu fee program.

Since the release of the DEIS in May 2009 and subsequent identification of the Preferred Alternative, several coordination meetings have taken place with USACE/NJDEP/NYSDEC as well as NYCDPR (as presented in Section 6.3 of this FEIS) in order to have preliminary discussions on conceptual wetland mitigation plans for any enhancement, restoration, creation and/or preservation sites in New Jersey and in New York. As the detailed wetland mitigation plans will depend on the actual acreages to be impacted, they will be fully developed during the environmental permitting process (i.e., subsequent to the ROD issuance by USCG) and pursuant to the Port Authority's internal Project Authorization. These fully detailed wetland mitigation plans will include a discussion of the mitigation type (i.e., enhancement, restoration, creation and/or preservation); watershed needs; site selection narrative; timing of the mitigation; and the amount of compensation being proposed, in comparison to the amount of impact. For purposes of this FEIS, the following strategies for conceptual wetland mitigation plans in both states are being contemplated, based on the wetland impact ranges currently identified in this FEIS:

- In New Jersey, the conceptual plan currently considers the following two options (in order of preference):
  - ***Option 1 - ProLogis Wetland Mitigation Bank***– Pursuant to its Project Authorization, the Port Authority would purchase credits from the ProLogis/Port Reading Wetland Bank. Based on preliminary conversations with NJDEP and ProLogis, both tidal and freshwater wetland impacts would be adequately covered by the bank. At this point in time and pursuant to its release of credits, ProLogis is expected to have about 7 credits available over the next 3 years.
  - ***Option 2 - NJDEP Wetlands Mitigation Fund*** – In the event that Option 1 is no longer viable, the Port Authority proposes to provide funding toward the NJ Wetlands Mitigation Fund, pursuant to further consultation with the NJDEP's Wetlands Mitigation Council.

- In New York, the Port Authority and NYSDEC-Region 2 have reached an informal agreement for the Port Authority to pursue wetland restoration of the Old Place Creek site with either an in-lieu fee payment or in-kind services. NYSDEC agreed that the current preliminary restorations plans for the site could be used by the Authority, pending some potential design updates as necessary. Further details on the restoration would be worked out with NYSDEC as the bridge design is finalized and the total extent of impacted wetlands becomes known during permitting and final design.

Mitigation for Indirect Wetland Habitat Fragmentation/Shading

As demonstrated in Section 5.13.4.3 of this FEIS, any of the Build Alternatives would have fairly similar indirect impacts as a result of wetland habitat fragmentation and shading. While habitat shading is unlikely to be adversely significant, it should be noted that the unpaved access road and security fence are likely to result in significant adverse impacts related to indirect habitat fragmentation to the Old Place Creek wetland complex and subsequent impacts to terrestrial wildlife and wetlands hydrology.

At a minimum, and upon advancement of final design during the environmental permitting review process with regulatory agencies (notably NYSDEC and USACE), the access road and security fence

would be designed so as to maintain a riparian corridor for aquatic and terrestrial wildlife along both shorelines of Old Place Creek. At this stage of conceptual design for the FEIS, a worst-case scenario for the access road (built on fill material with 3:1 slopes) and security fence (running continuously along the new bridge's right-of-way) is being assumed. However, other engineering considerations to further reduce/minimize and mitigate such fragmentation impacts will be developed and agreed upon with regulatory agencies during the permitting review and final design processes. For example, minimizing the extent of security fences in wetlands and/or installing culverts (for water and wildlife passage) underneath the access road will be considered in coordination with regulatory agencies in order to strike a balance between security and environmental concerns. Additionally, it should be noted that the wetland mitigation plan (as discussed above) will take into consideration any significant indirect impacts that could not be avoided or minimized.

5.13.5.3 Wildlife / Threatened and Endangered Species and Critical Habitat

Mitigation of direct and indirect impacts of the bridge construction and operation on wildlife / threatened and endangered species / critical habitat would require a variety of techniques, ranging from those that limit the spatial distribution of wildlife to limiting construction activities during certain times of the year. Mitigation techniques are limited in their detail because specific information regarding the timing of construction activities is not available at this time. A more detailed analysis will be performed during the permitting phase of the project.

Potential mitigation measures for direct construction impacts include:

- *Perform wildlife surveys to identify travel corridors* – To reduce the mortality and number of road kills of burrowing mammal species during the construction of temporary roads, limited wildlife surveys could potentially be performed prior to construction to identify local travel corridors (i.e., tunnels, burrows) and avoid high density areas if possible. This also includes consultation with Chris Nadaresky, Wildlife Biologist and Peregrine Expert of NYCDEP, during construction in order to verify latest peregrine falcon nesting and foraging status around the project site.
- *Fencing of construction staging areas and permanent access road* – All wildlife species will be prone to road kills along construction roads and landing areas; these areas should be fenced out to prevent entrance by wildlife. Work areas should be kept clear of debris piles that may provide habitat for some species (e.g., snakes, rabbits, mice, etc.).
- *Schedule construction activities to avoid wildlife disturbance during vulnerable life stages* – To avoid impacts from visual, noise, and vibration disturbance, construction activities should be timed to avoid vulnerable bird nesting/fledging periods and reproduction periods for mammals, amphibians, and reptiles. The nesting/fledging periods of the common groups of birds located near the Goethals Bridge are provided (see Table 5.13-3).
- *Use low impact lighting and curtains to avoid visual disturbance* – Visual disturbance may also be minimized by using low-impact lighting and using curtains to screen out workers when they are in close proximity to vulnerable species.
- *Prepare traffic management plan and stormwater management plan* – Impacts to air and water quality can be minimized through a traffic management plan for the concrete trucks and other vehicles to decrease idling time. A stormwater management plan should also be implemented for all construction areas.
- *Prepare a fluid spill response plan* – A spill response plan should be prepared to limit the impacts of potential fluid and oil spills.
- *Perform surveys for suitable diamondback terrapin nesting habitat and relocate vulnerable individuals* – To avoid impacts to diamondback terrapin nesting habitat, surveys should be

TABLE 5.13-3
NESTING SEASONS FOR SELECTED BIRD SPECIES - PRIMARY STUDY AREA

Species	Period	Month											
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Peregrine Falcon	Egg Dates												
	Unfledged Juv.												
Northern Harrier	Egg Dates												
	Unfledged Juv.												
Pied-billed Grebe	Egg Dates												
	Unfledged Juv.												
Great Egret	Egg Dates												
	Unfledged Juv.												
Snowy Egret	Egg Dates												
	Unfledged Juv.												
Black-crowned Night Heron	Egg Dates												
	Unfledged Juv.												
Yellow-crowned Night Heron	Egg Dates												
	Unfledged Juv.												
Glossy Ibis	Egg Dates												
	Unfledged Juv.												
Saltmarsh Sharp-tailed Sparrow	Egg Dates												
	Unfledged Juv.												
Seaside Sparrow	Egg Dates												
	Unfledged Juv.												

Notes: Egg Dates - The range of dates that eggs have been found for each species.
Unfledged Juv. - The range of dates that juveniles have been found in the nest before they are able to fly.

Source: New York State Department of Environmental Conservation, 2004. New York State Breeding Bird Atlas: Handbook for Workers. Website edition updated 23 February 2004. http://www.dec.state.ny.us/website/dfwmr/wildlife/bba/handbook.pdf

performed before the construction of temporary roads to identify and avoid areas of suitable habitat. Individuals found in areas of construction and on access roads should be relocated to more suitable habitat, to the extent practicable.

- *Use netting on the tops of cranes and around fluid sources for the exclusion of bird species (e.g., peregrine falcon)* – Fencing and netting should be placed around all fluid sources (e.g., oils, grease, etc.) that would affect the flight ability of birds if they come into contact with the fluid during construction.
- *Identify and restore potential habitat refuges prior to commencement of construction* – Potential restoration sites adjacent to the construction area should be identified prior to construction. These areas could be restored to provide a habitat refuge for those individuals fleeing the construction area once construction commences.
- *Utilize previously developed areas for construction staging zones, to the extent possible* – Existing disturbed areas (e.g., vacant lots, industrial sites) should be identified prior to construction of roads and staging areas. The use of previously developed areas should be maximized to reduce disturbance to undisturbed areas.

Additionally, in specific response to potential avian impacts, a number of mitigation measures and/or best management practices in the bridge's light design would be implemented to reduce the risk of bird collisions with the replacement bridge during the operational phase. While such details would not be readily available until the final design phase, typical mitigation measures that could be considered include the following:

- Markers are frequently placed on power lines which cross over water, in order to improve their visibility to birds during the day. Cable markers could be similarly affixed to the bridge cables if daytime collisions occur. In addition, downshields could be installed on any lights not needed for aviation safety.
- The risk of birds colliding with the bridge at night could be reduced by minimizing the illumination of the bridge as much as possible (Kahlert et al., 2005). Illumination should provide only what light is necessary to ensure the safety of ship, aircraft, and automobile traffic. If the bridge is to be illuminated for aesthetic purposes (i.e., beyond what is necessary for safety reasons), the light source should be fully cut off from approaching birds in order to avoid disorienting and/or attracting birds passing through the area. Additionally, to the extent practicable, aesthetic lighting should be turned off during peak migration periods in the spring and fall, and when inclement weather conditions may increase the risk of bird attraction/collisions. Lights required for federal aviation and marine safety regulations should be minimum-intensity white strobe lighting with a three second flash interval instead of continuous flood lighting, rotating lights, or red lighting (Manville, 2000).
- In November of 2000, the Port Authority turned off the floodlights that used to illuminate the TV masts on the roof of 1 World Trade Center at night to avoid the disorientation of migrating birds (The Port Authority of New York and New Jersey, 2000). Additionally, tenants in the World Trade Center were asked to turn off non-essential lights at night or to close their blinds whenever possible to reduce the attraction to birds. Since then, a number of cities have adopted "lights out" policies during bird migration periods (NYCAS, 2007).
- The pedestrian walkway/bikeway could potentially be used to conduct surveys to determine whether migrating birds and residential birds are encountering problems navigating through the bridge area, and what lighting regime or other measures might alleviate any problems. Interpretive signage along the pedestrian walkway would educate the public on the diversity of bird life in the area, and measures taken to minimize impacts to birds. Bridge maintenance personnel should collect any dead birds found on the bridge and report any bird mortalities, which

could provide insight into corrective and adaptive measures for reducing bird mortality in the long-term.

5.13.6 Permit/Consultation Requirements

As a result of the evaluation of impacts to the biotic communities existing within the Primary Study Area, the following agency consultations are required:

- Fish and Wildlife Coordination Act of 1958 Consultation (USFWS, NMFS, NJDEP, NYSDEC)
- Section 7 Consultation, Endangered Species Act of 1973 (USFWS, NMFS)
- Essential Fish Habitat Assessment Consultation, Magnuson-Stevens Fishery Conservation and Management Act (NMFS)
- Migratory Bird Treaty Act Consultation (USFWS)
- Estuary Protection Act (USFWS, NMFS, NJDEP, NYSDEC)

Also, the following permit requirements will include consideration of biotic communities in their review and approval processes:

- Section 404 of the Clean Water Act (USACE)
- Section 401 of the Clean Water Act-Water Quality Certification (NJDEP, NYSDEC)
- Waterfront Development Permit (NJDEP)
- Coastal Wetlands Permit (NJDEP)
- Freshwater Wetlands Individual Permit (NJDEP)
- Joint Application for Permit (NYSDEC)

5.13.7 Summary of Impacts to Biotic Communities

Impacts to biotic communities from the proposed replacement of the Goethals Bridge would primarily be in the form of temporary and permanent loss of wetland and upland habitat. This loss, in turn, would reduce habitat available to aquatic and terrestrial wildlife.

There would be a temporary loss of water column habitat available to aquatic biota during construction and demolition activities, but in the long term, the removal of the existing Goethals Bridge would result in a net gain of water column habitat. Also, the removal of Pier C and its protective dolphins from the Arthur Kill would allow the natural soft-sediment benthic community to become re-established.

No impacts to threatened, endangered, or special status species from the Proposed Project have been identified. The peregrine falcon, endangered in New Jersey and New York, formerly nested on the Goethals Bridge and at nearby locations, and the replacement bridge structure could provide nesting and foraging habitat for this species.

Permanent and long-term temporary (greater than six months) direct impacts to wetlands range from 5.27 to 5.59 acres, depending on the particular Build Alternative. Although these acreages are treated as permanent takings in this FEIS because they will all be in place for more than six months, some of them are actually temporary in nature since the construction access road and its fingers will be reduced and removed respectively after project completion. Total impacts, including short-term temporary impacts of less than six months, range from 5.54 to 5.86 acres among the four Build Alternatives. Impacts to two wetland restoration sites (e.g., Pier D Wetland Restoration and NYCDPR Old Place Creek Marsh) would range from 0.14 acres to 0.45 acres of wetlands, depending on the particular Build Alternative. Indirect impacts (most likely habitat fragmentation) may also occur under the Proposed Project but could be

further reduced in coordination with regulatory agencies during the development of final design and permitting process subsequent to this FEIS. Additionally, the removal of the existing Goethals Bridge will allow the restoration of additional wetland habitat.

Overall, the combination of direct and indirect impacts to the surrounding aquatic and wetland habitats would be compensated by the wetland mitigation plans in both New Jersey and New York. Those plans, while only developed conceptually at this time, would mitigate for permanent impacts to wetlands as required under state and federal regulations. While several other mitigation options have been contemplated in coordination with several stakeholders and regulatory agencies, the currently-preferred wetland mitigation plans for the ProLogis Wetland Mitigation Bank in Port Reading, New Jersey as well as for the NYSDEC's In-lieu Fee Program of Old Place Creek in Staten Island will be further developed and confirmed during the permitting process, subsequent to this NEPA process. These detailed wetland mitigation plans will include a discussion of the mitigation type; watershed needs; site selection narrative; timing of the mitigation; and the amount of compensation being proposed, in comparison to the amount of wetland impacts.

5.14 Coastal Zone Management

5.14.1 Introduction

The Coastal Zone Management Act of 1972 (16 U.S.C. §§1451-1464) was enacted by Congress to balance the competing demands of growth and development with the need to protect coastal resources. Its stated purpose is to "preserve, protect, develop, and, where possible, to restore or enhance, the resources of the nation's coastal zone..." The primary means of achieving this balance is through coastal zone management programs adopted by the states and designed to regulate land use activities that could affect coastal waters. The Act offered incentives to encourage the coastal states and territories to exercise their full authority over coastal areas through development of coastal zone management programs, consistent with the minimum federal standards. The Coastal Zone Reauthorization Act Amendments of 1990 strengthened the Act by requiring the state programs to focus more on controlling land use activities and the cumulative effect of activities in coastal zones.

5.14.2 Regulatory Framework

At the state level, both New Jersey (N.J.A.C. 7:7, 7:7E) and New York (Executive Law §§910-921) have federally-approved coastal zone programs administered through the Department of Environmental Protection and the Department of State, respectively. Pursuant to the federal Coastal Zone Management Act, both states have defined their coastal zone boundaries and the policies to be utilized to evaluate projects occurring within the designated zones:

- In New Jersey, the Waterfront Development Law (N.J.S.A. 12:5-3) and related requirements (N.J.A.C. 7:7-2.3) provide the authority for issuance of permits for, among other activities, the placement or construction of structures, pilings, or other obstructions in any tidal waterway. New Jersey's Rules on Coastal Zone Management are employed by the NJDEP's Land Use Regulation Program in the review of permit applications and coastal decision-making; they address issues of location, use, and resources. New Jersey's rules provide for a balancing between economic development and coastal resource protection, recognizing that coastal management involves explicit consideration of a broad range of concerns, in contrast to other resource management programs which have a more limited scope of concern.
- In 1981, New York State adopted the Waterfront Revitalization and Coastal Resources Act, creating the New York State Coastal Management Program (CMP) which is administered by the New York State Department of State (NYSDOS) – Division of Coastal Resources. The CMP

embodies 44 policy statements supportive of the Act's intent to promote a balance between economic development and coastal resource preservation and optimization.

At the local level, the City of Elizabeth has designated two waterfront "blight" areas (as defined by N.J.S.A. 40:55-21.2) and has prepared waterfront development plans for them. Both of these areas are north of the project's Primary Study Area. Projects and regulated activities proposed for the Elizabeth coastal area are reviewed in accordance with New Jersey's Rules on Coastal Zone Management, Land Use Regulation Program.

New York City's Waterfront Revitalization Program (WRP), administered by the New York City Department of City Planning (NYCDCP), was approved by New York State in 1982 and was revised in 2002. It contains 10 policies addressing local issues and guidelines for application of the state's 44 CMP policies in the New York City context. In 1992, New York City completed a long-range plan for its waterfront (known as the New York City Comprehensive Waterfront Plan: Reclaiming the City's Edge). Among a number of local land use, or reach, studies performed for the waterfront plan, a study for Reach 21 (Arthur Kill North) included the Goethals Bridge area; one of its recommendations was to "support expanding the capacity of the Goethals Bridge to improve local and regional truck access" such that the "design should minimize disturbance of wetlands."

As coastal zone management consists of policies governing a wide variety of resources, the Coastal Zone Consistency Assessment for the proposed Goethals Bridge replacement does not address environmental impacts directly, but rather addresses impacts by presenting the policies of the state and local coastal zone management plans and the Proposed Project's compliance with these policies. As such, the Coastal Zone Consistency Assessment does not address impacts of the No-Build Alternative, and generally does not address impacts of specific alternatives. For example, New York State Coastal Management Program Policy 41 states that "Land use or development in the coastal area will not cause national or state air quality standards to be violated." Section 5.20 addresses impacts to air quality by alternative, so the response to Policy 41 makes reference to this section and summarizes its findings in order to demonstrate compliance with Policy 41.

5.14.3 Summary

As the Proposed Project is within the coastal zone boundaries of both New York and New Jersey, it will be required to address New York City, New York State and New Jersey State policies to certify compliance with each coastal zone management program. As part of the DEIS of May 2009, a draft Coastal Zone Consistency Assessment, including the available questionnaires from the respective consistency assessment forms and an assessment of the coastal policies from each of the three coastal zone management programs, had been prepared and presented in Appendix L. Based on such preliminary evaluation of applicable policies, it was then determined that the Proposed Project (including any of the Build Alternatives) would be consistent with the respective coastal zone management programs for each state and with the City of New York.

However, this preliminary evaluation is no longer enclosed in Appendix L of this FEIS since such consistency determinations will be performed at a later time during the subsequent environmental permits. At this time of the FEIS and based on preliminary coordination with respective state and local agencies, the consistency concurrence in New York will be reached in consultation with NYSDOS, as well as with NYCDCP based on its local waterfront policies.[18] In New Jersey, the consistency concurrence will be reached during NJDEP' regulatory review of the Waterfront Development Permit and based on the New Jersey State policies.

[18] However, NYCDCP will once again evaluate such consistency during its subsequent review of city discretionary actions under its Uniform Land Use Review Procedure (ULURP) for the Proposed Project, after the NEPA process.

5.15 Navigation and Airspace

5.15.1 Introduction

Given the important nature of the Arthur Kill waterway and the proximity to Newark Liberty International Airport (EWR), a navigation and airspace impact evaluation was conducted to assess the potential impacts of the Proposed Project on marine and air traffic during and after construction of the main bridge structure and its approach spans.

Since all Build Alternatives are proposed to have similar deck clearances (i.e., air draft no less than the 135-foot existing bridge clearance) and elevations (i.e., proposed bridge heights up to 272 feet for the Southern Alternatives and two to three feet lower for the Northern Alternatives), potential impacts associated with either of the Southern or Northern Alternatives are expected to be similar. It should be noted that the maximum allowable bridge height must be reduced as the alignments move north and closer to EWR. As a result, the Northern Alternatives will have a maximum bridge height that is two to three feet lower than the Southern Alternatives, based on a 62.5:1 departure slope.

Impacts to marine and air traffic resulting from the demolition of the existing bridge are also identified and evaluated. Where deemed appropriate and necessary, mitigation measures are proposed and evaluated.

5.15.2 Methodology, Approach and Data Sources

Information concerning construction and operational impacts was gathered from personnel at the Bayway refinery and the existing conditions investigations.

The following sources were consulted:

1. **Information Obtained During the Investigation of Existing and Future Conditions:** Information from the Maritime Association of the Port of New York and New Jersey, the U.S. Army Corps of Engineers, and The Port Authority of New York and New Jersey serves as the basis for identifying the magnitude of potential conflicts and impacts, while conversations with harbor pilots and other waterway users, navigation charts, and other references provided an overall picture as to the current and future navigation conditions on the Arthur Kill in the vicinity of the bridge.

2. **Conceptual Plans of Proposed Alternatives:** Conceptual Plans for the existing bridge and the proposed alternatives served to identify the extent to which marine traffic and nearby air traffic could potentially be impacted. (this information is also presented in Section 3.6)

3. **Goethals Bridge Modernization Project – Constructability Review:** Review of Section 3.4 of this FEIS provided insight into construction methods which will be used to construct the proposed Goethals Bridge Replacement and its respective alignment alternatives.

4. **Demolition of Existing Bridge – White Paper:** Methods and means by which the existing bridge may be demolished and impacts on navigation (this information is also presented in Section 3.7).

5. **Bayway Refinery:** Personnel from the Bayway refinery provided information about potential construction impacts on terminal operations given the refinery's proximity to the bridge.

6. **Energy Information Administration:** The Energy Information Administration (EIA) is part of the U.S. Department of Energy. Information obtained from the EIA website included published data and statistics and the Annual Energy Outlook. The Annual Energy Outlook makes future projections of U.S. energy markets based on expected supply and demand along with other factors that could affect market conditions through the year 2030.

7. **Aviation Impact Analysis:** An Aviation Study was performed by the Port Authority and documented in a summary entitled "Application to the FAA on the Proposed Height of the Proposed Goethals Bridge" (October 3, 2006). The summary cites three primary sources: the Federal Aviation Administration (FAA), with which the Port Authority has been in close coordination and consultation regarding the height of the bridge; EWR, which is managed and operated by the Port Authority; and major airline tenants at EWR, regarding the standards used by some of the tenants to determine take-off weight (governed by the obstacle accountability area [OAA] along the path projected from the departure runway(s) that they utilize).

5.15.3 No-Build Alternative

5.15.3.1 Navigation

Marine traffic that travels on the Arthur Kill is primarily associated with the adjacent petroleum industry. Future growth of this traffic is closely tied and directly responsive to the various changes in demand that are placed on the petroleum industry, and increases as the demand for oil and refined petroleum increases.

Petroleum consumption in the U.S. is expected to rise over the next 25 years. The EIA Annual Energy Outlook for 2008 forecasts that the U.S. economy will grow at an annual average rate of 2.6% from 2006 through the year 2030 and that net imports of petroleum products are expected to rise by 0.65% per year from 2006 to 2030. Net imports of refined petroleum products as a percentage of total petroleum product imports are also expected to increase by 2030 despite increases in distillation capacity at domestic refineries. Due to projected increases in demand for both crude oil and refined petroleum product imports in the U.S., the terminals and refineries along the Arthur Kill will continue to play an important role in the U.S. petroleum supply and yearly throughput at these terminals would therefore be expected to rise by the year 2030 within their structural constraints.

Despite the forecasted increases in the amount of petroleum products expected to be imported through the terminals along the Arthur Kill, the waterway is constrained by both shallow drafts and the low vertical clearance of the railroad lift bridge[19] located directly north of the Goethals Bridge. The largest tanker vessels using the Arthur Kill have a maximum draft well in excess of the available channel depth. As a result, these vessels have to either operate at high-tide to maximize cargo loads or to reduce their draft by lightening cargo to tanker barges or other smaller vessels. Although the Arthur Kill is planned for dredging to a depth of 40 feet at the Bayway refinery, this will not allow for a significant increase in the size of vessels that enter the Arthur Kill; rather, it will give the refinery greater flexibility in determining which specific vessels can berth at their terminals. Due to the restrictions placed on vessel traffic by channel depth and air draft, it seems unlikely that there will be a significant increase in the size of the vessels using the Arthur Kill.

There is, however, adequate depth for many of the tankers to increase in size, since a majority is less than 50,000 DWT and do not approach the physical size limits imposed on the largest tankers. A combination of more vessel calls and increasing the size of the smaller tankers will serve to meet the increased throughput demand at the terminals and refineries along the Arthur Kill without the replacement or reconstruction of the existing Goethals Bridge.

[19] The Arthur Kill Lift Bridge has a vertical clearance of 131 feet in the open position and 31 feet in the closed position.

The No-Build Alternative would leave navigation conditions in the vicinity of the Goethals Bridge unchanged. However, since the average size of vessels using the Arthur Kill is expected to increase over the next 25 years, it is assumed that the number of vessels bound for the Bayway refinery that would experience navigational difficulties would increase. Since the Goethals Bridge does not control the maximum air draft along the Arthur Kill, the No-Build Alternative would not limit the maximum size of vessels that can operate on the waterway.

The No-Build Alternative is not expected to have any impact on recreational vessels since these vessels are small and are not affected by the physical constraints of available channel width, depth, and bridge clearance.

5.15.3.2 Airspace

The Goethals Bridge is located less than three miles from the southern boundary of EWR. Based on the runway configuration at the airport, the bridge lies within the obstacle accountability area (OAA) of two departure runways, 22L/4R and 22R/4L. Under FAR Part 121, departing aircraft must meet take-off requirements that the plane's weight not exceed that listed in the *Airplane Flight Manual*, which allows "a net takeoff flight path that clears all obstacles either by a height of at least 35 feet vertically, or by at least 200 feet horizontally within the airport boundaries and by at least 300 feet horizontally after passing the boundaries." It is assumed that the airplane is not banked before reaching a height of 50 feet, and that the maximum bank is not more than 15 degrees thereafter. The takeoff path extends from a standing start to a point in the takeoff, at which the airplane is 1,500 feet above the takeoff surface, or at which the transition from the takeoff to the en route configuration is completed and velocity at final takeoff is reached, whichever point is higher (FAR Part 25.111). Velocity at final takeoff (VFTO) is the speed at which the plane would climb after reaching acceleration altitude following an engine failure or single engine go-around.

In general, an additional obstacle protection area is provided to allow for greater airspeeds in the climb for those aircraft requiring them. For two-engine airplanes that have one engine inoperative (OEI), the steady gradient of climb must be positive with landing gear extended, may not be less than 2.4 percent with landing gear retracted, and at the end of the takeoff path, may not be less than 1.2 percent. Under the basic requirement of FAR Part 121, aircraft must be able to take off and climb at 2.4% - 0.8% or 1.6% (62.5:1) gradient with OEI. For these reasons, under common practice at U.S. airports, maximum takeoff weight (MTOW) is sometimes reduced (fewer passengers, less cargo, or less fuel) to climb in compliance with Parts 25 and 121 and safely avoid obstacles if an engine should fail.

As in the existing condition, the Goethals Bridge in the No-Build Alternative would not cause any impacts affecting the allowable weights for boarded, loaded and fueled airplanes departing from EWR (it is assumed that the directives of Parts 25 and 121 would still be applicable to the potentially larger aircraft used in the No-Build analysis year of 2034). This assessment is based on the FAR Part 121 OAA, defined by a constant 600-foot total width (i.e., 300 feet to each side of the runway centerline) along the path projected from a runway.

The aviation impact analysis prepared by the Port Authority noted that some airline tenants at EWR follow alternate standards, based on normal (all engines operating) operations, taken from either or both of two documents:

- Federal Aviation Administration Draft Advisory Circular AC-120.91, OBS Airport Obstacle Analysis
- International Civil Aviation Organization (ICAO) Procedures for Air Navigation Services—Aircraft Operations (PANS-OPS).

These alternate standards use wider OAAs, containing more obstacles to avoid than the less-conservative Part 121 OAA,[20] and typically assume a climb gradient of 200 feet per nautical mile (NM) unless a greater gradient is specified. Under these larger OAAs, severe weight restrictions and more limited runway usage would apply to departures at EWR, if these standards should be adopted by the FAA in the future. However, the existing height of the Goethals Bridge would not be the cause of these new policies' impacts upon EWR operations under the future No-Build condition; rather, the larger OAAs would encompass additional existing tall objects in the wider path from the runways to the Goethals Bridge site that would be considered as the weight-restricting obstacles. Per AC-120.91, operators would use reasonable judgment to account for the height of items such as trees, buildings, flagpoles, chimneys, and transmission lines, where these are classified as "indeterminate" objects without recorded height, in addition to consulting the following known sources of obstacle data:

- NOS Airport Obstruction Chart (OC)
- FAA Form 5010
- Topographical Quadrangle Charts
- Jeppesen/Lido Departure & Approach Charts
- National Flight Data Digest
- IFR Supplement (USAF)
- Low Altitude Instrument Approach Charts (DoD)
- Aeronautical Information Publication (AIP)
- ICAO Type A/B/C Charts (TPC)
- USGS 3 Arc Second Terrain Data
- USGS 1 Arc Second Terrain Data
- Digital Vertical Obstacle File (DVOF)
- Digital Terrain Elevation Data (DTED)
- National Geodetic Survey (NGS)
- Area Navigation Approach Survey (ANA)
- NOTAMs (Notice to Airmen).

5.15.4 Build Alternatives

5.15.4.1 Navigation

Construction Impacts

The navigation channel would be kept open during construction with the exception of some short duration channel closures for barge-based material deliveries and construction activities. Except for periods during the channel closures, vessels would be able to navigate without being adversely affected. These channel closures would be coordinated with the USCG to minimize vessel navigation conflicts and allow for the appropriate timing of releases of a Local Notice to Mariners (LNM).

Construction equipment for the Southern Alternatives (i.e., New Alignment South and Existing Alignment South) would be mostly located south of the existing Goethals Bridge but as far from the eastern channel edge as possible since the sterns of vessels turning into the Bayway refinery start to swing

[20] Part 121 requirements would be understood as more conservative in using OEI airplane performance, whereas Standard Instrument Departures or Departure Procedures based on AC-120-91 or PAN-OPS are based on normal (all engines operating) operations. An engine failure during takeoff is a non-normal condition.

out towards the edge of the channel in this area. Construction equipment for the Northern Alternatives (i.e., New Alignment North and Existing Alignment North) could be located along the edge of the channel north of the existing Goethals Bridge (and south of the Arthur Kill Lift Bridge) since the channel is straight in this location and vessels will not be turning.

Since all construction activities are located south of the Arthur Kill Lift Bridge, operations at New York Container Terminal (NYCT) at Howland Hook and the City of Elizabeth Marina would not be impacted. In addition, there would be no impacts to navigation on Old Place Creek, which is located directly north of the Goethals Bridge, since this creek is not a navigable waterway.

Operational Impacts

Any of the proposed Build Alternatives would include removal of the existing bridge piers and protective dolphins from the eastern edge of the navigation channel and construction of new piers well outside of the channel limits. As all Build Alternatives would span an additional 230 feet (approximately 900 feet clearance as opposed to the existing 672 feet) and would remove all structure obstacles from the navigation channel, they would substantially improve their horizontal clearances. As a result, they would improve marine navigation in the vicinity of the bridge, especially for the larger vessels that turn into the Bayway refinery, since vessels needing to turn into the refinery would no longer be required to swing close to the existing protective dolphins; therefore, this maneuver would be easier to complete. Additionally, none of the Build Alternatives would have any impact on vessels turning into the Bayway refinery since all new bridge piers would be located beyond the navigation channel. This is of particular note for the Southern Alternatives since they would be closer to the Bayway refinery than either of the Northern Alternatives would be.

Since the proposed air draft at the depth of the outside girders for all Build Alternatives would be maintained at or no less than its current 135-foot height, navigation as it relates to vertical clearance would not be adversely impacted.

5.15.4.2 Airspace

Construction Impacts

Construction of the Proposed Project has the potential to obstruct navigable airspace and thereby impact operations of EWR's airline tenants. FAR Part 77 (14 CFR), Airspace Obstruction Analysis, provides typical examples of temporary alterations and modifications for which notification must be provided to allow the FAA to identify potential aeronautical hazards in advance, thus preventing or minimizing the adverse impacts to the safe and efficient use of navigable airspace. Under Part 77, an object is defined as constituting an obstruction if it is 200 feet above ground level (AGL, for purposes of this FEIS, assumed as equivalent to MSL) or 200 feet above the airport elevation, whichever is greater, up to three miles (for runway lengths greater than 3,200 feet) from the airport.[21]

As the proposed replacement bridge would be taller than the existing Goethals Bridge (i.e., 272 feet tall for either of the Southern Alternatives, and two to three feet lower for either of the Northern

[21] FAA Advisory Circular AC70/7460-2K, Proposed Construction or Alteration of Objects that May Affect the Navigable Airspace, explains the Part 77 requirement to notify the FAA at least 30 days before construction begins if the proposed object will be greater than 200 feet in height AGL or within 20,000 feet of an airport with at least one runway more than 3,200 feet in length and the object would exceed a slope of 100:1 horizontally (100 feet horizontally for each 1 foot vertically) from the nearest point of the nearest runway.

AC 70/7460-2K further advises that in the case of an Interstate Highway that would exceed one or more of the above standards, the height of the traverse way (e.g., the proposed replacement Goethals Bridge approach viaducts) is adjusted upward by 17 feet.

Alternatives)[22], and the project site is located less than three miles from the southern boundary of EWR, there is potential for construction-period impact to airspace. The following Part 77-listed examples of construction-related objects which could constitute an obstruction, would likely apply to any of the Build Alternatives:

- Construction equipment (or, per AC 70/74060-2K, other temporary structures such as cranes, derricks, or earth moving equipment)
- Drilling rigs
- Haul routes
- Staging areas
- Stockpiles
- Temporary lights

As required by FAR Part 77, advance notification of these obstructions and related construction activities would be required to be made to the FAA to prevent or minimize impacts and ensure safe and efficient navigable airspace use by EWR's airline tenants.

Operational Impacts

At a height of 272 feet above mean sea level (MSL) for the Southern Alternatives and two to three feet lower for the Northern Alternatives, the maximum top elevation of the new Goethals Bridge with any of the four Build Alternatives would not cause any impacts affecting the allowable weights for boarded, loaded and fueled airplanes departing from EWR. In this regard, it is assumed that the directives of Parts 25 and 121 would still be applicable to the potentially larger aircraft used in the analysis year). As stated for the No-Build Alternative, some airline tenants at EWR follow alternate standards, based on normal operations (i.e., all engines operating). However, the height of the proposed Goethals Bridge Replacement would not be the cause of these new policies' impacts upon EWR operations under the future condition; rather, the larger OAAs would encompass additional existing tall objects in the wider path from the runways to the Goethals Bridge site that would be considered as the weight-restricting obstacles.

5.15.5 Demolition of the Existing Bridge

Demolition of the existing bridge is expected to be similar for each of the Build Alternatives. The main suspended span above the channel would be lowered to a barge and towed away after it has been lightened by removing the concrete deck. This operation would require a channel closure of approximately eight hours, which would need to be carefully coordinated with the USCG to minimize potential impacts to vessels operating on the Arthur Kill and to allow for the appropriate timing of releases of a Local Notice to Mariners (LNM). Barge-based construction activities that take place to remove the back-spans of the bridge are not expected to impact navigation since this equipment would be located outside of the navigation channel.

Removal of the concrete piers that support the bridge can be accomplished in two ways. First, controlled explosive demolition could be used to collapse the piers and then the concrete debris would be removed from the water using a crane with a clam shell bucket. Blast mats and containment structures, as required, would be placed as close to the bridge piers as possible in order to maximize their effectiveness. As a result of this containment system, this methodology of demolition is not expected to pose any impact to navigation.

The second option is to cut the pier into sections using diamond cutting and lifting sections onto barges for disposal. Removal of the protective dolphins is not expected to require protective structures or

[22] The maximum height for any of the Build Alternatives would be the top of the cable-stayed towers.

cofferdams since the dolphins, which are essentially cofferdams, would function as their own containment structures.

The placement of a temporary cofferdam around the east pier is not expected to pose significant impacts to navigation, assuming the cofferdam does not encroach excessively into the navigation channel. However, the placement of construction barges and other equipment along the edge of the channel south of the southern protective dolphin should be avoided, since this is the portion of the channel where the vessels' sterns swing out while turning into the Bayway terminal. Barges and other equipment would be located south of the bridge and placed away from the channel edge.

5.15.6 Mitigation of Impacts

During construction navigation, impacts to navigation on the Arthur Kill in the vicinity of the Goethals Bridge would be minimized by placing construction barges and equipment outside the navigation channel in locations coordinated with the USCG. Equipment placed south of the Goethals Bridge would be located away from the edge of the navigation channel to avoid impacts to large vessels turning into the Bayway refinery. Any construction activities requiring the use of barges in the channel would be accomplished during short channel closures scheduled between the passages of large vessels navigating the Arthur Kill.

Similarly, impacts to airspace would be avoided through compliance with FAA regulations (i.e., FAR Part 77 [14 CFR], Airspace Obstruction Analysis) and a construction-period coordination/notification effort with EWR and its tenants. Therefore, no additional mitigation would be necessary for any of the Build Alternatives.

5.15.7 Summary

Construction of the main span structure and piers would be staged from barges in the Arthur Kill. These barges would be located outside of the navigation channel to avoid interference with vessels navigating the Arthur Kill. The location of barge staging areas and times of channel closures would be closely coordinated with the USCG to avoid impacts to navigation. Since the new bridge would provide air draft equal to or greater than the existing bridge, it would pose no new restrictions on navigation. The existing eastern bridge pier and its protective dolphins would be removed from the edge of the navigation channel. The new bridge piers would be located well away from the edge of the channel, thereby resulting in improvements to navigation regardless of which alternative is chosen.

The proposed 272-foot maximum bridge height for the two Southern Alternatives (with the two Northern Alternatives' maximum bridge height being two to three feet lower than that) would not result in any significant impacts to airspace and flight patterns to/from EWR. During construction, all appropriate notifications would be provided to FAA and EWR in order to identify potential aeronautical hazards in advance, thus preventing or minimizing adverse impacts to the safe and efficient use of navigable airspace.

5.16 Solid Waste

5.16.1 Introduction

This section describes the potential impacts that the demolition of the existing bridge and the construction and operation of a new bridge would have on the solid waste management systems in the Elizabeth and Staten Island portions of the Goethals Bridge Study Area.

5.16.2 Methodology, Approach and Data Sources

The evaluation of potential solid waste impacts involved an inventory of existing facilities and current solid waste disposal regulations, as well as an evaluation of the solid waste disposal requirements associated with the demolition of the existing bridge.

5.16.3 No-Build Alternative

Ongoing maintenance and repair activities would continue to be required to keep the present Goethals Bridge in a state of good repair. These activities, which would have a range of complexity, may generate quantities of solid waste that would be disposed of according to appropriate regulations. Port Authority personnel located in the Goethals Bridge Administration Building, Maintenance Building and Toll Plaza would continue to generate solid waste at a rate similar to existing levels.

5.16.4 Build Alternatives

5.16.4.1 Construction Impacts

During construction, solid waste would be generated by site clearing and grubbing, structural demolition and other construction activities. The type and amount of solid waste generated by project construction would be similar for all of the Build Alternatives being considered. The Proposed Project will be designed to address and implement, where practical, feasible and appropriate, the Port Authority's current sustainable design guidelines.[23]

In New Jersey, construction and demolition (C&D) debris is defined as solid waste Type 13C, which includes building and structural material and rubble resulting from the construction, remodeling, repair, and demolition of houses, commercial buildings, pavement and other structures. C&D debris includes: treated and untreated wood scrap; tree parts, tree stumps and brush; concrete, asphalt, bricks, blocks, and other masonry; plaster and wallboard; roofing materials; corrugated cardboard and miscellaneous paper; ferrous and nonferrous metal; non-asbestos building insulation; plastic scrap; dirt; carpets and padding; glass (window and door); and other miscellaneous materials; but does not include other solid waste types.

In New York, C&D debris is defined as uncontaminated solid waste resulting from the construction, remodeling, and repair and demolition of utilities, structures and roads, as well as uncontaminated solid waste resulting from land clearing. Such waste includes, but is not limited to bricks, concrete and other masonry materials, soil, rock, wood (including painted, treated and coated wood and wood products), land clearing debris, wall coverings, plaster, drywall, plumbing fixtures, non-asbestos insulation, roofing shingles and other roof coverings, asphalt pavement, glass, plastics that are not sealed in a manner that conceals other wastes, empty buckets of ten gallons or less in size and having no more than one inch of residue remaining on the bottom, electrical wiring and components containing no hazardous liquids, and pipe and metals that are incidental to any of the above.

C&D debris generated by project-related demolition and construction may be recycled. In New Jersey, recyclable material is known as "Class B recyclable material", which is defined as a source-separated material which is subject to NJDEP approval prior to receipt, storage, processing or transfer at a recycling center in accordance with N.J.S.A. 13:1E-99.34b, and which includes, but is not limited to, the following:

- Source-separated, non-putrescible, waste concrete, asphalt, brick, block, asphalt-based roofing, scrap and wood waste;

[23] Port Authority of New York & New Jersey Engineering Department, *Sustainable Design Project Manual*, June 1, 2007.

- Source-separated, non-putrescible, waste materials other than metal, glass, paper, plastic containers, corrugated and other cardboard resulting from construction, remodeling, repair and demolition operations on houses, commercial buildings, pavements and other structures;
- Source-separated whole trees, tree trunks, tree parts, tree stumps, brush and leaves, provided that they are not composted;
- Source-separated scrap tires; and
- Source-separated petroleum contaminated soil.

In New York, C&D debris generated by project construction would be sent to processing facilities authorized to handle such material. These facilities remove reusable building or construction materials from the waste stream, and process the material into usable components or products.

In New Jersey, the disposal of these materials would be done in accordance with Union County's Solid Waste Management Plan and in compliance with the regulations of the *Solid Waste Management Act* (N.J.S.A. 13:1 E-1), which are implemented by N.J.A.C. 7:26 *et seq*. In New York, disposal is governed by the regulations contained in Chapter IV, Subchapter B, Part 360 of Title 6 of the *Official Compilation of Codes, Rules and Regulations of the State of New York* (6 NYCRR).

Tables 5.16-1 and 5.16-2 list the facilities in Union County (New Jersey) and Richmond County (Staten Island), respectively, that are authorized to process C&D debris.

5.16.4.2 Operational Impacts

The type and amount of solid waste generated by the operation of the new bridge would be similar for all of the Build Alternatives. Solid waste that is currently generated by the employees located in the Goethals Bridge Administration Building, Maintenance Building and Toll Plaza would continue with the Proposed Project. The operation of the new bridge is not expected to significantly increase these quantities above current levels.

5.16.4.3 Demolition of the Existing Bridge

As detailed in Section 3.4.6, the demolition of the existing bridge would involve the removal of the following structural elements:

- The main truss span superstructure and its main piers.
- The New Jersey and New York approach span superstructures and their piers.
- The New Jersey and New York hollow abutments and their foundations.

Preliminary estimates of demolition quantities, based on available existing bridge drawings, are presented in Table 5.16-3. As with the construction of the new bridge, demolition debris would be treated as C&D debris. Much of the demolished concrete would be taken to the various transfer stations and Class B recycling facilities and processed as C&D debris. The structural steel has commercial value as scrap metal and would be transported to appropriate facilities according to relevant state and local regulations. Because the main truss was recently painted, it is not anticipated that lead-based paint (LBP) would be present in this element. For the approach spans and the New Jersey east approach ramp, testing for LBP will be conducted prior to demolition. At this time, it is not clear whether the demolition debris would be taken away by truck or by barge, or by a combination of the two. All transportation of demolition debris would follow designated routes for such transport of materials and would comply with state and local regulations.

TABLE 5.16-1
SOLID WASTE FACILITIES AUTHORIZED
TO ACCEPT C&D DEBRIS IN UNION COUNTY, NEW JERSEY

Facility Type	Facility Name and Address	Materials Processed	Capacity	Total Volume Utilized (2002)	% Capacity Utilized (2002)
Transfer Station	***Waste Management of NJ*** 864 Julia Street Elizabeth	10, 13, 13C, 23, 25, 27	1,600 tpd	371,988 tons	77.5%
	Waste Management of NJ Amboy Avenue Elizabeth	10, 13, 13C, 23, 27	2,000 tpd	427,677 tons	71.3%
	Waste Management of NJ 1520 Lower Road Linden	10, 13, 13C, 23, 27	1,200 tpd	n/a	n/a
	Plainfield City Rock Avenue Plainfield	10, 13, 13C, 23	99 tpd	32,514 tons	109.5%
	Summit City New Providence Avenue Summit	10, 13, 13C, 23, 25, 27	100 tpd	10,601 tons	35.3%

TABLE 5.16-1 (CONTINUED)

Facility Type	Facility Name and Address	Materials Processed	Capacity	Total Volume Utilized (2002)	% Capacity Utilized (2002)
Class B	***Grasselli Point Industries*** Grasselli Road Linden	B&B, C	2,600 tpd	158,894 tons	20.4%
	Rockcrete Recycling Corp. 845 Julia Street Elizabeth	A, B&B, C	1,000 tpd	56,483 tons	18.8%
	Waste Management of NJ Amboy Avenue Elizabeth	A, B&B, C, W	1,000 tpd	7,412 tons	2.1%

Solid Waste Types:
10 = Municipal
13 = Bulky Waste
13C = C&D debris
23 = Vegetative Waste
25 = Animal and Food Processing Wastes
27 = Dry Industrial Waste

Capacity Abbreviations:
tpd = tons per day
n/a = not available

Recycled Materials Abbreviations:
A = Asphalt
ABRM = Asphalt-Based Roofing Material
B = Brush
B&B = Brick and Block
C = Concrete
PCS = Petroleum-Contaminated Soil (non-hazardous)
W = Wood (unpainted, not chemically-treated)
TP = Tree Parts
TRS = Trees
TS = Tree Stumps

Sources:

- NJDEP's Division of Solid and Hazardous Waste, Database Search of New Jersey Approved Class B Recycling Facilities, November 2007. (http://www.nj.gov/dep/dshw/lrm/classbsch.htm)
- NJDEP's Division of Solid and Hazardous Waste Management Program, 2006 State Wide Solid Waste Management and Sludge Management Plan Update, January 2006. (http://www.state.nj.us/dep/dshw/recycle/swmp/index.html)

TABLE 5.16-2
SOLID WASTE FACILITIES AUTHORIZED TO ACCEPT C&D DEBRIS IN RICHMOND COUNTY, (STATEN ISLAND) NEW YORK

Facility Name and Address	Materials Processed	NYSDEC Permit No.
Flag Container Services, Inc. 11 Ferry Street	C&D debris, concrete, soil (clean), rock, wood (clean), woodchips, trees and stumps, pallets and crates, cardboard, plastics, aluminum, waste tires	2-6401-00020
Stokes Waste Paper Co., Inc. 25 Van Street	C&D debris, concrete, brick, soil (clean), trees and stumps	2-6401-00001

Source: NYSDEC, Division of Solid & Hazardous Materials, Solid Waste Management Program, Construction and Demolition Debris Processing Facilities. http://www.dec.ny.gov/docs/materials_minerals_pdf/cddprocess.pdf

TABLE 5.16-3
ESTIMATED DEMOLITION QUANTITIES

Element	Demolition Quantities			
	Structural Steel (tons)	Deck Concrete (yd^3)	Pier Concrete (yd^3)	Foundation Concrete (yd^3)
Main Truss Span	4,300	1,800	8,000	6,400
New Jersey Approach Spans	5,300	4,000	7,600	3,300
New York Approach Spans	5,800	4,500	6,500	2,900
New Jersey East Approach Ramp	700	1,700	800	400
New Jersey Hollow Abutment	0	900	1,400	370
New York Hollow Abutment	0	700	1,000	300
Total	**16,100**	**13,600**	**25,300**	**13,670**

Source: HNTB.FIGG, October 2005.

5.16.5 Mitigation

No adverse impacts to local or county solid waste programs are anticipated to result from the Proposed Project. During construction and demolition, all practical efforts toward the beneficial reuse and recycling of waste material will be taken. Where practical and feasible, most of the structural steel in the existing bridge would be sold and recycled as scrap metal. The New Jersey Artificial Reef Program has used bridge demolition material in the past to build up existing reef sites. The location of the Goethals Bridge makes an ideal situation to load barges with material and deliver it to the reef sites along the coast. Much of the remaining demolition debris would be processed at area C&D facilities, which would remove reusable materials from the waste stream and process the material into usable components or products.

5.16.6 Summary

Where appropriate, construction and demolition debris will be recycled or reused. Most of the transfer stations and recycling facilities in Union and Richmond Counties function at or below their permitted capacity. As a result, project-generated construction and demolition debris can be adequately accommodated, especially given the temporary and short-term nature of such solid waste streams. The disposal of any construction and demolition debris inappropriate for recycling will be conducted in accordance with the regulations of the New Jersey Solid Waste Management Act and 6 NYCRR. During the new bridge's operation, maintenance and toll collection activities will maintain their current operational practices without any significant increase in solid waste. Consequently, the Proposed Project is not anticipated to generate a significant amount of solid waste to local collection and disposal services or to the solid waste streams in New Jersey or New York.

5.17 Infrastructure

5.17.1 Introduction

This section evaluates the potential impacts related to infrastructure that could result from the construction and operation of the Proposed Project, including the demolition of the existing bridge. The analysis focuses on construction activity since the construction work may directly impact and require the relocation of utilities that serve the Goethals Bridge Study Area.

5.17.2 Methodology, Approach and Data Sources

The evaluation of potential infrastructure impacts involved conversations with utility providers as well as a comparison of the existing and proposed utility and infrastructure design plans, right of way and construction requirements of the four Build Alternatives, thus depicting the location of underground utilities and other infrastructure in relationship to the footprints of the Build Alternatives.

5.17.3 No-Build Alternative

Under the No-Build Alternative, no impact to the area's infrastructure or utility services is expected.

5.17.4 Build Alternatives

Selection of any of the Build Alternatives would result in similar impacts to the infrastructure and utility services in New Jersey. However, there are some differences in impacts on the New York side of the Goethals Bridge Study Area between the two Southern Alternatives and the two Northern Alternatives.

5.17.4.1 Construction Impacts

New Jersey

Water Supply

All of Elizabeth's water mains are located within the existing rights-of-way of the city's local roads. None of the Build Alternatives would result in the closure or relocation of any local roads or water mains; therefore no impact is anticipated to the city's water mains.

Sanitary and Storm Sewers

All sewer lines in Elizabeth are located within the existing right-of-way of the city's local roads. None of the Build Alternatives would result in the closure or relocation of any local roads or sewer lines. Therefore no impact is anticipated to the city's sewer mains.

Communication and Electric Utilities

None of the Build Alternatives would result in any adverse impacts to local telephone or electric service in Elizabeth. Pole-mounted overhead electric lines can be easily relocated as necessary. The towers associated with the 138 kV overhead transmission line located near Interchange 13 of the New Jersey Turnpike would also not be affected by the construction of any of the alternatives.

Petroleum and Natural Gas Pipelines

No underground petroleum pipelines or natural gas mains in Elizabeth would be impacted by construction of any of the Build Alternatives. No other impacts are anticipated.

Railroads

None of the Build Alternatives is expected to impact the Staten Island Railroad, the Chemical Coast Secondary Line or the Chemical Coast Northern Connector. Placement of piers for the New Jersey approaches would avoid the railroad rights-of-way. In addition, the new approach roadways would span these rail lines.

New York

Water Supply

All of the Build Alternatives may result in the realignment of a section of Gulf Avenue; however, no impact to the 12-inch water main within Gulf Avenue right-of-way is anticipated. No other water supply impacts are anticipated with the Southern Alternatives.

Construction of either Northern Alternative would result in the relocation of Goethals Road North and its intersection with Western Avenue in Staten Island. This would result in the relocation of the 12-inch water main currently located within Goethals Road North. Any service impact to existing users would be temporary and would occur only during the construction period. No other water supply impacts are anticipated with the Northern Alternatives.

Sanitary and Storm Sewers

There are no sanitary or storm sewers located in the immediate vicinity of the bridge and construction zone on the New York side of the bridge. Therefore, no impacts to sanitary sewer service are anticipated with any of the Build Alternatives.

Communication and Electric Utilities

Due to proposed work in the vicinity of the existing toll plaza in Staten Island, any of the Build Alternatives would result in the relocation of several Con Edison electric lines both above and below ground. Because the Port Authority's fiber optic cable from the Teleport Business Park crosses the Arthur Kill along the existing bridge into New Jersey, this cable would need to be relocated to the new bridge. Also, in the case of either of the Northern Alternatives, the associated relocation of Goethals Road North would result in additional relocation of Con Edison electric lines both above and below ground. Any service impact to existing users would be temporary and would occur only during the construction period. No other impacts are anticipated.

Petroleum and Natural Gas Pipelines

No underground petroleum pipelines would be impacted by construction of any of the Alternatives. The piers for the New York approach would be located to avoid any natural gas and petroleum pipelines operated by Texas Eastern, Colonial, Coastal and Exxon/Mobil that pass beneath the New York approaches to the bridge. In the case of either Northern Alternative, some minor property acquisition at the Texas Eastern/KeySpan gas metering station located at the northeast corner of the Western Avenue/Goethals Road North intersection may be required. However no structures would be impacted and the facility's operation would not be permanently or adversely impacted.

Railroads

None of the Build Alternatives are expected to have long-term impacts to the Travis Branch of the Staten Island Railroad in Staten Island. The existing bridge that carries the railroad over the New York approach would be removed and replaced with a longer span. The construction impacts of a longer-span Travis Branch Railroad overpass would be minimal and limited to a single weekend with the roll-in construction method as presented in Section 3.4.8.

5.17.4.2 Operational Impacts

New Jersey

No adverse impact to the area's infrastructure in Elizabeth or Linden is anticipated due to the operation of any of the four Build Alternatives, nor would any of these alternatives cause an increase in the consumption of water or natural gas, or result in any increase in sanitary sewage generation. A marginal increase in the consumption of electricity is likely due to increased and improved lighting, electronic signage and security cameras, although this impact is not considered to be significant. No impacts to the Staten Island Railroad, the Chemical Coast Secondary Line or the Chemical Coast Northern Connector are expected as a result of the operation of the new bridge.

New York

No adverse impact to the area's infrastructure in Staten Island is anticipated from the operation of any of the Build Alternatives, nor will any of these alternatives cause any increase in the consumption of water or natural gas, or in sanitary sewage generation. As in New Jersey, a marginal increase in the

consumption of electricity is expected due to increased and improved lighting, electronic signage and security cameras. However, this impact is not considered to be significant. No impacts to the Travis Branch of the SIRR are anticipated as a result of the operation of the new bridge.

5.17.5 Mitigation of Impacts

Close coordination with the utility carriers will be implemented during the construction phase to avoid long term service disruption during the relocation of utility service lines. For example, the construction contractor will confirm exact field locations and schedule work with utilities. Upon the implementation of a Stormwater Management Plan and associated Best Management Practices (BMPs), it is anticipated that any potentially adverse impacts can be avoided, although such impacts are not anticipated to occur.

5.17.6 Summary

Depending upon which Build Alternative is selected; Gulf Avenue and/or Goethals Road North would be relocated or realigned. This would result in the relocation or realignment of some above-or below-ground utilities within the affected rights-of-way, none of which would result in a significant impact. A marginal increase in the consumption of electricity is anticipated with each of the Build Alternatives due to increased and improved lighting, electronic signage and security cameras. However, this increase is not considered to be significant. No impacts to any railroad operations are anticipated.

5.18 Contaminated Materials

5.18.1 Introduction

This section examines the potential impacts related to contaminated materials that could result from the construction and operation of the new bridge and the demolition of the existing bridge. The analysis considers the potential to encounter contaminated soil and groundwater and other hazardous materials, such as building materials, during the construction of the Proposed Project. Contaminated soils, sediments and groundwater are likely to be disturbed during subsurface construction activities. The type of contaminants encountered and the impacts of the contaminated materials will largely be dependent on the final alignment selected. Mitigation measures are also discussed to provide a means of avoiding potential impacts to human health and the environment during construction, as well as after the Proposed Project is completed and operational.

5.18.2 Methodology, Approach and Data Sources

The involvement of areas with potential contamination in the Proposed Project was identified by overlaying the project's conceptual design plans onto maps depicting sites of environmental concern, and use of the contaminated materials screening (Appendix I) and results of previous soil and groundwater sampling conducted by the Port Authority, as discussed in Section 4.18.

5.18.3 No-Build Alternative

Under the No-Build Alternative, the Proposed Project would not be undertaken and the existing bridge would remain. No potentially contaminated properties or sites with known contamination would be disturbed. In the case of the Borne Chemical Company property in Elizabeth, it is expected that the property would continue to be remediated and redeveloped as part of the Elizabethport Brownfields Development Area (BDA) by the City of Elizabeth in conjunction with Jay Cashman, Inc., regardless of the fact that no improvements to the Goethals Bridge would be implemented. Similarly, the R. T. Baker & Son property in Staten Island would likely be investigated and remediated, either by R.T. Baker & Son

or by the New York State Department of Environmental Conservation (NYSDEC), irrespective of the Proposed Project's construction.

5.18.4 Build Alternatives

Contaminated materials would likely be disturbed during construction along each of the four proposed alignments, although the degree to which contaminated materials would be involved would depend on the alignment selected.

5.18.4.1 Southern Alternatives

Impacts associated with both the New Alignment South and the Existing Alignment South alternatives would be similar, although the extent of encroachment on various properties known or suspected to be contaminated may vary.

Construction Impacts

New Jersey

The waterfront along the Arthur Kill in Elizabeth has a long history of industrial and manufacturing use dating back to at least the late 1800s and early 1900s. Based on the findings of the contaminated materials screening (Appendix I) and previous soil and groundwater sampling conducted by the Port Authority, contaminated soil and groundwater are anticipated to be encountered along the New Jersey approach at the former Byron Heffernan & Co./National Solvent Site, Waste Management Company, the former Borne Chemical property, Phelps Dodge Wire & Cable, the interpier basin/boat slip area at the edge of the Arthur Kill, and Bayway Industrial Center. Along the New Jersey approach, coal tar (consisting of volatile organic compounds [VOCs], polycyclic aromatic hydrocarbons [PAHs], metals and cyanide), solvents (VOCs), historic fill (consisting of possible PAHs, polychlorinated biphenyls [PCBs] and metals), and petroleum products (which typically include total petroleum hydrocarbons [TPH], VOCs and semivolatile organic compounds [SVOCs]) are known or likely to be present, and would be disturbed in the soils. The six areas of potential contamination identified within the alignments of the two proposed Southern Alternatives in New Jersey are depicted on Figure 4.18-2 in Section 4.18. Descriptions of the contamination found at each of these sites are discussed in detail in Section 4.18 and summarized in Table 5.18-1. The impacts of construction for the Southern Alternatives are discussed below.

Construction of the proposed New Alignment South and Existing Alignment South alternatives in New Jersey would require varying degrees of clearing, excavation, grading and demolition. Much of the excavation work would focus around the construction of the bridge pier abutments. The Southern Alternatives would require a crossing of the interpier basin on the New Jersey side of the Arthur Kill, thereby requiring pier placement within the basin; both Southern Alternatives also require temporary placement of a finger trestle across the interpier basin to provide access during construction. The interpier basin is bordered by Phelps Dodge Wire & Cable to the north and Bayway Industrial Center to the south. The bridge design would necessitate the construction of permanent roads along the sides of the interpier basin that would be constructed on fill for bridge construction, maintenance and security. Depending on the alignment, temporary and/or permanent roads would be constructed on the Phelps Dodge Wire & Cable, former Borne Chemical and/or Bayway Industrial Center properties.

Both commercial and residential properties would be acquired for the Southern Alternatives in the area bound by Krakow Street, South Front Street, Bay Way and Burlington Avenue. Most of the buildings on these properties appear to have been built prior to the 1970s. As a result, asbestos and lead-based paint may be found in the structures to be demolished as part of construction activities. Asbestos, lead-based paint, PCB-containing oil in electrical equipment, and other hazardous materials would be removed in

TABLE 5.18-1
AREAS OF POTENTIAL CONTAMINATION IMPACTED BY NEW AND EXISTING ALIGNMENT SOUTH ALTERNATIVES: NEW JERSEY

Fig. ID	Facility	Site Address	Potential Contaminants
1	Former Byron Heffernan & Co./ National Solvent Site	Currently a triangular area bounded by NJ Turnpike, Staten Island Rail Road and the Goethals Bridge Approach	Coal tar, solvents, petroleum products, metals and cyanide
4	Waste Management Co.	629-647 S. Front Street	Petroleum products, TPH, VOCs, SVOCs, PCBs and metals
5	Former Borne Chemical Property	632-650 S. Front Street	Petroleum products and historic fill
6	Phelps Dodge Wire & Cable	S. Front Street	Historic fill and possible petroleum products, PAHs, PCBs and metals
7	Interpier Basin / Boat Slip Area	Not Applicable	Petroleum products, SVOCs, PCBs, pesticides, dioxins and metals in sediments
8	Bayway Industrial Center	660 - 720 S. Front Street	Petroleum products, pesticides and historic fill; SVOCs, PCBs, pesticides, dioxins and metals in sediments;

Note: Facility locations are shown on Figure 4.18-2 in Section 4.18.
Source: Berger/PB, 2008.

accordance with local, New Jersey Department of Environmental Protection (NJDEP), New Jersey Department of Community Affairs (NJDCA), New Jersey Department of Labor (NJDOL), federal Occupational Safety and Health Administration (OSHA) and U.S. Environmental Protection Agency (USEPA) regulations. In addition, underground storage tanks (USTs) identified in the Proposed Project area that would be impacted by construction would be removed in accordance with local and NJDEP regulations.

New York

The waterfront along the Arthur Kill in Staten Island remained largely undeveloped until the 1960s. However, in the 1940s and 1950s, an undeveloped portion of the Arthur Kill shoreline was filled with dredged material. Based on the findings of the contaminated materials screening (Appendix I) and previous soil and groundwater sampling conducted by the Port Authority, contaminated soil and groundwater are anticipated to be encountered along the New York approach at the Shoreline Area (Block 1895, Lots 1, 50 and 100), R.T. Baker & Son Machinery Salvage Company, former GATX property, Heavy Equipment Rentals, Frank Liquori Plumbing, the Goethals Administration Building/Maintenance Facility and the Saperstein properties. Along the New York approach, petroleum products (TPH, VOCs and SVOCs), PCBs, and metals are known or likely to be present, and would be disturbed in the soils. The seven areas of potential contamination identified on Staten Island within the alignments of the two proposed Southern Alternatives are depicted on Figure 4.18-2 in Section 4.18. Descriptions of the contamination found at each of these sites are discussed in detail in Section 4.18 and summarized in Table 5.18-2. The impacts of construction for the Southern Alternatives are discussed below.

TABLE 5.18-2
AREAS OF POTENTIAL CONTAMINATION IMPACTED BY NEW AND EXISTING ALIGNMENT SOUTH ALTERNATIVES: NEW YORK

Fig. ID	Facility	Site Address	Potential Contaminants
9	Shoreline Area	Block 1895, Lots 1, 50 and 100	Dredge spoils area; SVOCs, TPH, metals, pesticides and possibly dioxins
10	R.T. Baker & Son Machinery Salvage Co.	250 Goethals Road North	Salvage yard – confirmed PCB, VOCs and metal contamination
11	Former GATX Property	500 Western Avenue	Pesticides in groundwater
13	Heavy Equipment Rentals	Gulf Ave, east of intersection with Western Avenue	Potential petroleum discharges, leaks and spills; VOCs, SVOCs and metals.
14	Frank Liquori Plumbing	Gulf Ave, east of intersection with Western Avenue	Potential petroleum discharges, leaks and spills; VOCs, SVOCs TPH and metals
15	Goethals Bridge Administration / Maintenance Facility	Goethals Road North	Underground fuel storage tanks; petroleum products, VOCs, SVOCs TPH and metals
16	Saperstein Properties	2828 & 2826 Gulf Avenue	Former Salvage yard: potential petroleum discharges, leaks and spills; VOCs, SVOCs TPH and metals

Note: Facility locations are shown on Figure 4.18-2 in Section 4.18.
Source: Berger/PB, 2008.

Along the New York approach, construction of the proposed New Alignment South and Existing Alignment South alternatives would involve varying degrees of clearing, excavation, grading, demolition and the construction of bridge piers. Construction activities would also include the realignment of Gulf Avenue, which would disturb potentially contaminated soils and groundwater through excavation and construction dewatering. Much of the excavation work would focus around the construction of the bridge pier abutments. The cable-stay bridge would require the construction of temporary and permanent access roads constructed on fill and trestles beneath the approach structure. The temporary finger roads would be utilized for construction only while the permanent road would be utilized for construction, as well as long-term maintenance and security. The permanent road would be constructed over a portion of the R.T. Baker site.

Operational Impacts

Contaminated materials would not be impacted on either the New Jersey or New York side by the operation of either of the Southern Alternatives. Long-term beneficial impacts could be realized through the remediation of contaminated materials.

5.18.4.2 Northern Alternatives

Impacts associated with both the New Alignment North and the Existing Alignment North alternatives would be similar, although the extent of encroachment on various properties known or suspected to be contaminated may vary.

Construction Impacts

New Jersey

Six areas of potential contamination have been identified within the alignments of the two proposed Southern Alternatives in New Jersey, including the former Byron Heffernan & Co./National Solvent Site, the former Olympia Trails Bus Company site, Bayway Metals, Waste Management Company, the former Borne Chemical property, Phelps Dodge Wire & Cable. These sites are depicted on Figure 4.18-2 in Section 4.18. Descriptions of the contamination findings for each site are discussed in detail in Section 4.18 and summarized in Table 5.18-3. Construction impacts at each site associated with each Northern Alternative are discussed in detail below.

TABLE 5.18-3
AREAS OF POTENTIAL CONTAMINATION IMPACTED BY NEW AND EXISTING ALIGNMENT NORTH ALTERNATIVES: NEW JERSEY

Fig. ID	Facility	Site Address	Potential Contaminants
1	Former Byron Heffernan & Co./ National Solvent Site	Currently a triangular area bounded by NJ Turnpike, Staten Island Rail Road and the Goethals Bridge Approach	Coal tar, solvents, petroleum products, metals and cyanide
2	Former Olympia Trails Bus Co. Site	220 Relocated Bayway Avenue	Petroleum products, TPH, VOCs and SVOCs,
3	Bayway Metals	637-647 Amboy Ave	Petroleum products, PCBs and metals
4	Waste Management Co.	629-647 S. Front Street	Petroleum products, TPH, VOCs, SVOCs, PCBs and metals
5	Former Borne Chemical Property	632-650 S. Front Street	Petroleum products and historic fill
6	Phelps Dodge Wire & Cable	S. Front Street	Historic fill and possible petroleum products, PAHs, PCBs and metals

Note: Facility locations are shown on Figure 4.18-2 in Section 4.18.
Source: Berger/PB, 2008.

Construction activities for the proposed Northern Alternatives in New Jersey would be similar to those of the two Southern Alternatives. Much of the excavation work would focus around the construction of the bridge pier abutments. However, unlike the Southern Alternatives, there would be no involvement with the interpier basin/boat slip area at the edge of the Arthur Kill. A permanent road would be constructed on fill on the former Borne Chemical and Phelps Dodge Wire & Cable properties and would be utilized for construction, as well as for long-term maintenance and security.

The acquisition and demolition of buildings in the area bounded by Krakow Street, South Front Street, Bay Way and Burlington Avenue would be limited in the case of the Existing Alignment North, or not required at all in the case of the New Alignment North.

New York

Eight known or potentially contaminated areas were identified within the alignments of the two proposed Northern Alternatives on Staten Island, including the Shoreline Area along the Arthur Kill, the R.T. Baker & Son Machinery Salvage Company, the former GATX property, the Coca Cola distributor, Heavy

Equipment Rentals, Frank Liquori Plumbing, the Goethals Bridge Administration/Maintenance Facility, and the Saperstein properties. These sites are depicted on Figure 4.18-2 in Section 4.18. Descriptions of the contamination findings for each site are discussed in detail in Section 4.18 and summarized in Table 5.18-4. Construction impacts at each site associated with each Northern Alternative are discussed in detail below.

TABLE 5.18-4
AREAS OF POTENTIAL CONTAMINATION IMPACTED BY NEW AND EXISTING ALIGNMENT NORTH ALTERNATIVES: NEW YORK

Fig. ID	Facility	Site Address	Potential Contaminants
9	Shoreline Area	Block 1895, Lots 1, 50 and 100	Dredge spoils area; SVOCs, TPH, metals, pesticides and possibly dioxins
10	R.T. Baker & Son Machinery Salvage Co.	250 Goethals Road North	Salvage yard – confirmed PCB, VOCs and metal contamination
11	Former GATX Property	500 Western Avenue	Pesticides in groundwater
12	Coca Cola Distributor	Western Avenue	Underground Storage Tanks
13	Heavy Equipment Rentals	Gulf Ave, east of intersection with Western Avenue	Potential petroleum discharges, leaks and spills; VOCs, SVOCs and metals.
14	Frank Liquori Plumbing	Gulf Ave, east of intersection with Western Avenue	Potential petroleum discharges, leaks and spills; VOCs, SVOCs TPH and metals
15	Goethals Bridge Administration/Maintenance Facility	Goethals Road North	Underground fuel storage tanks; petroleum products, VOCs, SVOCs TPH and metals
16	Saperstein Properties	2828 & 2826 Gulf Avenue	Former Salvage yard: potential petroleum discharges, leaks and spills; VOCs, SVOCs TPH and metals

Note: Facility locations are shown on Figure 4.18-2 in Section 4.18.
Source: Berger/PB, 2008.

Construction activities for the proposed Northern Alternatives in New York would be similar to those of the Southern Alternatives. Much of the excavation work would focus around the construction of the bridge pier abutments. Construction would also include the relocation of Goethals Road North, east of the Goethals Bridge Administration/Maintenance Facility that connects to Western Avenue in the vicinity of the Coca Cola distributor on Western Avenue. Construction activities would also include the realignment of Gulf Avenue, which would encroach on several properties south of the bridge approach and disturb potentially contaminated soils and groundwater through excavation and construction dewatering. The bridge designs would require the construction of temporary and permanent roads constructed on fill and trestles beneath the approach structure. A permanent road would be constructed over a portion of the R.T. Baker site for the Existing Alignment North and potentially the New Alignment North; the road would be used for construction, as well as long-term maintenance and security purposes.

Operational Impacts

Contaminated materials would not be impacted on either the New Jersey or New York side by the operation of either of the Northern Alternatives. Long-term beneficial impacts could be realized through the remediation of contaminated materials.

5.18.5 Mitigation

Mitigation measures would be necessary to address the contaminated materials that would be encountered during construction. Interagency coordination regarding contamination, impacts, and mitigation would be a requirement throughout the planning, sampling and remediation process, as necessary. Due to the existing findings and history of contamination at the former Borne Chemical Co. in New Jersey and the R.T. Baker & Son site in New York, remediation at these properties would be necessary, regardless of the Proposed Project.

The former Borne Chemical site is currently being developed as part of an ongoing Brownfields Development Area in Elizabeth. Soil and groundwater investigations on the property have been completed and a Remedial Action Workplan (RAW) for soil is currently awaiting approval by the NJDEP; a separate RAW for groundwater is anticipated to be submitted to NJDEP at a later date. It is currently anticipated that the most contaminated soils (i.e., "hot spots") on the property will be excavated and disposed of off-site. Any remaining contaminated soils in excess of NJDEP standards that will be left in-place will be covered by an impermeable cap, and a deed notice filed. Soil remediation could potentially be completed prior to the construction of the proposed Goethals Bridge Replacement project. Groundwater remediation at the Borne Chemical site is anticipated to include the removal of separate phase product from the water table as well as long-term groundwater monitoring.

Bridge piers and a temporary or permanent access roadway would be constructed on portions of the Borne Chemical site as part of either of the two Northern Alternatives for the Goethals Bridge Replacement project. Since soil remediation could potentially be complete before construction of the bridge replacement, appropriate precautions and coordination with the NJDEP and landowners will be necessary to ensure that construction activities do not disturb any contaminated materials and that the cap is adequately protected. If soil remediation of this site does not occur prior to the construction of the new bridge crossing, mitigation measures would be required to prevent potential adverse impacts.

In New York, the proposed construction will require either the partial or full acquisition of the R.T. Baker property. According to the NYSDEC case manager, additional investigation activities will be completed, but no definite schedule has been set for the investigation. It is considered unlikely that remediation of this site will be completed prior to the construction of the bridge replacement. As a result, additional soil and groundwater investigation may be necessary to evaluate the current concentrations and extent of contamination present on the property, as well as to evaluate and select appropriate remedial alternatives. If necessary, the likely remediation alternative for the contaminated soils would be "hot-spot" removal and offsite disposal of the highly contaminated soils, while other less contaminated soil would potentially remain in place with engineering and institutional controls, such as capping and deed notice.

Further Investigations

Although contamination is expected throughout much of the Proposed Project area, site-specific sampling has not been conducted at most of the known or suspected contaminated areas within the proposed alignments. Additional soil, sediment and groundwater sampling will be necessary to assess the nature and extent of contamination, determine whether remediation is necessary, assess waste management or reuse options, and determine the level of worker and public health and safety necessary. The sampling locations would likely focus on all or selected pier locations because much of the contaminated materials generated during construction would be associated with the installation of the piers. However, other areas in which soil excavation and construction dewatering would be required during construction should also be considered for additional investigation.

Detailed construction specifications for excavation, management of contaminated soil/sediments and dewatering effluent, and health and safety procedures can only be determined once the limits of

disturbance are identified and an appropriate testing program can be developed. Once the actual alternative has been chosen, coordination between the Port Authority, the various state and local agencies (NJDEP, NYSDEC and NYCDEP), property owners, and potentially other responsible parties (or affected parties) would be consulted in order to: 1) obtain environmental background information on the portions of the site which will be disturbed or acquired; 2) develop a scope and schedule for subsurface investigation activities; 3) establish health and safety requirements during the testing; and 4) consider ongoing or anticipated investigation/remediation efforts at selected sites, such as Borne Chemical Co. and R.T. Baker. A testing program and remediation activities, if necessary, would need to be coordinated and be consistent with any ongoing environmental activities at these sites.

A comprehensive investigation workplan would be prepared that details the sampling objectives, locations, depths, procedures and analytical methods. The workplan would be prepared to be consistent with applicable guidance and regulations including NJDEP's *Technical Requirements for Site Remediation* and NYSDEC *Draft DER-10*. The NJDEP's *The Management and Regulation of Dredging Activities and Dredged Material in New Jersey's Tidal Waters* and appropriate US Army Corps of Engineers' guidance documents may also be used to evaluate appropriate sediment sampling requirements.

Remediation of Contaminated Sites

Once the contamination that will be disturbed has been characterized, a RAW would be prepared to address remediation of the contaminated sites and areas within the project corridor where contamination is present in excess of applicable state and federal guidelines, criteria or standards. The RAW would be prepared after the subsurface investigations are completed and remedial alternatives have collectively been assessed. The workplans would be prepared consistent with applicable guidance and regulations, including NJDEP's *Technical Requirements for Site Remediation*, NYSDEC Draft *DER-10* and New York City's *Environmental Quality Review Manual* (Chapter 3J). The RAW would detail the nature and extent of contamination present and the specific mitigation requirements for contaminated sites in the project area. Mitigation of contaminated materials would include remediating contaminated soils, groundwater and sediments through beneficial reuse, offsite disposal or treatment. Mitigation measures could also include the use of engineering (e.g., capping) and institutional controls (e.g., deed notice) where contaminants remain in place in excess of applicable guidelines, standards and criteria, but do not represent a threat to human health and the environment. The RAW would need to be reviewed and approved by the Port Authority and by applicable state and local agencies.

Contaminated Materials Handling Plans

A contaminated materials handling plan will be developed for the management, handling, treatment and disposal of contaminated soils, sediments, groundwater and wastes encountered during construction. This plan would include procedures for stockpiling, testing, loading, transporting, and disposing of contaminated materials. The material handling plans should incorporate the requirement of the RAW where applicable. The plan would contain the general procedures and requirements for the contractor to manage contamination, soil sediment, groundwater, wastes and debris encountered during construction. Specific requirements for handling, dewatering and management of contaminated sediments would be included. The plan would detail the quantity and location of contaminated materials and would direct the proper testing, documentation, handling, containment, reuse and/or remediation during construction.

Dewatering

Construction would require dewatering in some areas where contaminated groundwater may be encountered. A testing and monitoring program would be developed as part of the project's dewatering

permit(s). New Jersey Pollutant Discharge Elimination System (NJPDES) regulations (N.J.A.C. 7:14A) and New York State Pollutant Discharge Elimination System (SPDES), as well as local ordinances, prohibit the discharge of contaminated groundwater to the ground, surface water bodies or sewer systems without discharge permits that establish specific discharge limits. If groundwater limits exceed the local sewer use limitations, the water would be treated prior to its disposal into local sewer systems. Additionally, the contractor would be required to obtain all applicable permits prior to discharge of any groundwater. Alternatively, the contractor may containerize the contaminated groundwater for transport and off-site disposal at a Port Authority-approved facility.

Demolition of Structures

In order to mitigate potential worker and public exposure to asbestos and lead-based paint during the demolition of various buildings and structures, surveys of asbestos and lead-based paint would be conducted on buildings and other structures to be demolished. Any asbestos and lead-based paint identified, as well as PCB-containing materials, would be removed in accordance with all NYSDEC, NYSDOL, NJDEP, NJDCA, NJDOL, OSHA and USEPA regulations, as appropriate. In addition, any underground storage tanks (USTs) identified during the demolition activities in impacted areas would be removed in accordance with applicable local, NJDEP and NYSDEC regulations.

In the case of the existing bridge, the approach spans and the New Jersey east approach ramp would be surveyed for asbestos and lead-based paint prior to demolition. If lead-based paint surfaces are present on the existing bridge structure, an exposure survey would be conducted to assess whether lead exposure would occur during construction of the Proposed Project. If the exposure survey indicates that there is the potential to generate airborne dust or fumes with lead levels exceeding health-based standards, a higher personal protection equipment standard would be employed. In all cases, appropriate methods to control dust and air monitoring, as required by OSHA, would be implemented.

Asbestos-containing materials (ACMs) may also be present on the existing bridge in materials such as caulks, gaskets, pipes, asbestos-cement pipes, packings, linings, insulation, etc. Proper handling, removal and disposal of asbestos-containing material are governed by both federal and state requirements. Appropriate engineering controls, such as encapsulation, wetting and other dust control measures to minimize asbestos exposure, would be implemented prior to and throughout the project's construction. Under any of the Build Alternatives, testing will be conducted at locations where construction would require demolition of structures having suspect materials to determine the presence of ACMs. Any confirmed positive materials would be removed during construction using appropriately licensed abatement contractor(s), in accordance with applicable state and federal regulations.

Health and Safety Plan

A Health and Safety Plan (HASP) would be developed prior to conducting any subsurface investigations and construction activities associated with the project to reduce the potential for worker or public contact with contaminated materials. The HASP would address the potential exposure pathways and other safety concerns associated with a variety of investigation and construction activities. The HASP would address both the known contamination issues (e.g., the need for air monitoring if excavating in known solvent-contaminated soil) as well as contingency items (e.g., if unknown tanks or drums are encountered).

The HASP would be the primary measure used to safeguard construction workers and nearby residents during construction. This document would describe, in detail, air, soil, and water sampling and monitoring that would take place during construction, planned responses to monitoring data, protective equipment to be used by workers, dust and vapor control measures and emergency procedures. These procedures would include requirements to notify appropriate regulatory agencies, as well as procedures to

quickly and safely address potential issues. The HASP may also include routine monitoring of both air and soil.

The provisions of the HASP would be required for all contractors engaged in any construction activities. On-site personnel would comply with all applicable local, state, Port Authority and OSHA codes and regulations. The HASP would require Port Authority and NJDEP and NYSDEC review and approval, as applicable.

5.18.6. Summary

Sixteen areas of potential soil, sediment and/or groundwater contamination (i.e., eight sites in New Jersey and eight sites in New York) have been identified along the proposed alignments of the Southern and Northern Alternatives being considered, which is, therefore, likely to result in the disturbance of potential contaminated materials. Table 5.18-5 summarizes the potential involvement of these sites by specific alternative. As summarized in the table, the Southern Alternatives (i.e., New Alignment South and Existing Alignment South) would have potential involvement with 13 known or potentially contaminated properties, while the Northern Alternatives (i.e., New Alignment North and Existing Alignment North) could involve construction impacts on 14 known or potentially contaminated properties.

TABLE 5.18-5
SUMMARY OF ANTICIPATED CONSTRUCTION IMPACTS ON POTENTIAL AREAS OF CONTAMINATION

Figure ID	FACILITY	SOUTHERN ALTERNATIVES		NORTHERN ALTERNATIVES	
		EXISTING	NEW	EXISTING	NEW
New Jersey – Elizabeth					
1	Former Byron Heffernan & Co./National Solvent	X	X	X	X
2	Former Olympia Trails Bus Co.			X	X
3	Bayway Metals			X	X
4	Waste Management Co.	X	X	X	X
5	Former Borne Chemical Property	X	X	X	X
6	Phelps Dodge Wire & Cable	X	X	X	X
7	Interpier Basin /Boat Slip Area	X	X		
8	Bayway Industrial Center	X	X		
New York – Staten Island					
9	Shoreline Area	X	X	X	X
10	R.T. Baker & Son	X	X	X	X
11	Former GATX Property	X	X	X	X
12	Coca-Cola Distributor			X	X
13	Heavy Equipment Rentals	X	X	X	X
14	Frank Liquori Plumbing	X	X	X	X
15	Goethals Bridge Administration/	X	X	X	X
16	Saperstein Properties	X	X	X	X

Note: - Facility locations are shown on Figure 4.18-2 in Section 4.18.
- "X" indicates disturbance to areas of potential contamination is anticipated.

Source: Berger/PB, 2008.

Prior to construction of the selected alternative, soil and groundwater testing would be performed at all or selected proposed pier locations in areas where contamination is known or suspected. Additional soil, sediment and groundwater testing will be conducted, as necessary, in other areas where subsurface construction activities are anticipated to encounter soil, sediments and/or groundwater contamination. The results of the testing would assist in the determination of appropriate waste management options such as soil/sediment disposal or reuse options, management of construction dewatering effluent, and determination of the level of worker and public health and safety.

Contamination Investigations would be implemented in each of these areas to characterize anticipated soil, sediment and/or groundwater contamination. The resulting data are used to facilitate the development of procedures and specifications for the proper management of the contaminated soil, sediment and groundwater anticipated to be encountered during various subsurface construction activities.

5.19 Energy

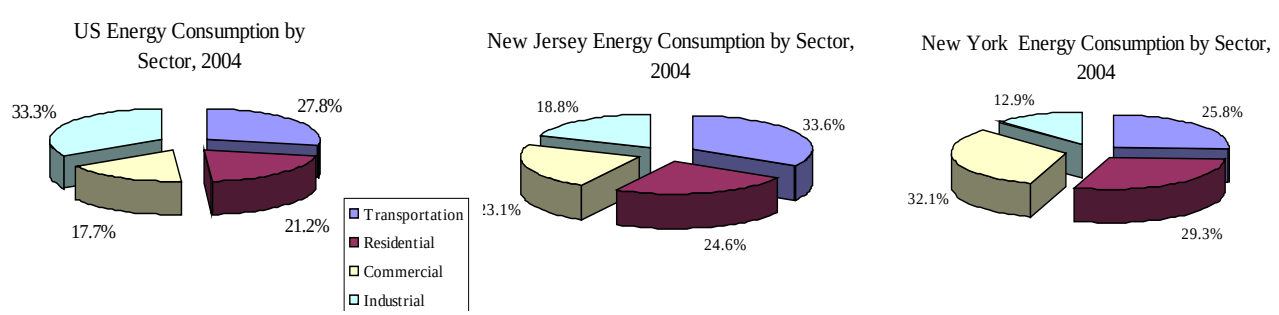
5.19.1 Introduction

Energy is commonly measured in terms of British thermal units, or BTUs. A BTU is defined as the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit. For transportation projects, energy usage is predominantly influenced by the amount of fuel used. The average BTU content of fuels is the heat value (or energy content) per quantity of fuel.

Transportation energy is generally discussed in terms of direct and indirect energy. Direct energy involves all energy consumed by vehicle propulsion. This energy is a function of traffic characteristics such as volume, speed, distance traveled, vehicle mix, and thermal value of the fuel being used. Indirect energy consumption involves the non-recoverable, one-time energy expenditure involved in constructing the physical infrastructure associated with the project and for the project's annual operations.

As shown in Figure 5.19-1, transportation is the second largest source of energy consumption in the United States. In New York, the transportation sector is the third largest source of energy consumption, while in New Jersey; the transportation sector is the largest source of energy consumption. Petroleum (e.g., gasoline, diesel fuel, jet fuel) is the predominant source of energy for transportation in New York and New Jersey.

Figure 5.19-1 Energy Consumption by Sector



Source: *U.S. Department of Energy, Energy Information Administration, State Energy Data 2003 Consumption, Washington, DC: 2006. URL - http://www.eia.doe.gov/emeu/states/_states.html*

5.19.2 Methodology, Approach and Data Services

Per Federal Highway Administration Technical Advisory T6640.8A (*Guidance for Preparing and Processing Environmental and Section 4(f) Documents*, 1987) on quantifying direct and indirect energy consumption related to a highway project, the potential energy effects of the construction and operation of the project alternatives were evaluated in comparison to the No-Build alternative. A detailed energy analysis was conducted based on the criteria in NYSDOT's *Draft Energy Analysis Guidelines for Project-Level Analysis* (2003), which are based on FHWA's 1987 energy analysis procedures. As New Jersey does not currently have state-specific guidelines regarding energy analysis procedures, the NYSDOT/FHWA guidelines have been applied to all analysis areas.

Both the potential direct and indirect energy impacts of the Proposed Project were analyzed based on guidance and procedures developed by NYSDOT for estimating the energy impacts from construction and operation of transportation projects. Based on the project alternatives' estimated time of completion (ETC) for construction (2014), the energy analysis was performed for future No-Build and Build Alternatives for ETC (2014), ETC + 10 (2024) and ETC +20 (2034), as per the NYSDOT guidelines.

While the Proposed Project's Build Alternatives vary in alignment, they would not vary operationally (i.e., affect traffic conditions); therefore the direct energy estimates are uniformly applicable to all four of the Build Alternatives. However, alternative-specific indirect energy estimates were done for each of the four Build Alternatives, reflecting their varying construction periods, ranging from 56 to 70 months, and for the No-Build alternative, which reflects only annual maintenance energy requirements.

5.19.3 Direct Energy

Direct energy impact is the energy consumed by vehicles using a facility, based on vehicular volumes, weight and average travel speeds. The direct energy analysis uses the Urban Fuel Consumption Method (UFCM) for light-duty vehicles and medium and heavy trucks described in NYSDOT's energy analysis guidelines. The UFCM is used with vehicle miles traveled (VMT), vehicle hours traveled (VHT) and resulting speeds for the No-Build and Build Alternatives assuming ETC (2014), ETC+10 (2024) and ETC+20 (2034), and estimates of energy use are calculated.

Input assumptions for the analysis are as follows:

- Vehicle volumes are derived for each facility segment, producing VMT for the Study Area.
- Vehicle weights are based on vehicle classifications, which are used to identify fuel consumption rates.
- The effect of slowdowns and stops associated with urban traffic on vehicle speeds is built into the average travel speeds and fuel consumption rates of the UFCM.

5.19.4 Fuel Consumption Rate/Fuel Economy

Based on an average vehicle weight, an average speed for each evaluation year and peak (AM and PM) time period, the fuel consumption rates for light-duty vehicles and medium and heavy trucks were determined using values provided in NYSDOT's *Draft Energy Analysis Guidelines*, which adjusts base-year factors for No-Build and Build Alternatives for ETC, ETC+10 and ETC+20.

5.19.5 Total Vehicular Fuel Use

To estimate the total fuel used for the No-Build and Build conditions for ETC, ETC+10 and ETC+20, average daily weekday VMT was multiplied by its corresponding fuel consumption rate and summed.

As shown in Table 5.19-1, the Proposed Project is predicted to decrease direct energy consumption for all years analyzed. In 2014, the Build Alternatives' direct energy consumption is predicted to be 0.4% less than the No-Build Alternative. In 2024, the Build Alternatives' direct energy consumption is predicted to be 1.6% less than the No-Build alternative. In 2034, the Build Alternatives' direct energy consumption is predicted to be 4.6% less than the No-Build alternative. The reduction in direct energy consumption with the Build Alternatives is directly related to the predicted increase in speed and reduction in VMT with the Build Alternatives, compared to the No Build Alternative.

TABLE 5.19-1
DIRECT ENERGY CONSUMPTION

	ETC (2014)		ETC + 10 (2024)		ETC + 20 (2034)	
	No-Build	**Build**	**No-Build**	**Build**	**No-Build**	**Build**
Peak-Period VMT	37,362,526	37,276,377	39,532,736	39,369,804	41,702,946	41,463,231
Average Speed	16.3	16.4	15.1	15.6	14.0	14.9
BTUs (Millions) by Mode						
Light-Duty Vehicles	*252,103*	*251,047*	*264,793*	*260,601*	*284,970*	*271,660*
Medium Trucks	*32,320*	*32,183*	*35,070*	*34,506*	*38,445*	*36,916*
Heavy Trucks	*91,762*	*91,370*	*93,397*	*91,870*	*97,506*	*92,788*
Total BTUs (Millions)	376,185	374,600	393,259	386,977	420,921	401,364
Total Gallons of Fuel Consumed	2,929,017	2,916,678	3,063,533	3,014,622	3,280,638	3,128,286
Barrels of Oil Consumed	64,859	64,586	67,803	66,720	72,573	69,201
% Change from No-Build	-	-0.4%	-	-1.6%	-	-4.6%

Source: Berger/PB, 2008.
Notes:
1 gallon gasoline – 125,000 BTUs
1 gallon diesel fuel = 138,700 BTUs
1 barrel of crude oil = 5,800,000 (average for all crudes)

5.19.6 Indirect Energy

The remaining energy effects of the Proposed Project relate to indirect energy use associated with constructing, operating and maintaining the facility. The indirect energy analysis was conducted using the Input-Output Approach provided in the NYSDOT *Draft Energy Analysis Guidelines for Project-Level Analysis*, and is focused on the differences between the No-Build and Build alternatives in energy consumed due to construction. Construction energy covers production and transport of materials, powering on-site equipment, worker transportation and other factors plus the materials used in construction itself. Maintenance energy is based on the lane-miles of pavement type for a facility.

5.19.6.1 Construction Energy

Construction energy is the energy consumed during construction based on an established energy factor per dollar of construction costs, annualized by dividing total project costs by the number of years between the start of construction and the project's horizon year, which is the last year of the Long Range Plan; as noted earlier, this is 2030 in both New York and New Jersey. Since the first year of construction for this project is assumed to be 2009 and the last year of the Long Range Plan is 2030, the total construction

energy estimate is annualized over this 21-year period. The estimated construction cost (2007 dollars) for each of the Build Alternatives is shown in Table 5.19-2. Based on the cost categories included in these construction cost estimates, the Existing Alignment South is expected to have the highest construction cost, followed closely by the Existing Alignment North, and then the New Alignment South and the New Alignment North.

Cost categories for purposes of the construction-related energy analysis exclude "soft" costs, including General Conditions (mobilization/demobilization, field supervision, site surveys and testing, temporary utilities, maintenance of traffic, site enclosure & security, field offices and sheds, special equipment rentals, removals and clean-up, and traffic staging), Civil, Architectural, and Traffic costs.

TABLE 5.19-2
INDIRECT CONSTRUCTION ENERGY CONSUMPTION

Construction Item	Estimated Construction Cost*				Predicted Energy Use (BTUs)			
	New Alignment South	Existing Alignment South	New Alignment North	Existing Alignment North	New Alignment South	Existing Alignment South	New Alignment North	Existing Alignment North
Roadway	$216,369,175	$234,117,153	$215,438,988	$233,764,437	1.95E+12	2.11E+12	1.94E+12	2.10E+12
Toll Plaza	$4,477,000	$4,477,000	$4,477,000	$4,477,000	4.03E+10	4.03E+10	4.03E+10	4.03E+10
Bridge Modification	$204,986,100	$220,776,600	$204,986,100	$216,311,700	2.28E+12	2.46E+12	2.28E+12	2.41E+12
Electronics	$52,864,900	$52,864,900	$52,864,900	$52,864,900	2.28E+11	2.28E+11	2.28E+11	2.28E+11
Electrical	$35,400,000	$35,400,000	$35,400,000	$35,400,000	1.53E+11	1.53E+11	1.53E+11	1.53E+11
Total cost and BTUs	$514,097,175	$547,635,653	$513,166,988	$542,818,037	4.65E+12	4.99E+12	4.64E+12	4.93E+12
Total BTUs Annualized over 21 years					2.21E+11	2.37E+11	2.21E+11	2.35E+11

Source: Berger/PB, 2008.
Notes: Cost shown represents actual structure construction only - it does not include "soft" costs such as general contractor's overhead and profit, contingency items, architectural, etc…

As shown in Table 5.19-2, the Existing Alignment South is predicted to consume the largest amount of energy (4.99 x 10^{12} BTUs), followed by the Existing Alignment North (4.93 x 10^{12} BTUs), the New Alignment South (4.65 x 10^{12} BTUs) and the New Alignment North alternatives (4.64 x 10^{12} BTUs). The difference in predicted construction energy consumption between the highest (Existing Alignment South) and the lowest alternatives (New Alignment North) is approximately 7 percent.

5.19.6.2 Energy Required for Roadway Maintenance

The estimate of energy required to operate and maintain each alternative is based on the energy consumed for roadway maintenance (e.g., patching, crack sealing, lighting, landscape maintenance, etc.), based on the total lane-miles for each alternative. For the No-Build Alternative, the total annual maintenance energy estimated (i.e., for roadway maintenance of the existing Goethals Bridge) is 2.84 x10^9 BTUs. For the Build Alternatives, with the exception of the New Alignment North alternative, the total annual maintenance energy is estimated to be 2.84 x 10^9 BTUs. The New Alignment North alternative's lane miles (15.9 vs. 16.0) are slightly less (0.7%) than for the other alternatives; therefore, the annual maintenance energy is predicted to be slightly lower, at 2.82 x 10^9 BTUs.

5.19.7 Summary

Direct energy estimates for the four Build alternatives (not including indirect energy estimates) are lower than for the No-Build Alternative, with Build energy usage 4.6% lower when compared to the No-Build Alternative in 2034.

Total energy estimates for the Build Alternatives are greater than the No-Build Alternative due principally to indirect energy usage for construction of the Build Alternatives. Measures to mitigate the larger indirect energy usage during construction may include limiting idling of machinery and optimizing construction methods to lower fuel use.

5.20 Traffic and Transportation

5.20.1 Introduction

This section: 1) describes the methodology and criteria used to forecast and evaluate future design year (2034) No-Build and Build traffic and transportation conditions; 2) identifies potential project-related traffic and transportation impacts that would result with implementation of the proposed GBR; and 3) describes the traffic mitigation plan proposed to address the identified impacts, and the forecasted traffic conditions that would result with implementation of the proposed mitigation measures.

As the four Build Alternatives evaluated in this FEIS all have the same traffic-carrying capacity and would make the same roadway-network connections with New Jersey Turnpike Interchange 13 in New Jersey and the Staten Island Expressway in New York, the analysis of potential traffic impacts is the same for all of the alignment alternatives. Therefore, the following discussions of potential project-related traffic impacts and proposed traffic mitigation measures apply equally to all alignments of the four Build Alternatives.

Section 5.20.2 describes the traffic forecasting and evaluation methodology, including the travel demand model used to forecast traffic volumes in the future design year (2034), both without (No-Build) and with the proposed GBR (Build) alternatives. This section also defines the traffic impact criteria used to identify significant project-related traffic impacts.

Sections 5.20.3 and 5.20.4 present the future No-Build and Build traffic conditions at the Goethals Bridge and other key crossings in the regional traffic study area (see Figure 4.3-1 in Section 4.0). The focus is in specific traffic analysis areas in the Goethals Bridge corridor that are forecast to be affected by the Build alternatives. Based on the forecasted traffic conditions, comparing Build conditions to those forecast without the proposed GBR, significant traffic impacts were identified, using the impact criteria; these are reported in Section 5.20.4.

Section 5.20.5 describes the proposed traffic mitigation plan to address forecasted project-related traffic impacts, and future traffic conditions with the proposed mitigation in place, including impacts that would remain after mitigation. Section 5.20.6 describes the results of mitigation analyses pursuant to the City of New York's City Environmental Quality Review (CEQR) procedures.

Section 5.20.7 addresses future freight rail and mass transit conditions and potential project-related effects on these transport modes. Section 5.20.8 summarizes the overall traffic impact analysis results and the effectiveness of the proposed traffic mitigation plan.

5.20.2 Methodology, Approach and Data Sources

The primary traffic study areas and the comprehensive traffic data collection program for the GBR EIS, on the basis of which existing traffic patterns and conditions were determined, are described in Section 4.19. The impact analysis phase of the GBR EIS traffic evaluations comprised: 1) travel demand forecasting of future No-Build and Build traffic volumes; 2) analysis of future No-Build and Build traffic conditions, based on the modeled forecasts of traffic volumes; and 3) comparison of the differences between No-Build and Build traffic conditions to the defined impact criteria in order to identify potential project-related traffic impacts. The methodologies employed for the traffic forecasting and impact analyses follow current "state-of-the-practice" procedures for travel demand forecasting and NEPA guidance pertaining to evaluation of impacts and development of mitigation measures.

5.20.2.1 Goethals Transportation Model (GTM)

In support of the GBR EIS studies, the Goethals Transportation Model (GTM) was developed to forecast future travel demand within the Goethals Bridge corridor and the broader New York/New Jersey regional study area for the 2034 design year (i.e., estimated time of project completion plus 20 years). The GTM was developed specifically to provide the corridor-level detail required for the GBR EIS to analyze future traffic conditions without and with the Proposed Project (see Appendix A.3 for a detailed description of the GTM).

The GTM was developed from the New York Best Practice Model (NYBPM or BPM), the travel demand model created and used by the New York Metropolitan Transportation Council (NYMTC). NYMTC is the Metropolitan Planning Organization (MPO) for the five counties comprising the City of New York, as well as for Nassau, Suffolk, Westchester, Putnam and Orange counties. The BPM, which is the Federal Highway Administration (FHWA)-approved regional model for the downstate New York metropolitan area, encompasses 28 counties in New York, New Jersey, and Connecticut.

The GTM model's utility for forecasting of future traffic conditions in the regional, bi-state study area defined for the GBR EIS traffic and transportation studies was enhanced through incorporation of the North Jersey Regional Travel Model's (NJRTM) zone system for the area of New Jersey located in the Goethals Bridge influence area. The NJRTM is the FHWA-approved regional model for the northern New Jersey counties, for which the North Jersey Transportation Planning Authority (NJTPA) serves as its MPO. NJTPA's socioeconomic data for the zones located in New Jersey were adopted for the GTM to further improve the model's forecasting accuracy for trips between New Jersey and New York. Several additional, significant network refinements were made to the BPM highway network to bring the New Jersey portion of the study area to a similar level of detailed, GIS-based, uni-directional representation as in the New York part of the regional model's network. Network enhancements were also made for the three Staten Island bridges (i.e., Goethals Bridge, Outerbridge Crossing and Bayonne Bridge).

The GTM was also refined to more accurately represent travel characteristics for the Goethals Bridge corridor-level study area, particularly for trips involving interstate crossings of the downstate Hudson River and via the three Staten Island bridges. These additional GTM refinements and enhancements included more refined zonal socioeconomic (population and employment) input data; explicit representation of seaport-related truck traffic (Howland Hook Marine Terminal, Port Newark and Port Elizabeth); explicit representation of passenger traffic at Newark Liberty International Airport; and time-of-day tolling with differential tolls for various vehicle types and passenger occupancies.

Transportation improvements and major land use-related developments assumed to be in place by the forecast year were also incorporated in the GTM, including the following:

- Staten Island Expressway median bus lane extension from the Verrazano-Narrows Bridge to Slosson Avenue, and subsequent extension of the bus lane to the vicinity of Richmond Avenue;

- New Jersey Turnpike Interchange 12 reconstruction;
- West Shore Expressway service road improvements;
- Staten Island Railroad reactivation to and from the Howland Hook Marine Terminal;
- Ferry services to Lower Manhattan from Elizabeth, Bayonne and South Amboy;
- Build-out of Howland Hook Marine Terminal Parcel C; and
- As-of-right development on the former GATX property.

Finally, based on discussions with NYMTC, the New York City Economic Development Corporation (NYCEDC), and the New York City Department of City Planning (NYCDCP), and on analysis of land use development patterns and potential to the 2034 design year, employment growth projections for Staten Island were refined to represent a more realistic, moderate forecast. Following incorporation of this moderate employment growth forecast in the GTM, NJTPA, NYMTC, NYCEDC and NYCDCP reviewed and accepted the GTM as an appropriate travel demand forecasting model for use in the GBR EIS' traffic impact evaluation.

5.20.2.2 Impact Analysis Methodology

Significant project-related traffic impacts and the consequent need to identify and evaluate potential mitigation measures were identified based on the difference between No-Build (i.e., future without the Proposed Project) and Build (i.e., construction and operation of a Goethals Bridge replacement bridge) traffic conditions in the project design year of 2034. As noted in Section 4.19.4, analysis of traffic conditions in urban areas, such as the Goethals Bridge Regional Study Area, is generally based on peak-hour traffic conditions at intersections and roadway segments, and is defined in terms of levels of service (LOS), ranging from LOS A (free-flow condition) to LOS F (breakdown in vehicular flow or excessive delay). Typically, LOS E and LOS F are considered to operate at congested and severely congested conditions, respectively, with mid-LOS D generally defining the limit before traffic begins to result in congested traffic conditions in urban areas. Definitions of the various LOS conditions for signalized intersections, unsignalized intersections, freeway segments and ramp segments are based on the 2000 *Highway Capacity Manual* (HCM); calculation of these LOSs are based on the methodologies presented in the HCM.

Traffic impacts at signalized and unsignalized intersections and on highway ramps, mainline sections, weaves, merges, and diverges in the GBR EIS traffic study areas were identified on the basis of the forecast changes in LOS from the No-Build to the Build condition, as listed below and summarized in Table 5.20-1:

- For locations forecast to operate at LOS A, B, or C with the No-Build alternative, deterioration of traffic conditions were considered a significant impact if the forecast Build condition would be mid-LOS D or worse.
- For locations forecast to operate at mid-LOS D or worse with the No-Build alternative, deterioration of traffic conditions was identified as a significant impact if the Build condition would be one or more levels of service worse than the No-Build (e.g., No-Build LOS mid-D forecast to be LOS E or F with the Build alternatives, or No-Build LOS E forecast to be LOS F with the Build).
- For signalized and unsignalized intersections, ramps and mainline sections forecast to operate at LOS F with the No-Build alternative, deterioration of traffic conditions were identified as an impact, though not a significant one, if the Build LOS is forecast with additional delay that would be perceptible to a driver.

TABLE 5.20-1
CRITERIA USED TO IDENTIFY TRAFFIC IMPACTS

No-Build LOS	Build LOS
LOS "A," "B" or "C"	Deterioration to mid-LOS "D" or worse
Mid-LOS "D" or worse	Deterioration by 1 or more LOS
LOS "F"	LOS "F" with perceptible additional delay

LOS – Level of Service

Density, which provides an additional measure of traffic operations, is defined as the number of vehicles occupying a mile of roadway in each lane (i.e., passenger cars per mile per lane). Density ranges from 0 to approximately 45 passenger cars per mile per lane, depending on the LOS and operating speed on the roadway. In general, densities that exceed 35 passenger cars per mile per lane are operating at LOS E or worse, indicating unacceptable conditions for an urban setting like the Goethals Bridge corridor.

Locations forecast to be significantly impacted with implementation of the Proposed Project were further analyzed to determine whether reasonable and feasible mitigation measures are available to improve future project-related traffic conditions (i.e., LOS) to the forecast No-Build traffic conditions, at minimum (i.e., to traffic conditions that would be anticipated in 2034 without the Proposed Project). An exception to this is where project-related traffic deterioration would be from a No-Build LOS better than mid-D (e.g., LOS A, B, C, or low D), in which case, reasonable and feasible mitigation should return traffic conditions at least to mid-LOS D.

Additionally, locations that would already operate at LOS F in the No-Build condition and are forecast to deteriorate to a worse LOS F in the Build condition were identified as having a project-related impact, though not a significant one. For such locations, mitigation measures were also investigated to determine if they are reasonable and feasible to implement and improve traffic conditions.

5.20.3 No-Build Alternative

5.20.3.1 Travel Demand Forecast

Future (2034) traffic forecasts for the AM and PM peak hours of travel were prepared for the No-Build alternative using the GTM as the forecasting tool. Figure 5.20-1 shows future No-Build peak-hour traffic volumes at select locations in the Goethals Bridge corridor. Table 5.20-2 shows existing and future No-Build bi-directional traffic volumes in the AM and PM analysis hours at key bridge crossings, and the changes that are forecast between existing and No-Build conditions.

As shown in Table 5.20-2, future No-Build travel demand at the Goethals Bridge is forecast to grow by 23 percent and 19 percent, respectively, in the peak hour, peak direction of travel, which is westbound in the AM and eastbound in the PM. Travel demand at the Goethals Bridge in the off-peak direction of travel is forecast to grow by 60 percent and 46 percent, respectively, in the eastbound AM and westbound PM peak hours. This would result in more directionally balanced flows during the peak hours than currently occurs, although the peak direction would remain the same as today (i.e., AM westbound and PM eastbound).

The other Port Authority-owned and operated Staten Island bridges (i.e., Outerbridge Crossing and Bayonne Bridge) are forecast to experience similar, albeit somewhat lesser, levels and patterns of travel demand growth in the future with the No-Build alternative. The growth forecast at the Goethals Bridge and Outerbridge Crossing is consistent with the socioeconomic (population, employment) growth forecast for Staten Island, which is projected to be substantially higher than for the other New York City boroughs and western New Jersey counties in the Study Area. The Verrazano-Narrows Bridge, the only non-Port

Authority crossing into Staten Island, would have similar traffic volume growth as the Goethals Bridge, albeit with lower growth percentages because of the higher existing traffic volume.

TABLE 5.20-2
EXISTING AND FUTURE (2034) NO-BUILD PEAK-HOUR TRAFFIC FORECASTS AT KEY BRIDGE CROSSINGS

Location	Direction	Existing (2004)		No-Build (2034)	
		AM Volume	PM Volume	AM Volume (% change)	PM Volume (% change)
Goethals Bridge	EB	1,820	3,055	2,915 (60%)	3,630 (19%)
	WB	2,885	2,085	3,540 (23%)	3,045 (46%)
Outerbridge Crossing	EB	2,665	3,095	3,910 (47%)	3,895 (26%)
	WB	2,520	2,405	3,340 (33%)	3,470 (44%)
Bayonne Bridge	SB	520	1,375	820 (58%)	1,885 (37%)
	NB	1,020	405	1,335 (31%)	635 (57%)
Verrazano-Narrows Bridge	EB	9,510	5,415	11,960 (26%)	6,420 (19%)
	WB	4,730	7,995	5,580 (18%)	10,320 (29%)

Source: Berger/PB, 2004 and 2008.

Table 5.20-3 shows the comparative traffic growth between existing and future No-Build conditions along some of the major routes in the Goethals Bridge corridor. Traffic growth in the Bayway area is forecast to range from 11 to 25 percent in the vicinity of the Bayway Circle, and as high as 58 percent in the vicinity of South Broad Street. Along Route 1 in the vicinity of Bayway Circle, traffic is forecast to grow by as much as 50 percent in the peak direction (northbound in the AM and southbound in the PM). Increases at New Jersey Turnpike Interchange 13 would be similar, with No-Build traffic traveling to and from the New Jersey Turnpike increasing by as much as 27 and 34 percent, respectively, over existing volumes.

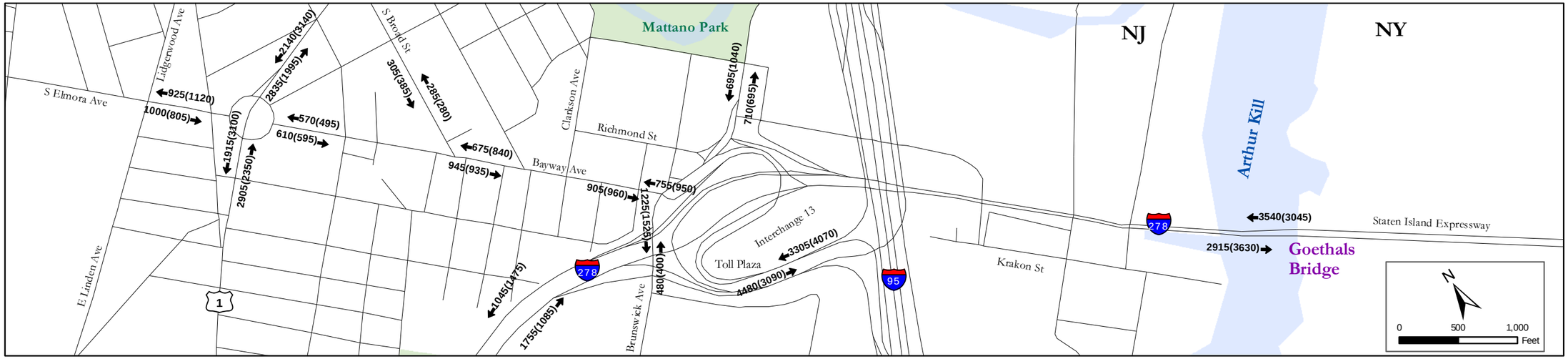
In New York, traffic volume increases along the Staten Island Expressway would range from 16 to 36 percent, while growth along the West Shore Expressway would range from 10 to 19 percent.

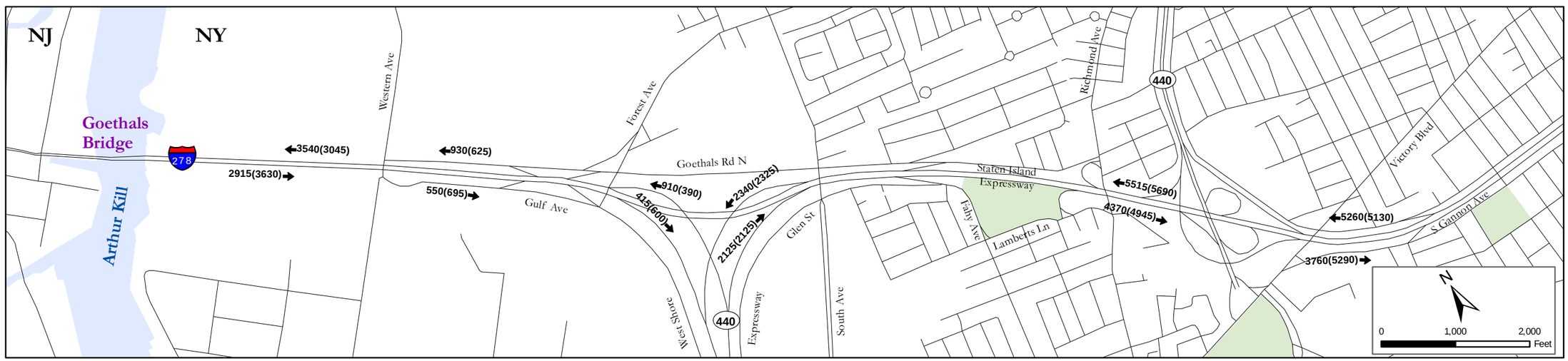
5.20.3.2 No-Build Traffic Operations

Using the GTM forecasts of future peak-hour traffic volumes, future No-Build traffic operations were analyzed for the following potential impact areas, each of which is discussed below:

- Key bridge crossings;
- New Jersey I-278 mainline and ramps/New Jersey Turnpike Interchange 13;
- New Jersey local roads in the Bayway Circle/Bayway Avenue corridor;
- New York Staten Island Expressway (I-278) mainline, ramps and weaving sections; and
- New York service and local roads in the Howland Hook Marine Terminal and Verrazano-Narrows Bridge areas.

The traffic analyses provide measures of future traffic operations at the above locations in terms of LOS, ranging from LOS A (free-flow condition) to LOS F (breakdown in vehicular flow or excessive delay), as per the definitions of the LOS conditions for signalized intersections, unsignalized intersections, freeway segments and ramp segments in the 2000 *Highway Capacity Manual* (HCM).





Legend

2470 - AM Peak Hour Vehicles (One-Way)
(3160) - PM Peak Hour Vehicles (One-Way)

Source: ESRI, 2008.
Data: Berger/PB 2005.

Goethals Bridge Replacement EIS

FIGURE 5.20-1

No Build Traffic Volumes
(2034) Peak Hour

United States Coast Guard

TABLE 5.20-3
EXISTING AND FUTURE (2034) NO-BUILD PEAK-HOUR TRAFFIC FORECASTS FOR SELECTED MAJOR ROUTES

Location	Direction	Existing (2004)		No-Build (2034)	
		AM Volume	PM Volume	AM Volume (% change)	PM Volume (% change)
Route 1 South of Bayway Circle	NB	1,925	1,885	2,905 (51%)	2,350 (25%)
	SB	1,425	2,085	1,915 (34%)	3,100 (49%)
Bayway Ave. at Bayway Circle	EB	550	580	610 (11%)	595 (3%)
	WB	455	405	570 (25%)	495 (22%)
Bayway Ave. East of S. Broad Street	EB	770	790	945 (23%)	935 (18%)
	WB	590	530	675 (14%)	840 (58%)
NJ Turnpike Interchange 13	Entering	3,530	2,695	4,480 (27%)	3,090 (15%)
	Exiting	2,470	3,160	3,305 (34%)	4,070 (29%)
West Shore Expressway South of Staten Island Expressway	NB	2,765	2,115	3,035 (10%)	2,515 (19%)
	SB	2,345	2,535	2,755 (17%)	2,925 (15%)
Staten Island Expressway East of West Shore Expressway	EB	3,385	4,245	4,240 (25%)	5,010 (18%)
	WB	4,160	3,925	4,970 (19%)	4,775 (22%)
Staten Island Expressway East of Route 440	EB	2,755	4,390	3,760 (36%)	5,290 (21%)
	WB	4,330	4,415	5,260 (21%)	5,130 (16%)

Source: Berger/PB, 2008.

Key Bridge Crossings

In 2034, during the morning and evening peak hours in the peak direction of traffic flow, the Goethals Bridge is forecast to operate at capacity (LOS F) with the No-Build alternative. Even in the off-peak direction, LOS E conditions would prevail. Similarly, the Outerbridge Crossing and the Verrazano-Narrows Bridge would experience LOS F traffic operations during the morning and evening peak hours in the peak directions of traffic flow. At the Bayonne Bridge, traffic operations would be at acceptable LOS A, B, or C in both peak hours and peak directions. The expected traffic LOS at each of the Staten Island bridge crossings is shown in Table 5.20-4.

New Jersey

I-278 Mainline and Ramps/New Jersey Turnpike Interchange 13

Future No-Build traffic would generally operate at acceptable levels of service along I-278, west of the Goethals Bridge, except in the New Jersey Turnpike Interchange 13 area. As shown in Tables 5.20-5A and 5.20-5B, the overall traffic service levels on the I-278 mainline and ramps, respectively, would be generally at LOS D or better.

Interchange 13 traffic often operates near or above capacity levels during today's peak hours. This is generally due to queues of vehicles in the cash or ticket toll-booth lanes blocking access from the ramps to the toll plaza. This characterization is based on in-field observations of the interchange, because standard capacity analysis methods do not apply to toll plaza operations. This congestion is expected to

TABLE 5.20-4
FUTURE (2034) NO-BUILD PEAK-HOUR TRAFFIC OPERATIONS AT KEY BRIDGE CROSSINGS

Bridge	AM Peak-Hour LOS	PM Peak-Hour LOS
Eastbound/Southbound:		
Goethals Bridge	E	F
Bayonne Bridge	A	C
Outerbridge Crossing	F	F
Verrazano-Narrows Bridge	F	D
Westbound/Northbound:		
Goethals Bridge	F	E
Bayonne Bridge	B	A
Outerbridge Crossing	F	F
Verrazano-Narrows Bridge	D	F

Source: Berger/PB, 2008.

TABLE 5.20-5A
FUTURE (2034) NO-BUILD PEAK-HOUR TRAFFIC OPERATIONS ON NEW JERSEY I-278 MAINLINE

Segment	AM Peak Hour		PM Peak Hour	
	LOS	Density	LOS	Density
EB I-278 Route 1&9 – Brunswick Avenue Exit Ramp	B	12.9	A	7.5
EB I-278 Brunswick Avenue Exit – NJ Turnpike Exit Ramp	B	11.0	A	5.8
EB NJ Turnpike Entrance Ramp – Brunswick Avenue Entrance Ramp	C	24.7	D	31.0
WB NJ Turnpike Entrance Ramp – Brunswick Avenue Entrance Ramp	A	8.2	B	11.2
WB Brunswick Avenue Entrance Ramp – Route 1	B	11.1	B	15.9

Density = passenger cars per mile per lane
Source: Berger/PB, 2008.

TABLE 5.20-5B
FUTURE (2034) NO-BUILD PEAK-HOUR TRAFFIC OPERATIONS ON NEW JERSEY I-278 RAMPS

LOCATION	AM Peak Hour		PM Peak Hour	
	LOS	Density	LOS	Density
EB I-278 Exit Ramp to Brunswick Avenue	B	18.1	B	10.5
EB I-278 Exit Ramp to NJ Turnpike	B	14.6	A	7.2
EB Entrance Ramp from NJ Turnpike to Goethals Bridge	C	23.3	D	28.6
EB Entrance Ramp from Bayway Avenue to Goethals Bridge	D	28.1	D	33.1
WB Goethals Bridge Exit Ramp to Bayway Avenue	D	29.2	C	24.7
WB Exit Ramp from Goethals Bridge to Turnpike	D	28.7	C	24.4
WB Entrance Ramp from NJ Turnpike to I-278	A	4.2	A	6.6
WB I-278 Entrance Ramp from Brunswick Avenue	B	13.0	B	16.6

Density = passenger cars per mile per lane
Source: Berger/PB, 2008.

worsen in the future No-Build forecast year as traffic volumes grow, particularly at the approaches and exits from the toll plaza.

Local Roads (Bayway Circle, Bayway Avenue Corridor)

As shown in Table 5.20-6, many intersections in the Elizabeth portion of the traffic study area will operate at LOS F with the future No-Build alternative, particularly along the South Elmora/Bayway avenues corridor and along Route 1&9. The Bayway Avenue No-Build forecast shows congestion at eight intersections between Bayway Circle and the Goethals Bridge access points, with LOS E or F. Similarly, the first three intersections west of the Circle along South Elmora Avenue all operate at LOS E and F. This congestion is caused by high traffic volumes in combination with a large percentage of trucks traveling along the two-lane roadway. The majority of these vehicles are forecast to be traveling to or from the New Jersey Turnpike or the Goethals Bridge.

New York

Staten Island Expressway (I-278) Mainline, Ramps and Weaving Sections

Tables 5.20-7A, 5.20-7B and 5.20-7C show future No-Build operations along the Staten Island Expressway mainline, ramps, and weaving sections, respectively. Generally, a significant portion of the corridor will operate at LOS E or F with the future No-Build alternative, including at 15 mainline segments, eight merge or diverge locations where traffic on the ramps would enter or leave the mainline, and two weaving sections.

Service and Local Roads (Howland Hook Marine Terminal and Verrazano-Narrows Bridge Areas)

Intersections in the local roadway networks near both the Howland Hook Marine Terminal and the Verrazano-Narrows Bridge are forecast to operate at poor levels of service (LOS E or F) with the future No-Build alternative. As shown in Tables 5.20-8 and 5.20-9, both signalized and unsignalized intersections are forecast with poor traffic operations in the No-Build condition. Future traffic problems will generally be the result of traffic growth in both of these areas, adding to already moderately congested conditions.

5.20.4 Build Alternatives

5.20.4.1 Travel Demand Forecasts

As with the No-Build alternative, design year (2034) traffic forecasts for the AM and PM peak hours were forecast for the Build alternatives using the GTM. Only one forecast was prepared for the four Build alternatives since the respective alignments would all make the same roadway network connections, thus having the same effect on future traffic demand forecasts. Figure 5.20-2 shows future AM and PM peak-hour traffic forecasts in the Goethals Bridge Study Area with the Build alternatives in place.

Table 5.20-10 provides bi-directional, peak-hour volume forecasts with the Build alternatives at the four key bridge crossings, and the percent increase or decrease compared to future No-Build volumes. Construction of the proposed Goethals Bridge replacement with additional capacity (i.e., three lanes in each direction, compared to two lanes in each direction on the existing Goethals Bridge) would attract 28 to 40 percent more traffic volume to that crossing, depending on the time of day and direction. As the Proposed Project would accommodate a higher share of travel demand due to its additional capacity, travel demand at the parallel Outerbridge Crossing would be moderately reduced in 2034. The increased

TABLE 5.20-6
FUTURE (2034) NO-BUILD PEAK-HOUR TRAFFIC OPERATIONS IN BAYWAY CIRCLE/BAYWAY AVENUE CORRIDOR

Intersection & Approach	AM Peak Hour		PM Peak Hour	
	Seconds of Delay	LOS	Seconds of Delay	LOS
Bayway Circle WB at Route 1&9	43.9	D	27.5	C
Bayway Circle EB at Route 1&9	77.1	E	31.1	C
South Elmora Ave. at Edgar Rd.	320.5	F	184.2	F
South Elmora Ave. at Lidgerwood Ave.	95.6	F	170.9	F
Bay Way at Grier Ave.	40.0	D	84.1	F
Bayway Ave. at South Broad St.	44.9	D	62.5	E
Summer St. at South Broad St.	281.6	F	330.8	F
Summer St. at Grier Ave.	22.4	C	20.4	C
Grier Ave. at Route 1&9	232.1	F	66.6	E
Bacheller Ave. at Route 1&9	61.8	E	100.1	F
Bayway Circle WB at Summer St.	15.9	C	29.5	D
Bayway Ave. at Bayway Circle	196.9	F	178.7	F
South Elmora Ave. at New York Ave.	262.6	F	212.7	F
Bayway Ave. at Bonnet St.	25.8	D	65.8	F
Bayway Ave. at South Broad St.	170.5	F	107.0	F
Myrtle St. at Route 1&9	29.9	D	27.2	D
Edgar Rd./Spofford Ave./Urbanowitz Ave. at Route 1&9 (EB) (two approaches shown)	105.7	F	1,186.0	F
	27.8	D	279.5	F
Allen St. at Route 1&9	20.9	C	15.4	C
Meacham Ave. at Route 1&9	23.2	C	14.4	B
Ashton Ave. at Route 1&9	14.9	B	22.1	C
Bayway/Goethals Off Ramp at Atlantic Ave.	152.8	F	251.1	F
Goethals On/Off Ramp at Atlantic Ave.	108.6	F	33.0	D
Off-Ramp from Goethals at Trenton Ave./ Relocated Bay Way	14.5	B	11.9	B
Bayway Ave. at Clarkson Ave.	248.8	F	105.2	F
Relocated Bayway Ave. at Cole Ave.	13.7	B	10.6	B
Bayway Ave. at Thomas St.	40.8	E	26.8	D
Bayway Ave. at Polonia Ave.	35.1	E	39.8	E
Richmond St. at Clarkson Ave.	8.4	A	7.9	A
Richmond St. at McKinley St.	7.8	A	7.3	A
Richmond St. at Pulaski St.	13.3	B	10.2	B
Clifton St. at Pulasky St.	16.7	C	11.5	B
On-Ramp to I-278 WB at Brunswick Ave.	15.3	C	15.3	C
I-278 EB Off-Ramp at Brunswick Ave.	241.5	F	176.3	F
Allen St. at Brunswick Ave. (two approaches shown)	68.9	F	14.9	B
	18.0	C	17.9	C

Source: Berger/PB, 2008.

TABLE 5.20-7A
FUTURE (2034) NO-BUILD PEAK-HOUR OPERATIONS ON STATEN ISLAND EXPRESSWAY (I-278) MAINLINE

Segment	AM Peak Hour		PM Peak Hour	
	LOS	Density	LOS	Density
Eastbound Staten Island Expressway Mainline				
Forest Ave. Exit Ramp – West Shore Expy. SB Exit Ramp	C	19.7	C	24.1
West Shore Exp. SB Exit Ramp – West Shore Expy. NB Entrance Ramp	C	25.0	D	30.0
West Shore Expy. NB Entrance Ramp – Richmond Ave. Exit Ramp	C	24.6	D	26.1
Richmond Ave. Exit Ramp – Richmond Ave. Entrance Ramp	C	23.2	C	23.3
Dr. Martin Luther King, Jr. Expy. South Exit Ramp – Dr. Martin Luther King, Jr. Expy. North Exit Ramp	D	31.0	D	32.1
Dr. Martin Luther King, Jr. Expy. North Exit Ramp – Dr. Martin Luther King, Jr. Expy. South Entrance Ramp	C	25.8	D	29.5
Dr. Martin Luther King, Jr. Expy. South Entrance Ramp – South Gannon Ave. Entrance Ramp	D	28.1	E	37.7
South Gannon Ave. Entrance Ramp – Bradley Ave. Exit Ramp	D	32.4	F	N/A
Bradley Ave. Exit Ramp – Bradley Ave. Entrance Ramp	D	31.1	E	42.1
Bradley Ave. Entrance Ramp – Slosson Ave. Exit Ramp	E	38.8	F	N/A
Targee Street Entrance Ramp – Lily Pond Ave. Exit Ramp	F	N/A	E	41.3
Lily Pond Ave. Exit Ramp – Lily Pond Ave. Entrance Ramp	E	35.1	D	26.4
Westbound Staten Island Expressway Mainline				
Lily Pond Ave. Exit Ramp – Lincoln Ave. Entrance Ramp	D	29.2	E	40.9
Lincoln Ave. Entrance Ramp – Targee St. Exit Ramp	D	33.3	E	44.9
Slosson Ave. Entrance Ramp – Bradley Ave. Exit Ramp	E	42.7	F	N/A
Bradley Ave. Exit Ramp – Bradley Ave. Entrance Ramp	E	37.2	F	N/A
Bradley Ave. Entrance Ramp – Victory Blvd. Exit Ramp	F	N/A	F	N/A
Victory Blvd. Exit Ramp – Dr. Martin Luther King, Jr. Expy. North Exit Ramp	E	39.7	E	38.4
Dr. Martin Luther King, Jr. Expy. North Exit Ramp – Dr. Martin Luther King, Jr. Expy. North Entrance Ramp	D	33.1	D	33.4
Dr. Martin Luther King, Jr. Expy. North Entrance Ramp – Dr. Martin Luther King, Jr. Expy. South Entrance Ramp	E	35.6	E	36.0
Richmond Ave. Exit Ramp – South Ave. Exit Ramp	E	40.9	E	38.8
South Ave. Exit Ramp – Richmond Ave. Entrance Ramp	D	34.5	D	32.9
Richmond Ave. Entrance Ramp – West Shore Expy. SB Exit Ramp	E	38.1	D	35.0
West Shore Expy. SB Exit Ramp – West Shore Expy. NB Entrance Ramp	D	31.3	D	27.4
West Shore Expy. NB Entrance Ramp – Forest Ave. Entrance Ramp	D	27.9	C	21.0

Density = passenger cars per mile per lane
Density is not calculated for LOS F; therefore, not applicable (N/A).
Source: Berger/PB, 2008.

TABLE 5.20-7B
FUTURE (2034) NO-BUILD PEAK-HOUR OPERATIONS ON STATEN ISLAND EXPRESSWAY (I-278) RAMPS

LOCATION	AM Peak Hour		PM Peak Hour	
	LOS	Density	LOS	Density
Staten Island Expressway Eastbound				
Richmond Ave. Exit Ramp Diverge	C	22.5	C	25.4
Dr. Martin Luther King, Jr. Expy. Exit Ramp Diverge	D	30.2	D	30.3
Dr. Martin Luther King, Jr. Expy. Entrance Ramp Merge	C	25.1	D	33.7
South Gannon Ave. Entrance Ramp Merge	C	26.6	F	34.7
Bradley Ave. Exit Ramp Diverge	D	28.8	F	35.2
Bradley Ave. Entrance Ramp Merge	D	32.3	F	36.6
Lily Pond Ave. Exit Ramp Diverge	E	35.2	D	29.9
Staten Island Expressway Westbound				
Lily Pond Ave. Entrance Ramp Merge	C	26.9	D	31.9
Bradley Ave. Exit Ramp Diverge	E	35.9	F	39.5
Bradley Ave. Entrance Ramp Merge	F	33.9	F	34.9
Victory Blvd. Exit Ramp Diverge	F	41.7	F	38.3
Dr. Martin Luther King, Jr. Expy. Exit Ramp Diverge	E	35.2	D	34.4
Dr. Martin Luther King, Jr. Expy. Entrance Ramp Merge	D	28.5	D	28.8
South Ave. Exit Ramp Diverge	E	35.6	D	34.9
South Ave. Entrance Ramp Merge	D	31.3	D	29.3

Density = passenger cars per mile per lane
Source: Berger/PB, 2008.

TABLE 5.20-7C
FUTURE (2034) NO-BUILD PEAK-HOUR OPERATIONS ON STATEN ISLAND EXPRESSWAY (I-278) WEAVING SECTIONS

Weaving Section	AM Peak Hour		PM Peak Hour	
	LOS	Density	LOS	Density
Eastbound Staten Island Expressway Mainline				
Gulf Ave. Entrance Ramp –Forest Ave. Exit	C	24.8	C	27.2
Richmond Ave. Entrance Ramp –Victory Blvd. Exit	C	27.6	D	28.2
Westbound Staten Island Expressway Mainline				
Dr. Martin Luther King, Jr. Expy. SB Entrance Ramp – Richmond Ave. Exit Ramp	E	40.6	F	43.9
Forest Ave. Entrance Ramp –Goethals Rd. North Exit Ramp	E	35.8	C	23.4

Density = passenger cars per mile per lane
Source: Berger/PB, 2008.

TABLE 5.20-8
FUTURE (2034) NO-BUILD PEAK-HOUR TRAFFIC OPERATIONS ON LOCAL ROADS NEAR HOWLAND HOOK MARINE TERMINAL

Intersection & Approach	AM Peak Hour		PM Peak Hour	
	Seconds of Delay	LOS	Seconds of Delay	LOS
Forest Ave. at Goethals Rd. North	100.8	F	15.6	B
Gulf Ave. at Forest Ave.	1,636.0	F	217.6	F
Goethals Rd. North and Western Ave.	287.1	F	138.6	F

Source: Berger/PB, 2008.

TABLE 5.20-9
FUTURE (2034) NO-BUILD PEAK-HOUR TRAFFIC OPERATIONS ON LOCAL ROADS NEAR VERRAZANO-NARROWS BRIDGE

Intersection & Approach	AM Peak Hour		PM Peak Hour	
	Seconds of Delay	LOS	Seconds of Delay	LOS
Lily Pond Ave. at Narrows Rd. South	40.6	D	125.4	F
Narrows Rd. North at Finberboard Rd.	21.2	C	89.6	F
Narrows Rd. South at Fingerboard Rd.	304.4	F	87.3	F
Narrows Rd. North at Hylan Blvd. (SB)	21.3	C	86.8	F
Narrows Rd. North at Hylan Blvd. (NB)	24.1	C	124.9	F
Narrows Rd. South at Hylan Blvd. (SB)	22.0	C	16.7	B
Narrows Rd. South at Hylan Blvd. (NB)	32.3	C	21.2	C
McClean Ave. at Lily Pond Ave.	118.2	F	144.7	F
Narrows Rd. North at St. John's Ave.	10.3	B	22.0	C
Narrows Rd. South at Hylan Blvd. (NB)	30.0	D	10.9	B
Narrows Rd. South at Legion Pl.	33.2	D	10.3	B
Narrows Rd. South at Grasmere Dr.	16.8	C	10.0	A
Merle Pl. at Fingerboard Rd.	13.3	B	12.2	B
Harvey St. at Fingerboard Rd.	12.7	B	12.9	B
Lincoln Pl. at Fingerboard Rd.	13.5	B	14.0	B
Cleveland Pl. at Fingerboard Rd.	63.7	F	19.5	C
Major Ave. at Lily Pond Ave.	51.2	F	28.4	D

Source: Berger/PB, 2008.

TABLE 5.20-10
FUTURE (2034) PEAK-HOUR TRAFFIC FORECAST AT KEY BRIDGE CROSSINGS, COMPARING NO-BUILD AND BUILD ALTERNATIVES

Location	Direction	2034 No-Build		2034 Build	
		AM Volume	PM Volume	AM Volume (% change)	PM Volume (% change)
Goethals Bridge	EB	2,915	3,630	4,030 (+38%)	4,670 (+29%)
	WB	3,540	3,045	4,635 (+31%)	4,320 (+42%)
Outerbridge Crossing	EB	3,910	3,895	3,795 (-3%)	3,575 (-8%)
	WB	3,340	3,470	3,015 (-10%)	3,210 (-7%)
Bayonne Bridge	SB	820	1,885	770 (-6%)	1,965 (+4%)
	NB	1,335	635	1,415 (+6%)	625 (-2%)
Verrazano-Narrows Bridge	EB	11,960	6,420	12,220 (+2%)	6,440 (0%)
	WB	5,580	10,320	5,770 (3%)	10,490 (+2%)

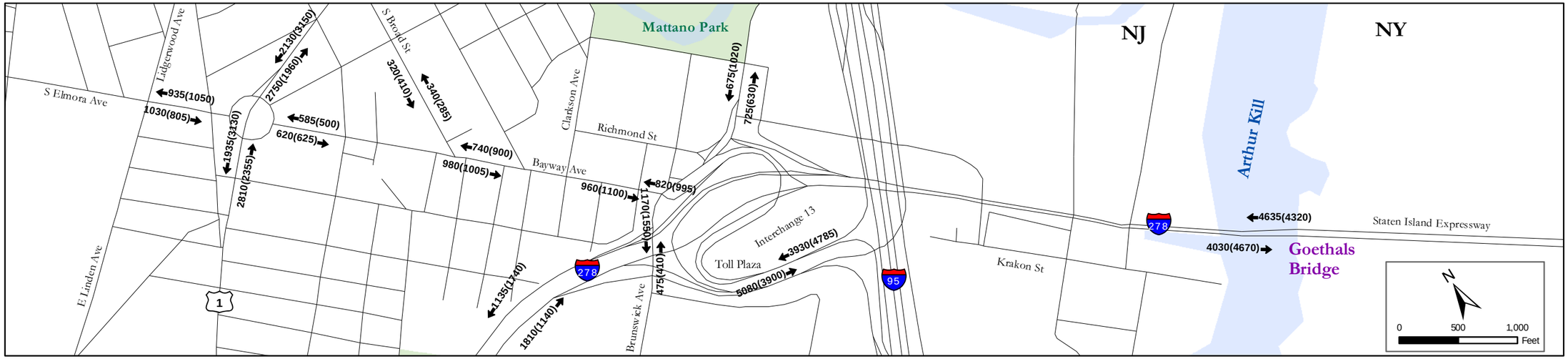
Source: Berger/PB, 2008.

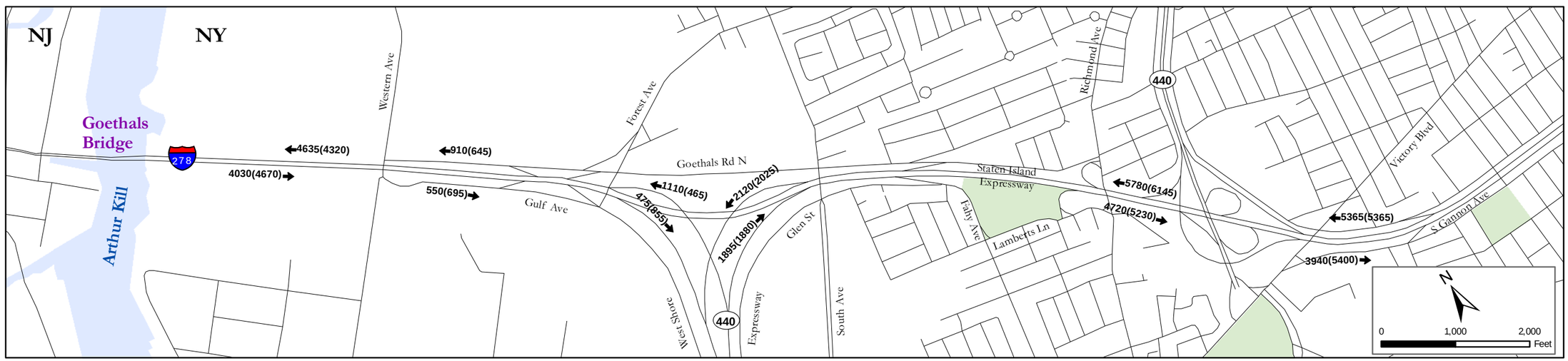
demand at the Goethals Bridge with the Build alternatives would derive principally from trips diverted from the Outerbridge Crossing/West Shore Expressway corridor due to changes in travel patterns in response to the additional capacity at the Goethals Bridge for trips into and out of New Jersey. The new Goethals Bridge would have limited effect on the Bayonne Bridge, with changes ranging from -6 to +6 percent, representing a decrease of 50 trips and an increase of 80 trips, respectively, neither a significant change. The Verrazano-Narrows Bridge would not be impacted by the new Goethals Bridge, with the largest increase at this crossing comprising 190 trips (3 percent increase) in the westbound, off-peak direction in the morning.

Table 5.20-11 provides a comparison of No-Build and Build traffic volumes, the latter of which are shown on Figure 5.20-2.

As shown on Figures 5.20-1 and 5.20-2, traffic volumes along I-278 in New Jersey would increase with the Proposed Project, with the largest percentage increase forecast east of NJ Turnpike Interchange 13, showing an 18 percent increase over No-Build volumes. However, absolute traffic volume increases would be the highest in the Interchange 13 area, with the highest peak-hour volume entering Interchange 13 in the morning; over 5,000 vehicles in the morning peak hour would be destined for the New Jersey Turnpike, from both the Goethals Bridge and the local Elizabeth street network, constituting an increase of 13 percent over No-Build volumes. The largest percentage increase at Interchange 13 would occur with traffic entering the Turnpike in the evening peak hour, showing a 26 percent increase. Along Route 1&9, traffic changes resulting with the Build alternatives are expected to be minimal (i.e., generally less than 1 percent). In the Bayway Avenue corridor, traffic increases would be less than 5 percent in the Bayway Circle area and greater than 7 percent east of South Broad Street.

Traffic increases on the Staten Island Expressway (I-278) in New York, between the No-Build and the Build, would be largest in the vicinity of the West Shore Expressway. As traffic reaches the Route 440 connection to the Bayonne Bridge, the traffic increase resulting with the Proposed Project would be less than 5 percent over No-Build volumes. Traffic on the West Shore Expressway itself is expected to decrease with the Build alternatives.





Legend

2470 - AM Peak Hour Vehicles (One-Way)
(3160) - PM Peak Hour Vehicles (One-Way)

Goethals Bridge Replacement EIS

FIGURE 5.20-2

Build Traffic Volumes
(2034) Peak Hour

United States Coast Guard

Source: ESRI, 2008.
Data: Berger/PB 2004.

TABLE 5.20-11
FUTURE (2034) PEAK-HOUR TRAFFIC FORECASTS FOR SELECTED MAJOR ROUTES, COMPARING NO-BUILD AND BUILD ALTERNATIVES

Location	Direction	2034 No-Build		2034 Build	
		AM Volume	PM Volume	AM Volume (% change)	PM Volume (% change)
Route 1 South of Bayway Circle	NB	2,905	2,350	2,810 (-4%)	2,355 (0%)
	SB	1,915	3,100	1,935 (1%)	3,130 (1%)
Bayway Ave. at Bayway Circle	EB	610	595	620 (2%)	625 (5%)
	WB	570	495	585 (3%)	500 (1%)
Bayway Ave. East of S. Broad Street	EB	945	935	980 (4%)	1,005 (7%)
	WB	675	840	740 (10%)	900 (7%)
NJ Turnpike Int. 13	Entering	4,480	3,090	5,080 (13%)	3,900 (26%)
	Exiting	3,305	4,070	3,930 (19%)	4,785 (18%)
West Shore Expressway South of Staten Island Expressway	NB	3,035	2,515	3,005 (-1%)	2,345 (-7%)
	SB	2,755	2,925	2,595 (-6%)	2,880 (-2%)
Staten Island Expressway East of West Shore Expressway	EB	4,240	5,010	4,695 (11%)	5,285 (5%)
	WB	4,970	4,775	5,265 (6%)	5,335 (12%)
Staten Island Expressway East of Route 440	EB	3,760	5,290	3,940 (5%)	5,400 (2%)
	WB	5,260	5,130	5,365 (2%)	5,365 (5%)

Source: Berger/PB, 2008.

5.20.4.2 Build Traffic Operations and Impacts

The forecast traffic volumes presented in the preceding sections were used to analyze future traffic operations in the AM and PM peak hours at the same locations as were analyzed for the No-Build alternative, using the HCM procedures. Changes in LOS between the No-Build and Build alternatives in 2034 were calculated to identify where future traffic operations would be significantly impacted by the Proposed Project. As described in Section 5.20.2.2, defined impact criteria were used to identify locations where: 1) LOS would deteriorate from the No-Build to the Build condition by at least one LOS to mid-LOS D or worse; and 2) No-Build LOS F would worsen with the Build alternatives due to additional traffic demand, potentially lengthening traffic queues and delays at a given location.

Figure 5.20-3 shows the specific areas within the broader Goethals Bridge traffic study area where project-related traffic impacts would potentially occur, as follows:

- In New Jersey, in the Bayway Avenue corridor, at I-278 mainline and interchanges, and at New Jersey Turnpike Interchange 13;
- In New York, on the Staten Island Expressway and service and local roads in the vicinity of the Howland Hook Marine Terminal; and
- In New York, on service and local roads in the vicinity of the Verrazano-Narrows Bridge.

The following sections identify the traffic-related impacts resulting with the Build alternatives, compared to the No-Build alternative, in the three impact analysis areas. In each table accompanying the location-specific identification of impacts, traffic impacts in the Build condition are bolded.

Figure 5.20-3 Areas of Potential Traffic Impact with the Build Alternatives

Key Bridge Crossings

During the AM and PM peak hours, in the peak directions of traffic flow, traffic operations would improve significantly at the Goethals Bridge replacement, at LOS D, even with increased demand; this would compare to No-Build operations at capacity (i.e., LOS F). Traffic operations at the Outerbridge Crossing would continue to operate at LOS E or F, despite traffic diversions from the Outerbridge Crossing to the Goethals Bridge. No significant changes in traffic operations are forecast at the Bayonne Bridge or the Verrazano-Narrows Bridge with the new, 6-lane Goethals Bridge in place. The forecasted traffic LOS at the key bridge crossings are provided in Table 5.20-12.

TABLE 5.20-12
FUTURE (2034) PEAK-HOUR TRAFFIC OPERATIONS ON KEY BRIDGE CROSSINGS, COMPARING NO-BUILD AND BUILD ALTERNATIVES

Bridge	No-Build LOS AM	Build LOS AM	No-Build LOS PM	Build LOS PM
Eastbound/Southbound				
Goethals Bridge	E	D	F	D
Bayonne Bridge	A	A	C	C
Outerbridge Crossing	F	F	F	F
Verrazano-Narrows Bridge	F	F	D	D
Westbound/Northbound				
Goethals Bridge	F	D	E	D
Bayonne Bridge	B	B	A	A
Outerbridge Crossing	F	E	F	E
Verrazano-Narrows Bridge	D	D	F	F

Source: Berger/PB, 2008.

New Jersey

I-278 Mainline and Ramps/New Jersey Turnpike Interchange 13

Future Build forecasts indicate that traffic demand could increase by 750 to 1000 vehicles at New Jersey Turnpike Interchange 13 in the peak direction during the peak hours of travel. This would further affect the poor conditions forecast for the toll plaza approach areas even in the future No-Build condition. In addition, the ramps to and from the Goethals Bridge to the New Jersey Turnpike are forecast to already be over capacity with the No-Build alternative, and the ramps to and from Bayway Avenue and the Goethals Bridge would be at No-Build LOS F. The increased project-related demand would adversely impact these ramps, as shown in Table 5.20-13. As indicated in the table, LOS at each of the analyzed locations would deteriorate with the Build alternatives, compared to No-Build traffic operations, indicating significant traffic impact.

TABLE 5.20-13
PEAK-HOUR LOS DETERIORATION ON 1-278 MAINLINE AND RAMPS/NJ TURNPIKE INTERCHANGE 13, COMPARING NO-BUILD AND BUILD ALTERNATIVES

Type	Location	Time Period	No-Build LOS	Build LOS*
Mainline	**I-278 Eastbound/Interchange 13**			
	NJ Turnpike Entrance – Brunswick Ave. Entrance	AM	C	**E**
	NJ Turnpike Entrance – Brunswick Ave. Entrance	PM	D	**E**
Ramp	**I-278 Eastbound/Interchange 13**			
	Entrance ramp from NJ Turnpike Interchange 13	AM	C	**D**
	Entrance ramp from Bayway Ave.	AM	D	**F**
	Entrance ramp from NJ Turnpike Interchange 13	PM	D	**F**
	Entrance ramp from Bayway Ave.	PM	D	**F**
	I-278 Westbound/Interchange 13			
	Exit ramp to NJ Turnpike Interchange 13	AM	D	**E**
	Exit ramp to NJ Turnpike Interchange 13	PM	C	**E**

* **Bold LOS** indicates project-related traffic impact.
Source: Berger/PB, 2008.

Local Roads (Bayway Circle, Bayway Avenue Corridor)

As shown in Tables 5.20-14 and 5.20-15, many of the intersections in the Bayway corridor will be operating poorly in the future No-Build condition in 2034. Locally, on Bayway Avenue, Route 1 & 9, South Broad Street and at the Brunswick Avenue/Atlantic Avenue intersection, project-related increases in delay would be small (i.e., generally less than 5 percent), except at a few isolated locations along Broad Street and Atlantic Street. Most of the traffic demand for this corridor would already be present in the No-Build condition. Along Bayway Avenue, Build volumes would be generally 3 to 5 percent larger than in the No-Build condition, with both the No-Build and Build conditions operating at very poor levels of service. With the Proposed Project, some longer-distance trips would use Brunswick Avenue and then turn onto the New Jersey Turnpike Interchange 13 ramp to continue northward. On the local street network, project-related traffic increases in delay along Bayway Avenue would range between 4 percent at Bayway Circle to 15 percent near New Jersey Turnpike Interchange 13.

TABLE 5.20-14
PEAK-HOUR LOS DETERIORATION ON LOCAL ROADS IN BAYWAY CIRCLE/BAYWAY AVE. CORRIDOR, COMPARING NO-BUILD AND BUILD ALTERNATIVES

Type	Location	Time Period	No-Build LOS	Build* LOS
Intersection	**Route 1/Bayway Circle**			
	Bayway Circle WB at Route 1 & 9	AM	D	**F**
	Bayway Circle EB at Route 1 & 9	AM	E	**F**
	Bayway Ave. at South Broad St.	AM	D	**E**
	Bayway Circle WB at Route 1 & 9	PM	C	**F**
	Bayway Circle EB at Route 1 & 9	PM	C	**E**
	Local Roads			
	Goethals Bridge On/Off Ramps at Atlantic Ave.	PM	D	**E**
	Bayway Ave. at Polonia Ave.	PM	E	**F**

* **Bold LOS** indicates project-related traffic impact.
Source: Berger/PB, 2008.

TABLE 5.20-15
PEAK-HOUR LOS F DETERIORATION ON LOCAL ROADS IN BAYWAY CIRCLE/BAYWAY AVE. CORRIDOR, COMPARING NO-BUILD AND BUILD ALTERNATIVES

Type	Location	Time Period	No-Build Delay (seconds)	Build Delay* (seconds)
Intersection	**Local Roads**			
	South Elmora Ave. at Edgar Rd.	AM	320.5	**494.2**
	South Elmora Ave. at Lidgerwood Ave.	AM	95.6	**173.2**
	Bayway Ave. at Bayway Circle	AM	196.9	**221.2**
	South Elmora Ave. at New York Ave.	AM	262.6	**287.9**
	Bayway Ave. at South Broad St. (NB)	AM	170.5	**213.2**
	Bayway Ave./NJ Turnpike Interchange 13 Off Ramp at Atlantic Ave	AM	152.8	**197.4**
	Goethals Bridge On/Off Ramps at Atlantic Ave	AM	108.6	**196.9**
	Bayway Ave at Clarkson Ave	AM	248.8	**305.4**
	South Elmora Ave at Edgar Rd	PM	184.2	**218.3**
	Bayway Ave at Grier Ave	PM	84.1	**96.9**
	Bayway Ave at Bayway Circle	PM	178.7	**208.5**
	Bayway Ave at South Broad St (NB)	PM	107.0	**163.3**
	Bayway Ave at Bonnet St	PM	65.8	**80.7**
	Bayway Ave at Clarkson Ave	PM	105.2	**149.9**
	I-278 EB Off Ramp at Brunswick Ave	PM	176.3	**264.5**

* **Bold delay** indicates project-related traffic impact.
Source: Berger/PB, 2008.

New York

Staten Island Expressway (I-278) Mainline, Ramps and Weaving Sections

The increase in volumes resulting from the Proposed Project would impact several sections of the Staten Island Expressway corridor between the Goethals Bridge and Richmond Avenue, as well as some interchange areas, diminishing LOS by one level, as shown on Table 5.20-16. Additionally, while several sections along the Staten Island Expressway are already forecast to operate at LOS F in the No-Build condition, as shown in Table 5.20-17, the traffic demand and resulting queues would increase with the Build alternative, worsening LOS F conditions. Table 5.20-17 shows the actual density changes in the LOS F range for ramp merges, diverges and weaves. As densities are not calculated for the mainline in the LOS F range, only LOS F is shown on Table 5.20-17. The largest project-related impact along the

TABLE 5.20-16
PEAK-HOUR LOS DETERIORATION ON STATEN ISLAND EXPRESSWAY MAINLINE, RAMPS & WEAVING SECTIONS, COMPARING NO-BUILD AND BUILD ALTERNATIVES

Type	Location	Time Period	No-Build	Build*
Mainline	**Staten Island Expressway Eastbound**			
	West Shore Expy. SB Exit – West Shore Expy. NB Entrance	AM	C	**D**
	West Shore Expy. SB Exit – West Shore Expy. NB Entrance	PM	D	**E**
	Forest Ave. Exit – West Shore Expy. SB Exit	PM	C	**D**
	Staten Island Expressway Westbound			
	Victory Blvd. Exit – Dr. Martin Luther King, Jr. Expy. North Exit	AM	E	**F**
	Richmond Ave. Exit – South Ave. Exit	AM	E	**F**
	West Shore Exp. NB Entrance – Forest Ave. Entrance	AM	C	**D**
	Route 440 North Exit – Dr. Martin Luther King, Jr. Expy. North Entr.	PM	D	**E**
	Richmond Ave. Exit – South Ave. Exit	PM	E	**F**
	South Ave. Exit – Richmond Ave. Entrance	PM	D	**E**
	Richmond Ave. Entrance – West Shore Expy. SB Exit	PM	D	**E**
	West Shore Expy. SB Exit – West Shore Expy. NB Entrance	PM	D	**E**
	West Shore Expy. NB Entrance Ramp – Forest Ave. Entrance	PM	C	**D**
Ramp	**Staten Island Expressway Westbound**			
	Route 440 Exit Ramp Diverge	AM	D	**E**
	South Ave. Exit Ramp Diverge	AM	D	**E**
	South Ave. Exit Ramp Diverge	PM	D	**E**
Weaving	**Staten Island Expressway Eastbound**			
	Gulf Ave. Entrance – Forest Ave. Exit	AM	C	**D**
	Richmond Ave. Entrance – Victory Blvd.	AM	C	**D**
	Gulf Ave. Entrance – Forest Ave. Exit	PM	D	**E**
	Staten Island Expressway Westbound			
	Forest Ave. Entrance – Goethals Rd. North Exit	AM	D	**E**
	Forest Ave. Entrance – Goethals Rd. North Exit	PM	C	**E**

* **Bold delay** indicates project-related traffic impact.
Source: Berger/PB, 2008.

TABLE 5.20-17
PEAK-HOUR LOS F DETERIORATION ON STATEN ISLAND MAINLINE, RAMPS & WEAVING SECTIONS, COMPARING NO-BUILD AND BUILD ALTERNATIVES

Type	Location	Time Period	No-Build LOS	Build LOS
Mainline	**Staten Island Expressway Eastbound**			
	Bradley Ave. Entrance – Slosson Ave. Exit	AM	F	**F**
	South Gannon Ave. Entrance – Bradley Ave. Exit	PM	F	**F**
	Bradley Ave. Exit – Bradley Ave. Entrance	PM	F	**F**
	Bradley Ave. Entrance – Slosson Ave. Exit	PM	F	**F**
	Staten Island Expressway Westbound			
	Slosson Ave. Entrance – Bradley Ave. Exit	AM	F	**F**
	Bradley Ave. Entrance – Victory Blvd. Exit	AM	F	**F**
	Slosson Ave. Entrance – Bradley Ave. Exit	PM	F	**F**
	Bradley Ave. Exit – Bradley Ave. Entrance	PM	F	**F**
	Bradley Ave. Entrance – Victory Blvd. Exit	PM	F	**F**
Ramp	**Staten Island Expressway Eastbound**		**Density**	**Density**
	South Gannon Ave. Entrance Ramp Merge	PM	34.2	34.6
	Bradley Ave. Exit Ramp Diverge	PM	35.2	35.5
	Staten Island Expressway Westbound			
	Bradley Ave. Entrance Ramp Merge	AM	33.2	33.6
	Bradley Ave. Exit Ramp Diverge	PM	39.1	39.6
	Bradley Ave. Entrance Ramp Merge	PM	34.1	35.1
	Victory Blvd. Exit Ramp Diverge	PM	37.8	38.6
Weaving	**Staten Island Expressway Westbound**			
	Dr. Martin Luther King, Jr. Expy. SB Entrance – Richmond Ave. Exit	PM	43.4	47.4

* **Bold delay** indicates project-related traffic impact.
Source: Berger/PB, 2008.

Staten Island Expressway would occur on the segment between the Goethals Bridge and Richmond Avenue; congestion would already occur on several sections with the No-Build alternative. No increase in these sections would be more than one LOS. East of Richmond Avenue, the Staten Island Expressway would operate at LOS F, as shown in Table 5.20-17.

Local Roads (Howland Hook Marine Terminal Area)

Increases in traffic volumes would occur with the Build alternatives in a few areas of the local roadway network in the vicinity of the HHMT. These would occur along Forest Avenue, on several ramps, and along a small section of Goethals Road North where traffic already operates poorly, as shown in Table 5.20-18. These would result from truck traffic shifting to the proposed 6-lane Goethals Bridge replacement from the Outerbridge Crossing. HHMT-related traffic would shift towards greater use of the Goethals Bridge. The Staten Island Expressway eastbound off-ramp and westbound on-ramp volumes would be higher with the Build than with the No-Build alternative as a result of this shift, thus impacting Forest Avenue and a section of Gulf Road.

TABLE 5.20-18
PEAK-HOUR LOS F DETERIORATION IN VICINITIES OF HOWLAND HOOK MARINE TERMINAL AND VERRAZANO-NARROWS BRIDGE, COMPARING NO-BUILD AND BUILD ALTERNATIVES

Type	Location	Time Period	No-Build Delay (seconds)	Build Delay (seconds)
Intersection	**Howland Hook Marine Terminal Area**			
	Forest Ave. at Gulf Ave.	AM	1,636.0	**2,000+**
	Forest Ave. at Goethals Rd. North	AM	100.8	**115.7**
	Forest Ave. at Gulf Ave.	PM	217.6	**1,488.0**
	Verrazano-Narrows Bridge Area			
	Narrows Rd. South at Fingerboard Rd.	AM	304.4	**353.6**
	Mclean Ave. at Lily Pond Ave.	AM	118.2	**138.2**
	Major Ave. at Lily Pond Ave.	AM	51.2	**58.6**
	Narrows Rd. South at Lily Pond Ave.	PM	125.4	**138.3**
	Narrows Rd. South at Fingerboard Rd.	PM	89.6	**98.6**
	Narrows Rd. South at Hylan Blvd. SB	PM	86.8	**99.4**
	Narrows Rd. South at Hylan Blvd. NB	PM	124.9	**142.0**
	Mclean Ave. at Lily Pond Ave.	PM	144.7	**147.6**

* **Bold delay** indicates project-related traffic impact.
Source: Berger/PB, 2008.

Service and Local Roads (Verrazano-Narrows Bridge Area)

In the vicinity of the Verrazano-Narrows Bridge, traffic changes would result primarily due to some travel shifting to destinations in New Jersey, thus shifting local traffic patterns to access the Staten Island Expressway. These changes would also cause traffic to find different local paths as the overall congestion on the local network would alter drivers' consideration of route options. In addition, the Staten Island Expressway in this area would operate at capacity during peak hours. A minor portion of the relatively small Build-related increases in traffic in the Verrazano-Narrows Bridge vicinity would use the service roads to access or leave the Verrazano-Narrows Bridge, contributing to traffic impacts along these service roads. The changes would occur along Fingerboard Road, Hylan Boulevard and at the Tompkins/Lily Pond Avenue intersection. At the intersections evaluated along the service road near the Verrazano-Narrows Bridge, the project-related effects would be deterioration within LOS F from No-Build to Build, as shown in Table 5.20-18.

5.20.5 Traffic Mitigation Plan

5.20.5.1 Summary of Locations with Project-Related Traffic Impacts

Along the I-278 corridor, the increase in forecasted volume would significantly impact several sections of the highway corridor, as well as some interchange areas. While several sections along the Staten Island Expressway are forecast to already operate at LOS F in the No-Build condition, project-related traffic demand and resulting queues would increase with the Build alternatives, worsening LOS F conditions. An impact is also forecast with the Build alternatives in the New Jersey Turnpike Interchange 13

complex. The ramps connecting the Goethals Bridge to and from Interchange 13, and the ramps connecting Bayway Avenue to and from both the Goethals Bridge and the New Jersey Turnpike, would be over capacity in both the No-Build and Build conditions. Increased demand from the new Goethals Bridge would add traffic demand to an already over-capacity condition at Interchange 13.

Much of Bayway Avenue is forecast to operate in the future No-Build condition at LOS F in both the AM and PM peak hours. While volume increases with the Build alternatives would not be large, they would add to an already overcrowded situation, thus producing impacts at a number of locations.

In the Howland Hook Marine Terminal area, more trucks would use the Goethals Bridge with implementation of the Proposed Project, resulting in a change in local travel patterns in the Terminal's vicinity. With the Proposed Project, congestion at the local intersections would increase somewhat due to changes in access and egress patterns with the Build alternatives.

At the east end of the study area in the vicinity of the Verrazano-Narrows Bridge, intersections evaluated along the Staten Island Expressway service roads are projected to deteriorate within the LOS F range with the Build alternatives, compared to No-Build conditions.

5.20.5.2 Mitigation Measures Investigated

Following the identification of significant traffic impacts, and of LOS F impacts (i.e., locations where project-related increases in LOS F seconds-of-travel-delay compared to No-Build LOS F conditions would be perceptible to a driver), potential measures to mitigate project-related impacts were investigated. The analysis of potential mitigation measures focused on identifying feasible and reasonable measures that would most cost-effectively improve Build traffic conditions at the locations with significant or LOS F project-related impacts back to or better than No-Build conditions.

The mitigation measures investigated included various managed-use lane (MUL) options and a set of transportation system management (TSM) measures. An MUL is a lane in which traffic access is controlled by definition (i.e., high-occupancy vehicles containing three persons or more [HOV 3+]) and by time of day and possibly by direction, thereby mitigating the operational effects of increased volumes on a roadway. TSM measures are typically relatively low-cost physical or operational improvements that are implemented to improve or maximize the efficiencies of existing roadway intersections, thus reducing delays at both signalized and unsignalized intersections.

The MUL options investigated for mitigation purposes included a bi-directional MUL either on the proposed 6-lane bridge replacement and/or on segments of the Staten Island Expressway, assuming extension of the Staten Island Expressway's bus lane to Richmond Avenue in the future with or without the Proposed Project. TSM measures investigated during these studies included intersection-specific signal re-timing, provision of new signals, restriping, reduction of parking at selected intersection approaches, and, in a limited number of locations, minor widening to provide channelized turn lanes. These measures were investigated for implementation in the Bayway Avenue/Bayway Circle corridor, on significantly impacted local roads in the HHMT area, and on service and local roads near the Verrazano-Narrows Bridge.

As the traffic mitigation measures would require implementation of measures on roadways owned and operated by State and local transportation agencies (i.e., agencies other than the project sponsor, the Port Authority), coordination with these agencies was conducted during development of the traffic mitigation plan. These agencies include the New York State Department of Transportation (NYSDOT), the New Jersey Department of Transportation (NJDOT), the New Jersey Turnpike Authority (NJTA), and the New York City Department of Transportation (NYCDOT).

5.20.5.3 Analysis of MUL Mitigation Options

The initial MUL configuration investigated as a potentially effective measure to mitigate impacts on the Staten Island Expressway included the following elements:

- The MUL extended across the Goethals Bridge and integrated with New Jersey Turnpike Interchange 13;
- One continuous managed-use lane in each direction on the Staten Island Expressway for buses and 3+ HOVs, between the Goethals Bridge and the Verrazano-Narrows Bridge, operated during peak commuting periods;
- Three general-purpose lanes in each direction on the Staten Island Expressway;
- Two exits and two entrances along the Staten Island Expressway for purposes of attracting Staten Island users;
- No connection to the West Shore Expressway, with the MUL assumed to extend through the Staten Island Expressway/West Shore Expressway interchange, with the last westbound exit at Richmond Avenue; and
- Potentially attractive bus routes that emerged from the GBR EIS's screening-phase modeling and analysis of a potential Bus Rapid Transit option.

The GTM was used to forecast mitigated Build conditions with this MUL option. Forecasts indicate that the full-length MUL would mitigate all of the identified significant traffic impacts on the Staten Island Expressway mainline, ramps, and weaving sections back to No-Build conditions, with the exception of two locations:

- South Avenue exit ramp/Richmond Avenue entrance ramp, where the mitigated LOS would remain at LOS E, as in the Build condition, a one-LOS deterioration from No-Build LOS D; and
- Richmond Avenue entrance ramp/West Shore Expressway southbound exit ramp, where the mitigated LOS would remain at LOS E, as in the Build condition, a one-LOS deterioration from No-Build LOS D.

The full-length MUL would also effectively mitigate the Staten Island Expressway mainline general-purpose lanes back to No-Build levels at locations where the No-Build and Build conditions are forecast to be LOS F. The majority of the MUL's benefit in mitigating impacts would accrue to the Staten Island Expressway segment of roughly 7 miles, rather than on the much shorter roadway segment on the Goethals Bridge and its approaches.

While not defined to address traffic impacts on the New Jersey side of the traffic study area, the full-length MUL would also mitigate significant New Jersey-side impacts, as follows:

- Improve traffic conditions back to No-Build LOS at eight locations on the I-278 mainline and ramps and at several Bayway Circle and local roadway intersections;
- Reduce delay at 10 local intersections to better than No-Build LOS; and
- Reduce traffic demand at New Jersey Turnpike Interchange 13 in the AM and PM peak hours, resulting in a return to No-Build conditions at the Interchange.

Subsequent to modeling of this MUL mitigation option, NYSDOT, which owns and operates the Staten Island Expressway, advised the Port Authority that extension of the existing Staten Island Expressway Bus Lane/MUL to the Goethals Bridge is no longer being considered at this time and has been removed

from NYSDOT's capital program. The Staten Island Expressway Bus Lane/MUL will be extended westward only to Richmond Avenue. Given this, the following three additional MUL mitigation options were defined and evaluated for the GBR EIS to determine the effectiveness of each in mitigating the project-related traffic impacts:

- *Option 1* – MUL on the full extent of the Staten Island Expressway but not across the proposed Goethals Bridge replacement;
- *Option 2* – MUL extended westward from its current terminus at Slosson Avenue, but terminating at Richmond Avenue, as proposed presently by NYSDOT, and not crossing the proposed Goethals Bridge replacement; and
- *Option 3* – MUL on the Goethals Bridge replacement (terminating the MUL on the Staten Island Expressway at Richmond Avenue), as currently proposed by NYSDOT, and then crossing the proposed Goethals Bridge replacement to connect to New Jersey Turnpike Interchange 13, with an MUL gap between Richmond Avenue and the new bridge. One MUL would be operated in each direction on the replacement bridge, during peak travel periods, for buses and HOVs, while the remaining two lanes in each direction would be operated at all times as general-use lanes (i.e., for all vehicles).

NYSDOT also advised that comprehensive reconstruction of the Staten Island Expressway/West Shore Expressway Interchange is being deferred for the foreseeable future due to capital financing constraints as well as potential wetlands-related and environmental issues. Therefore, an improved Staten Island Expressway/West Shore Expressway Interchange was not included for consideration in the mitigation plan, although minor incremental improvements in the vicinity of the interchange may be identified by NYSDOT as feasible and affordable over the next 4 to 6 years. While not identified specifically for purposes of mitigating impacts at Bayway Avenue and the Bayway Circle area, the MUL was also investigated for its mitigation potential at locations with significant impacts in New Jersey, as well as in New York.

The additional MUL options that were investigated, using the GTM to forecast travel demand and HCM procedures to calculate LOS and delays, produced the following results:

- *Option 1 – MUL on the full extent of the Staten Island Expressway, but not across the proposed Goethals Bridge replacement* – the effect of not continuing the MUL across the proposed new bridge is that future Build volumes on the bridge would result in volumes similar to or greater than No-Build volumes (i.e., no mitigation effect on the bridge). On the Staten Island Expressway section west of Richmond Avenue, the MUL would have mixed effect, mitigating some, but not all Build volumes back to No-Build levels. There would be limited reduction of traffic at Interchange 13 and along the Bayway Avenue corridor.
- *Option 2 – MUL extended westward from its current terminus at Slosson Avenue, but terminating at Richmond Avenue and not crossing the proposed Goethals Bridge replacement* – the effect of terminating the MUL on the Staten Island Expressway at Richmond Avenue is that future volumes on the new bridge would be only slightly lower than Build volumes and still significantly greater than forecasted No-Build volumes, and no impacts on the Staten Island Expressway west of Richmond Avenue would be mitigated. Similarly no impacts in New Jersey would be mitigated or improved with this option.
- *Option 3 – MUL on the Goethals Bridge replacement (terminating the MUL on the Staten Island Expressway at Richmond Avenue)* – the effect of this MUL mitigation option is that it would effectively mitigate most, but not all, of the impact locations along the Staten Island Expressway back to No-Build LOS. Significant impacts would remain at seven locations between Richmond Avenue and the new Goethals Bridge, notably in the Staten Island Expressway/West Shore

Expressway interchange area, which would also not be mitigated by the initial, full-length MUL option investigated. (Of the remaining impact locations, four could be mitigated with provision of an auxiliary lane or completion of the Staten Island Expressway MUL between Richmond Avenue and the Goethals Bridge; however, these options are not considered part of the GBR EIS traffic mitigation plan as NYSDOT does not include completion of a full-length MUL in its program).

Option 3, with the MUL on the Goethals Bridge replacement, would effectively mitigate most of the impact locations in New Jersey in the NJ Turnpike Interchange 13 complex, some within the Bayway Circle area, and some along the Bayway Avenue corridor. In the latter two areas, the MUL would serve to complement the mitigation effects of the defined TSM measures, which are discussed below. Therefore, Option 3, the Goethals Bridge Replacement Managed Use Lane, is proposed as a key element of the project's traffic mitigation plan.

5.20.5.4 Mitigation Measures for New Jersey Impact Locations

Key Bridge Crossings

With Option 3 (the MUL on the Goethals Bridge replacement), traffic operations on the other three Staten Island bridges (Outerbridge Crossing, Bayonne Bridge, Verrazano-Narrows Bridge) would be at or slightly better than No-Build levels. The largest effect would be at the Outerbridge Crossing where AM peak-direction traffic volumes would be slightly higher than No-Build levels. The Outerbridge Crossing and Verrazano-Narrows Bridge would operate at LOS F, as in the Build and No-Build conditions. The Goethals Bridge would operate at LOS E with Option 3.

I-278 Mainline and Ramps/New Jersey Turnpike Interchange 13

As shown in Table 5.20-19, the MUL on the proposed replacement bridge alone would mitigate nearly all project-related impacts in New Jersey, with the exception of the ramp merge from Bayway Avenue and one mainline section of I-278 in the New Jersey Turnpike Interchange 13 complex. With the MUL on the new bridge, all other areas in the Interchange 13 complex, including the toll plaza area, would be improved to future No-Build levels.

Local Roads (Bayway Circle, Bayway Avenue Corridor)

As shown in Table 5.20-20, TSM measures would be generally effective in the Bayway Avenue/Bayway Circle corridor at locations with significant project-related impacts, while proving very effective at locations where the project-related effect is deterioration within LOS F from No-Build to Build. With the Build alternatives, LOS impacts within the Bayway Circle complex would require more robust mitigation measures than the low-cost TSM options assumed in this analysis (Appendix J.5 defines the location-specific TSM measures included in the traffic mitigation plan).

As shown in Table 5.20-21, the TSM improvements would reduce delays to better than No-Build conditions at the affected intersections in the Bayway Avenue corridor that are forecast to operate at LOS F in both the No-Build and Build conditions. At two intersections (South Elmora Avenue/Lidgerwood Avenue and Bayway Avenue/Bonnet Street), the TSM mitigation in combination with the MUL on the Goethals Bridge replacement would serve to mitigate the project-related impacts back to No-Build conditions.

TABLE 5.20-19
PEAK-HOUR TRAFFIC OPERATIONS ON I-278 MAINLINE & RAMPS/NJ TURNPIKE INTERCHANGE 13, COMPARING BUILD AND MITIGATED-BUILD CONDITIONS

Type	Location	Time Period	No-Build LOS	Build LOS	Mitigated-Build LOS
Mainline	**I-278 Eastbound/Interchange 13**				
	NJ Turnpike Entrance – Brunswick Ave. Entrance	AM	C	E	E
	NJ Turnpike Entrance – Brunswick Ave. Entrance	PM	D	E	D
Ramp	**I-278 Eastbound/Interchange 13**				
	On ramp from NJ Turnpike Interchange 13	AM	C	D	D
	On ramp from Bayway Ave.	AM	D	F	F
	On ramp from NJ Turnpike Interchange 13	PM	D	F	D
	On ramp from Bayway Ave.	PM	D	F	F
	I-278 Westbound/Interchange				
	Off ramp to NJ Turnpike Interchange 13	AM	D	E	D
	Off ramp to NJ Turnpike Interchange 13	PM	C	E	D

Source: Berger/PB, 2008.

TABLE 5.20-20
PEAK-HOUR LOS F TRAFFIC OPERATIONS IN BAYWAY CIRCLE AREA, COMPARING BUILD AND MITIGATED-BUILD CONDITIONS

Type	Location	Time Period	No-Build LOS	Build LOS	Mitigated-Build LOS
Intersection	**Route 1 & 9/Bayway Circle**				
	Bayway Circle WB at Route 1 & 9	AM	D	F	D
	Bayway Circle EB at Route 1 & 9	AM	E	F	E
	Bayway Ave. at South Broad St.	AM	D	E	E
	Bayway Circle WB at Route 1 & 9	PM	C	F	C
	Bayway Circle EB at Route 1 & 9	PM	C	E	C
	Local Roads				
	Goethals Bridge Entrance/Exit Ramps at Atlantic Ave.	PM	D	E	D
	Bayway Ave. at Polonia Ave.	PM	C	F	E

Source: Berger/PB, 2008.

TABLE 5.20-21
PEAK-HOUR LOS F TRAFFIC CONDITIONS ON LOCAL ROADS IN BAYWAY AVENUE CORRIDOR, COMPARING BUILD AND MITIGATED-BUILD CONDITIONS

Type	Location	Time Period	No-Build Delay (seconds)	Build Delay (seconds)	Mitigated-Build Delay (seconds)
Intersection	**Local Roads**				
	South Elmora Ave. at Edgar Rd.	AM	320.5	494.2	52.8
	South Elmora Ave. at Lidgerwood Ave.	AM	95.6	173.2	80.9
	Bayway Ave. at Bayway Circle	AM	196.9	221.2	41.6
	South Elmora Ave. at New York Ave.	AM	262.6	287.9	117.5
	Bayway Ave. at South Broad St. (NB)	AM	170.5	213.2	78.6
	Bayway Ave./NJ Tpke. Off Ramp at Atlantic Ave.	AM	152.8	197.4	34.9
	Goethals Bridge On/Off Ramps at Atlantic Ave.	AM	108.6	196.9	69.5
	Bayway Ave. at Clarkson Ave.	AM	248.8	305.4	156.0
	South Elmora Ave. at Edgar Rd.	PM	184.2	218.3	59.2
	Bayway Ave. at Grier Ave.	PM	84.1	96.9	33.7
	Bayway Ave. at Bayway Circle	PM	178.7	208.5	35.6
	Bayway Ave. at South Broad St. (NB)	PM	107.0	163.3	22.3
	Bayway Ave. at Bonnet St.	PM	69.8	80.7	52.2
	Bayway Ave. at Clarkson Ave.	PM	105.2	149.9	70.4
	I-278 EB Off Ramp at Brunswick Ave.	PM	176.3	264.5	18.0

Source: Berger/PB, 2008.

5.20.5.5 Mitigation Measures for New York Impact Locations

I-278 Mainline, Ramps and Weaving Sections

As shown in Tables 5.20-22 and 5.20-23, Option 3 (the MUL on the Goethals Bridge replacement) would effectively mitigate most of the impact locations along the Staten Island Expressway at non-LOS F locations and at LOS F locations, respectively, back to No-Build LOS conditions. Impacts would remain at seven locations between Richmond Avenue and the new Goethals Bridge (see Table 5.20-22 and Figure 5.20-4), notably in the Staten Island Expressway/West Shore Expressway interchange area, where a full-length MUL would not effectively mitigate project-related impacts, either. Full mitigation at the Staten Island Expressway/West Shore Expressway impact locations would require NYSDOT to undertake a major interchange modification in order to improve traffic operations throughout the interchange, an improvement that is not currently contemplated by NYSDOT. However, the proposed MUL on the Goethals Bridge replacement would very effectively return Build volumes back to No-Build levels in the general-use lanes along the Staten Island Expressway. The mitigated-Build LOS at each of the locations shown in Table 5.20-23 represents improved LOS F conditions with implementation of the proposed mitigation plan, compared to pure Build traffic operations.

TABLE 5.20-22
PEAK-HOUR LOS TRAFFIC CONDITIONS ON SITE MAINLINE, RAMPS & WEAVING SECTIONS, COMPARING BUILD AND MITIGATED-BUILD CONDITIONS

Type	Location	Time Period	No-Build LOS	Build LOS	Mitigated-Build LOS*
Mainline	**Staten Island Expressway Eastbound**				
	West Shore Expy. SB Exit – West Shore Expy. NB Entrance	AM	C	D	**D**
	West Shore Expy. SB Exit – West Shore Expy. NB Entrance	PM	D	E	D
	Forest Ave. Exit – West Shore Expy. SB Exit	PM	C	D	C
	Staten Island Expressway Westbound				
	Victory Blvd. Exit – Dr. Martin Luther King, Jr. Expy. North Exit	AM	E	F	E
	Richmond Ave. Exit – South Ave. Exit	AM	F	F	E
	West Shore Expy. NB Entrance – Forest Ave. Entrance	AM	C	D	**D**
	Route 440 North Exit – Route 440 North Entrance	PM	D	E	D
	Richmond Ave. Exit – South Ave. Exit	PM	E	F	**F**
	South Ave. Exit – Richmond Ave. Entrance	PM	D	E	**E**
	Richmond Ave. Entrance – West Shore Expy. SB Exit	PM	D	E	**E**
	West Shore Expy. SB Exit – West Shore Expy. NB Entrance	PM	D	E	D
	West Shore Expy. NB Entrance Ramp – Forest Ave. Entrance	PM	C	D	C
Ramp	**Staten Island Expressway Westbound**				
	Route 440 Off Ramp Diverge	AM	D	E	D
	South Ave. Exit Ramp Diverge	AM	D	E	D
	South Ave. Exit Ramp Diverge	PM	D	E	**E**
Weaving	**Staten Island Expressway Eastbound**				
	Gulf Ave. Entrance – Forest Ave. Exit	AM	C	D	C
	Richmond Ave. Entrance – Victory Blvd. Exit	AM	C	D	**D**
	Gulf Ave. Entrance – Forest Ave. Exit	PM	D	E	D
	Staten Island Expressway Westbound				
	Forest Ave. Entrance – Goethals Rd. North Exit	AM	D	E	D
	Forest Ave. Entrance – Goethals Rd. North Exit	PM	C	E	C

* **Bold LOS** indicates unmitigated traffic impact.
Source: Berger/PB, 2008.

TABLE 5.20-23
PEAK-HOUR LOS F TRAFFIC OPERATIONS ON SITE MAINLINE, RAMPS & WEAVING SECTIONS, COMPARING BUILD AND MITIGATED-BUILD CONDITIONS

Type	Location	Time Period	No-Build LOS	Build LOS	Mitigated-Build LOS
Mainline	**Staten Island Expressway Eastbound**				
	Bradley Ave. Entrance – Slosson Ave. Exit	AM	F	F	F
	South Gannon Ave. Entrance – Bradley Ave. Exit	PM	F	F	F
	Bradley Ave. Exit – Bradley Ave. Entrance	PM	F	F	F
	Bradley Ave. Entrance – Slosson Ave. Exit	PM	F	F	F
	Staten Island Expressway Westbound				
	Slosson Ave. Entrance – Bradley Ave. Exit	AM	F	F	F
	Bradley Ave. Entrance – Victory Blvd. Exit	AM	F	F	F
	Slosson Ave. Entrance – Bradley Ave. Exit	PM	F	F	F
	Bradley Ave. Exit – Bradley Ave. Entrance	PM	F	F	F
	Bradley Ave. Entrance – Victory Blvd. Exit	PM	F	F	F
Ramp	**Staten Island Expressway Eastbound**		**Density**	**Density**	**Density**
	South Gannon Ave. On Ramp Merge	PM	34.2	34.6	33.6
	Bradley Ave. Off Ramp Diverge	PM	35.2	35.5	34.7
	Staten Island Expressway Westbound				
	Bradley Ave. On Ramp Merge	AM	33.2	33.6	32.4
	Bradley Ave. Off Ramp Diverge	PM	39.1	39.6	39.3
	Bradley Ave. On Ramp Merge	PM	34.1	35.1	34.7
	Victory Blvd. Off Ramp Diverge	PM	37.8	38.6	38.3
Weaving	**Staten Island Expressway Westbound**				
	Dr. Martin Luther King, Jr. Expy. SB Entrance – Richmond Ave. Exit	PM	43.4	47.4	43.5

Source: Berger/PB, 2008.

Figure 5.20-4 Staten Island Unmitigated Locations

Service and Local Roads (Howland Hook Marine Terminal and Verrazano-Narrows Bridge Areas)

A comprehensive set of relatively low-cost improvements at signalized and unsignalized intersections was defined to address the specific locations that would be impacted by the Build alternatives. Appendix J.5 provides details of the location-specific TSM improvements evaluated and then included in the proposed traffic mitigation plan.

As shown in Table 5.20-24, the TSM improvements would effectively reduce delays to substantially better than No-Build conditions at the three intersections evaluated in the vicinity of the HHMT. However, all of these locations would continue to operate at LOS F in the mitigated-Build condition, as they would in the future No-Build condition.

At the intersections evaluated along the Verrazano-Narrows Bridge service road, project-related effects would be deterioration within LOS F from No-Build to Build. The defined TSM improvements would effectively reduce delays to better and, in some cases to substantially better, than No-Build conditions at all of the intersections evaluated.

TABLE 5.20-24
PEAK-HOUR LOS F TRAFFIC OPERATIONS IN VICINITIES OF HOWLAND HOOK MARINE TERMINAL & VERRAZANO-NARROWS BRIDGE, COMPARING BUILD AND MITIGATED-BUILD CONDITIONS

Type	Location	Time Period	No-Build Delay (seconds)	Build Delay (seconds)	Mitigated-Build Delay (seconds)
Intersection	**Howland Hook Marine Terminal Vicinity**				
	Forest Ave. at Gulf Ave.	AM	1,636.0	2000+	31.9
	Forest Ave. at Goethals Rd. North	AM	100.8	115.7	19.3
	Forest Ave. at Gulf Ave.	PM	217.6	1488.0	32.7
	Verrazano-Narrows Bridge Vicinity				
	Narrows Rd. South at Fingerboard Rd.	AM	304.4	353.6	249.9
	Mclean Ave. at Lily Pond Ave.	AM	118.2	138.2	73.9
	Major Ave. at Lily Pond Ave.	AM	51.2	58.6	58.6
	Narrows Rd. South at Lily Pond Ave.	PM	125.4	138.3	75.6
	Narrows Rd. South at Fingerboard Rd.	PM	89.6	98.6	72.0
	Narrows Rd. South at Hylan Blvd. SB	PM	86.8	99.4	28.2
	Narrows Rd. South at Hylan Blvd. NB	PM	124.9	142.0	45.6
	Mclean Ave. at Lily Pond Ave.	PM	144.7	147.6	107.8

Source: Berger/PB, 2008.

5.20.5.6 Proposed Mitigation Plan

On the basis of the traffic analyses of the various MUL scenarios and TSM measures considered, a traffic mitigation plan comprising the following elements has been identified to improve traffic conditions at locations impacted by the Build alternatives back to No-Build conditions:

- Option 3, an MUL on the proposed 6-lane bridge replacement for buses and high-occupancy vehicles (HOV), with one MUL in each direction, operating during peak commuting periods, with the two remaining lanes operating as general-use lanes at all times; and
- A set of transportation system management (TSM) measures to be implemented in the Bayway Avenue/ Bayway Circle corridor, on significantly impacted local roads in the HHMT area, and on service and local roads near the Verrazano-Narrows Bridge; TSM measures included in the traffic mitigation plan comprise intersection-specific signal re-timing, provision of new signals, restriping, reduction of parking at selected approaches and, in a limited number of locations, minor widening to provide channelized turn lanes

The comprehensive package of MUL and TSM measures was evaluated to determine the effectiveness of these measures to mitigate the project-related traffic impacts. Generally, the combined effect was to fully mitigate most of the impacts, returning future LOS with the Build alternatives back to No-Build levels. However, certain project-related traffic impacts could not be effectively mitigated absent more

comprehensive transportation improvements than are warranted for the identified project-related traffic impacts. The studies showed that:

- The TSM improvements would effectively reduce delays to substantially better than No-Build conditions at the three intersections evaluated in the HHMT vicinity, which would all operate at LOS F in the No-Build and Build conditions. Proposed Port Authority improvements in the vicinity of the HHMT and/or the provision of direct connection ramps to and from the HHMT would further improve traffic conditions.
- At the intersections evaluated along the Verrazano-Narrows Bridge service road, the defined TSM improvements would effectively reduce delays to better and, in some cases, to substantially better, than No-Build conditions at all of the intersections evaluated. Ongoing coordination continues with New York City regarding proposed mitigation solutions for intersections on City-owned local streets.
- In the Bayway Avenue/Bayway Circle area, the TSM measures would be somewhat effective at locations with significant project-related impacts, while proving very effective at locations where the project-related effect is deterioration within LOS F from No-Build to Build. The MUL on the proposed bridge replacement would also effectively mitigate some of the impact locations in New Jersey in the New Jersey Turnpike Interchange 13 complex, the Bayway Circle area, and the Bayway Avenue corridor. In the latter two areas, the MUL would serve to complement the mitigation effects of the defined TSM measures.
- The TSM improvements would reduce delays to better than No-Build conditions at most of the affected intersections in the Bayway Avenue corridor that are forecast to operate at LOS F in both the No-Build and Build conditions. The remaining unmitigated intersections are unsignalized, each with specific conditions that suggest signalization would not be the appropriate mitigation solution. At two intersections (South Elmora Avenue/Lidgerwood Avenue and BayWay Avenue/Bonnet Street), the TSM mitigation proved ineffective, but the MUL served to mitigate those impacts. Ongoing coordination with the NJDOT continues regarding future implementation of these TSM solutions.
- The effect of the MUL is that it would effectively mitigate many of the impact locations along the Staten Island Expressway back to No-Build LOS. Seven locations would remain unmitigated on the Staten Island Expressway between the new Goethals Bridge and Richmond Avenue. Ongoing coordination continues with NYSDOT to determine whether or when that agency may move forward with an improvement project in that area.
- At New Jersey Turnpike Interchange 13, volumes would return to No-Build LOS with the MUL operating on the Goethals Bridge during peak periods, with the exception of two ramp locations in the Interchange complex, for which mitigation is not reasonable without comprehensive reconfiguration of the Interchange.

In addition to the Proposed Project's traffic mitigation plan, NYSDOT is planning a new project along the Staten Island Expressway service roads in the vicinity of the Verrazano-Narrows Bridge, as an entirely separate action from the Goethals Bridge Replacement. This project would reconfigure and add several on/off ramps of the Staten Island Expressway to enable the Expressway mainline and service roads to function as a single system with a better balance of traffic between the two roadways. Also, in the Forest Avenue/Gulf Avenue/Goethals Road North street network, the Port Authority is looking at potentially improving access to the HHMT, thus improving future local traffic operations.

5.20.5.7 Remaining Unmitigated Project Impacts

Locations at which project-related impacts would not be effectively mitigated by the proposed traffic mitigation plan are as follows:

New Jersey Locations

- I-278 eastbound: New Jersey Turnpike entrance ramp – Brunswick entrance ramp, AM peak period; and
- I-278 eastbound: on-ramp from Bayway Avenue, AM and PM peak periods.

These project-related impacts cannot be readily mitigated without comprehensive reconfiguration of New Jersey Turnpike Interchange 13, a project that the NJTA does not currently include in its capital program. It would not be feasible or economically warranted to provide improvements solely for these locations without more comprehensive consideration of the entire interchange complex.

New York Locations

- Staten Island Expressway Eastbound: West Shore Expressway southbound exit ramp – West Shore Expressway northbound entrance ramp, AM peak period;
- Staten Island Expressway Westbound: South Avenue exit ramp – Richmond Avenue entrance ramp, PM peak period;
- Staten Island Expressway Westbound: Richmond Avenue entrance ramp – West Shore Expressway southbound exit ramp, PM peak period;
- Staten Island Expressway Westbound: West Shore Expressway northbound entrance ramp – Forest Avenue entrance ramp, AM peak period;
- Staten Island Expressway Westbound: Richmond Avenue exit ramp – South Avenue exit ramp, PM peak period;
- Staten Island Expressway Westbound: South Avenue off-ramp diverge, PM peak period; and
- Staten Island Expressway Eastbound: Richmond Avenue entrance ramp – Victory Boulevard, AM peak period.

Mitigation of impacts at the first three of these locations, which lie within the Staten Island Expressway/West Shore Expressway interchange complex, will continue to be discussed through coordination with NYSDOT to determine feasible capital improvements that would be under NYSDOT's auspices. Mitigation of impacts at the last four of these locations could be effected with provision of an auxiliary lane or completion of the Staten Island Expressway MUL between Richmond Avenue and the Goethals Bridge, although this is not currently contemplated. Both full MUL completion and reconstruction of the Staten Island Expressway/West Shore Expressway interchange are projects that NYSDOT has deferred to sometime in the future. No other economical or effective improvements are feasible for these sections.

5.20.5.8 Interagency Coordination

The Port Authority, the project sponsor, does not have authority over the roadway facilities that would be significantly impacted by the Proposed Project and, therefore, cannot compel implementation of the traffic mitigation plan. To encourage implementation of the mitigation measures included in the plan, the Port Authority has coordinated and consulted with the affected agencies with ownership and responsibility for operation of the affected facilities, i.e., NYSDOT, NJDOT, NJTA, and NYCDOT.

The following meetings have been held, to date, with the NYSDOT, NJDOT and NJTA:

- October 18, 2007 – meeting with NJTA and NJDOT to present and discuss analysis of existing and No-Build traffic conditions at New Jersey Turnpike Interchange 13 and Bayway Avenue/ Bayway Circle area;
- February 8, 2008 – meeting with NJTA and NJDOT to present and discuss results of impact and mitigation analyses at New Jersey Turnpike Interchange 13 and Bayway Avenue/Bayway Circle area;
- February 20, 2008 – meeting with NYSDOT to present and discuss the results of the existing, No-Build, Build, and mitigation analyses in the New York portion of the traffic study area;
- April 9, 2008 – meeting with NYSDOT for discussion of the agency's studies and plans for the Staten Island Expressway;
- June 9, 2008 – meeting with NYSDOT to present and discuss results of MUL options, and discuss potential improvements at the Staten Island Expressway/West Shore Expressway Interchange;
- October 6, 2008 – meeting with NJDOT (as well as FHWA) to discuss studies to be conducted of the potential transportation and environmental effects of the US Route 1&9/I-278 Interchange Ramp Studies (formerly known as the Missing Links Study), which is progressing as a separate project from the proposed Goethals Bridge Replacement project, with independent utility; and
- October 10, 2008 – meeting with NYSDOT to discuss the MUL element of the proposed traffic mitigation plan, relative to NYSDOT's Staten Island Expressway studies.

5.20.6 CEQR Analysis

In addition to the detailed GTM forecasting and subsequent traffic operations and impact analyses conducted for the GBR EIS, traffic analyses of locations in the Staten Island portion of the study area were evaluated in accordance with the City of New York's City Environmental Quality Review (CEQR) procedures for traffic impact and mitigation analysis. The impact criteria used in the CEQR analysis process and the results of these analyses are discussed below.

5.20.6.1 Impact Criteria

CEQR policies and procedures, which are detailed in the *CEQR Technical Manual*, include specific criteria and thresholds for determination of significant traffic impacts and required mitigation. For traffic impact analyses conducted pursuant to CEQR, the following criteria and thresholds apply:

> "Levels of service that deteriorate from acceptable LOS A, B, or C in the future no action condition to marginally unacceptable mid-LOS D or unacceptable LOS E or F in the future build condition would be considered significant impacts."

The following specific impact criteria are defined for signalized and unsignalized intersections using measures of delay to determine significance:

- Future no-action (No-Build) LOS D, an increase in Build delays of ≥ 5 seconds, if the Build delay exceeds mid-LOS D;
- Future no-action (No-Build) LOS E, Build results in 4 seconds of delay;
- Future no-action (No-Build) LOS F, Build results in 3 seconds of delay; and
- Future no-action (No-Build) LOS F with delays > 120 seconds, Build results in ≥ 1.0 second delay, unless the proposed action would generate < 5 vehicles in the peak hour.

The following specific impact criteria are defined for highway or ramp sections, including mainline and weaving sections, and ramp junctions to determine significance:

- Deterioration of no-action LOS D, E, or F by more than ½ of a LOS from no-action to Build conditions.

5.20.6.2 Additional Impact Locations

The impacts determined to be significant, per the criteria listed above, would require mitigation. The additional analyses performed to identify significant traffic impacts using the CEQR criteria were conducted for several additional intersection locations, as follows:

- Victory Boulevard and Richmond Avenue
- Victory Boulevard and Staten Island College Drive
- South Narrows Road and Legion Place
- Goethals Road North and Western Avenue

A TSM mitigation solution was developed for each of these locations. In addition, one additional mainline segment of the Staten Island Expressway would have a significant project-related impact, per the CEQR impact criteria. This section of the Expressway will be mitigated by a NYSDOT project that is planned for 2010 construction. The project will provide additional ramps to connect the mainline and service roads, thus better balancing traffic flows in this area.

Several coordination meetings were held during development of the GBR EIS with the City of New York's Mayor's Office of Environmental Coordination (OEC), NYCDOT, and the New York City Department of City Planning (NYCDCP) to discuss the GBR EIS traffic studies, including the proposed TSM improvements to mitigate impacts near the Verrazano-Narrows Bridge and the HHMT. The purpose of these meetings was to obtain the City's CEQR review of the GBR EIS traffic studies' sufficiency for purposes of CEQR and the City's Uniform Land Use Review Procedure (ULURP), and to obtain concurrence on inclusion of these mitigation measures in the GBR EIS. Coordination with OEC and NYCDOT regarding these issues was concluded and is documented in this FEIS.

5.20.6.3 Impact Analysis of 2014 Conditions

Following NYCDOT's review of the traffic analyses documented in the DEIS of May 2009, NYCDOT requested that traffic No-Build, Build and Build with mitigation analyses also be conducted for 2014, per *CEQR Technical Manual* requirements for analysis during the first year that the proposed project would be substantially operational. In the traffic impact analyses documented in the DEIS, a number of intersections in Staten Island were determined to require mitigation in 2034, based on CEQR impact guidelines. In developing the 2014 traffic impact analyses, the following was considered:

- Locations that would not have impacts requiring mitigation in 2034, based on the analyses completed for the DEIS, would not have impacts requiring mitigation in 2014; and
- Staten Island Expressway (SIE) locations forecast with impacts in 2034 do not require analysis for 2014.

On that basis, 14 intersections were analyzed to determine potential traffic impacts in 2014 (see Appendix J.6 of this FEIS). The analyses found that of the 14 locations analyzed, the following would have significant impact, as defined by CEQR, and would require mitigation in 2014, based on CEQR guidance:

- Forest Avenue and Gulf Avenue left turn southbound – AM and PM peak hour.*
- Forest Avenue and Goethals Road North northbound left – AM peak hour.*

- Narrows Road North and Hylan Boulevard NB westbound through – PM peak hour.**
- Narrows Road South and Fingerboard Avenue left turn southbound and overall intersection – AM peak hour.**
- Lily Pond Avenue and Narrows Road South southbound through – PM peak hour.**
- McLean Avenue and Lily Pond Avenue – northbound through in AM and southbound left, through, right in PM peak hour.
- Victory Boulevard and Richmond Avenue – eastbound through, right in AM and southbound left in PM peak hour.

The intersections noted by "*" will be reconstructed under the planned Forest Avenue Interim Improvement project for Howland Hook by the Port Authority and the New York City Economic Development Corporation (NYCEDC). As part of that project, the bi-directional Forest Avenue (between Gulf Avenue and Goethals Road North) will be converted to one way northbound, and its intersections with Gulf Avenue and Goethals Road North will be improved for local traffic and truck traffic to/from Howland Hook. The intersections noted by "**" will be modified as part of the NYSDOT's Staten Island Expressway Access Improvement Project (PIN. X73130), which is currently in development. As these two projects are expected to be completed by 2014, the impact and mitigation analysis of these four intersections assumed their implementation. Based on these analyses, no further mitigation will be required at these intersections.

The impact at the Lily Pond Avenue/McLean Avenue intersection could be mitigated through signal timing and on-street parking modifications. At the Victory Boulevard/Richmond Avenue intersection, the addition of a MUL on the new Goethals Bridge would reduce overall intersection delay, with the exception of a left-turn impact in the PM peak hour, which could not be mitigated without resulting in an impact to another lane group in the intersection. The Port Authority will continue to coordinate with NYCDOT regarding the details of mitigation for these two impacts.

The Staten Island Expressway locations that are forecast with impacts in 2014 are generally the same locations as identified for 2034 (see above Section 5.20.4.2 and its respective Table 5.20-16 for the list of those locations). Each impacted location would 1) either be mitigated with the GBR's MUL or 2) its mitigation would require comprehensive reconstruction of the Staten Island Expressway/West Shore Expressway Interchange, which the NYSDOT has advised is being deferred for the foreseeable future.

As this FEIS has been prepared to also satisfy New York City environmental review requirements, per CEQR, consultation and coordination were achieved with the New York City Mayor's Office of Environmental Coordination (OEC) and the NYCDOT for review of and concurrence with the methodology, results and findings of the traffic analyses (see NYCDOT review letter of June 25, 2010 in Appendix J.7 of this FEIS).

5.20.7 Railroads

As reported previously in Section 4.19.6, reactivation of rail freight services on the Staten Island Railroad (SIRR), which crosses the Arthur Kill via the Arthur Kill Lift Bridge just north of the Goethals Bridge up to the Arlington Yards and also extends south along the western shore of Staten Island via the Travis Branch, is a key component of New York City's Rail Access Program. The freight line is the City's only connection to the national freight rail network. In April 2007, the freight line reopened; and it has been estimated that, as a result, up to 125,000 truck trips have been eliminated from City roadways since its reopening. On November 10, 2008, the New York City Economic Development Corporation (NYCEDC), along with the Port Authority and CSX, announced that it will operate dedicated intermodal services from the New York Container Terminal (NYCT), operating from the NYCT's ExpressRail Staten Island rail yard facility (located at Port Ivory) in support with the Arlington Yards facility in Staten Island, to the Midwest and to New England. The NYCEDC estimates that the new CSX service would

eliminate 45,000 truck trips per year. Implementation of the Proposed Project would not adversely affect the continued re-emergence of rail-based freight movement in the region, but would be a complementary action to support improved freight movement by improving traffic flows across the Goethals Bridge and traffic operations in the Goethals Bridge corridor. This would, in turn, serve to facilitate truck movements in the corridor, particularly to and from the NYCT in Staten Island and Ports Newark and Elizabeth in Elizabeth, New Jersey.

During the replacement of the Travis Branch Railroad Overpass (a.k.a., "Travis Bridge") over I-278 in order to accommodate the widened New York approach of the proposed new Goethals Bridge (regardless of the Build Alternatives), the interruption to current freight rail operations would be minimal and limited to a single weekend with the roll-in construction method as presented in Section 3.4.8.

5.20.8 Transit

The only mass-transit services that currently use the Goethals Bridge are express bus routes between Manhattan and Staten Island. It is anticipated that these would continue to operate in the future No-Build scenario, with ridership levels likely to be affected by prevailing fuel costs and regional economic conditions.

Several potential new bus routes were examined during the alternatives-screening phase of the GBR EIS (see Appendix B of this FEIS entitled *Alternatives Screening Report*, which includes detailed documentation of the screening analyses of potential transit alternatives). Express bus routes (e.g., between Brooklyn and New Jersey, with stops in Staten Island; along the West Shore Expressway to New Jersey; and along the North Shore of Staten Island to New Jersey) may warrant consideration in the future, if future transportation, development, and economic conditions warrant investigation and subsequent implementation of additional mass-transit services. For example, future shifts in bus routes and services operated by the Metropolitan Transportation Authority-New York City Transit may be accommodated by roadway-based transportation improvements, such as NYSDOT's re-decking of the Gowanus Expressway and westward extension of the Staten Island Expressway bus lanes. If certain of these bus routes, or other routes that would use the Goethals Bridge, are implemented and prove successful, they could become the building blocks for future use of the potential mass transit corridor included in the design of the Proposed Project. Similarly, if current planning studies of potential mass transit services in the West Shore and North Shore corridors of Staten Island result in future development of light rail transit, as is proposed, they could potentially be accommodated in the proposed Goethals Bridge replacement's corridor for such potential future mass transit facilities, to be situated between the east- and westbound roadway decks.

5.20.9 Summary

Implementation of the Proposed Project would result in significant and LOS F traffic impacts in three areas within the larger GBR EIS traffic study area. However, the proposed traffic mitigation plan to address the project-related traffic impacts would return the impacted locations to No-Build or better traffic conditions, as follows:

- Implement an MUL on the proposed Goethals Bridge Replacement during AM and PM peak periods, with one lane in each direction operated as an MUL for buses and HOVs only, and the remaining two lanes in each direction operated for all vehicles, with the MUL connecting to the Staten Island Expressway (I-278) in New York and the New Jersey Turnpike Interchange 13 complex in New Jersey;
- Implement the identified TSM improvements at impacted locations in the vicinities of the HHMT and the Verrazano-Narrows Bridge in New York and in the Bayway Circle/Bayway Avenue corridor in New Jersey, during the Proposed Project's construction period; and

- Continue interagency coordination with NJTA, NJDOT, NYSDOT, NYCDOT, and the Cities of Elizabeth and Linden, which was initiated during the DEIS process and will continue beyond this NEPA process, regarding mitigation measures proposed for roadway facilities not owned/operated by the Port Authority.

The proposed traffic mitigation plan would effectively mitigate most of the significant impacts at locations in New York and New Jersey. Only nine specific locations would not be fully mitigated with implementation of this plan. Mitigation at the remaining unmitigated impact locations would require that other transportation agencies, which own and operate the facilities on which these unmitigated impacts would occur, undertake planning studies and design for major reconstruction projects at New Jersey Turnpike Interchange 13 and along Staten Island Expressway between Richmond Avenue and West Shore Expressway. Such studies are not currently contemplated.

5.21 Air Quality

5.21.1 Introduction

This section presents the findings of the air quality analyses that were conducted for the No-Build and the four Build Alternatives. Qualitative and quantitative analysis results are presented for both the construction and operational phases of the Proposed Project. As deemed warranted, mitigation is presented that addresses increases in emissions between the No-Build and the Build Alternatives and any exceedances that might occur during the operation of the Proposed Project. Representative input and output and other technical sheets for the different air quality modeling analyses performed in this section are presented in Appendix N.

The following analyses were conducted to determine whether the Proposed Project has the potential to cause significant air quality impacts:

- A microscale (localized) CO analysis to determine whether project-related changes in local traffic conditions would cause or exacerbate a violation of the 8-hour National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO);
- A qualitative microscale $PM_{2.5}$ analysis, utilizing EPA/FHWA guidelines, to determine whether the Proposed Project would cause or exacerbate a violation of the NAAQS;
- A quantitative microscale $PM_{2.5}$ analysis conducted in accordance with NYCDEP's *$PM_{2.5}$ Interim Guidelines* to determine whether the impacts of the Proposed Project would exceed a significant threshold value established by NYCDEP;
- A mesoscale (regional) analysis to determine whether the Proposed Project would increase regional pollutant emissions;
- An analysis of potential mobile source air toxic (MSAT) impacts;
- An analysis of the Proposed Project's effects on greenhouse gas emissions;
- An analysis to determine whether the Proposed Project would comply with USEPA's General Conformity Rule; and
- A quantitative assessment of the project's potential construction impacts.

5.21.2 Microscale CO Analysis

The purpose of this analysis is to identify the potential for the Proposed Project to cause or exacerbate a localized violation of an ambient CO standard near any of the roadways that would be affected by project-related changes in traffic. At the affected congested intersections, a "hot-spot" (intersection-level)

modeling analysis was conducted to estimate future CO levels near these intersections with and without the Proposed Project.

Analyses were conducted following USEPA's *Intersection Modeling Guidelines* (EPA-454/R-92-005) for CO modeling methodology and receptor placement to estimate future No-Build and future Build CO levels. The methodology that was described in Section 4.20 to estimate levels with existing conditions was applied in these analyses, as summarized below.

Analysis Sites

Analyses were conducted at the four analysis sites in New York and New Jersey as presented in Tables 4.20-4 and 4.20-5 and on Figure 4.20-1, all in Section 4.20. These include the following:

Two locations in New Jersey:

- Routes 1&9 at Bayway Circle; and
- Bayway Avenue/Atlantic Ave and NJ Turnpike Interchange 13.

Two locations in New York:

- The Goethals Bridge Toll Plaza Area; and
- The Verrazano-Narrows Bridge Toll Plaza Area.

Traffic Data

Data for the air quality analysis were derived from traffic counts and other information developed as part of the traffic studies conducted for this EIS (see Appendix J). The weekday AM and PM peak traffic periods were considered.

Vehicle Emissions

Emission factors were estimated using USEPA's MOBILE 6.2.03 (EPA420-R-03-010), the most current version of the mobile emission factor algorithm model. Appropriate inputs for New Jersey and New York vehicles were applied.

Analysis Years

Analyses were conducted for two analysis years (i.e., the project's estimated time of completion [2014] and the project's design year [2034]).

Dispersion Model

USEPA's CAL3QHC Version 2 line-source dispersion model was used to estimate CO concentrations near the affected analysis sites. All major roadway segments (links) within approximately 1,000 feet of each analysis site were considered.

Background Values

Applicable background concentrations, which are presented in Table 4.20-6 in Section 4.20, were added to the modeling results to obtain total pollutant concentrations at each receptor site for each analysis year.

Results

Maximum predicted future CO concentrations at selected analysis sites for the future No-Build and Build conditions are shown in Table 5.21-1. Predicted CO levels, which are based on future No-Build and future Build traffic conditions, do not exceed the applicable 8-hour CO standard. Therefore, no significant CO impacts would occur, and mitigation would not be required.

TABLE 5.21-1
MAXIMUM 8-HOUR MOBILE SOURCE CO LEVELS (PPM)

NAAQS	9 ppm			
Analysis Sites	No-Build		Build	
	2014	2034	2014	2034
Routes 1&9 at Bayway Circle (New Jersey)	6.8	6.3	6.8	6.4
Bayway Avenue/Atlantic Ave & NJ Turnpike Interchange 13 (New Jersey)	5.8	5.6	6.2	5.7
Goethals Bridge Toll Plaza Area (New York)	3.7	3.5	4.4	4.1
Verrazano-Narrows Bridge Toll Plaza Area (New York)	5.5	5.0	5.6	5.1

Source: Berger/PB, 2008

5.21.3 Microscale $PM_{2.5}$ Analyses

Qualitative and quantitative analyses of the Proposed Project's potential effects on localized $PM_{2.5}$ emission levels were conducted, the former in accordance with joint USEPA and FHWA guidance and the latter consistent with NYCDEP impact criteria. The two analyses are each discussed below.

5.21.3.1 Qualitative $PM_{2.5}$ Analysis

A qualitative project-level hot-spot assessment was conducted to assess whether the Proposed Project would cause or contribute to any new localized $PM_{2.5}$ violations, increase the frequency or severity of any existing violations, or delay timely attainment of the $PM_{2.5}$ NAAQS. The assessment followed the joint EPA and FHWA *Transportation Conformity Guidance for Qualitative Hot-Spot Analyses in PM_{10} Nonattainment and Maintenance Areas* (EPA420-B-06-902), dated March 2006. Following the methodologies provided in this guidance, future AADTs on the roadways affected by the Proposed Project were compared to existing AADTs on roadways near the ambient $PM_{2.5}$ monitor to determine whether the project has the potential to cause or exacerbate a violation of the $PM_{2.5}$ NAAQS.

Representative Roadway

The mainline sections of I-278, on both sides of the Goethals Bridge, were selected as being the representative roadways for this project. Thus, the conditions along these roadways were used in the qualitative comparison approach to determine whether the project has the potential to cause or exacerbate a violation of the $PM_{2.5}$ NAAQS.

$PM_{2.5}$ Monitored Data in the Study Area

The NJDEP and NYSDEC operators routinely service the monitoring instrumentation, perform the quality assurance checks necessary to ensure that the analyzers are operating properly, and perform

various types of preventive maintenance. The current monitoring networks for both states have been developed following the requirements of 40 CFR Part 58 and applying the USEPA's *Guidance for Network Design and Optimum Site Exposure for $PM_{2.5}$ and PM_{10}.*

Representative Monitors

The following monitors were selected for the $PM_{2.5}$ analysis.

- Two NJDEP monitors located along the New Jersey Turnpike at Interchange 13 in Union County, New Jersey (within a few hundred feet of I-278); and
- One monitor located at Susan Wagner High School (Brielle Avenue and Manor Road) in Staten Island (within a mile of I-278), New York.

Monitored Particulate Levels

A review of the monitored data indicates that:

1.) Neither representative monitor has recorded an exceedance of either the annual or 24-hour $PM_{2.5}$ standards in 2006.
2.) The highest annual $PM_{2.5}$ level recorded at the New Jersey monitors is 14.7 ug/m^3; the highest 24-hour $PM_{2.5}$ level recorded in 2006 is 46.0 ug/m^3.
3.) The annual $PM_{2.5}$ level recorded at the New York monitors is 10.4 ug/m^3; the highest 24-hour $PM_{2.5}$ level recorded in 2006 is 36.0 ug/m^3.
4.) Monitored concentrations on both sides of the Goethals Bridge are below the applicable NAAQS of 15 and 65 ug/m^3, respectively.

Although the maximum recorded 24-hour values at the New Jersey and New York monitors are above the recently revised 24-hour standard of 35 ug/m^3, these values are within (below) the standard currently used by the Conformity process (65 ug/m^3). In addition, all monitored annual values are within (below) the annual NAAQS.

Changes in Traffic Volumes

Based on the fact that federally-mandated reductions in $PM_{2.5}$ vehicular emission rates in the future are greater than projected increases in area-wide traffic volumes, the project's first year of operation (2014) was selected to represent the year for the potential worst-case impacts. As such, 2014 is the analysis year for this qualitative $PM_{2.5}$ analysis.

Since I-278 is both the representative roadway and representative monitoring site, truck percentages do not have to be adjusted for this analysis. The qualitative analysis of traffic volumes, therefore, consists of a comparison of the future (2014) peak-period volumes along the affected roadway sections with the peak-period volumes along the same roadway sections during the latest year that monitored data were collected (2006). The result of this comparison is that overall existing AM and PM peak-period traffic volumes on I-278 (35,122) are approximately 17 percent lower in 2006 than in 2014 (41,050) or, conversely, future volumes would be approximately 17 percent higher than existing volumes.

Changes in Vehicular Emission Rates

USEPA's MOBILE 6.2.03 emission factor algorithm was used to estimate changes in vehicular $PM_{2.5}$ emission factors between 2006 and 2014. The result of this analysis is that future (2014) $PM_{2.5}$ emission

factors (0.0175 grams per vehicle mile) are 55 percent less than existing (2006) emission factors (0.0386 grams per vehicle mile). Several factors form the basis as to why the Proposed Project would not cause, worsen, or contribute to a violation of the $PM_{2.5}$ NAAQS. These factors include:

1.) No exceedances of the applicable annual and 24-hour $PM_{2.5}$ NAAQS have been recorded at the representative monitors in 2006;
2.) $PM_{2.5}$ impacts from vehicular emissions on a per-vehicle basis should decrease, based on estimated MOBILE 6.2.03 emission factors, by approximately 55 percent between 2006 and 2014. This is due to the implementation of national diesel engine and diesel sulfur fuel regulations, which are expected to cut heavy-duty diesel emissions. This reduction would more than offset emission increases resulting from the projected 17 percent increase in traffic volumes.
3.) The regional effects of the Proposed Project, which are provided in the mesoscale analysis section below, would result in a reduction in $PM_{2.5}$ emissions.

5.21.3.2 Quantitative $PM_{2.5}$ Analysis

As the Proposed Project is subject to certain approvals from the City of New York, which are obtained through its City Environmental Quality Review (CEQR) and Uniform Land Use Review Procedure (ULURP) processes, a quantitative $PM_{2.5}$ analysis pursuant to NYCDEP's procedures was also conducted. NYCDEP has established significant threshold values (STVs) for determining whether the potential $PM_{2.5}$ impacts from a Proposed Project subject to the CEQR review process are considered to be significant. The criteria for determining the potential for significant adverse impacts from $PM_{2.5}$ for roadway projects are as follows:

- Predicted incremental annual ground-level concentrations of $PM_{2.5}$ greater than 0.1 $\mu g/m^3$ estimated at a distance of 15 meters from an arterial roadway; and
- Predicted incremental 24-hour concentrations of $PM_{2.5}$ greater than 2 to 5 $\mu g/m^3$ estimated at discrete sensitive land uses, depending upon the probability of occurrence, the projected duration of such impacts, the magnitude of the area, and the potential number of people affected.

Actions that would increase $PM_{2.5}$ concentrations by more than the STVs would be considered to have the potential to result in significant adverse impacts. For actions subject to CEQR that would potentially cause an exceedance of these criteria, NYCDEP recommends that examination of potential measures to reduce or eliminate such impacts be included in an EIS. Therefore, for the Proposed Project, the NYCDEP STVs described above were used to evaluate the significance of predicted project impacts from mobile sources and stationary sources on $PM_{2.5}$ concentrations and to determine the need to minimize PM emissions from the Proposed Project.

Analyses were conducted following USEPA's *Intersection Modeling Guidelines* (EPA-454/R-92-005) to estimate future No-Build and future Build $PM_{2.5}$ levels. The methodology used to estimate levels with existing conditions (described in Section 4.20) was applied in these analyses, as summarized below.

Analysis Sites and Receptor Locations

Analyses were conducted at the Goethals Bridge and Verrazano-Narrows Bridge toll plazas. Receptors were placed at the nearest sidewalks or residential areas near these toll plazas.

Because USEPA considers sidewalks as "reasonable" receptors, all sidewalk locations around both toll plazas were considered for this analysis. However, a number of the sidewalks located directly adjacent to the Verrazano-Narrows Bridge toll plaza are not used to get from one point to another and, therefore, have little or no pedestrian traffic. While the results at these areas are included for disclosure purposes,

maximum values estimated at more reasonable receptors were also considered. The results obtained at these reasonable receptors were considered for determining whether predicted project increments would exceed the NYCDEP STVs.

Traffic Data

Data for the air quality analysis were derived from traffic counts and other information developed as part of the traffic studies conducted for this EIS (see Appendix J). The weekday AM and PM peak traffic periods were considered.

Vehicle Emissions

Emission factors were estimated using USEPA's MOBILE 6.2.03, even though USEPA does not consider MOBILE 6.2 emission factors for particulates to be accurate for estimating motor vehicle emissions. This analysis was conducted solely for the purpose of determining whether the impacts of the project would exceed a NYCDEP STV.

Analysis Year

Analyses were conducted for two analysis years -- the project's estimated time of completion (2014) and the project's design year (2034).

Dispersion Model

USEPA's CAL3QHCR line-source dispersion model was used to estimate $PM_{2.5}$ concentrations near the affected analysis sites. All major roadway segments (links) within approximately 1,000 feet of each analysis site were considered. Hour-by-hour analyses were conducted using 5 years of meteorological data from Newark International Airport.

Results

Maximum predicted future $PM_{2.5}$ increments (i.e., the differences in pollutant concentrations with and without the Proposed Project) near the two bridge portal sites are shown in Table 5.21-2. No exceedances of the 24-hour or annual STVs are estimated near the Verrazano-Narrows Bridge toll plaza, and no exceedance of the 24-hour STV is estimated near the Goethals Bridge toll plaza. While estimated project increments exceed the NYCDEP annual $PM_{2.5}$ STV near the Goethals Bridge toll plaza, these exceedances occur only at isolated locations near the toll plaza with little or no pedestrian traffic. The NYCDEP STVs, therefore, are not exceeded at reasonable worst-case receptor locations and, as such, no significant impacts are anticipated.

5.21.4 Mesoscale Analysis

A mesoscale emissions analysis was conducted to estimate the potential that the Proposed Project would have on the amount of mobile source-related air pollutants in the Study Area. The analysis was performed for CO, ozone precursors (volatile organic compounds [VOCs] and nitrogen oxides [NOx]), and particulate matter ($PM_{2.5}$). Emissions were based on peak- period (AM and PM) and daily estimates of vehicle miles of travel (VMT) and vehicle hours of travel (VHT) under future No-Build and Build traffic conditions.

The data used in this analysis are consistent with the most recent estimates made by the New York Metropolitan Transportation Council (NYMTC) and the North Jersey Transportation Planning Authority

TABLE 5.21-2
MAXIMUM $PM_{2.5}$ INCREMENTS (UG/M^3)

Analysis Site	Maximum Predicted Annual Increments			Maximum Predicted 24-hr Increments		
	2014	2034	NYCDEP STV	2014	2034	NYCDEP STV
Goethals Bridge Toll Plaza						
At reasonable worst-case receptor locations	0.09	0.03	0.1	0.6	0.9	5
At locations along nearby sidewalks with limited pedestrian traffic	0.2 *	0.13 *		1.3	1.6	
Verrazano-Narrows Bridge Toll Plaza	0.05	0.01		0.4	0.3	

Note: "*" Exceeds the NYCDEP annual STV.
Source: Berger/PB, 2008

(NJTPA) for traffic volume growth rates, including forecast changes in VMT and VHT. NYMTC and NJTPA developed these estimates from their traffic assignment models based on current and future population, employment, and travel and congestion information. The latest planning assumptions from this air quality analysis were used, and these assumptions are consistent with those in the current conformity determinations for the New Jersey and New York Transportation Plans and Transportation Improvement Programs (TIPs).

Future (2034) emission rates were calculated for the No-Build and Build alternatives. For the purposes of the mesoscale analysis, emission burdens for a single Build Alternative were estimated, based on the results of the traffic impact analyses, for which Build Alternative-specific differences in alignments would not result in differences operationally or in traffic conditions.

Methodology

VMT and VHT estimates were provided for future 2034 No-Build and Build conditions as output from the Goethals Transportation Model (GTM) (see Section 5.20 and Appendix A.3 for details of the GTM). Speeds used for determining emission rates were calculated by dividing VMT by VHT estimates for the No-Build and Build conditions. The USEPA MOBILE 6.2.03 emission factor algorithm was used to estimate emission factors.

Vehicle-mix data were provided from county-specific data provided by NYSDEC and NJDEP. These percentages were obtained from Mobile 6.2.03 data based on the 2003 New York State downstate vehicle registration data and VMT data provided by NYSDEC for Richmond and Kings Counties. Site-specific input data into the Mobile 6.2.03 model for Hudson, Essex, Union, and Middlesex counties were provided by NJDEP. Modeling input parameters are the same as those used for the CO microscale analysis, with the exception that an average ambient air temperature of 82.2° F for New York was used to estimate VOC and NOx emission rates under summertime conditions. Following NJDEP guidance, a minimum/ maximum ambient summertime temperature of 71º/95º F was used to estimate VOC and NOx emissions in New Jersey.

Results

Total emissions estimated for the future 2034 No-Build and Build alternatives are provided in Table 5.21-3. The mesoscale analysis indicates that the peak-period VMT and pollutant emission burdens (i.e., the amounts of pollutant emitted from the Study Area roadways) for each pollutant considered would decrease as a result of the Proposed Project. As such, the Proposed Project would not significantly impact regional air quality levels.

TABLE 5.21-3
TRAVEL DEMAND FORECASTS AND ESTIMATED FUTURE POLLUTANT EMISSION BURDENS (2034)

	Vehicle Miles of Travel (VMT)	Vehicle Hours of Travel (VHT)	Area-Wide Emission Rates (Pounds)			
			CO	NOx	VOCs	$PM_{2.5}$
No-Build	41,702,900	2,986,100	944,200	23,840	40,310	1,152
Build	41,463,200	2,938,500	937,100	23,670	39,770	1,145
Change	-240,000	-47,600	-7,100	-170	-540	-7
% Change	-0.6%	-1.69%	-0.86%	-0.7%	-1.3%	-0.6%

Source: Berger/PB, 2008

5.21.5 Mobile Source Air Toxics

In addition to the criteria pollutants for which there are NAAQS, USEPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories or refineries).

Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics defined by the CAA. MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline. The USEPA has assessed this expansive list in its latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007) and identified a group of 93 compounds emitted from mobile sources that is listed in its Integrated Risk Information System (IRIS) (http://www.epa.gov/ncea/iris/index.html). In addition, USEPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA).[24] These are:

- **Benzene** – characterized as a known human carcinogen;
- **Acrolein** – The potential carcinogenicity of acrolein cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure;
- **Formaldehyde** – a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals;

[24] See http://www.epa.gov/ttn/atw/nata1999/

- **1,3-Butadiene** – characterized as carcinogenic to humans by inhalation;
- **Diesel Exhaust (DE)** – likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust, as reviewed in this document, is the combination of diesel particulate matter and diesel exhaust organic gases. Diesel exhaust also represents chronic respiratory effects, possibly the primary non-cancer hazard from MSATs. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies;
- **Naphthalene** – USEPA has classified naphthalene as a Group C, possible human carcinogen. Acute exposure of humans to naphthalene by inhalation, ingestion, and dermal contact is associated with hemolytic anemia, damage to the liver, and neurological damage. Cataracts have also been reported in workers acutely exposed to naphthalene by inhalation and ingestion; and
- **Polycyclic Organic Matter (POM)** – defines a broad class of compounds that includes the polycyclic aromatic hydrocarbon compounds (PAHs), of which benzo[a]pyrene is a member. Cancer is the major concern with exposure to POM. USEPA has classified seven PAHs (benzo[a]pyrene, benz[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) as Group B2, probable human carcinogens.

FHWA, which has issued guidance for consideration of MSATs for transportation projects, considers these the priority mobile-source air toxics. The list is subject to change and may be adjusted in consideration of future USEPA rules.

The USEPA is the Federal agency for administering the CAA and has certain responsibilities regarding the health effects of MSATs. The USEPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources (66 Federal Register 17229, March 29, 2001); this rule was issued under the authority in Section 202 of the CAA. In its rule, USEPA examined the impacts of existing and newly promulgated mobile-source control programs, including its reformulated gasoline program, its national low emission vehicle standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and its proposed heavy-duty engine and vehicle standards and on-highway diesel fuel requirements. Future emissions would likely be lower than present levels as a result of the USEPA's national control programs, which are projected to reduce MSAT emissions by 72 percent from 1999 to 2050 even if VMT increases by 145 percent, as shown in Figure 5.21-1

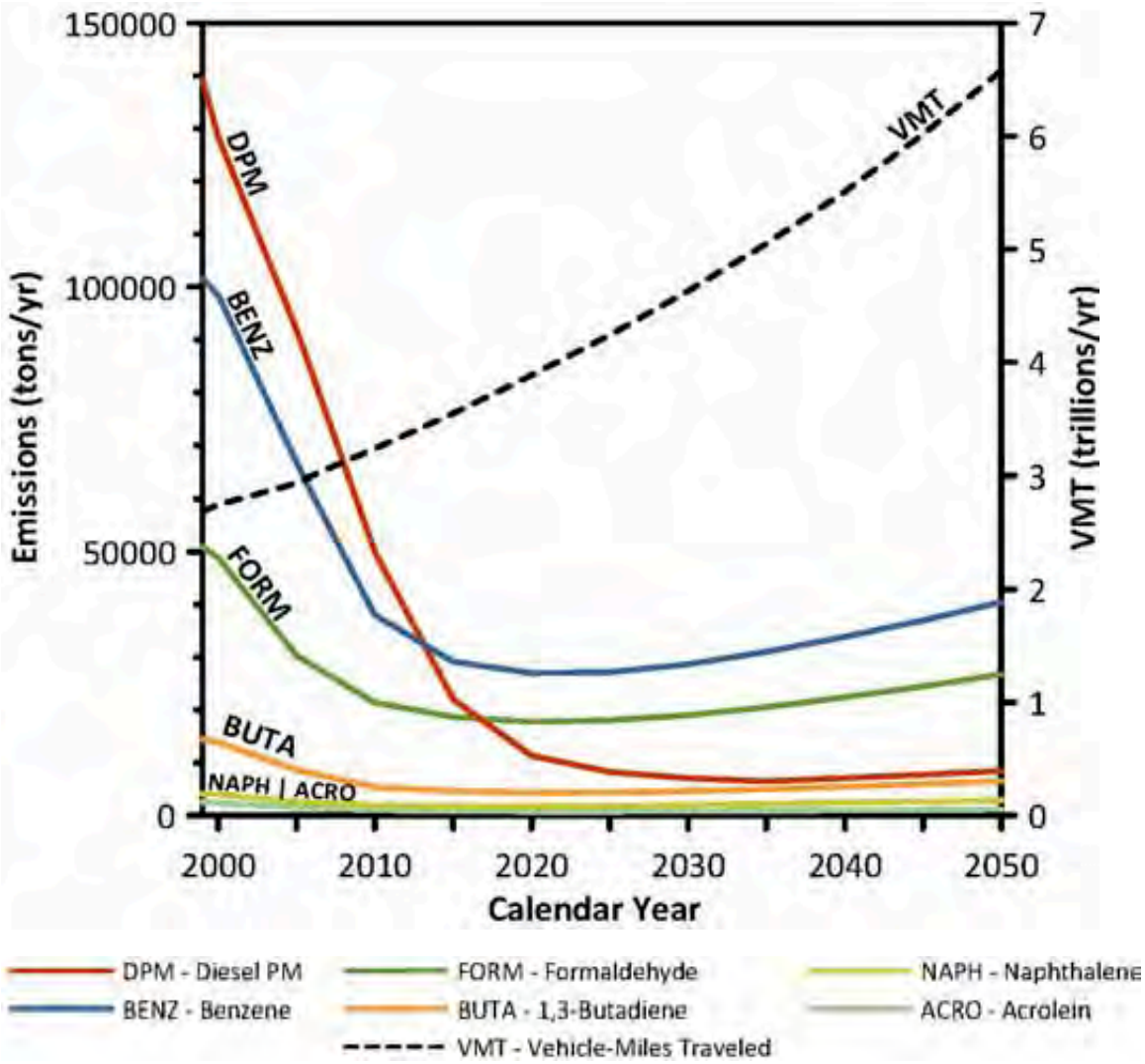
On February 9, 2007, and under authority of CAA Section 202(l), USEPA signed a Final Rule, Control of Hazardous Air Pollutants from Mobile Sources, which sets standards to control MSATs from motor vehicles. Under this rule, USEPA is setting standards on fuel composition, vehicle exhaust emissions, and evaporative losses from portable containers. The new standards are estimated to reduce total emissions of MSATs by 330,000 tons in 2030, including 61,000 tons of benzene. Concurrently, total emissions of volatile organic compounds (VOC) will be reduced by over 1.1 million tons in 2030 as a result of adopting these standards.

5.21.5.1 Environmental Consequences

On February 3, 2006, the FHWA released "Interim Guidance on Air Toxic Analysis in NEPA Documents." This guidance was superseded on September 30, 2009, by FHWA's "Interim Guidance Update on Air Toxic Analysis in NEPA Documents." The purpose of FHWA's guidance is to advise on when and how to analyze MSATs in the NEPA process for highways. This guidance is interim because MSAT science is still evolving. As the science progresses, FHWA will update the guidance.

A qualitative analysis provides a basis for identifying and comparing the potential differences, if any, among MSAT emissions from project alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled "A Methodology for Evaluating Mobile Source Air

Figure 5.21-1: National MSAT Emission Trends 1999 – 2050 for Vehicles Operating on Roadways, Using USEPA's Mobile6.2 Model



Source: U.S. Environmental Protection Agency. MOBILE6.2 Model run 20 August 2009.

Note:
(1) Annual emissions of polycyclic organic matter are projected to be 561 tons/yr for 1999, decreasing to 373 tons/yr for 2050.
(2) Trends for specific locations may be different, depending on locally derived information representing vehicle-miles traveled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors

Toxic Emissions Among Transportation Project Alternatives".[25] FHWA's Interim Guidance groups projects into the following tiers:

Tier 1. No analysis for projects with no potential for meaningful MSAT Effects;

Tier 2. Qualitative analysis for projects with low potential MSAT effects; or

Tier 3. Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.

Based on the recommended tiering approach, the Proposed Project falls within the Tier 2 approach. Tier 2 is appropriate for this project because it does not fall under the Tier 1 category, which includes:

- Projects qualifying as a categorical exclusion under 23 CFR, Part 771.117(c);
- Projects exempt under the Clean Air Act conformity rule under 40 CFR, Part 93.126; or
- Other projects with no meaningful impacts on traffic volumes or vehicle mix.

The project also does not fall under the Tier 3 category. Tier 3 includes projects that:

- Create or significantly alter a major intermodal freight facility that has the potential to concentrate high levels of diesel particulate matter in a single location; or
- Create new or add significant capacity to urban highways such as interstates, urban arterials, or urban collector-distributor routes with traffic volumes where the Average Annual Daily Traffic (AADT) is projected to be in the range of 140,000 to 150,000 vehicles per day (vpd), or greater, by the design year;

and also are:

- Proposed to be located near populated areas.

As stated in FHWA's guidance, Tier 2 projects "are those that serve to improve operations of highway, transit or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase MSAT emissions. This category covers a broad range of projects. We anticipate that most highway projects that need an MSAT assessment will fall into this category." Based on this guidance, the project was analyzed using the Tier 2 approach.

The amount of MSATs emitted with the No-Build and Build alternatives would be proportional to the vehicle-miles traveled (VMT), assuming that other variables such as fleet mix are the same for each alternative. Table 5.21-4 shows estimated total VMT for the No-Build and Build alternatives. As shown, the Build alternatives would reduce total estimated VMT by 0.2 percent in 2014, 0.4 percent in 2024, and 0.6 percent in 2034. As the Build alternative is not anticipated to affect congestion or vehicular speeds, MSAT emission rates should decrease by approximately these percentages. However, the extent to which speed-related emissions changes may affect overall MSAT levels cannot be reliably projected because of the inherent deficiencies of technical models.

Based on these results, the Proposed Project is predicted to reduce MSATs in the overall project area in contrast to the No-Build Alternative. Also, emissions likely would be lower than present levels in future years as a result of USEPA's national control programs that are projected to reduce annual MSAT emissions by 72 percent between 1999 and 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the USEPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the project area likely would be lower in the future in nearly all cases.

[25] Found at: www.fhwa.dot.gov/environment/airtoxic/msatcompare/msatemissions.htm

TABLE 5.21-4
PROJECTED VMT

	ETC (2014)		ETC + 10 (2024)		ETC + 20 (2034)	
	No-Build	**Build**	**No-Build**	**Build**	**No-Build**	**Build**
Peak-Period VMT	37,362,526	37,276,377	39,532,736	39,369,804	41,702,946	41,463,231
% Change from No-Build	-	-0.2%	-	-0.4%	-	-0.6%

Source: Berger/PB, 2008

The replacement of the Goethals Bridge and its approaches may move some traffic slightly closer to some nearby homes or businesses and reduce volumes in other locations when traffic shifts slightly away from them. Therefore, ambient concentrations of MSATs with the project could be slightly different at some locations than with the No-Build Alternative. However, on a regional basis USEPA's vehicle and fuel regulations, coupled with fleet turnover, will cause substantial MSAT reductions over time that, in almost all cases, will cause region-wide MSAT levels to be lower than today.

In summary, it is expected that MSAT emissions would decrease in the immediate area of the project, relative to the No-Build Alternative, as a result of the reduced VMT. While MSAT levels could be higher in some locations, current tools and science are not adequate to quantify these changes. Regardless, on a regional basis, USEPA's vehicle and fuel regulations, coupled with fleet turnover, will cause substantial reductions over time; in almost all cases, this will cause region-wide MSAT levels to be significantly lower than today.

This document provides a qualitative analysis of MSAT emissions relative to the Proposed Project and acknowledges that the Build alternative could increase exposure to MSAT emissions in certain locations, although the concentrations and duration of exposures are uncertain. However, available technical tools do not enable prediction of the project-specific health impacts of the emission changes associated with the project alternatives. Because of these limitations, the following discussion is included in accordance with the President's Council on Environmental Quality (CEQ) regulations (40 CFR, Section 1502.22[b]) regarding incomplete or unavailable information.

5.21.5.2 Information that is Unavailable or Incomplete

In FHWA's view, information is incomplete or unavailable to credibly predict the project-specific health impacts due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced by the uncertainty introduced into the process through assumption and speculation rather than providing genuine insight about the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

The USEPA is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. The USEPA is the lead authority for administering the Clean Air Act and its amendments and has specific statutory obligations with respect to hazardous air pollutants and MSAT. The agency is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. It maintains the Integrated Risk Information System (IRIS), which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects" (USEPA, http://www.epa.gov/ncea/iris/index.html). Each report contains assessments of non-cancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures with uncertainty spanning perhaps an order of magnitude.

Other organizations are also active in the research and analyses of the human health effects of MSATs, including the Health Effects Institute (HEI). Two HEI studies are summarized in Appendix D of FHWA's "Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents." Among the adverse health effects linked to MSAT compounds at high exposures are cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current environmental concentrations (HEI, http://pubs.healtheffects.org/view.php?id=282) or in the future as vehicle emissions substantially decrease (HEI, http://pubs.healtheffects.org/view.php?id=306).

5.21.5.3 Emissions

The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and then final determination of health impacts – each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable. The results produced by the USEPA's MOBILE6.2 model, the California EPA's Emfac2007 model, and the USEPA's DraftMOVES2009 model in forecasting MSAT emissions are highly inconsistent. Indications from the development of the MOVES model are that MOBILE6.2 significantly underestimates diesel particulate matter (PM) emissions and significantly overestimates benzene emissions.

5.21.5.4 Dispersion

Regarding air dispersion modeling, an extensive evaluation of USEPA's guideline CAL3QHC model was conducted in an NCHRP study (http://www.epa.gov/scram001/dispersion_alt.htm#hyroad), which documents poor model performance at 10 sites across the country – three where intensive monitoring was conducted plus an additional seven with less intensive monitoring. The study indicates a bias of the CAL3QHC model to overestimate concentrations near highly congested intersections and underestimate concentrations near uncongested intersections. The consequence of this is a tendency to overstate the air quality benefits of mitigating congestion at intersections. Such poor model performance is less difficult to manage for demonstrating compliance with National Ambient Air Quality Standards for relatively short time frames than it is for forecasting individual exposure over an entire lifetime, especially given that some information needed for estimating 70-year lifetime exposure is unavailable. It is particularly difficult to reliably forecast MSAT exposure near roadways, and to determine the portion of time that people are actually exposed at a specific location.

5.21.5.5 Exposure Levels and Health Effects

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSATs, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (http://pubs.healtheffects.org/view.php?id=282). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. The USEPA[26] and the HEI[27] have not established a basis for quantitative risk assessment of diesel PM in ambient settings.

There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the USEPA as provided by the Clean Air Act to determine whether more stringent

[26] See http://www.epa.gov/risk/basicinformation.htm#g
[27] See http://pubs.healtheffects.org/getfile.php?u=395

controls are required to provide a sufficient margin of safety to protect public health or to prevent an adverse environmental effect from industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires the USEPA to determine a "safe" or "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in one million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than 1 in one million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in one million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld USEPA's approach to addressing risk in its two-step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than safe or acceptable

Because of the limitations in the methodologies for forecasting health impacts, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis.

This qualitative analysis of MSAT emissions relative to the project alternatives acknowledges that the project may result in increased exposure to MSAT emissions in certain locations, but the concentrations and duration of exposures are uncertain. Because of this uncertainty, the health effects from these emissions cannot be estimated.

5.21.6 Greenhouse Gas Emissions Analysis

The majority of greenhouse gas emissions result from fossil fuels combustion. The burning of fossil fuels produces emissions of carbon dioxide (CO_2), which are a result of oxidation of the carbon in the fuel. This analysis of potential emissions of greenhouse gases uses the results from the direct energy analyses (see Section 5.19) and is reported in total carbon emissions.

It is assumed that CO_2 emissions from the direct energy consumption are the result of the combustion of motor vehicle fuel. Therefore, this analysis employed carbon emission coefficients for motor vehicle fuel to calculate the carbon equivalent of CO_2 emissions resulting from operation of the Proposed Project. These coefficients are provided in NYSDOT's *Draft Energy Analysis Guidelines*, dated November 2003.

While the Proposed Project's four Build Alternatives have distinct alignments, these alternatives would not vary operationally (i.e., each of the four Build Alternatives would result in the same future traffic conditions - see Section 5.20, *Traffic and Transportation*). Therefore, the CO_2 calculations, which are based on the direct energy estimates, are the same for all of the Build Alternatives. However, CO_2 calculations, which are based on the different indirect energy estimates related to construction, operation, and maintenance of the four alternatives' different alignments (see Section 5.19) were performed for each of the four Build alternatives and the No-Build alternative.

5.21.6.1 CO_2 Emissions Estimates from Direct Energy Consumption

As shown in Table 5.21-5, the Proposed Project is predicted to decrease CO_2 for all years analyzed. In 2014, the Build Alternatives' CO_2 emissions estimate is predicted to be 0.4% less than for the No-Build Alternative. In 2024, the Build Alternatives' CO_2 emissions estimate is predicted to be 1.6% less than the estimate for the No-Build Alternative. In 2034, the Build Alternatives' CO_2 emissions estimate is predicted to be 4.6% less than the estimate for the No-Build Alternative. The reduction in CO_2 emissions

with the Build Alternatives is directly related to predicted increases in vehicular speeds and reduction in VMT in the Study Area estimated for the Build Alternatives, as compared to the No-Build Alternative.

TABLE 5.21-5
CO_2 EMISSIONS ESTIMATES BASED ON DIRECT ENERGY ESTIMATES

Project Alternative	Carbon Emissions: CO_2 (Tons per Year)		
	ETC (2014)	ETC + 10 (2024)	ETC +20 (2034)
No- Build	8,005	8,367	8,954
Build Alternative	7,971	8,233	8,538
% Change from No- Build	-0.4%	-1.6%	-4.6%

Source: Berger/PB, 2008.
Note: ETC – Estimated Time of Completion of project construction.

5.21.6.2 CO_2 Emissions Estimates from Indirect Energy Consumption

A summary of the CO_2 emissions estimates from indirect energy consumption, reported as tons of CO_2, are presented in Table 5.21-6. These values represent the total of annual construction emissions and maintenance emissions for the Proposed Project from the beginning of construction (2009) to the project's horizon year, which is the last year of the area's Transportation Long Range Plan (2030 in both New York and New Jersey). Therefore, the total construction energy is annualized over this 21-year period (i.e. from 2009 to 2030). The No-Build values represent only maintenance energy requirements, as the No-Build Alternative presumes no project-related construction.

TABLE 5.21-6
CO_2 EMISSIONS ESTIMATES BASED ON INDIRECT ENERGY ESTIMATES

Project Alternative	Total Tons CO_2	Annual Total Tons CO_2
No-Build	1,300	62
Build Alternative	103,000	4,880

Source: Berger/PB, 2008.

5.21.6.3 Annual CO_2 Emissions Estimated for the Total Project

Total carbon emissions in 2014, 2024 and 2034 are presented in Table 5.21-7. As that table indicates, the Build Alternative's CO_2 emissions are higher than with the No-Build Alternative due to construction emissions. Operationally (excluding construction emissions), the Build Alternative is predicted to decrease CO_2 emissions by approximately 4.8% in the design year of 2034.

5.21.6.4 Mitigation

Total CO_2 emissions attributed to the Build Alternative would be greater than with the No-Build Alternative during the Project's construction period, which is estimated to be approximately 56 months. Inclusion of the construction-phase CO_2 emissions in the total emissions estimates results in greater Build

TABLE 5.21-7
TOTAL CO_2 EMISSIONS (ANNUALIZED INDIRECT AND ANNUAL DIRECT ENERGY CONSUMPTION)

Project Alternative	Carbon Emissions CO_2 (Tons per Year)		
	(ETC) 2014	(ETC+10) 2024	(ETC+20) 2034
No- Build	8,067	8,429	9,016
Build Alternative	12,852	13,115	13,419

Source: Berger/PB, 2008.

estimates. The application of the mitigation measures discussed in Section 5.21.7.3, which are designed to reduce criteria pollutant levels during construction, will aid in the reduction of CO_2 emissions by limiting idling of machinery and optimizing construction methods for lower fuel consumption.

5.21.7 Construction Impacts

In accordance with consultation conducted by the USCG with USEPA Region 2, and concurrence from NYCDEP, a quantitative construction-phase air quality analysis of the Preferred Alternative was conducted. The Preferred Alternative, the New Alignment South, was identified on the basis of the GBR DEIS and consideration of agency and public comments received during the DEIS formal public meetings and comment period. Pollutant emissions generated within and near the major construction areas associated with the following activities were considered:

- Demolition and grading;
- Handling and transport of construction material and debris;
- Operation of heavy-duty diesel-powered construction equipment; and
- Operation of heavy-duty diesel trucks for transport of construction materials within construction areas and on the area's roadways.

Pollutant emissions generated by on-site construction activities, marine vessels, and truck and worker trips to and from the construction sites were estimated on an annual and monthly basis for the entire construction period, and potential air quality impacts were estimated during peak construction periods. Annual estimated emissions generated during the construction period within the New York/New Jersey/Connecticut nonattainment region were also compared with USEPA General Conformity emission thresholds to determine whether a Conformity determination is applicable.

Actual details of the Proposed Project's construction will not be determined until later project development phases. Therefore, the assumptions made for the construction-phase air quality analyses regarding equipment, vehicles, staffing, etc. are based on professional judgment and experience with construction practices in the NY/NJ region and for similar types of projects. A detailed discussion of the methodologies and assumptions used in the construction-phase analysis is presented in Appendix N.2, (*Construction-Phase Air Quality Technical Report*) of this FEIS. As this FEIS has been prepared to also satisfy New York City environmental review requirements, per CEQR, consultation and coordination were achieved with the New York City Mayor's Office of Environmental Coordination (OEC) and the NYCDEP for review of and concurrence with the methodology, results and findings of the construction-phase air quality analysis (see NYCDEP review letter of May 14, 2010 in Appendix N.3 of this FEIS).

5.21.7.1 Activities and Emission Rates

The analysis to estimate potential air quality impacts caused by on-site (e.g., demolition activities, construction equipment operations, and truck movements) and off-site (e.g., motor vehicle traffic effects due to truck and worker trips and ramp closures) construction-phase activities included the following:

- Estimation of emissions generated by the construction activities (e.g., deconstruction, concrete and steel construction), including fugitive dust emissions and emissions released from diesel-powered equipment and trucks based on the hours of operation of each piece of equipment;
- Determination of the distances between major construction activities and nearby sensitive land uses (e.g., residences, schools, parks);
- Identification of heavily traveled truck routes to estimate the cumulative effects of on-site construction activity emissions and off-site traffic emissions;
- An "on-site" dispersion modeling analysis of the two major construction areas – one on either side of the bridge (i.e., one in Elizabeth, New Jersey, and the other in Staten Island, New York);
- An "off-site" dispersion modeling analysis of the roadway intersections/interchanges adjacent to the construction areas using traffic data that include construction-related vehicles and background traffic;
- Determination of future baseline concentrations, which are the sum of modeled future No-Build traffic concentrations and ambient background values; results of the construction–phase analysis is the sum of these future baseline values and project-related construction impacts; and
- A comparison of the cumulative (on-site and off-site) modeling results to the applicable NAAQS for the applicable pollutants and, for the New York-side analysis, the NYCDEP significant threshold values and *de minimis* impact levels.

Emission rates for these activities were estimated based on the following:

- The number of hours per day and duration of each construction activity;
- The number and type of construction equipment to be used;
- Horsepower (HP) and utilization rates (hours per day) for each piece of equipment;
- The quantities of construction/demolition material produced and removed from each site; and
- The number of truck trips needed to remove construction/demolition material, and to bring the supply materials to each site.

5.21.7.2 Pollutants for Analysis

The on-site analysis evaluated the effects of construction activities on ambient PM_{10}, $PM_{2.5,}$ CO, and NO_2 concentrations. The off-site analysis, which estimated emissions associated with truck traffic on public roads used for the transportation of construction material, rock, debris removal, and cement, and their effect on traffic flow at the most affected roadway locations, evaluated the effects on ambient CO, PM_{10} and $PM_{2.5}$ concentrations. Annual emission rates of CO, PM_{10} and $PM_{2.5}$, NO_x, SO_2, and VOCs were estimated for comparison with USEPA General Conformity emission thresholds.

5.21.7.3 Emission Control Measures

The Port Authority's sustainability design guidelines will be followed during construction of the Proposed Project to minimize construction-phase emissions. In accordance with these guidelines, construction activities would incorporate the following measures designed to minimize air quality impacts.

- Emission Control Measures for Diesel Equipment Exhaust
  - Ultra-low sulfur diesel fuel would be used for construction vehicles and equipment;

- Engines for non-road construction equipment with a horsepower (HP) rating above 50 HP would be in compliance with USEPA's Tier 2 standards;
- Eighty percent of construction equipment with engines above 50 HP would be retrofitted with best available control technology (BACT) verified by USEPA and/or the California Air Resources Board, which reduce PM emissions up to 90 percent (without increasing NOx emissions), using diesel particulate filters, diesel oxidation catalysts, flow through filter technology, etc.;
- Idling of diesel-fueled vehicles would be limited (maximum of 3 minutes per vehicle);
- Diesel equipment exhausts would be located away from sensitive land uses; and
- Electric compressors and pumps would be used where possible, instead of diesel-powered equipment.

- Emission Control Measures for Fugitive Dust
  - Wet suppression, with or without approved binding agents, would be used on-site on a routine basis with hoses or a sprinkler system during deconstruction and material-handling activities aimed at a 10-percent moisture content in the ground;
  - Wet spray power vacuum street sweeper would be used on paved roadways;
  - Calcium chloride would be used instead of wet suppression when freezing conditions exist;
  - Wheel-wash stations or crushed stone at construction ingress/egress areas would be used;
  - Dump trucks during material transport on public roadways would be covered;
  - Idling times on diesel-powered engines would be limited to 3 minutes; and
  - Truck speed within the construction sites would be limited to less than 5 miles per hour (mph).

5.21.7.4 Estimated Annual Emission Rates

Total annual estimated emissions generated within the entire New York-New Jersey-Connecticut region during the project's construction period are provided in Table 5.21-8. These values are the peak on-site emissions during each analysis year plus maximum annual off-site emissions. Peak off-site emissions are based on the following conservative assumptions:

- All dump trucks, girder delivery trucks, rebar delivery trucks, pipe pile trucks, and steel demolition trucks would travel 60 miles each way within the region, to and from the construction sites;
- All trucks delivering concrete to the construction sites would travel 10 miles each way; and
- Construction workers would travel 50 miles each way to and from the construction site.

The values presented in Table 5.21-8 are provided for comparison with General Conformity applicability threshold values; they include emissions generated by off-site vehicular travel and marine vessels that were not included in the dispersion modeling analyses, as these emissions are released too far from the receptor locations evaluated to affect local pollutant concentrations.

5.21.7.5 On-Site Dispersion Modeling Analysis

An atmospheric dispersion analysis was conducted to estimate pollutant levels at receptor sites near the selected GBR construction analysis areas at points beyond the fence lines of these areas. The USEPA AERMOD model was used for this analysis. AERMOD, which is USEPA's regulatory model, is

TABLE 5.21-8
TOTAL ANNUAL EMISSIONS FROM CONSTRUCTION EQUIPMENT AND ACTIVITIES AT NEW JERSEY AND NEW YORK CONSTRUCTION SITES

Pollutant	Emissions (Tons/Year)					Conformity Applicability Values (Tons/Year)*
	2011	2012	2013	2014	2015	
CO	149	170	155	140	137	100
NO_x	114	153	130	96	92	100
PM_{10}	5	4	3	3	2	100
$PM_{2.5}$	3	3	3	2	2	100
SO_2	7	10	8	5	5	100
VOCs	4	4	4	4	4	50

Source: Berger/PB, 2008.
Note:
*Conformity applicability values are discussed in 5.21.8.

generally applied to estimate impacts from point-source emissions from stacks, as well as emissions from volume and area sources. Emission sources within the construction sites were modeled using the area source algorithm incorporated in the model. Five years of applicable meteorological data were used. Maximum estimated project impacts were added to appropriate background values to estimate total pollutant concentrations.

Receptor locations (i.e., locations where pollutant concentrations are estimated) considered at each construction site include all nearby sensitive land uses (i.e., residences, parks, and sidewalks open to pedestrian traffic).

5.21.7.6 Off-Site (Mobile Source) Analysis

Potential construction-phase air quality impacts associated with the operation of vehicles (including trucks used for the transportation of rock and debris removal, and transport of construction materials and cement, and construction workers' vehicles) on the roadway network and changes in ramp configurations (as a result of lane closures in New Jersey during peak construction periods) were estimated.

The following intersections/areas were evaluated:

- New Jersey – Bayway Avenue/Atlantic Street and NJ Turnpike Interchange 13; and
- New York – Forrest Avenue and Goethals Road and Staten Island Expressway.

5.21.7.7 Total Construction-Related Impacts

The highest project-generated increments from on-site and off-site construction activities, the highest total increments, and the maximum estimated total concentrations (including the background concentrations) of each pollutant of concern, with the implementation of the anticipated emission control measures, are shown in Table 5.21-9 for New York and Table 5.21-10 for New Jersey.

TABLE 5.21-9
MAXIMUM PREDICTED PROJECT INCREMENTS AND TOTAL CONCENTRATIONS IN NEW YORK

Pollutant	Average Period	Maximum Increment			Total Concentration	Applicable NAAQS	STV
		On-Site	Off-Site[1]	Total			
CO (ppm)	8-Hour	0.15	0.3	0.45	2.8	9.0	
NO_2 ($\mu g/m^3$)	Annual	0.9	n/a	0.9	47.9	100	
PM_{10} ($\mu g/m^3$)	24-Hour	1.08	4.55	5.63	60.6	150	
$PM_{2.5}$ ($\mu g/m^3$)	24-Hour	0.74	0.47	1.21	33.8	35	2 to 5
	Annual Max	0.12	0.049	0.169	13.0	15	0.3
	Annual Neighborhood[2]	0.03	0.031	0.061	N/A		0.1

Notes:
1. The off-site increments are the result of differences in future traffic conditions with and without construction activities.
2. Increments were estimated following NYCDEP procedures for a "neighborhood" level analysis for comparison with applicable NYCDEP STV.

TABLE 5.21-10
MAXIMUM PREDICTED TOTAL PROJECT INCREMENTS AND TOTAL CONCENTRATIONS IN NEW JERSEY

Pollutant	Average Period	Maximum Increment			Total Concentration	Applicable NAAQS	STV
		On-Site	Off-Site[1]	Total			
CO (ppm)	8-Hour	0.84	0.3	1.14	4.6	9.0	
NO_2 ($\mu g/m^3$)	Annual	3.39	n/a	3.39	46.6	100	
PM_{10} ($\mu g/m^3$)	24-Hour	8.84	3.68	12.52	79.5	150	
$PM_{2.5}$ ($\mu g/m^3$)	24-Hour	3.34	0.49	3.83	**41.8**[2]	35	2 to 5
	Annual Max	0.55	0.032	0.58	14.0	15	0.3

Notes:
1 Off-site increments are the result of differences in future traffic conditions with and without construction activities.
2 Exceeds NAAQS primarily as a result of the 24-hour background value (38 $\mu g/m^3$) used in the analysis.

New York

Total concentrations estimated near the New York site would not exceed the NAAQS for any pollutant analyzed. In addition, project-generated $PM_{2.5}$ increments would not exceed the NYSDEC and NYCDEP significant threshold values.

New Jersey

Total concentrations estimated near Bayway Ave/Atlantic Street/NJ Turnpike Interchange 13 receptor sites would not exceed the NAAQS for CO, NO_2, PM_{10}, and annual $PM_{2.5}$,. However, construction operations would impact an area that already exceeds the 24-hour $PM_{2.5}$ standard. As there are no STVs defined for New Jersey for purposes of assessing construction-phase impacts, NJDEP advised that the increments could be compared to the NYCDEP STV to determine impact significance. On that basis, the maximum project-generated 24-hour increment (on-site plus off-site) of 3.83 $\mu g/m^3$ is within the range (2 to 5 $\mu g/m^3$) that could be considered marginally significant. However, per the consultation with NJDEP, impacts within this range should be evaluated on a case-by-case basis to determine their significance. As such, the conservative assumptions used in this analysis and the temporary nature of construction activities were considered in determining whether this impact is significant.

The construction-phase analyses for the Proposed Project are conservative due to the following assumptions:

1. The analysis assumed peak annual emission rates would occur during the entire construction period;
2. The short-term (8- and 24-hour) analyses assumed that peak-hour emission rates would occur 24-hours per day for the entire construction period; and
3. The analysis assumed that the on-site emissions would be spread out uniformly throughout the sites although, during actual construction, efforts will be made to maximize distances between the heavy-duty diesel equipment and nearby sensitive land uses.

Therefore, due to the conservative nature of the analysis and that the construction activities will be temporary, the potential 24-hour $PM_{2.5}$ construction-phase effects in New Jersey are not considered significant.

5.21.8 Conformity Analysis

As approval for the Proposed Project is necessary from a federal agency other than the FHWA or FTA (i.e., the USCG is the Federal Agency from which a Bridge Permit is required), the Proposed Project is subject to review under the General Conformity Rule. For projects subject to this rule, the EPA has established *de minimis* levels (in tons per year) for each of the criteria pollutants for each type of designated nonattainment and maintenance area. If the emissions generated by a project (on an area-wide basis) are less than these levels, the project's impacts are not considered to be significant, the Conformity Rule is not applicable, and no additional conformity-related analyses are required.

The Proposed Project is located in an area that is designated as a moderate nonattainment area for the 8-hour ozone standard, nonattainment for $PM_{2.5}$, and a maintenance area for CO. The applicable threshold levels for general conformity for this area (which is located within an ozone transport region), according to 40 CFR Part 93, are as follows:

- Carbon Monoxide (CO) = 100 tons per year
- Volatile Organic Compounds (VOCs) = 50 tons per year
- Nitrogen Oxides (NO_x) = 100 tons per year
- $PM_{2.5}$ (Direct Emissions) = 100 tons per year
- Sulfur Dioxide (as a $PM_{2.5}$ Precursor) = 100 tons per year

As the regional emissions for all of the applicable pollutants are lower during the operations phase of the Build Alternative than with the No-Build Alternative, only emissions generated during the construction phase were compared to these threshold levels to determine conformity compliance. As shown in Table 5.21-8, construction-phase emissions (in New Jersey and New York combined) are less than the General Conformity applicability rates, with the following two exceptions:

- Annual estimated NOx emissions are greater than the applicability rate of 100 tons per year for the first three years of the construction phase;[28] and
- Annual estimated CO emissions are greater than the applicability rate of 100 tons per year for all years of the construction phase.

As such and in accordance with the applicable regulations of the General Conformity Rule (pursuant to the Clean Air Act; 42 U.S.C. 7401 et seq. as amended), a Draft General Conformity Determination, required for this project for these pollutants for these years, has herein been prepared for review (see FEIS Appendix N.4). The USCG has determined that the Proposed Project as designed will conform to the approved State Implementation Plans (SIPs), based on the following findings:

- A commitment from the Port Authority that, during the first three years of construction for the Proposed Project, all construction-phase NOx emissions generated (estimated to be 150 tons per year; thus over the *de minimis* levels) will be offset by the utilization of credits from projects developed by the Port Authority in conjunction with the Harbor Deepening Program;
- A determination that project-generated $PM_{2.5}$ emissions would not exceed the conformity applicability threshold for $PM_{2.5}$; and
- A demonstration, based on the results of areawide and microscale CO analyses that the CO emissions generated during the project's construction-phase meet the requirements of the Conformity Rule.

No additional analyses are required for the other pollutants. Following receipt of any comments on the Draft General Conformity Determination, the USCG will prepare and make public its Final General Conformity Determination.

5.22 Public Health

5.22.1 Operational Phase

Air pollutants emitted by motor vehicles pose potentially significant public health risks, particularly for populations living close to heavily traveled and/or congested roadways. Over the past 30 years, federal and state vehicular emissions reduction programs, as well as recent advances in vehicle and fuel technologies, have dramatically reduced the vehicular emissions of these pollutants. This, in turn, has resulted in substantial improvements to ambient air quality levels, even with population and employment growth and related increases in vehicle miles traveled.

Pollutants emitted from mobile sources, which cause some of the greatest potential air quality-related public health impacts, are carbon monoxide, ozone, and small particulates ($PM_{2.5,}$ as well as PM_{10}). These pollutants generally cause health risks at levels that exceed National Ambient Air Quality Standards (NAAQS) and, as such, these standards represent the concentrations developed by USEPA for each

[28] While Table 5.21-8 indicates the first three years of construction to include 2011, 2012 and 2013; the timing of construction has recently been determined to be on a two-year delayed schedule (i.e., 2013-2017). Therefore, the first three years of construction would then more likely occur in 2013, 2014 and 2015. The difference between the construction period assessed herein for impacts and the currently anticipated construction schedule should not result in a significant difference in impacts.

pollutant primarily to protect human health. Projects that cause or exacerbate an exceedance of the NAAQS at sensitive land uses, therefore, are considered to cause adverse public health impacts.

The results of the air quality analysis indicate that the operational phase of the Proposed Project:

- would not cause or exacerbate a localized violation of a NAAQS;
- would result in decreases in the amounts of mobile source-related pollutants generated when compared to the future No-Build levels;
- would not result in future areawide mobile source air toxic (MSAT) emission rates greater than existing emission rates.

As such, the operational phase of the Proposed Project is not anticipated to adversely affect public health. In addition, localized increases in emissions would be limited principally to the I-278 corridor, which generally provides some buffer between the mainline roadways and nearby residential areas, with some changes in traffic conditions at affected intersections.

5.22.2 Construction Phase Impacts and Mitigation

Emissions would be generated during the construction phase of the Proposed Project. Gaseous emissions from diesel-fuel burning equipment and dust generated by earth-moving operations are the primary sources of these emissions that could affect public health. To mitigate the potential impacts of these emissions, control measures would be employed during the project's construction phase. These measures are described in Section 5.21.7.3.

A quantitative construction-phase air quality analysis of the Preferred Alternative was conducted. The result of this analysis is that, with one exception, total pollutant concentrations at sensitive land uses located near the construction sites would not exceed the NAAQS. The only exception is for $PM_{2.5}$, where background levels already exceed the 24-hour standard near the New Jersey site. Per consultation with NJDEP, construction-related $PM_{2.5}$ impacts in New Jersey are not considered to be significant due to the conservative assumptions used in the construction-phase analysis and the temporary nature of the construction activities.

5.23 Noise

5.23.1 Introduction

This section assesses potential noise impacts resulting from the construction and operation of the Proposed Project. Noise impacts during the construction of the new bridge and demolition of the existing bridge are evaluated for the Preferred Alternative; assuming that this analysis is also representative of the three other Build Alternatives given that construction equipment would be similar. Aside from slightly different locations of work activities amongst all alternatives, the most notable difference between alternatives is that for the Existing Alignment alternatives, construction durations would be longer, thereby resulting in longer exposures to construction noise.

5.23.2 Methodology, Approach and Data Sources

5.23.2.1 Operation-Phase Analysis

Traffic noise impact analysis and determination of abatement measures were conducted according to procedures set forth in the FHWA's *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, 23 CFR Part 772, reissued as FHWA Policy and Guidance document dated June, 1995. These procedures have been adopted by NYSDOT in *Noise Analysis Policy – Environmental Procedures Manual*,

Chapter 3.1, dated August 1998, and NJDOT in *Traffic Noise Management Policy and Noise Wall Design Guidelines*, revised on July 10, 2003. As part of these procedures, the FHWA has established noise abatement criteria based on the noise sensitivity of various land uses for motor vehicle noise on roadways conducted with federal funds. These criteria are presented in Table 5.23-1 and were used as part of the impacts evaluation since the USCG does not have specific criteria in this regard. In this report, all receptors evaluated are categorized as FHWA Activity Category B.

TABLE 5.23-1
NOISE ABATEMENT CRITERIA IN DB(A) (NAC)

Activity Category	Noise Abatement Criteria (L_{eq})	Description of Activity Category
A (Exterior)	57	Tracts of land for which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. Such areas could include amphitheaters, particular parks or portions of parks, open spaces, or historic districts dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.
B (Exterior)	67	Picnic areas, recreation areas, playgrounds, active sports areas, and parks that is not included in Category A; and residences, motels, hotels, public meeting rooms, schools, churches, libraries and hospitals.
C (Exterior)	72	Developed lands, properties or activities not included in Categories A or B above.
D	—	Undeveloped lands.
E (Interior)	52	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

Source: 23 CFR Part 772.

According to FHWA 23 CFR Part 772, a project is defined as having noise impacts when:

- Sound levels approach or exceed the noise abatement criteria given in Table 5.23-1. Noise levels that approach the criteria are defined by the FHWA, NYSDOT and NJDOT as occurring at one (1) dBA less than the criteria levels; or
- There is a substantial increase in the sound levels over existing conditions. A substantial increase refers to the net increase in sound levels from the existing condition to that predicted for the design year at the same location. Since the FHWA's Policy and Guidance document does not specifically quantify a "substantial" noise increase, an increase of 6 dB(A), as defined to be "substantial" by NYSDOT, was used for the Staten Island receptors while a 10 dB(A) increase, as defined to be "substantial" by NJDOT, was used for the Elizabeth receptors.

Noise modeling of future No-Build and Build conditions was conducted by utilizing the FHWA's Traffic Noise Model (TNM) 2.5. Specific roadway geometric data including roadway centerline and width, receptor locations, elevation data for all roadway, receptor, and barrier points, and traffic data variables such as volume and speed, were utilized as input for the noise model. A combination of TrafficNoiseCAD, Microstation and SoundPlan 6.4 was utilized to "digitize" the roadway geometry and receptor locations from existing and proposed 100-scale design plans. Elevation data were obtained from the design plans for the No-Build Alternative and from 100-scale profiles of the proposed bridge for the Build Alternatives. Ground elevation information was accurate to the one-foot interval contour level.

No-Build and Build peak hour traffic volumes and vehicle classifications were obtained from a traffic study prepared specifically for the Proposed Project. To reflect the worst-case noise condition, the AM peak hour traffic volumes for the higher traffic volume period, along with the posted speed limits along local roadways, highways and the bridge, were used as inputs in the TNM model. In general, the traffic noise modeling process incorporates a large number of variables that describe various types of vehicles operating at different speeds through a continuously changing highway configuration and surrounding terrain.

Representative receptor points for individual residences or clusters of residences as well as schools were included in the model to predict future noise levels and consequently identify traffic noise impacts. Receptor points were placed at first row homes, which are within closest proximity to the roadway, as well as second row homes to determine the extent of impacts.

5.23.2.2 Construction-Phase Analysis

Subsequent to earlier agency coordination efforts during the preparation of the DEIS of May 2009, it was agreed with the New York City Mayor's Office of Environmental Coordination (OEC) and the New York City Department of Environmental Protection (NYCDEP) that the FEIS will include a quantitative construction-phase noise analysis, once a preferred alternative will be identified.[29] As a result, this quantitative analysis, presented in this FEIS, was performed independently in consultation/review with the City agencies for all construction and demolition activities (including stationary and mobile sources within 1,800 feet from noise-sensitive receptors) that would take place in Staten Island in order to satisfy the New York's City Environmental Quality Review (CEQR) requirements. To that effect, the technical report, that was prepared pursuant to the guidelines of the *CEQR Technical Manual* (City of New York, 2001), is presented in Appendix K.2 along with its respective methodology descriptions for the stationary sources (on-site), mobile sources (off-site), and cumulative construction-phase noise impact analyses.

In New Jersey, a refined qualitative noise assessment has been conducted for the New Alignment South (i.e., the Preferred Alternative) based on additional design information such as a construction schedule, a description of the construction phases and respective areas of disturbance, equipment lists, man hour/crew lists, and construction truck/crew vehicle activities.

For any of the above quantitative and qualitative noise impact analyses, it should be noted that the additional design information developed for the New Alignment South was only developed at a conceptual level by the Port Authority. Therefore, all related construction schedule, equipment, staffing, assumptions, etc. were based on professional judgment and experience with other construction practices in the NY/NJ region for similar types of projects. They cannot necessarily represent that actual construction details that will be determined at later project development phases by the construction contractor. Nonetheless, the conceptual design and construction information developed for the herein analyses were developed in a conservative manner in order to evaluate a realistic and yet worst-case scenario.

5.23.3 No-Build Alternative

The 2034 No-Build Alternative assumes that the Proposed Project would not be constructed. The No-Build Alternative would result in an increase in traffic volumes and traffic congestion in comparison to the Existing Condition; however, the traffic noise level, which is directly related to both traffic volume and speed, would increase due to the higher traffic volumes but may not increase during the period of increased congestion due to the decreased travel speeds. Therefore, the traffic noise levels at the sensitive

[29] The US Environmental Protection Agency (USEPA) was also consulted at that time and only requested that a quantitative construction-phase analysis be done for air quality (see Section 5.21 of this FEIS) and not for noise.

receptor locations in the 2034 No-Build condition would essentially be the same as or worse than the traffic noise levels under the Existing Condition.

Under the No-Build Alternative, noise levels are predicted to range between 63 and 70 dBA during the AM peak hour among the Elizabeth receptors and 68 and 73 dBA among the Staten Island receptors during the AM peak hour. Noise levels approaching (i.e., within 1 dBA) or in excess of the NAC of 67 dBA are predicted at first row receptors in Elizabeth (except at the Bay Way and Krakow Street neighborhood, where both first and second row receptors were predicted for alternatives where those receptors would continue to exist), and at first and second row receptors in Staten Island.

5.23.4 Build Alternatives

The 2034 Build Alternatives were modeled using the existing roadway geometries for ramps and local roadways within the Primary Study Area in combination with design plans depicting the proposed bridge alignments and profiles containing the bridge elevations. A description of how each of the proposed Build Alternatives affects noise levels at sensitive receptors within the Primary Study Area as well as a comparison to the predicted No-Build Alternative noise levels for each alternative follows.

5.23.4.1 New Alignment South

Under the New Alignment South, a single-span bridge would be built to the south of the location of the existing bridge, therefore resulting in a shift in the right-of-way of the bridge and approach roads. This shift requires the acquisition of all residential units along Bay Way and Krakow Street in Elizabeth, thereby eliminating all receptors (sites M2, R10, R10a, R10b, R11, R11a) in that area from any potential traffic noise impacts as a direct result of the new bridge location. Therefore, no noise levels were predicted in this neighborhood for this alternative.

Future noise levels associated with the New Alignment South were predicted at other sensitive receptors in Elizabeth as well, including: P.S. 22, William F. Halloran Elementary School (site M4); residences located along Brunswick Avenue in Elizabeth, represented by sites R2, R3, R4, R5, and R6; and additional residences along the I-278 westbound (WB) On-Ramp from Brunswick Avenue in Elizabeth, represented by sites M3, R1, R7, R8, and R9. Future noise levels associated with the New Alignment South were also predicted at the Goethals Garden Homes community in Staten Island, represented by sites M1, R12, R13, R14, R15, R16, R17, R18, R19, and R20. The locations of these sites are shown in Figure 5.23-1.

The predicted noise levels at first row receptors at the other locations in Elizabeth and at first and second row receptors in Staten Island approach (i.e., within 1 dBA) or exceed the NAC 67 dBA impact level, just as they did for the No-Build Alternative. However, these predicted noise levels for the Elizabeth receptors are not a direct result of the Proposed Project. Impacts at R2, R3, R4, R5, and R6 continue to be a direct result of traffic noise on Brunswick Avenue; the impacts at M3 and R1 continue to be a direct result of traffic noise on the I-278 WB On-Ramp; and impacts predicted at P.S. 22 are attributed to a combination of traffic on Brunswick Avenue and ramps to and from the New Jersey Turnpike and the Goethals Bridge.

FHWA defines a Type I Project as the area where there is significant vertical and horizontal changes to the existing roadway or an increase in thruway lanes. The residential areas in Elizabeth as well as P.S. 22 are in locations where physical alteration of the roadways adjacent to these receptors would not directly occur as part of the Proposed Project, although it is possible that the NJ Turnpike Authority may propose some ramp improvements at Interchange 13. The predicted noise levels are due to traffic sources beyond the actual limits of the Proposed Project. Therefore, these receptors should not be classified as impacts resulting from the Proposed Project. Similarly, impacts predicted at the Goethals Garden Homes community in Staten Island, represented by sites M1, R12, R13, R14, R15, R16, R17, R18, R19, and R20

are not directly attributed to the Proposed Project because this community is also located beyond project limits for the physical alteration of the roadways.

As exhibited in Table 5.23-2, which compares model-predicted No-Build and Build Alternative noise levels for the New Alignment South, impacts are not necessarily a direct result of the Proposed Project.

TABLE 5.23-2
NO-BUILD & NEW ALIGNMENT SOUTH NOISE LEVEL COMPARISONS

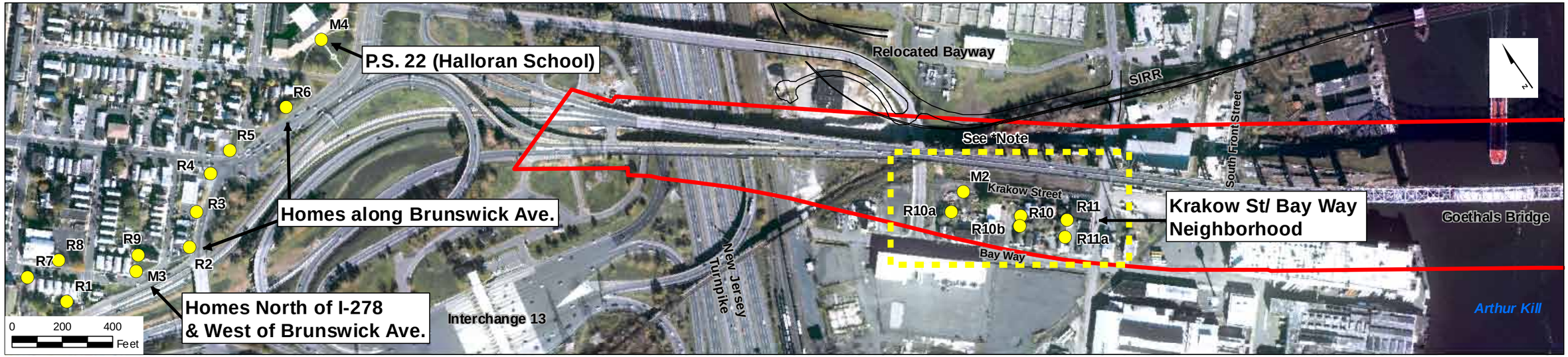
State	Receptor	Land Use	Approximate Site Location	Modeled Noise Levels (dBA)		
				No-Build	New Alignment South	Difference
New Jersey	R2	Residential	Homes Along Brunswick Avenue	70	70	0
	R3			70	70	0
	R4			69	69	0
	R5			69	70	1
	R6			69	69	0
	M4	School	P.S. 22 Halloran School Along Brunswick Avenue	65	66	1
	M3	Residential	Homes North I-278 WB On-Ramp & West of Brunswick Avenue	67	67	0
	R1			69	70	1
	R7			63	64	1
	R8			63	63	0
	R9			65	65	0
	M2	Residential	Residential Neighborhood of Bay Way & Krakow St.	68	Taken	N/A
	R10			66		
	R11			66		
	R10a			67		
	R10b			66		
	R11a			65		
New York	M1	Residential	Goethals Garden Homes Along Goethals Road North	73	74	1
	R12			73	75	2
	R13			72	74	2
	R14			71	72	1
	R15			70	71	1
	R16			71	73	2
	R17			71	73	2
	R18			71	72	1
	R19			69	71	2
	R20			68	69	1

Note: R= receptor and M= monitoring site (as presented in Section 4.21)
Source: Berger/PB, 2008.

While noise levels are predicted to approach or exceed the NAC under the Build Alternative, noise levels would only increase by approximately 0 to 2 dBA when compared to the No-Build Alternative. Thus, the noise level increases associated with the New Alignment South would be minor and would not be perceptible (i.e., greater than a 3 dBA increase over the No-Build Alternative) for the modeled receptors. Based on these conclusions, mitigation measures were not evaluated.

5.23.4.2 Existing Alignment South

The construction of a single-span bridge in an alignment within and extending south of the existing Goethals Bridge would shift the existing right-of-way closer to the homes along Bay Way and Krakow Street, thereby requiring the acquisition of all residential units in this neighborhood and eliminating any



NEW JERSEY

NEW YORK

Legend

- Noise Receptors
- Extent of Alternatives

*Note: These receptors are not applicable for Southern Alignments due to acquisitions of all receptors. Receptors R10 and R11 would also be acquired for the Existing Alignment North.
Source: Basemapping: Port Authority of New York and New Jersey, 2002.
Data: Berger/PB 2005.

Goethals Bridge Replacement EIS

FIGURE 5.23-1
Locations of Noise
Sensitive Receptors

United States Coast Guard

potential traffic noise impacts directly associated with the new bridge location. As a result, noise levels at this neighborhood were not predicted for this alternative.

Noise levels associated with the Existing Alignment South were predicted at other sensitive receptors in Elizabeth, including: P.S. 22, William F. Halloran Elementary School (site M4); residences located along Brunswick Avenue, represented by sites R2, R3, R4, R5, and R6; and additional residences along the I-278 WB On-Ramp, represented by sites M3, R1, R7, R8, and R9. Future noise levels associated with the Existing Alignment South were also predicted at the Goethals Garden Homes community in Staten Island, represented by sites M1, R12, R13, R14, R15, R16, R17, R18, R19, and R20. The locations of these sites are shown in Figure 5.23-1.

The predicted noise levels at first row receptors at the other locations in Elizabeth and at first and second row receptors in Staten Island approach (i.e., within 1 dBA) or exceed the NAC 67 dBA impact level, just as they did for the No-Build Alternative. However, these predicted noise levels for the Elizabeth receptors are not a direct result of the Proposed Project. Impacts at R2, R3, R4, R5, and R6 continue to be a direct result of traffic noise on Brunswick Avenue; the impacts at M3 and R1 continue to be a direct result of traffic noise on the I-278 WB On-Ramp; and impacts predicted at P.S. 22 are attributed to a combination of traffic noise on Brunswick Avenue and ramps to and from the New Jersey Turnpike and the Goethals Bridge.

FHWA defines a Type I Project as the area where there is significant vertical and horizontal changes to the existing roadway or an increase in thruway lanes. The residential areas in Elizabeth as well as P.S. 22 are in locations where physical alteration of the roadways directly adjacent to these receptors would not occur as part of the Proposed Project, although it is possible that the NJ Turnpike Authority may propose some ramp improvements at Interchange 13. The predicted noise levels are due to traffic sources beyond the actual limits of the Proposed Project. Therefore, these receptors should not be classified as impacts resulting from the Proposed Project. Similarly, impacts predicted at the Goethals Garden Homes community in Staten Island, represented by sites M1, R12, R13, R14, R15, R16, R17, R18, R19, and R20, are not directly attributed to the Proposed Project because this community is also located beyond project limits for the physical alteration of the roadways.

As exhibited in Table 5.23-3, which compares model-predicted No-Build and Build Alternative noise levels for the Existing Alignment South, impacts are not necessarily a direct result of the Proposed Project. While noise levels are predicted to approach or exceed the NAC under the Build Alternative, noises level would only increase by approximately 0 to 2 dBA when compared to the No-Build Alternative. Thus, the noise level increases associated with the Existing Alignment South would be minor and would not be perceptible (i.e., greater than a 3 dBA increase over the No-Build Alternative) for the modeled receptors. Based on these conclusions, mitigation measures were not evaluated.

5.23.4.3 New Alignment North

The New Alignment North is similar to the New Alignment South in that a new single-span bridge would be constructed, but entirely to the north of the existing Goethals Bridge. Constructing this proposed bridge alignment would not require the acquisition of properties along Bay Way and Krakow Street. Therefore, noise levels at this neighborhood, represented by sites M2, R10, R10a, R10b, R11 and R11a were predicted for this alternative.

Noise levels were also predicted for the New Alignment North at the other sensitive receptors in Elizabeth, including: P.S. 22, William F. Halloran Elementary School (site M4); residences located along Brunswick Avenue, represented by sites R2, R3, R4, R5, and R6; and residences along the I-278 WB On-Ramp, represented by sites M3, R1, R7, R8, and R9. Future noise levels associated with the New Alignment North were also predicted at the Goethals Garden Homes community in Staten Island,

TABLE 5.23-3
NO-BUILD & EXISTING ALIGNMENT SOUTH NOISE LEVEL COMPARISONS

State	Receptor	Land Use	Approximate Site Location	Modeled Noise Levels (dBA)		
				No-Build	Existing Alignment South	Difference
New Jersey	R2	Residential	Homes Along Brunswick Avenue	70	70	0
	R3			70	70	0
	R4			69	69	0
	R5			69	70	1
	R6			69	69	0
	M4	School	P.S. 22 Halloran School Along Brunswick Avenue	65	66	1
	M3	Residential	Homes North I-278 WB On-Ramp & West of Brunswick Avenue	67	67	0
	R1			69	70	1
	R7			63	64	1
	R8			63	63	0
	R9			65	65	0
	M2	Residential	Residential Neighborhood of Bay Way & Krakow St.	68	Taken	N/A
	R10			66		
	R11			66		
	R10a			67		
	R10b			66		
	R11a			65		
New York	M1	Residential	Goethals Garden Homes Along Goethals Road North	73	74	1
	R12			73	75	2
	R13			72	74	2
	R14			71	72	1
	R15			70	71	1
	R16			71	73	2
	R17			71	73	2
	R18			71	72	1
	R19			69	71	2
	R20			68	69	1

Note: R= receptor and M= monitoring site (as presented in Section 4.21)
Source: Berger/PB, 2008.

represented by sites M1, R12, R13, R14, R15, R16, R17, R18, R19, and R20. The locations of these sites are shown in Figure 5.23-1.

Noise levels from the New Alignment North are expected to decrease by 0 to 4 dBA from model-predicted No-Build Alternative noise levels at the Bay Way and Krakow Street residences, as shown in Table 5.23-4, since the New Alignment North would shift the traffic further away from these residences in comparison to the existing bridge. Further, noise levels among all residences located in this neighborhood, with the exception of the residences represented by site R10a, are predicted to be below the NAC 67 dBA impact level, once again due to the fact that the New Alignment North would shift the traffic further away from the residences. The impacted noise level predicted among the residences represented by R10a was previously attributed to the heavy truck traffic along Relocated Bayway Avenue and therefore was not considered a direct result of the Proposed Project. However, it should be noted that, since the noise measurements were conducted in March 2005, the eastern end segment of Relocated Bayway Avenue (which used to connect to Bay Way near the residences of R10a) was relocated towards

TABLE 5.23-4
NO-BUILD & NEW ALIGNMENT NORTH NOISE LEVEL COMPARISONS

State	Receptor	Land Use	Approximate Site Location	Modeled Noise Levels (dBA)		
				No-Build	New Alignment North	Difference
New Jersey	R2	Residential	Homes Along Brunswick Avenue	70	70	0
	R3			70	70	0
	R4			69	69	0
	R5			69	70	1
	R6			69	69	0
	M4	School	P.S. 22 Halloran School Along Brunswick Avenue	65	66	1
	M3	Residential	Homes North I-278 WB On-Ramp & West of Brunswick Avenue	67	67	0
	R1			69	70	1
	R7			63	64	1
	R8			63	63	0
	R9			65	65	0
	M2	Residential	Residential Neighborhood of Bay Way & Krakow St.	68	65	-3
	R10			66	63	-3
	R11			66	62	-4
	R10a			67	67	0
	R10b			66	65	-1
	R11a			65	64	-1
New York	M1	Residential	Goethals Garden Homes Along Goethals Road North	73	74	1
	R12			73	75	2
	R13			72	74	2
	R14			71	72	1
	R15			70	71	1
	R16			71	73	2
	R17			71	73	2
	R18			71	72	1
	R19			69	71	2
	R20			68	69	1

Note: R= receptor and M= monitoring site (as presented in Section 4.21)
Source: Berger/PB, 2008.

Amboy Avenue as part of the Staten Island Railroad (SIRR) Reactivation for Freight Rail Project.[30] As a result, traffic no longer travels near the residences represented by R10a (see Figure 4.2-1 of this FEIS for the current configuration of Relocated Bayway Avenue). As such, the future noise levels predicted at R10a would likely be similar to those predicted at the other first-row receptors (i.e. M2, R10 and R11) and would thus be below, and would not approach, the NAC of 67 dBA. Because noise levels would not approach (i.e. within 1 dBA of the NAC) or exceed the NAC at this neighborhood, noise mitigation would not be required.

The predicted noise levels at the other first row receptors in Elizabeth and at first and second row receptors in Staten Island approach (i.e., within 1 dBA) or exceed the NAC 67 dBA impact level, just as they did for the No-Build Alternative. Again, as shown in the New Alignment South impact assessment; these predicted noise levels for the other Elizabeth receptors are not a direct result of the Proposed Project. Impacts at sites R2, R3, R4, R5, and R6 continue to be a direct result of traffic noise on

[30] The SIRR Reactivation Project included the construction of the Northern Rail Connector in 2007 by the Port Authority between the SIRR line and the Chemical Coast Railroad Secondary Line in Elizabeth, NJ. Under such project, the at-grade segment of Relocated Bayway Avenue (located east of the NJ Turnpike) was once again relocated so to now connect with Amboy Avenue, just north of the existing Goethals Bridge. See Appendix C of this FEIS for more details on such project.

Brunswick Avenue, while the impacts at M3, R1, R7, R8, and R9 continue to be a direct result of traffic noise on the I-278 WB On-Ramp; impacts predicted at P.S. 22 are attributed to a combination of traffic noise on Brunswick Avenue and ramps to and from the New Jersey Turnpike and the Goethals Bridge.

FHWA defines a Type I Project as the area where there is significant vertical and horizontal changes to the existing roadway or an increase in thruway lanes. The residential areas in Elizabeth as well as P.S. 22 are in locations where physical alteration of the roadways directly adjacent to these receptors would not occur as part of the Proposed Project, although it is possible that the NJ Turnpike Authority may propose some ramp improvements at Interchange 13. The predicted noise levels are due to traffic sources beyond the limits of the Proposed Project. Therefore, these receptors should not be classified as impacts resulting from the Proposed Project. Similarly, impacts predicted at the Goethals Garden Homes community in Staten Island, represented by sites M1, R12, R13, R14, R15, R16, R17, R18, R19, and R20, are not directly attributed to the Proposed Project because this community is also located beyond project limits for the physical alteration of the roadways.

As exhibited in Table 5.23-4, which compares model-predicted No-Build and Build Alternative noise levels for the New Alignment North, impacts at the other Elizabeth sites (i.e., besides the Bay Way / Krakow Street neighborhood) and in Staten Island are not necessarily a direct result of the Proposed Project. While noise levels are predicted to approach or exceed the NAC under the Build Alternative, noise levels would only increase by approximately 0 to 2 dBA when compared to the No-Build Alternative. Thus, the noise level increases associated with the New Alignment North would be minor and would not be perceptible (i.e., greater than a 3 dBA increase over the No-Build Alternative) for the modeled receptors. Based on these conclusions, as well as the improved noise levels at the Bay Way / Krakow Street neighborhood, mitigation measures were not evaluated.

5.23.4.4 Existing Alignment North

The Existing Alignment North involves construction of a single-span bridge in an alignment within and extending north of the existing Goethals Bridge, thereby slightly shifting the bridge right-of-way away from the homes along Bay Way and Krakow Street. Constructing this proposed bridge alignment would require the acquisition of approximately six properties along Krakow Street, represented by sites R10 and R11, due to the elimination of access along Krakow Street as a result of right-of-way requirements associated with the alternative. Noise levels associated with the Existing Alignment North are predicted at sensitive receptors in Elizabeth, including: the remaining residences in the Bay Way / Krakow Street neighborhood, represented by sites M2, R10a, R10b, and R11a; P.S. 22, William F. Halloran Elementary School (site M4); residences located along Brunswick Avenue, represented by sites R2; R3; R4; R5; and R6; and residences along the I-278 WB On-Ramp, represented by sites M3; R1; R7; R8; and R9. Future noise levels associated with the Existing Alignment North were also predicted at the Goethals Garden Homes community in Staten Island, represented by sites M1, R12, R13, R14, R15, R16, R17, R18, R19, and R20. The locations of these sites are shown in Figure 5.23-1.

Noise levels from the Existing Alignment North are expected to decrease by 0 to 3 dBA from model-predicted No-Build Alternative noise levels among the remaining Bay Way/Krakow Street neighborhood residences, as shown in Table 5.23-5. Noise levels among most of the remaining residences are predicted to be below the NAC 67 dBA impact level since the Existing Alignment North would shift the traffic, especially the westbound traffic, further away from the residences in comparison to the existing bridge alignment. However, the noise levels predicted for the residences represented by site R10a were previously predicted to continue to be 67 dBA with this alternative, which was attributed to the heavy truck traffic along Relocated Bayway Avenue. However, as discussed in above Section 5.23.4.3, it should be noted that, since the noise measurements were conducted in March 2005, the eastern end segment of Relocated Bayway Avenue was again relocated. As such, the future noise levels predicted at R10a would likely be similar to those predicted at the other first-row receptors (i.e., M2) and would thus be below, and

TABLE 5.23-5
NO-BUILD & EXISTING ALIGNMENT NORTH NOISE LEVEL COMPARISONS

State	Receptor	Land Use	Approximate Site Location	Modeled Noise Levels (dBA)		
				No-Build	Existing Alignment North	Difference
New Jersey	R2	Residential	Homes Along Brunswick Avenue	70	70	0
	R3			70	70	0
	R4			69	69	0
	R5			69	70	1
	R6			69	69	0
	M4	School	P.S. 22 Halloran School Along Brunswick Avenue	65	66	1
	M3	Residential	Homes North I-278 WB On-Ramp & West of Brunswick Avenue	67	67	0
	R1			69	70	1
	R7			63	64	1
	R8			63	63	0
	R9			65	65	0
	M2	Residential	Residential Neighborhood of Bay Way & Krakow St.	68	65	-3
	R10			66	Taken	N/A
	R11			66	Taken	N/A
	R10a			67	67	0
	R10b			66	64	-2
	R11a			65	62	-3
New York	M1	Residential	Goethals Garden Homes Along Goethals Road North	73	74	1
	R12			73	75	2
	R13			72	74	2
	R14			71	72	1
	R15			70	71	1
	R16			71	73	2
	R17			71	73	2
	R18			71	72	1
	R19			69	71	2
	R20			68	69	1

Note: R= receptor and M= monitoring site (as presented in Section 4.21)
Source: Berger/PB, 2008.

would not approach, the NAC of 67 dBA. Because noise levels would not approach (i.e. within 1 dBA of the NAC) or exceed the NAC at this neighborhood, noise mitigation would not be required.

The predicted noise levels at the other first row receptors in Elizabeth and at first and second row receptors in Staten Island approach (i.e., within 1 dBA) or exceed the NAC 67 dBA impact level, just as they did for the No-Build Alternative. The predicted noise levels for the Elizabeth receptors are not a direct result of the Proposed Project. Impacts at sites R2, R3, R4, R5, and R6 continue to be a direct result of traffic noise on Brunswick Avenue, while the impacts at sites M3, R1, R7, R8, and R9 continue to be a direct result of traffic noise on the I-278 WB On-Ramp; impacts predicted at P.S. 22 (site M4) are attributed to a combination of traffic noise on Brunswick Avenue and ramps to and from the New Jersey Turnpike and the Goethals Bridge.

FHWA defines a Type I Project as the area where there is significant vertical and horizontal changes to the existing roadway or an increase in thruway lanes. The residential areas in Elizabeth as well as P.S. 22 are in locations where physical alteration of the roadways directly adjacent to these receptors would not occur as part of the Proposed Project, although it is possible that the NJ Turnpike Authority may propose some ramp improvements at Interchange 13. The predicted noise levels are due to traffic sources beyond

the limits of the Proposed Project. Therefore, these receptors should not be classified as impacts resulting from the Proposed Project. Similarly, impacts predicted at the Goethals Garden Homes community in Staten Island, represented by sites M1, R12, R13, R14, R15, R16, R17, R18, R19, and R20, are not directly attributed to the Proposed Project because this community is also located beyond project limits for the physical alteration of the roadways.

As exhibited in Table 5.23-5, which compares model-predicted No-Build and Build Alternative noise levels for the Existing Alignment North, impacts at the other Elizabeth sites (i.e., besides the Bay Way / Krakow Street neighborhood) and in Staten Island are not necessarily a direct result of the Proposed Project. While noise levels are predicted to approach or exceed the NAC under the Build Alternative, noise levels would only increase by approximately 0 – 2 dBA when compared to the No-Build Alternative. Thus, the noise level increases associated with the Existing Alignment North would be minor and would not be perceptible (i.e., greater than a 3 dBA increase over the No-Build Alternative) for the modeled receptors. Based on these conclusions, as well as the improved noise levels at the Bay Way / Krakow Street neighborhood, mitigation measures were not evaluated.

5.23.5 Noise Impacts During Construction Period

Impacts on community noise levels during a project construction typically include noise from construction equipment operating at the work site (stationary or on-site sources) and noise from construction/delivery/crew's vehicular traffic traveling to and from the site (mobile or off-site sources). The level of impact from these noise sources typically depends upon the noise characteristics of the equipment and related usage factors, the construction duration and timing, and the distance from noise-sensitive receptors.

For the Proposed Project, temporary increases in noise levels could occur during the construction period on receptors in the immediate vicinity of the areas of disturbances. For the purpose of this analysis, the construction period for the Proposed Project includes not only the new bridge's construction but also the existing Goethals Bridge's demolition; which overall would last about 52 to 60 months (see Section 3.4.2 of this FEIS). As mentioned earlier in Section 5.23.2.2, the analyses below were updated from the DEIS of May 2009 by evaluating the New Alignment South (the Preferred Alternative). Such analyses are also deemed representative of the three other Build Alternatives given similar construction equipment (with same noise characteristics and predicted usage factors) and their relative proximity to each other. The only exception though would be for the Existing Alignment Alternatives (either north or south ones) which would require longer construction durations (i.e., an additional 15 to 18 months as described in Section 3.4.2 of this FEIS) and therefore longer exposures to construction-noise emissions.

Overall, construction and demolition activities of the Proposed Project could result in impacts to sensitive receptors in the immediate vicinity of the project site during the various stages of its construction period. Construction/demolition activities associated with the Proposed Project are anticipated to range from pile driving, blasting, excavation and concrete work to typical at-grade roadway widening and paving. Except under special circumstances, construction for the Proposed Project would be limited to a regular 40-hour Monday to Friday work week.

As noted earlier in Section 5.23.2.2, a detailed qualitative assessment was performed in New Jersey while a quantitative construction-phase noise analysis was performed in New York to fulfill the CEQR requirements (see Appendix K.2 of this FEIS). As this FEIS has been prepared to also satisfy New York City environmental review requirements, per CEQR, consultation and coordination were achieved with the OEC and the NYCDEP for review of and concurrence with the methodology, results and findings of the construction-phase noise analysis (see NYCDEP review letter of May 14, 2010 in Appendix K.3 of this FEIS).

5.23.5.1 New Jersey

Sensitive Receptors and Assumptions

Specifically in New Jersey, sensitive receptors to either stationary or mobile noise sources from the construction of the Proposed Project would include those community facilities and/or neighborhoods in close proximity to the construction activities and along anticipated construction access routes, including: P.S. 22 Halloran School and nearby residences along Brunswick Avenue in the City of Elizabeth (same ones as depicted in earlier Figure 5.23-1), as well as some residences and the Louis Avenue Park[31] directly abutting I-278's northern right-of-way in the City of Linden.

Based on information provided by the Port Authority and earlier Figure 3.3-14 of this FEIS, potential staging areas would be located away from sensitive receptors within the vacant and industrial areas along Krakow Street in Elizabeth and would only be used for storage and/or office uses.[32] Thus, major noise-generating construction activities would not occur within those staging areas. As further described in Section 3.4.2.5 of this FEIS, the construction vehicle access routes would be centrally-located around the NJ Turnpike Interchange 13 and would then converge onto Route 439 (where the streets of Bayway Avenue/Cole Place/Atlantic Avenue meet in front of P.S. 22 Halloran School) to access Relocated Bayway Avenue and its overpass over the NJ Turnpike; the sole eastward access route onto the bridge construction and staging areas east of the NJ Turnpike and along Krakow Street in Elizabeth.

In addition, the noise-sensitive receptors in both Elizabeth and Linden along the proposed local traffic detour were considered in this evaluation. As further discussed in Section 3.4.5 of this FEIS, for the entire construction period, a temporary U-turn within the median of I-278 would also be constructed further west in Linden, connecting I-278 WB to I-278 EB in order to maintain regular traffic access to the Goethals Bridge from Elizabeth's local street network as a result of the closure of the Atlantic Avenue EB On-Ramp (an elevated structure onto I-278 EB and Goethals Bridge). To that effect, Elizabeth's local traffic headed towards the Goethals Bridge from Route 439 would be diverted onto I-278 WB (via the I-278 WB On-Ramp from Brunswick Avenue) to access the temporary U-turn and connect with I-278 EB in order to then access the Goethals Bridge. This temporary U-turn (also depicted in Figure 3.3-16) would also be required under any of the four Build Alternatives.

Stationary Sources

Construction tasks in New Jersey expected to increase noise levels at the sensitive receptors described above in Elizabeth include the temporary reconfiguration of NJ Turnpike Interchange 13 ramps and the demolition/construction of the NJ Abutment while construction of the temporary I-278 U-turn would affect sensitive receptors, as described above, in Linden. Activities associated with such construction tasks, the equipment necessitated by such activities and the anticipated potential effects on proximate sensitive receptors are described below by construction task/area of disturbance. All equipment lists, with respective number of pieces, were compiled conceptually and only for sizeable noise-generating equipment based on other similar projects, while also taking into consideration the level of work required for the Proposed Project. To that effect, it should be noted that those different types of equipment within each area of disturbance could run simultaneously but at different spot locations. As further described below, it should also be noted that none of the work in one specific area of disturbance would occur simultaneously with the work in another area.

[31] Louis Avenue Park is a small 0.28-acre municipal park of Linden, which is for passive use and has no amenities, located at the intersection of the Louis Avenue & Bedle Place, Linden.

[32] As noted in Section 5.3.4.1 of this FEIS, the entire residential neighborhood along Bay Way and Krakow Street in Elizabeth would have been displaced and acquired in advance of project construction; thereby eliminating all sensitive receptors.

Temporary Reconfiguration of NJ Turnpike Interchange 13 - This area of disturbance consists of temporary at-grade roadways (or ramps) for the maintenance and protection of traffic (MPT) during the construction period (respective MPT plan is further detailed in Section 3.4.5 of this FEIS). Minimum receptor-to-source distance would be approximately 250 feet and work would last approximately five months (from May to November 2011); including activities such as grading and drainage, structure re-alignment, paving, signing and striping as well as traffic switches. The noisiest equipment anticipated to be used includes a grader, a bulldozer, a drum roller, a road widener and an asphalt compactor, which all produce noise emissions of approximately 85 dBA at 50 feet based on equipment specifications provided in the FHWA's Roadway Construction Noise Model (RCNM) 1.1 equipment database.

Overall, such activities and types of equipment are considered typical for at-grade roadway construction (lower in intensity relative to other major noise-generating equipment used for typical bridge construction). While these activities would likely result in noise level increases, especially at those sensitive receptors within closest proximity, such increases would be short-term. Further, noise levels produced at 50 feet would attenuate with distance, approximately at a rate of 6 dBA per doubling of distance, solely based on source geometry. Additional factors such as topography and usage factors would also contribute to noise level attenuations at the sensitive receptors.

Demolition/Construction of NJ Abutment - This area of disturbance would be farther from the sensitive receptors with a minimum receptor-to-source distance of approximately 750 to 800 feet (notably from P.S. 22), but its activities are anticipated to be of greater intensity over the course of two distinct and longer phases (again for the sake of MPT). First, work would focus on the eastbound travel lanes with the consecutive demolition/construction of the existing/new NJ eastbound abutment; which would last approximately eight months (from February to October 2012). Secondly, and once traffic patterns would have been switched two years later, work would then focus on the westbound travel lanes with the consecutive demolition/construction of the existing/new NJ westbound abutment; which would last approximately seven months (from April to November 2014). The noisiest pieces of equipment required for demolition activities for either the eastbound or westbound abutments (i.e., deck/barrier/steel girders removal and substructure deconstruction) include concrete and wire saws, which may produce a noise emission level of 90 dBA at 50 feet based on equipment specifications found in the FHWA's RCNM 1.1 equipment database. Other pieces of equipment that would be required for such demolition work (i.e. cranes, excavators, hydraulic shears and core drills) could produce noise emissions levels of 85 dBA at 50 feet based on equipment specifications provided in the RCNM 1.1 database. The noisiest pieces of equipment anticipated for construction activities for either the new eastbound or westbound abutments (i.e., sheet/pile driving and removal, excavation, and concrete work for abutment foundations) include a vibratory driver/extractor, pile hammers and fixed leads with spotter, which can all produce noise emissions of 95 dBA at 50 feet based on equipment specifications provided in FHWA's RCNM 1.1 equipment database. It should be noted that measured values of pile hammers and vibratory drivers have reached 101 dBA at 50 feet. Other pieces of equipment required for abutment construction (i.e. pile cutters and hydraulic hammers) could produce noise emission levels of 90 dBA at 50 feet based on equipment specifications provided in the RCNM 1.1 database.

Overall, such activities and types of equipment are anticipated to increase noise levels above the ambient background noise levels at these sensitive receptors, especially during the high-intensity activities related to sheet/pile driving and removal activities via the use of pile hammers and/or vibratory driver/extractor. However, it should be noted that noise levels produced at 50 feet would attenuate with distance, approximately at a rate of 6 dBA per doubling of distance, solely based on source geometry. Additional factors such as topography and usage factors would also contribute to noise level attenuations at the sensitive receptors.

Construction of I-278 Temporary U-turn - The area of disturbance created from work associated with the construction of the temporary I-278 U-turn would be located at a minimum distance of approximately 150 feet from receptors in Linden, as identified above. Work would occur in two phases: (i) construction

would last approximately six weeks at the beginning of the construction period, and (ii) site restoration would last approximately four weeks at the end of the construction period. Such work would require similar at-grade roadway activities and types of equipment as described above for the Temporary Reconfiguration of NJ Turnpike Interchange 13.

Overall, such activities and types of equipment are considered typical for at-grade roadway construction (lower in intensity relative to other major noise-generating equipment used for typical bridge construction). While these activities would likely result in noise level increases, especially at those sensitive receptors within closest proximity, such increases would be temporary and short-term. Further, noise levels produced at 50 feet would attenuate with distance, approximately at a rate of 6 dBA per doubling of distance, solely based on source geometry. Additional factors such as topography and usage factors would also contribute to noise level attenuations at the sensitive receptors.

Mobile Sources

Based on preliminary design information developed by the Port Authority for predicted daily truck trips and construction staffing lists (i.e., number of crew workers per work shift), it was determined that the combined peak period for crew/construction truck traffic would last three months during the first year of construction between September 2011 and November 2011. For example, a maximum of 147 truck trips per day (entering and leaving the site in New Jersey) would occur between these months (see the *GBR Truck Trips Table* in Appendix K.2 of this FEIS). Daily truck trips would then decrease to a maximum of 65 trips per day for the second year of construction and continue thereafter to decrease for the remaining construction period.

Noise-Levels from Construction-Generated Traffic - In spite of the increased daily construction traffic, it should be noted that the total truck trips per day would occur over the entire 8-hour work shift; such that the hourly truck trips would be much less (e.g., about 18 truck trips per hour during the three-month peak period). In addition, this construction-generated traffic would be geographically spread out over the construction access network in New Jersey (as described above or also depicted in Figure 3.3-14 of this FEIS), with the exception of the Route 439 segment in front of the noise-sensitive receptors of P.S. 22 Halloran School and nearby residences. At this location, the construction-generated traffic would converge onto Route 439 before going over the NJ Turnpike on the overpass of Relocated Bayway Avenue, and could thus add additional traffic to the already-existing local traffic heading towards the Atlantic Avenue EB On-Ramp from Route 439. However, this localized volume increase of construction-generated traffic combined with regular local traffic would be less than during the No-Build conditions because the prevailing local traffic heading to I-278 EB/Goethals Bridge would be diverted onto I-278 WB (and its temporary I-278 U-turn to connect with I-278 EB) as a result of the temporary closure of the Atlantic Avenue EB On-Ramp. Using existing volumes from the 2004 Traffic Counts ((see Appendix J.2 of this FEIS), Figure 5.23-2 depicts the shift of traffic volumes along the roadways that would be affected by the local traffic detour (i.e. Atlantic Avenue EB On-ramp, Route 439, I-278 WB On-ramp from Brunswick Avenue and I-278 WB Mainline). During the AM peak hour, 290 total vehicles access the Atlantic Avenue EB On-ramp to I-278 EB/Goethals Bridge while 450 total vehicles access this ramp during the PM peak hour. Application of the truck percentages determined during the 2004 traffic counts (see Table 2.1 of Appendix J.1 of this FEIS) to these volumes yields approximately 41 trucks during the AM peak hour and approximately 23 trucks during the PM peak hour.[33] During construction, the volume of trucks that currently use the Atlantic Avenue EB On-ramp would be diverted to the temporary I-278 U-turn. As depicted in Figure 5.23-2, the majority of vehicles that access the Atlantic Avenue EB On-Ramp come from the west on Route 439/Bayway Avenue and head east towards this ramp as compared to those vehicles that come from the north on Atlantic Avenue. Although there would still be regular local truck

[33] As noted in Table 2.1 of Appendix J.1 of this FEIS, truck percentages on the Atlantic Avenue EB On-Ramp are higher in the AM peak hour (with 14%) than in the PM peak hour (with 5%); thus explaining why the volumes of trucks are higher in the AM peak hour rather than in the PM peak hour which has a higher total vehicle volume.

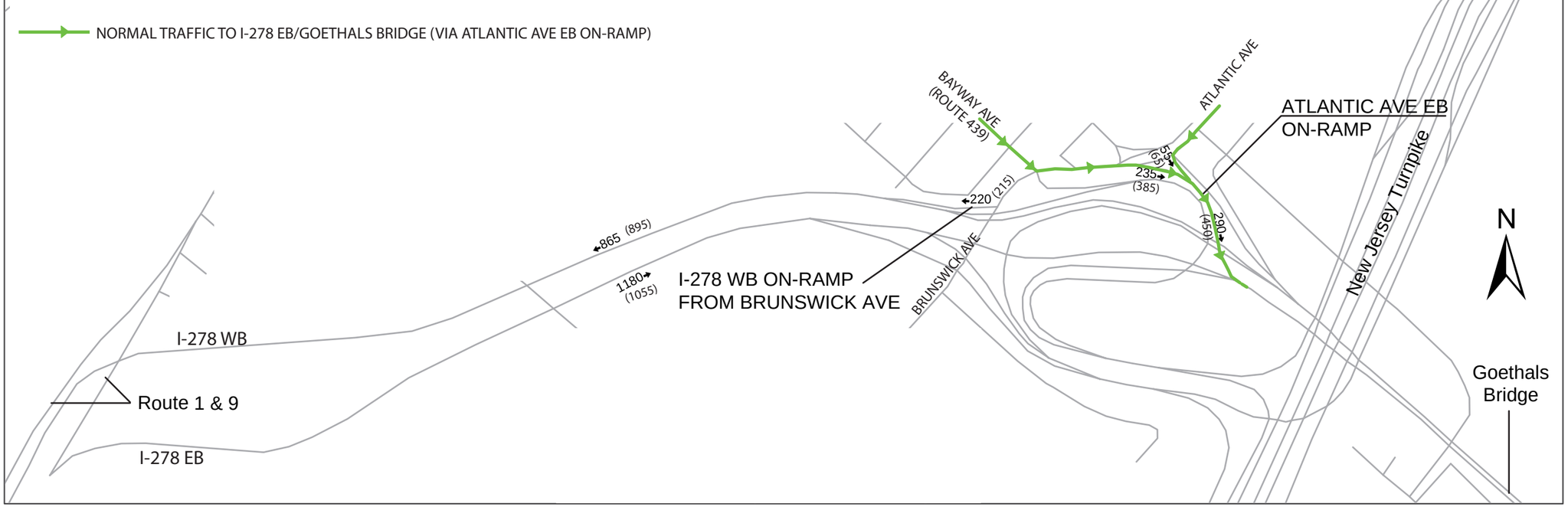
traffic passing the P.S. 22 Halloran School and nearby residences coming from the north and heading towards the I-278 U-turn, the majority of the trucks would now make a right turn from Route 439/Bayway Avenue to access the I-278 WB On-Ramp from Brunswick Avenue to head towards the I-278 U-turn; and would thus no longer pass in front of the school or nearby residences. In comparison, the number of construction-generated trucks per hour (i.e. 18 trucks per hour as stated above) that would be headed towards Relocated Bayway Avenue to access the staging areas and construction sites would be much less than the regular truck traffic typically passing by the P.S. 22 Halloran School on Route 439. Therefore, since the majority of the current truck traffic would be diverted away from the school, the additional construction-generated traffic is not anticipated to create a perceivable noise increase over the ambient background noise levels at P.S. 22 Halloran School and nearby residences.

Noise-Levels from Local Traffic Detour - As a result of the same local traffic detour mentioned above, noise levels at the adjacent neighborhoods along Brunswick Avenue and the I-278 WB On-Ramp and Mainline (in both Elizabeth and Linden) could increase as a result of increased traffic volumes. Figure 5.23-2 depicts the construction period traffic volumes that would result if all vehicles that currently access the Atlantic Avenue EB On-Ramp would use the temporary I-278 U-turn (i.e. this represents a worst-case scenario as opposed to using alternative approaches to obtain access to I-278 EB/Goethals Bridge due to earlier warning signage). During the AM peak hour there could be approximately 510 total vehicles on the I-278 WB On-Ramp from Brunswick Avenue compared to the 220 total vehicles that currently use this ramp; while there could be 665 total vehicles during the PM peak hour during construction compared to the 215 total vehicles that currently access the ramp. As such, traffic noise levels among those sensitive receptors in Elizabeth that are located along the I-278 WB On-Ramp may increase in a perceivable manner (i.e. noise level increases of 3 dBA) as regular I-278 traffic volumes could potentially double with the local traffic detour. However, the exact increase is dependent upon factors including topography between source and receptor as well as vehicle speed. Similarly, traffic along the I-278 WB Mainline would increase such that, during construction, there could be approximately 1,155 total vehicles during the AM peak hour, compared to 865 total vehicles that currently use the I-278 WB Mainline; while there could be 1345 total vehicles during the PM peak hour, compared to the current 895 total vehicles. As such, traffic noise levels among those sensitive receptors in Elizabeth and Linden along the I-278 WB Mainline could potentially increase as a result of increase traffic levels, although the increase would likely not be in a perceivable manner (i.e. because the traffic is not anticipated to double). Upon completion of the Proposed Project, the local traffic detour would be terminated and the Atlantic Avenue EB On-Ramp would be re-opened; thus returning traffic movements to their pre-existing conditions.

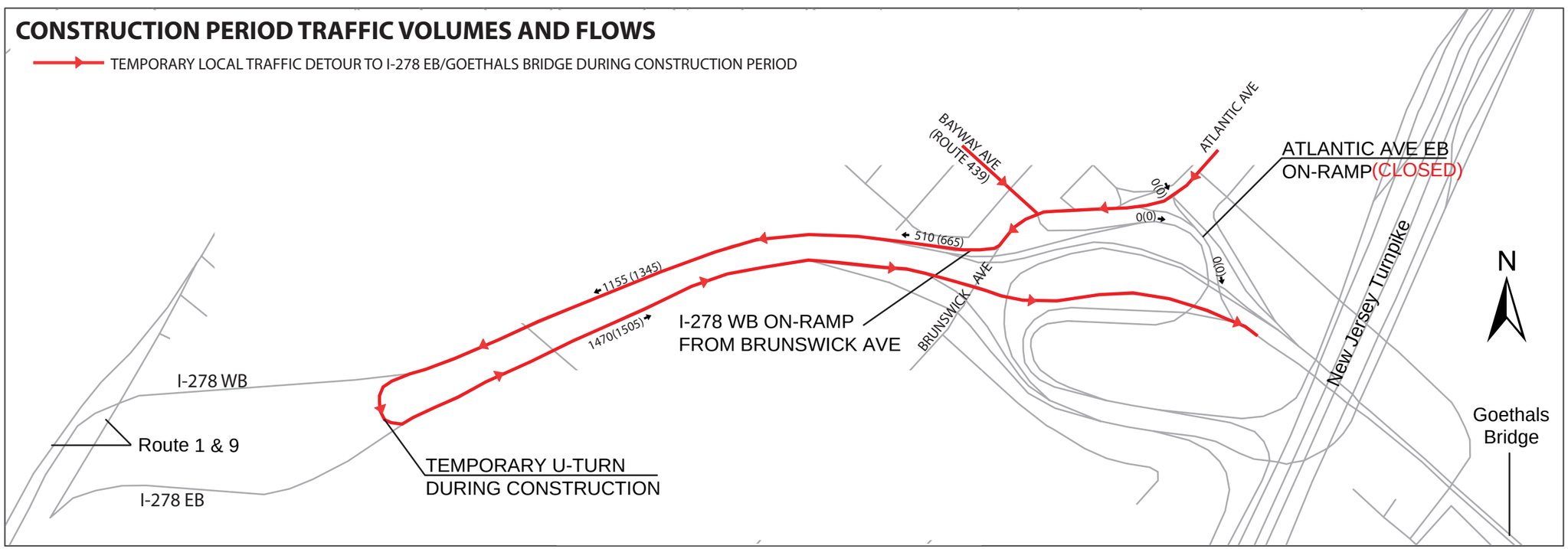
Mitigation

Based on the above-qualitative construction-phase noise analysis in New Jersey, it is anticipated that the Proposed Project could have significant noise level increases from stationary sources, notably on P.S. 22 Halloran School as a result of the activities for the Demolition/Construction of NJ Abutment (between February-October 2012 and then April-November 2014). Additionally, perceivable noise level increases from mobile sources could also occur at the Elizabeth residences along I-278WB On-Ramp as result of the local traffic detour that would likely double traffic volumes on this ramp during construction, assuming a worst-case scenario where all regular traffic would indeed be detour onto I-278 WB Mainline and the temporary I-278 U-turn. Noise levels could also potentially increase among residences and the Louis Avenue Park in Linden along the I-278 WB Mainline due to increased traffic from the detour, although increases are not anticipated to be perceivable. Nonetheless, the following mitigation measures would be taken into consideration by the Port Authority and its contractor. To that effect, such measures to minimize construction noise from stationary/mobile sources to the adjacent sensitive residential neighborhoods and community facilities of Elizabeth and Linden would be incorporated into the construction contracts and made part of the construction specifications.

EXISTING CONDITIONS TRAFFIC VOLUMES AND FLOWS



CONSTRUCTION PERIOD TRAFFIC VOLUMES AND FLOWS



NOTES:
1. AM (PM) PEAK HOUR VOLUMES
2. ESTIMATED VOLUMES ARE EXTRAPOLATED FROM 2004 TRAFFIC COUNTS (SEE APPENDIX J.2 OF FEIS)

Source: Berger/PB, 2010

Goethals Bridge Replacement EIS

FIGURE 5.23-2
NJ Local Traffic Detour and Estimated Traffic Volume Shifts

United States Coast Guard

Development of a Construction Environment Plan - Consistent with the Port Authority's policy for Sustainable Design Guidelines, the construction contracts will require the implementation of a "*Construction Environment Plan, which reduces pollution, noise and vibration from construction activities and vehicles to adjoining neighborhoods*."[34] As part of this plan, a stipulation for reducing noise and vibration impacts calls for scheduling and coordination with adjacent construction activities as well as for consideration of noise barriers where practicable. Additional provisions for mitigating construction noise impacts and for consideration of inclusion within the Proposed Project's standard construction specifications may include the following:

- All construction equipment powered by an internal combustion engine shall be equipped with a properly maintained muffler,
- Air compressors shall meet current USEPA noise emission exhaust standards,
- Air powered equipment shall be fitted with pneumatic exhaust silencers,
- Stationary equipment powered by an internal combustion engine shall not be operated within 150 feet of noise sensitive areas without portable noise barriers placed between the equipment and noise sensitive sites. Noise sensitive sites shall include: residential buildings, motels, hotels, schools, churches, hospitals, nursing homes, libraries and public recreation areas. Portable noise barriers shall be constructed of plywood or tongue and groove boards with a noise absorbent treatment on the interior surface (facing the equipment), or
- A noise monitoring program shall be established to record noise levels at noise-sensitive receptors during construction to determine if ambient noise levels are being exceeded by construction.

Community/Municipality Outreach and Notifications - In addition to adherence with the Port Authority's policy, coordination with local officials and community groups will be conducted to advise local residents about construction schedules, notably including periods of higher levels of construction-related noise. Notices to local residents will be provided through the municipal offices of each affected municipality.

Work Time Restrictions - Based on preliminary design information received from the Port Authority, all construction activities would also take place during daytime hours, and not within the local nighttime restrictions, as mandated in the municipal ordinances of the Cities of Elizabeth and Linden.[35] [36] A special permit for nighttime construction though may be needed from Elizabeth for the construction of the new approach span over the New Jersey Turnpike, given safety reasons and lower highway traffic volumes on the Turnpike; however such activities would be far enough away from any noise sensitive receptors for any adverse nighttime noise impacts. Construction specifications, as part of the construction documents, will reference any and all time periods when the operation of construction equipment and related construction activities must be restricted for each municipality.

Coordination and/or Street Signage for Alternate Local Traffic Detour – As for the local traffic detour from the closure of the Atlantic Avenue EB On-Ramp during the entire construction period, coordination

[34] See Construction Environment for CEQ-1 (pp.89) of the PANYNJ's 2007 *Sustainable Design Project Manual*, enacted by the Office of the Executive Director, AP 45-2 – Sustainable Design (Effective July 13, 2006).

[35] For Elizabeth, see Chapter 8.48 Noise Control, also known as the Noise Control Ordinance (§97A-1). *Construction* - *Operating or causing the operation of any tools or equipment used in construction, drilling, repair, alteration or demolition work, between the hours of 7:30 p.m. and 7:00 a.m. the following day, such that the sound therefrom is audible across a residential real property boundary or within a quiet zone, except for emergency work for public service utilities or by permit issued by proper authority. There shall be no such construction on Sundays and legal holidays, with the exception of emergency work for public service utilities or by permit issued by proper authority*".

[36] For Linden, see Chapter 3.2 Noise, 3-2.6 (b) (6). *Construction and Demolition* - *Operating or permitting the operation of any tools or equipment used in construction, drilling, earthmoving, excavating, or demolition work between the hours of 6:00 p.m. and 7:00 a.m. the following day on weekdays or at any time on weekends or legal holidays, provided such equipment is equipped with a functioning muffler except for (a) emergency work, (b) by variance issued pursuant to subsection 3-2.8, or (c) when the sound level does not exceed any applicable limit specified in Table I.*

with local officials and community groups will serve to advise local residents of detour routes and the periods of their duration. Efforts will be made to limit the re-routing of vehicular traffic and, in particular, heavy construction equipment through residential neighborhoods to the greatest extent possible. Public outreach will be conducted as part of the construction process to advise local residents and business property owners about the construction schedule, detour routes and periods of construction activity. In addition, appropriate street signage will be implemented within the local street network to announce the closed direct access to I-278 EB/Goethals Bridge (or Atlantic Avenue EB Ramp) and to provide early notices to local traffic for taking alternate routes rather than taking a circuitous detour on Brunswick Avenue/I-278 WB/Temporary U-Turn: which in turn would reduce the potential for significant noise level increases to adjacent sensitive receptors along the I-278 WB On-Ramp from Brunswick Avenue and I-278 WB Mainline. Such street signage mitigation will be developed in consultation with NJDOT and the Cities of Elizabeth and Linden.

5.23.5.2 New York – CEQR Analysis

Specifically for New York, and as explained earlier in Section 5.23.2.2, a quantitative construction-phase noise analysis (for stationary/mobile/cumulative sources) was performed in consultation with the NYCDEP/OEC for compliance with the CEQR requirements. As agreed with NYCDEP/OEC, this analysis focused on the Goethals Garden Homes (located on Goethals Road North) as this residential community is the only sensitive receptor adjacent to the Proposed Project; i.e., within the 1,500-feet CEQR distance threshold from the proposed areas of disturbance and potential construction vehicle access routes. A detailed discussion of the assumptions and methodologies used for such construction-phase noise analysis is presented in the Technical Report (see Appendix K.2 of this FEIS) that was reviewed and approved independently by NYCDEP/OEC. Nonetheless, the following points should be noted:

- No local traffic detour would be required in Staten Island.
- Upon coordination with the New York City Economic Development Corporation (NYCEDC) and OEC, it was agreed that the NYCEDC's New York Container Terminal Berth 4 Expansion Project (Berth 4 Project) would be considered for potential cumulative noise impacts with the GBR Project, since the two projects have concurrent construction timeline.
- The potential construction vehicle access routes in Staten Island are described in Section 3.4.2.5 and depicted in Figure 3.3-15 of this FEIS. Overall, construction access routes (either coming from the west or the east on major highways) would then converge onto the local roadway loop composed of Goethals Road North, Gulf Avenue, and Forest Avenue.[37]
- While the *CEQR Technical Manual* has different established-impact thresholds at receptors based on time of the day and ambient noise levels, it was determined for the Proposed Project that a 3-dBA increase or greater in hourly Leq over the No-Build noise levels should be considered significant. This threshold was determined given the predicted No-Build daytime noise levels of 71.1 dBA around the Goethals Bridge.
- The impact threshold for nighttime hours (10:00 PM to 7:00 AM), while also set as a 3-dBA increase or greater in hourly Leq, would not apply to the Proposed Project since no nighttime work is being proposed.
- Just like in New Jersey, the staging areas in Staten Island were not considered as potential stationary noise sources as they would be mainly used for storage and/or office space.

[37] Additionally, it was assumed that the interim improvements at Forest Avenue (i.e., I-278 EB off-ramp modification, one-way conversion of Forest Avenue between Gulf Avenue & Goethals Road North, and signal timing adjustments) under the NYCT's Howland Hook Interim Access Project will be in place at the time of the GBR Construction.

Stationary Sources

For the stationary-source analysis, it was determined that the Berth 4 Project would occur approximately 4,000 feet from the Goethals Garden Homes, so that its cumulative noise effects on Build conditions was not considered with the Proposed Project. As such, three areas of disturbance were defined upon the major construction phases (and respective activities) of the Proposed Project, which would occur within the 1,500-feet CEQR distance threshold. In turn, the shortest source-to-receptor distances between these three areas of disturbance and the Goethals Garden Homes were measured and conservatively assumed for the sake of conducting a worst-case analysis. The areas of disturbance are graphically depicted in Appendix K.2, and they include:

- New York Abutment: this area of disturbance includes all construction activities associated with the demolition of the existing NY Abutment and the phased construction of a new one. This area runs about 250 feet long, and is the westernmost one from the Goethals Garden Homes with a source-to-receptor distance of about 1,350 feet.

- At-Grade Roadway: this area of disturbance includes all construction activities associated with the at-grade roadway widening that will take place east of the NY Abutment. This area extends approximately 1,300 feet long running east underneath the Travis Bridge and then up to the Goethals Bridge Toll Plaza. It should be noted that current plans for work within the Toll Plaza only include roadway widening and paving activities. The distance between the receptors and the eastern edge of the At-grade roadway construction area is about 310 feet.

- Travis Bridge: this area of disturbance includes all construction activities associated with the replacement of the Travis Branch Railroad Overpass (a.k.a., "Travis Bridge") over I-278 and city streets (i.e., Gulf Avenue and Goethals Road North).[38] This area extends approximately 85 feet east and west from the tracks and overlaps the above area of disturbance for the At-Grade Roadway. Its source-to-receptor distance is about 875 feet.

Based on preliminary design information developed by the Port Authority, noise modeling for the analysis of stationary sources was performed with the FHWA's RCNM 1.1, as further described in Appendix K.2.

Results of analysis identified significant adverse impacts at the Goethals Garden Homes within only four contiguous months out of the overall construction period (between September-December 2011) as a result of the work associated with the replacement of Travis Bridge, notably its activities associated with driving sheets and temporary piles. While the maximum predicted noise level increase would be 3.9 dBA at the Goethals Garden Homes, those noise level increases would only be for intermittent periods.

The study also recommended the construction contractor to conduct an additional noise evaluation for the roadway widening/paving activities (At-Grade Roadway area), especially within 310-360 feet of the Goethals Garden Homes and once equipment locations/types will be better known at final design. Such recommendation was based on the fact that the adverse findings for the At-Grade Roadway area were based on unrealistic and overly conservative assumptions for the geographical distributions of equipment.

Mobile Sources

For the mobile-source analysis, it was determined that the construction-generated traffic of the Proposed Project could only affect the noise levels of the Goethals Garden Homes due to the likelihood for increased traffic volumes along Goethals Road North, most notably in addition to the regular freight

[38] As noted earlier in this FEIS, This overpass carries the Travis Branch Railroad, also part of the larger Staten Island Railroad (SIRR) network that was reactivated in 2006 for heavy freight.

trucks heading towards to the marine terminal at Howland Hook. In addition and based on information received from NYCEDC, approximately 90% of the construction vehicles for the Berth 4 Project would access the site via Goethals Road North and then Western Avenue; thus the only common access routes in front of the Goethals Garden Homes. More details on such access routes with respect to common noise receptors for both projects are described and graphically depicted in Appendix K.2 of this FEIS. Therefore, the vehicles associated with Berth 4 construction activities were included into the future No-Build traffic volumes so that the off-site analysis considered the cumulative effect of traffic generated by the Proposed Project as well as Berth 4. As the Goethals Garden Homes community is the only noise-sensitive land use along these construction access routes, it was the only area of noise-sensitive receptors considered for the mobile source construction-phase noise analysis.

Based on preliminary design information developed by the Port Authority, which indicated 2012 peak construction traffic year in Staten Island, noise modeling for the analysis of mobile sources was performed with the FHWA's TNM 2.5, as further described in Appendix K.2. Traffic volumes were developed based on 3-way vehicle classifications (autos, medium trucks and heavy trucks) for AM and PM peak traffic hours for both the 2012 No-Build and Build conditions. As noted above, the 2012 No-Build condition accounts for construction vehicles associated with the Berth 4 Project as it would occur regardless of the construction of the Proposed Project.

Results of the analysis identified that the additional truck and worker trips associated with construction of the Proposed Project would be negligible, such that the maximum noise level increase between No-Build and Build conditions would be 0.4 dBA during the AM peak hour and 0.3 dBA during the PM peak hour. Therefore, construction-generated traffic would not result in significant adverse impacts to the Goethals Garden Homes.

Cumulative Sources Analysis

In accordance with CEQR guidelines, a cumulative stationary and mobile source analysis was conducted to determine if the construction-generated traffic coupled with noise from heavy construction equipment would result in additional impacts to the Goethals Garden Homes. Although no impacts were predicted from stationary sources during the 2012 peak construction traffic year, the cumulative analysis was still conducted for 2012 because mobile sources could still tip over the near-significantly adverse noise level increases associated with stationary sources.

Results of the analysis identified that the combination of increased construction traffic and heavy construction equipment in 2012 would not produce any significant adverse impacts, whereas the incremental change in the noise level at the Goethals Garden Homes would still be less than the 3 dBA threshold of perceivable change. The maximum predicted increase would actually be from 2.7 dBA to 2.8 dBA during the months of April, July and October of 2012 when the installation or removal of the temporary rolling pier/frame for the Travis Bridge would take place concurrent with increased construction traffic. Outside the 2012 peak construction traffic year, no cumulative analysis was conducted since impacts were already predicted from stationary sources alone and because the construction-generated truck traffic in Staten Island would rapidly decrease to fewer daily truck trips during the remaining construction period, such that the cumulative noise levels would be similar to the value contributed by stationary sources.

Mitigation

Based on the above-quantitative construction-phase noise analysis in New York, it is anticipated that the Proposed Project could have significant noise level increases on the Goethals Garden Homes within only four contiguous months (between September-December 2011) out of the overall construction period as a result of the work associated with the replacement of Travis Bridge. No other impacts from mobile or cumulative sources would occur. As the maximum predicted noise level increase would only be 0.9 dBA

above the 3-dBA threshold and would only occur for intermittent periods during those four months, they would be minimized with the implementation of the Port Authority's policy for Sustainable Design Guidelines, as also proposed in New Jersey.

In addition, it was concluded that noise levels from construction-related activities associated with the Proposed Project would at least be minimized, if not fully mitigated, through compliance with the provisions set forth in this New York City Noise Code. In addition to maximum permissible noise levels,[39] the New York City Noise Code includes provisions to be implemented by the contractor executing the work, which are as follows:

- Develop and follow a Noise Mitigation Plan posted conspicuously on the construction site;
- Use equipment whose noise emission levels comply with those found in the FHWA's RCNM;
- All on-site equipment must be equipped with appropriate manufacturer's noise reduction devices;
- Operate construction devices with internal combustion engines at lower engine speeds and use noise-insulating material mounted on engine housing to mitigate noise;
- Portable compressors, generators, pumps should be covered with noise-insulating material;
- Use quieter-type adjustable backup alarms on equipment pre-2008;
- Provide laborer training for quieter work methods;
- Inform the affected public about work schedule and mitigation plans, and
- Use of perimeter noise barriers whenever practicable for all construction projects.

Aside from the required noise mitigation measures listed above for general construction, the revised Chapter 28 for citywide construction noise mitigation (that went into effect on July 1, 2007) also includes requirements for additional mitigation measures when the following five categories of devices are used:

- Impact Equipment: Pile Drivers, Jackhammers, Hoe Rams, Blasting
- Earth Moving Devices: Vacuum Extractors
- Construction Trucks: Dump Trucks
- Stationary Devices: Cranes, Auger Drills, Street Plates Backup Alarms
- Manual Devices: Concrete Saws

Such mitigation measures range from source controls (i.e. quieter models and mufflers) to establishment of noise pathway controls via noise barriers and enclosures.

As also proposed for New Jersey, measures to minimize construction noise adjacent to the Goethals Garden Homes would be incorporated into the construction contracts and made part of the construction specifications. Further, coordination with local officials and Community Board 1 will be conducted to notify residents within the Goethals Garden Homes about construction schedules, notably for the anticipated periods of higher levels of construction-related noise. Notices to these residents could be provided via the management office of the Goethals Garden Homes.

5.23.6 Summary

For the operational phase of the Proposed Project, a noise mitigation analysis was deemed unwarranted for any of the four Build Alternatives. Although noise levels are predicted to approach or exceed the FHWA NAC in the Build Year, noise impacts are predicted to occur beyond project limits, and/or are not attributed to any of the four Build Alternatives being considered. Specifically, impacts to residences in

[39] Those specific noise thresholds vary on the construction activity and proximity/nature of sensitive receptors; however, they can be found in Title 14 (*Environmental Protection and Utilities*) of the Rules of the City of New York (as amended by the *New York City Noise Code Local Law 113 of 2005*) under Chapter 2 (*Noise Control*), §24-219 – 24-224; §24-226; and §24-228 – 24-230.

Elizabeth along Brunswick Avenue and the I-278 WB On-Ramp are a result of natural traffic increases on both of these roadways in the Build Year, regardless of the operation of the Proposed Project. Impacts to P.S. 22, William F. Halloran School are a result of the combination of natural traffic growth along Brunswick Avenue and ramps to and from the New Jersey Turnpike and the Goethals Bridge. Additionally, P.S. 22 and these Elizabeth residences are all located beyond the physical limits of the Proposed Project improvements. Similarly, the Goethals Garden Homes community in Staten Island is located beyond physical limits of the Proposed Project improvements. Impacts at locations beyond project limits should not be classified as operational impacts associated with the Proposed Project.

Under the Preferred Alternative (i.e., New Alignment South), the residences along Bay Way/Krakow Street neighborhood in Elizabeth would be acquired and thus no longer considered as sensitive noise receptors. The same rationale would be true for the Existing Alignment South. In the case of the two Northern Alternatives (i.e., New Alignment North and Existing Alignment North), noise levels were actually found to slightly decrease due to the shift of the alignment to the north in comparison to the existing bridge alignment. Further, since noise levels are not predicted to approach (i.e. within 1 dBA) or exceed the NAC of 67 dBA under these two Northern Alternatives, mitigation would not be required either.

For the construction phase of the Proposed Project, some perceivable adverse noise level impacts are anticipated in both New Jersey and New York, most notably from on-site demolition/construction work (i.e., at NJ Abutment in Elizabeth and at the Travis Bridge in Staten Island) that happen to be of greater intensities (especially with activities such as sheet/pile driving and removal) and that also happen to be closer to sensitive receptors than the rest of the other areas of disturbance. In addition, the mobile source noise emission levels associated with the local traffic detour (not the actual construction vehicles) in New Jersey has the potential to increase noise levels at the adjacent neighborhoods along Brunswick Avenue, I-278 WB On-Ramp and the I-278 WB Mainline segment leading to the temporary U-turn in the median of I-278. Nonetheless, and as further described in the respective mitigation sections for New Jersey and New York, it is anticipated that such noise level increases would at least be minimized, if not fully mitigated, through compliance with local noise codes and the implementation of noise mitigation plans consistent with the Port Authority's policy for Sustainable Design Guidelines. In addition, appropriate outreach and notifications with local officials and community stakeholders along with coordination and/or street signage for alternate local traffic detours would ensure the success of mitigation measures.

5.24 Indirect Effects and Cumulative Impacts

5.24.1 Introduction

This section discusses the indirect effects and cumulative impacts (IECI) associated with the Proposed Project. The objective of this assessment is to evaluate the future condition of human and natural environmental resources through consideration of direct and indirect impacts associated with the Build Alternatives, combined with the impacts of other past, present, and reasonably foreseeable future actions, regardless of their relationship to the proposed Build Alternatives. This evaluation of IECI provides information to the public, stakeholders and decision-makers on the incremental effects of human activities over time and resources that could be affected by the project.

Council on Environmental Quality (CEQ) regulations for the implementation of the National Environmental Policy Act (NEPA) specifically require that environmental impact statements include the evaluation of indirect effects and cumulative impacts along with the disclosure of potential direct impacts. Although this FEIS uses the terms "indirect effects" and "cumulative impacts," the terms "impact" and "effect" are synonymous under NEPA, and can be beneficial or adverse (40 C.F.R. §1508.8).

As a guide to the evaluation of indirect effects and cumulative impacts under NEPA, the CEQ regulations and other relevant sources provide definitions of direct, indirect and cumulative impacts, as follows:

Direct impacts are "caused by the action and occur at the same time and place" (40 C.F.R. §1508)

Indirect effects are those effects that are "caused by the action and are later in time and farther removed in distance but are still reasonably foreseeable". Indirect effects "may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems".

Guidance developed for the National Cooperative Highway Research Program (NCHRP) outlines three types of indirect effects:[40]

- *Encroachment-Alteration Effects* - alteration of the behavior and function of the affected environment caused by project encroachment (physical, chemical, or biological) on the environment.
- *Induced Growth Effects* - changes in the intensity of the use to which land is put that are caused by the action/project. These changes would not occur if the action/project does not occur. For transportation projects, induced growth is attributed to changes in accessibility caused by the project.
- *Induced Growth Related Effects* - alteration of the behavior and function of the affected environment attributable to induced growth.

Cumulative impacts are environmental impacts resulting from the incremental effects of an activity when added to other past, present and reasonably foreseeable future activities regardless of what entities undertake such actions. Cumulative effects can result from individually minor, but collectively significant activities taking place over time and over a broad geographic scale, and can include both direct and indirect impacts (40 C.F.R. §1508.7).

5.24.2 Eight-Step Process for Identifying Indirect Effects and Cumulative Impacts

The IECI assessment for the Goethals Bridge Replacement was conducted using the eight-step process detailed in two National Cooperative Highway Research Program (NCHRP) reports: 1) NCHRP *Report 403: Estimating the Indirect Effects of Proposed Transportation Projects* (1998); and 2) *NCHRP Report 466: Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects* (2002). The eight-step process involves the identification of important trends and issues, and analysis of the potential for land use change and related environmental impacts on valued and vulnerable resources. The eight-step process is similar to, and fully consistent with the assessment process described in the CEQ guidance document entitled *Considering Cumulative Effects under the National Environmental Policy Act* (1998). The eight steps of the IECI assessment process are summarized below and are described in greater detail in the sections that follow.

- *Step 1 – Define the Study Area Boundaries*. The purpose of Step 1 is to set appropriate study area boundaries for the analysis of indirect effects and cumulative impacts as well as the timeframe for the analysis.
- *Step 2 – Identify the Study Area Communities' Trends and Goals*. The purpose of Step 2 is to gather information on community trends and goals in the study area, focusing on socioeconomic and land use issues.

[40] The Louis Berger Group, Inc., *NCHRP Report 403: Estimating the Indirect Effects of Proposed Transportation Projects,* Transportation Research Board, Washington, D.C., 1998.

- *Step 3 – Inventory Notable Features*. The purpose of Step 3 is to identify specific valued, vulnerable or unique elements of the natural environment that will be analyzed in the assessment of indirect effects and cumulative impacts.
- *Step 4 – Identify Impact-Causing Activities of the Proposed Action*. The purpose of Step 4 is to identify the cause and effect relationships between the transportation project and potential impacts that may come into conflict with the goals identified in Step 2 or the notable features identified in Step 3.
- *Step 5 – Identify Potential Impacts For Analysis.* The purpose of Step 5 is to compare the impact-causing activities developed in Step 4 with the inventory of Indirect Effects and Cumulative Impacts Assessment goals, trends and notable features that make up the baseline conditions identified in Steps 2 and 3.
- *Step 6 – Analyze Impacts.* The purpose of Step 6 is to determine the magnitude and location of the potential impacts identified in Step 5.
- *Step 7 – Evaluate Analysis Results.* The purpose of Step 7 is to evaluate the uncertainties in the methodology used to evaluate impacts, in order to better understand the analysis results.
- *Step 8 – Assess Consequences and Develop Mitigation.* The purpose of Step 8 is assess the consequences of the impacts and to develop strategies to address unacceptable impacts, which occur when an impact identified in Step 6 conflicts with a goal identified in Step 2 or with a notable feature identified in Step 3.

5.24.3 Step 1 – Define the Study Area Boundaries

5.24.3.1 Introduction

When estimating the direct effects of a Proposed Project, study areas are often delineated using a set distance, e.g., from the centerline or right-of-way limits. Since indirect effects and cumulative impacts can occur at a distance in time or space from the Proposed Project, broader limits must be set, that are often not a uniform distance from the Proposed Project. The purpose of Step 1 is to set appropriate study area boundaries for the analysis of indirect effects and cumulative impacts as well as the timeframe for the analysis. The literature regarding the indirect land use change impacts of highway projects indicates that there are two general types of potential effects:

- *Intraregional development shifts.* Highway projects can change the pattern and location of future growth by making certain areas more or less accessible at a regional scale. By reducing transportation costs, a transportation improvement can lead to households and businesses making different location decisions, such as locating farther away from an urban center where the cost of land is lower. As the transportation network matures, the extent of this effect for any individual project decreases.
- *Induced growth at transportation network nodes.* Highway projects that create new interchanges or improve accessibility to existing interchanges/intersections can lead to complementary land development of highway-oriented businesses such as gas stations, restaurants, and motels in the immediate vicinity of the interchange.

Both intraregional development shifts and induced growth at transportation network nodes need to be considered in an IECI assessment.

5.24.3.2 Resource Study Area (RSA) Boundaries

The resource study area (RSA) is specific to IECI analysis and is different from the project study area established to assess direct impacts resulting from the Proposed Project; that is the Goethals Bridge Study Area as defined earlier in Section 4.2. Boundaries for the RSA need to be defined carefully, taking into consideration that a RSA that is too small may not include other reasonably foreseeable future actions affecting the same resources as the Proposed Project and may not provide an accurate picture of the health of environmental resources if the resource is in good condition locally, but declining regionally. However, a RSA that is too large will unnecessarily increase data gathering requirements and may result in smaller notable environmental features being overlooked.

According to USEPA, the "geographic boundaries and time periods used in cumulative impact analysis should be based on all resources of concern and all of the actions that may contribute, along with the project effects, to cumulative impacts" (USEPA, 1999). California's *Guidance for Preparers of Cumulative Impact Assessments* recommends resource-specific study area boundaries that are "large enough to provide the context necessary for understanding the health of the resource and compact enough to present a proper perspective" (Caltrans, 2005).

For the purposes of this assessment, a RSA for each resource evaluated has been developed, taking into consideration the issues associated with that resource as well as appropriate agency input (see Step 3 in Section 5.24.4.2 for a discussion of how the decision was made regarding which resources to evaluate for IECI). The result is a RSA that was developed to be specific to that particular resource and will allow for the assessment of indirect effects and cumulative impacts in the most appropriate context for that resource. The RSAs for the individual resources studied are presented below.

Wetlands – The RSA for indirect effects and cumulative impacts to wetlands and wetland resources is the upper reach of the Arthur Kill, including Old Place Creek, Goethals Pond, Bridge Creek, Arlington Marsh and all associated wetlands. This area encompasses all wetlands and open waters that would drain to/from the Project Area, or have a direct connection to the Goethals Bridge Study Area. The RSA boundary/area was determined by identifying all water systems (wetlands and open waters) that flow into the Goethals Bridge Study Area from tidal, riverine or storm water discharges. As the project is primarily located in the Old Place Creek Complex and Arthur Kill, all surrounding water features were viewed to identify a hydrologic connection to these two features. This RSA is depicted in Figure 5.24-1.

Biotic Communities – The RSA for indirect effects and cumulative impacts to biotic communities includes the northwest portion of Staten Island, encompassing the Arthur Kill, Shooters Island, Pralls Island, Isle of Meadows, Old Place Creek and adjacent wetland and undeveloped upland environments. This area includes the NYSDEC's Harbor Herons Bird Conservation Area. This RSA is depicted in Figure 5.24-2.

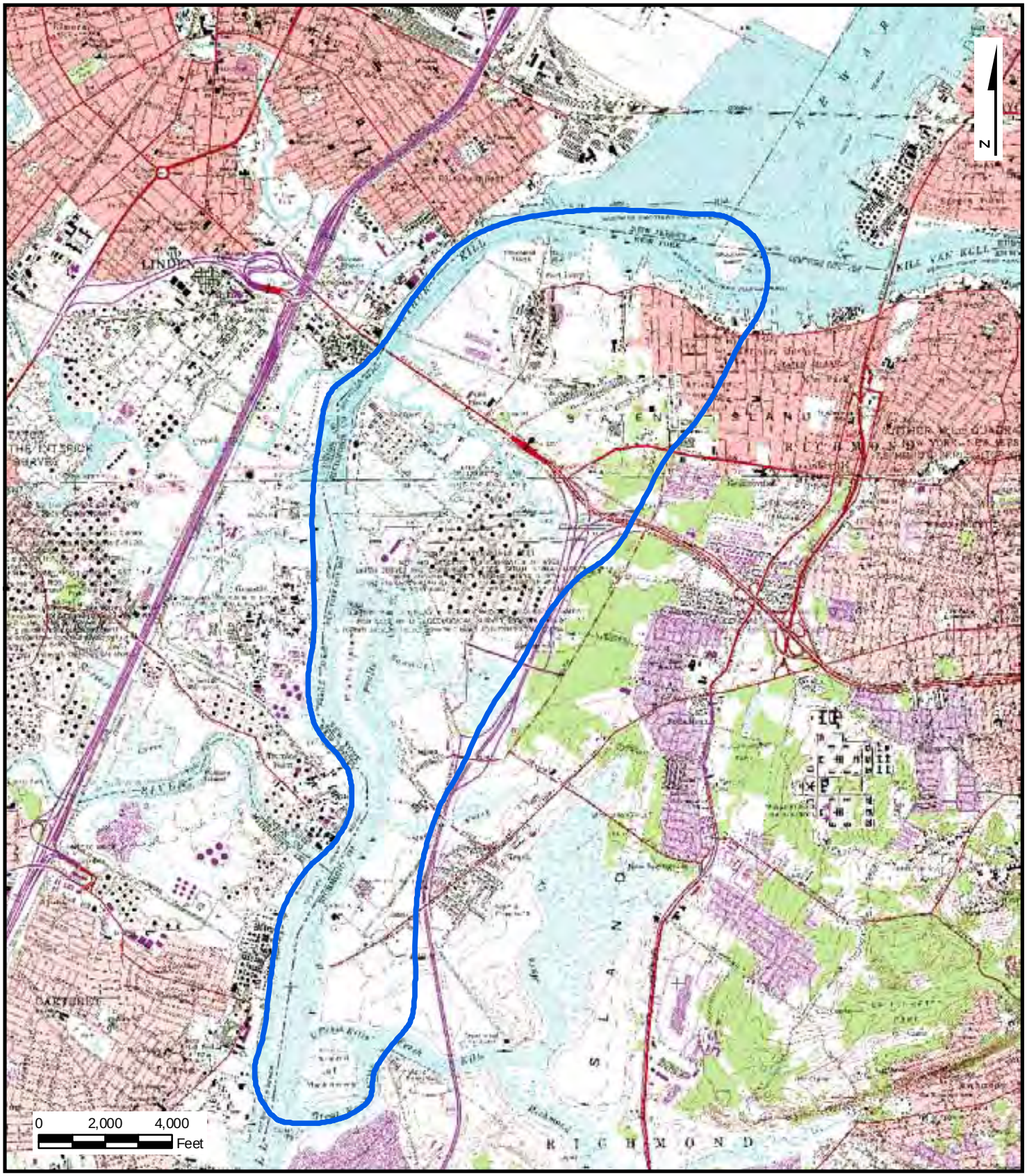
Traffic – The RSA for purposes of forecasting cumulative traffic impacts comprises the regional study area that was defined to forecast future No-Build and Build traffic conditions in 2034 (see Figure 4.3-1 in Section 4.3). The regional study area, in turn, includes the 14 primary traffic study areas (PTSAs) located along major roadways in the vicinity of the Proposed Project and other major travel routes in the region, which were defined for purposes of determining potential localized project-related traffic impacts. Four PTSAs were determined to be the areas within which project-related traffic impacts would occur and require impact mitigation (i.e., the Goethals Bridge toll plaza area, including the local roadway network near the Howland Hook Marine Terminal (HHMT); Bayway Circle, North Avenue/ Newark Avenue, and New Jersey Turnpike Interchange 13 toll plaza in Elizabeth, New Jersey; the Staten Island Expressway corridor from the West Shore Expressway to Richmond Avenue; and the Verrazano-Narrows Bridge toll plaza area).

Source: USGS Topographic Quadrangle. Berger/PB 2008.

Goethals Bridge Replacement EIS

FIGURE 5.24-1
Resource Study Area for Indirect Effects and Cumulative Impacts to Wetlands

United States Coast Guard



Goethals Bridge Replacement EIS

FIGURE 5.24-2
Resource Study Area for Indirect Effects and Cumulative Impacts to Biotic Communities

United States Coast Guard

Source: USGS Topographic Quadrangle.
Berger/PB, 2008.

Air Quality – The RSA for purposes of forecasting cumulative air quality impacts comprises the regional study area that was defined to forecast future No-Build and Build traffic conditions in 2034 (see Figure 4.3-1 in Section 4.3), which also served as the RSA for forecasting cumulative traffic impacts, as described above.

5.24.3.3 Time Frame

Since indirect effects and cumulative impacts can occur distant from an action in both location and time, setting a time horizon for the analysis is another important objective of Step 1. The time frame should be short enough in duration to anticipate reasonably foreseeable events, but should be long enough in duration to capture the development and relocation effects that may only transpire over the course of several business cycles. NCHRP Report 466 states that most IECI evaluations set a time horizon equal to the design life of a project, and the horizon of local and regional plans.

A 2034 analysis year was selected for the IECI assessment to be generally consistent with the project design year, as well as with the horizon of the regional plan and current regional planning activities discussed in the NYMTC Regional Transportation Plan, which extends to the year 2030. The Goethals Transportation Model (GTM) was used to forecast socioeconomic trends in individual Traffic Analysis Zones to the year 2034, and these data are used as the baseline for discussing the potential for induced growth as an indirect effect of the Proposed Project.

5.24.3.4 Identification of No-Build Scenario Projects

Identifying other programmed, committed, and on-going projects and studies within the regional study area provides a context for evaluating cumulative impacts for the Proposed Project by providing a No-Build scenario by which to compare impacts.

Projects that are programmed and committed for implementation and that would potentially affect travel or cumulative environmental impacts in the regional study area were identified through review of NYMTC and NJTPA TIPs and project-related materials, as well as through consultation with project sponsors and public agencies. These projects are listed in Section 4.4.5, *Planned Future Development*, and described in Appendix C, *2008 Update of Programmed/Committed Projects and Ongoing Planning Initiatives*. The locations of these projects are shown in both Figure 1 in Appendix C and Figure 4.4-3 in Section 4.4. While the referenced list represents all projects that are known to be programmed and committed within the regional study area used for traffic and air analysis, not all of the projects that appear on this list are reasonably foreseeable future actions discussed in this IECI analysis because they may be located outside of the RSA for that particular resource.

5.24.4 Step 2 – Identify the Study Area Communities' Trends and Goals

5.24.4.1 Introduction

Transportation investments have the potential to result in land use changes only in the presence of other factors. These factors include supportive local land use policies, local development incentives, the availability of land, and a good investment climate. The purpose of Step 2 is to gather information on community trends and goals in the defined resource study area (RSA), focusing on socioeconomic and land use issues. These trends and goals establish the context for the evaluation of indirect effects and cumulative impacts. This section describes trends in population, households, employment and the economy for the area surrounding the Goethals Bridge that would most likely be influenced by the Proposed Project. This section serves as a baseline for the consideration of potential induced growth effects.

5.24.4.2 Methodology

For the purposes of discussing induced growth, a total of six Traffic Analysis Zones (TAZs)[41] directly connected to the Goethals Bridge were selected within the Cities of Elizabeth and Linden in Union County and the Borough of Staten Island in New York City. These six TAZs were selected out of over 3000 TAZs that are included in the Goethals Transportation Model (GTM) and together will serve as the RSA for the purposes of discussing induced growth (see Figure 5.24-3). For the socioeconomic and demographic discussion, census data are presented at the city level, and trends are then forecasted to the year 2034 for the TAZs.

Overall, the six TAZs that comprise the RSA were selected with the recognition that the proposed Goethals Bridge Replacement does not provide new access points between existing major highways (i.e., I-278 and I-95/NJ Turnpike) and the local roadway network, but it is intended to replace and improve an already existing link between New Jersey and New York with the same termini. The main goals of the Proposed Project are to provide for a modernized crossing link with the elimination of the current design's functional and physical obsolescence in order to reduce roadway congestion and enhance mobility on the Goethals Bridge. One of the results of this goal is that the Proposed Project would improve the flow of goods to and from Staten Island and ultimately provide for a safe and reliable truck access for regional goods movement within the broader metropolitan region. As indicated in Section 2.3.6 of the Purpose and Need discussion, it is anticipated that the Proposed Project would contribute beneficial indirect effects to the already sustained economic growth in the direct vicinity of the Goethals Bridge by providing more efficient freight movement, most notably along the northwestern shore of Staten Island where the New York Container Terminal (NYCT) has experienced robust growth over recent years, and is anticipated to continue such growth in future years.

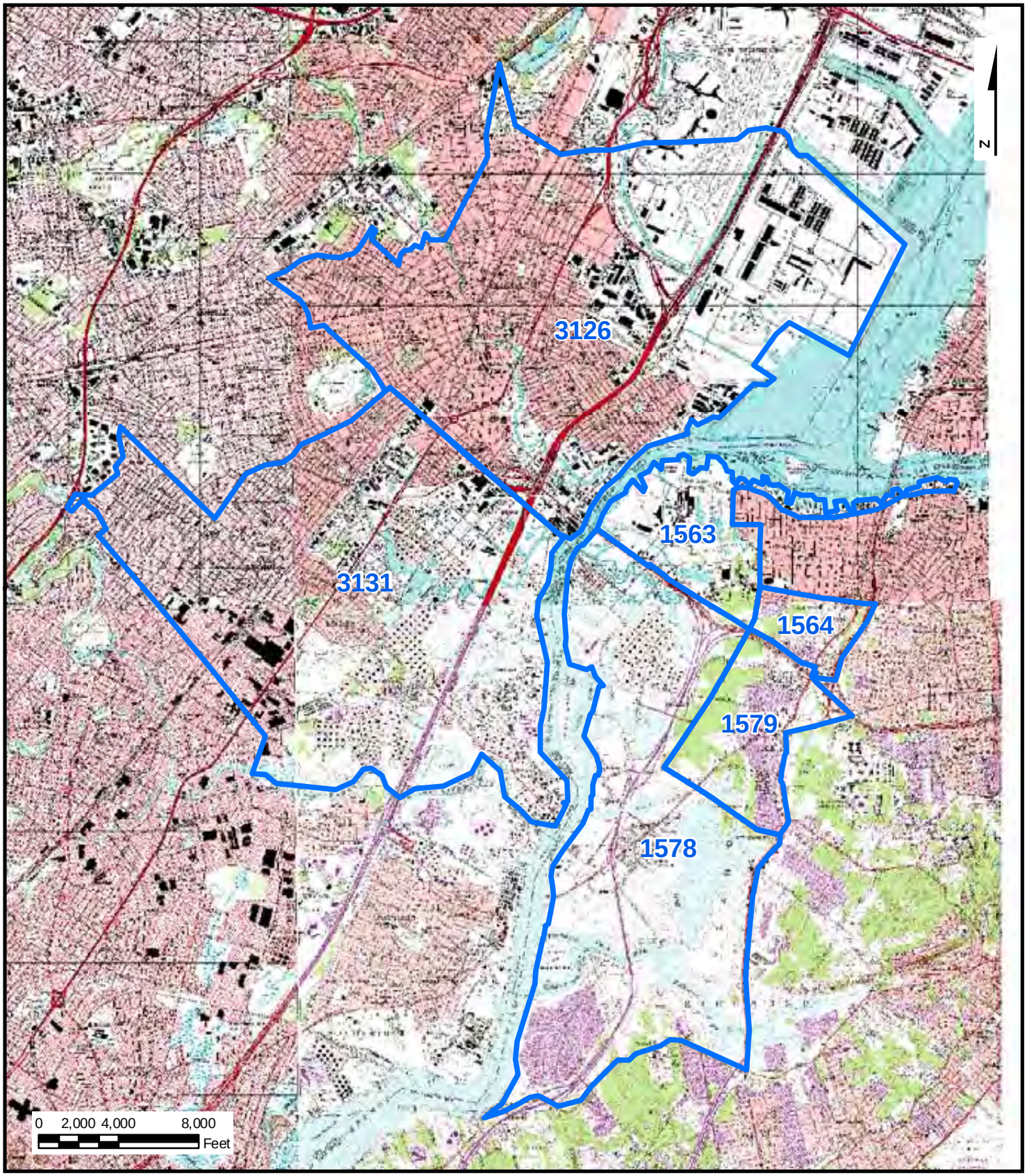
While the trends and goals are described below, additional information on existing land use and socioeconomic conditions and patterns can be found in Sections 4.4 and 4.5, which also included a review of several important local and regional planning documents. In addition, population and socioeconomic characteristics were obtained from the U.S. Census Bureau as provided in the 2000 Census data and the more recent 2006 American Community Survey.

5.24.4.3 Demographics and Housing

In New Jersey, historical data indicate that the populations of the cities of Elizabeth and Linden had an annual growth of 1.02 percent and 0.67 percent, respectively, between 1990 and 2006; both of these growth rates are greater than for Union County as a whole, which exhibited a 0.46 percent annual increase in population during that same time period. As of 2000, the population densities of Elizabeth and Linden averaged 8,976 and 3,456 persons per square mile (p/sm), respectively; in the case of Elizabeth, this density is greater than that of Union County as a whole (5,059 p/sm), while Linden's is less. It should be noted that Linden has a lower population density than Elizabeth since its residential uses only cover 23.6 percent of its land area, mainly due to large industrial tracts (notably, the Bayway Refinery), compared to 57.9 percent in Elizabeth. Housing characteristics for the cities of Elizabeth and Linden in 2000 reflected similar patterns, with 40,482 and 15,567 household units and housing occupancies of 94.5 and 96.5 percent, respectively. Based on the socioeconomic data and forecasts of the GTM, the population within the selected TAZs of Union County is estimated to increase from 161,471 in 2002 to 201,409 in 2034, which would amount to an annual growth of 0.69 percent and an estimated increase of about 11,960 household units, based on developable land zoned for residential uses.

In New York, historical data indicate that the population of Staten Island had an annual growth of 1.45 percent between 1990 and 2006, a rate that is greater than for New York City as a whole (0.72 percent annual increase during that same time period). As of 2000, the population density in Staten Island

[41] Overall, the six selected TAZs encompass a larger extent than the Goethals Bridge Study Area as defined in Figure 4.2-1).



Legend

Traffic Analysis Zone (TAZ) from the Goethals Transportation Model (GTM)

Source: USGS Topographic Quadrangle.
Berger/PB, 2008.

Goethals Bridge Replacement EIS

FIGURE 5.24-3

Resource Study Area for Induced Growth

United States Coast Guard

averaged 7,588 persons per square mile (p/sm) which is lower than that of New York City as a whole (26,403 p/sm). In turn, housing characteristics in 2000 revealed 163,993 household units in Staten Island with a housing occupancy of 95.3 percent. Based on the socioeconomic data and forecasts of the GTM, the population within the selected TAZs of Staten Island is estimated to increase from 28,047 in 2002 to 39,181 in 2034, which would amount to an annual growth of 1.05 percent and an estimated increase of about 3,400 household units on developable land zoned for residential uses.

5.24.4.4 Economic Activity and Employment

Based on an economic profile of the types of business establishments for zip codes comprising the selected TAZs on the New Jersey side of the resource study area (see Table 2 of Appendix D.3 of this FEIS), Retail Trade comprises the single largest industry sector (17.5% of the total number of units), followed by Transportation & Warehousing (9.5%) and Manufacturing (9.3%). An identical pattern is exhibited within Union County as a whole, with those three sectors being the three largest employment sectors in the county (see Table 1 of Appendix D.3 of this FEIS). Combined, the two sectors of Transportation & Warehousing and Manufacturing represent about 19.3 percent of the employment base in Union County.

Within the selected TAZs, the industrial and commercial businesses located near the Goethals Bridge make up the majority of the economic activity of those Transportation & Warehousing and Manufacturing establishments. Light-to-medium manufacturing establishments and warehousing businesses are located between the NJ Turnpike and the Arthur Kill, as well as along Brunswick Avenue on the west side of the NJ Turnpike between I-278 and the Staten Island Railroad. The heavy industrial activities of the Bayway Refinery occupy the large tract of land south of the Staten Island Railroad and west of the NJ Turnpike. In all, these well-established manufacturing and warehousing activities are located within a 1- to 2-mile range from the NJ Turnpike Interchange 13 complex. Further west, along Bayway Avenue and US Route 1/9, the economic activities consist mainly of neighborhood and regional retail establishments. According to the socioeconomic data and forecasts of the GTM, the employment within the selected TAZs of Union County is estimated to increase from 63,819 in 2002 to 82,510 in 2034, which would amount to an additional 18,691 employees or an annual rate of 0.81 percent in employment growth.

Based on an economic profile of the types of business establishments for zip codes comprising the selected TAZs on the New York side of the resource study area (see Table 4 of Appendix D.3 of this FEIS), Retail Trade comprises the single largest industry sector (20.4% of the total number of units) followed by Construction (12.2%) and Health Care & Social Assistance (10.5%). An identical pattern is exhibited within Staten Island as a whole, with those three sectors being the three largest employment sectors in Staten Island (see Table 3 of Appendix D.3 of this FEIS). Within the selected TAZs, the sectors of Transportation & Warehousing and Manufacturing comprise 3.2 percent and 1.9 percent, respectively, of the total number of units. In turn, the industrial and commercial businesses located near the Goethals Bridge make up the majority of the economic activity of the Transportation & Warehousing and Manufacturing establishments. Combined, these two sectors represent about 7.5 percent of the employment base in Staten Island (see Table 3 of Appendix D.3 of this FEIS).

The northwestern portion of Staten Island, which is included within the selected TAZs, has several large shipping and rail transportation hubs (e.g., the New York Container Terminal [NYCT], the intermodal Arlington Yards, and Port Ivory), even though this area also comprises large parcels of either vacant industrial uses or undeveloped parcels with extensive wetlands (e.g., the former GATX petroleum storage terminal). Within the selected TAZs and moving away from the Goethals Bridge, both the neighborhoods of Graniteville, Arlington and Mariner's Harbor (towards the northeast) and the neighborhoods of Bloomfield, Chelsea and Travis (along the West Shore Expressway corridor to the south) include other economic activities, including small light-industrial uses, utilities, auto-related businesses, regional/neighborhood retail establishments, professional and office services. Based on the socioeconomic data and forecasts of the GTM, the employment within the selected TAZs of Staten Island

is estimated to increase from 11,672 in 2002 to 19,398 in 2034, which would amount to an additional 7,726 employees or an annual rate of 2.73 percent in employment growth.

5.24.4.5 Land Use and Planning Goals

In New Jersey, both cities of Elizabeth and Linden are well-established communities mostly consisting of medium-density residential, industrial, and commercial land uses. According to the 2002 Linden Master Plan, only 3.7 percent of the city's land area was vacant and available for development as of 1995. According to the 2005 Elizabeth Master Plan, 7.7 percent of the city's land area was available for development as of 2005. With the exception of the Elizabeth Port residential neighborhood in Elizabeth Ward #1 (along the Arthur Kill north of the Elizabeth River and south of the Port Newark/Port Elizabeth Marine Terminal), all residential neighborhoods of both Linden and Elizabeth are located east of the New Jersey Turnpike. Both cities contain large industrial areas along the Arthur Kill (including the selected TAZs) whose development over the years was facilitated by the area's diverse and complex transportation network such as numerous ports, railroads, highways, and an airport. These regional transportation facilities represent a large percentage of the total developed land in both cities and are a significant factor in the region's economic activity. Nearly half of Elizabeth's total land area is comprised of transportation facilities, including portions of Newark Liberty International Airport and Port Newark/Port Elizabeth, one of the world's largest container ports. In Linden, transportation facilities combined with industrial uses occupy a substantial amount of Linden's overall land area, while the area along the Arthur Kill waterfront is occupied by Bayway Refinery (now owned by ConocoPhillips), an electric generating station and various petroleum and chemical storage facilities.

In New York, the Borough of Staten Island is, for the most part, characterized by suburban, low-density residential development, consisting mainly of a mix of one- and two-family houses and multi- family properties. Large areas within the borough are dedicated to open space, including La Tourette Park and Golf Course, Fresh Kills Park (the former landfill currently under a master planning phase), Clay Pit Pond State Preserve, Gateway National Recreation Area, Clove Lake Park, Great Kills Park, Miller Field, Fort Wadsworth and Silver Lake Park. According to the Borough's 2006 land use survey, 18.8 percent of the borough's land area was vacant and available for development. Most of the industrial and manufacturing uses in the borough are located on the low-lying banks of the Arthur Kill and Kill Van Kull (including the Port Mobil, Con Edison and NYCT facilities). The selected TAZs along the northwestern shores of Staten Island actually contain a large portion of those vacant lands as well as those industrial and manufacturing land uses.

Within the selected TAZs in both New Jersey and New York, similar and consistent land use trends as well as planning goals and strategies have been identified to emerge from the review of several planning documents[42], which largely advocate waterfront and economic redevelopments of the underutilized properties along with improvements to the current transportation infrastructure. To that effect, it is anticipated that by 2034, the current land use and zoning patterns within the surrounding areas of the Goethals Bridge and nearby highways will continue to be further advanced or revitalized into similar industrial, commercial and intermodal transportation services. Most notably, the re-introduction and on-going expansion of the maritime industry at Howland Hook since 1985 (operated by NYCT) along with the recent re-activation of intermodal freight services on the Staten Island Railroad and at the Arlington Yards further demonstrate such future planning trends in the transportation, warehousing and manufacturing sectors. Other programmed projects and planning initiatives of similar nature are discussed in Section 4.4.5 and Appendix C of this FEIS.

[42] For New Jersey, those documents included, most importantly, the City of Elizabeth 2005 Master Plan and the City of Linden 2002 Master Plan, as well as the New Jersey State Development and Redevelopment Plan and the Union County 1998 Master Plan. For New York, those documents included the Statements of Needs from Staten Island Community Boards 1 and 2, the Strategic Policy Statement from the Office of the Staten Island Borough President, the SIEDC's Staten Island 2020, the Staten Island West Shore Land Use and Transportation Study, the New Waterfront Revitalization Program, the Plan for the Staten Island Waterfront, and the PlaNYC2030.

5.24.5 Step 3 – Inventory of Notable Features

5.24.5.1 Introduction

The purpose of Step 3 is to identify and describe specific valued, vulnerable or unique elements of the natural environment that will be analyzed in the assessment of indirect effects and cumulative impacts. This section first describes the process by which a limited number of regionally important notable features were selected to be included in this study. Second, the resources selected for analysis are described, including overlay mapping with the various study areas and discussion of the trends affecting the health of each resource.

5.24.5.2 Process of Resource Identification

On September 13, 2006, the GBR project team met with staff of the USEPA Region 2 to discuss the approach and methodology by which the Proposed Project would be evaluated in terms of potential indirect and cumulative impacts, focusing primarily on cumulative impacts. The purpose of the meeting was to discuss and identify agreed-upon methods and approaches for identifying potential areas for which cumulative impacts might result from the construction and operation of the Proposed Project, and to identify those programmed and committed projects that would be considered as part of the cumulative impact analysis.

As a result of that meeting, it was agreed that impacts to wetlands and air quality would be the primary focus of the cumulative impacts analysis. It was further agreed that the focus of the wetlands analysis would be on the New York side, where a predominance of the wetlands were tidal, more extensive and part of a larger wetland system, whereas the New Jersey wetlands were considered as isolated small pockets that are not part of a larger wetland system. It was further determined that the tidal wetlands associated with Old Place Creek would be the focus of the IECI analysis for wetlands.

On March 20, 2008, the GBR project team met with the Inter-Agency Mitigation Group (IMG) created for this project. During this meeting, the New York State Department of Environmental Conservation (NYSDEC) requested that the EIS also consider indirect effects and cumulative impacts from other Port Authority projects in northwest Staten Island. The NYSDEC also felt that the area of consideration for wildlife impacts should be expanded.

A second meeting regarding indirect effects and cumulative impacts was held with USEPA Region 2 on August 20, 2008. At that meeting, the prior discussion of the cumulative impacts analysis for wetlands and air quality at the September 13, 2006 meeting was summarized, as was the discussion regarding cumulative impacts to wildlife at the March 20, 2008 IMG meeting. In addition, the GBR team presented its plan for assessing cumulative traffic impacts.

Based on these meetings with USEPA and the IMG, the discussion of indirect effects and cumulative impacts is primarily focused on wetlands and wetland resources, wildlife (including Harbor Herons and aquatic communities), traffic, and air quality impacts. Although not specifically discussed at any of the meetings, the potential for the Proposed Project to result in induced growth to the area is also included as part of the IECI analysis. While direct impacts are addressed within the individual resource area discussions throughout Section 5.0, this section presents a brief overview of the existing conditions within each RSA used to establish a baseline for analysis and discussion of potential indirect effects to the selected resources, as well as an analysis of cumulative impacts resulting from the indirect effects of the Proposed Project in conjunction with the incremental impacts of other reasonably foreseeable future actions.

5.24.5.3 Current Health and Conditions of the Resources

This section describes the current health and conditions of each resource within the RSA for that resource as described above.

Wetlands – The wetland and open water habitat on the New Jersey side of the Arthur Kill posed to be impacted includes freshwater wetlands that have been altered or created by humans and degraded by the establishment of invasive species. Several freshwater wetlands (the majority being isolated) are present in and around the NJ Turnpike Toll Plaza at Interchange 13A. These wetlands contain invasive plant species and are remnants of larger historic wetlands, or are the result of grading activities.

Those wetlands on the New York Side of the Arthur Kill have also been modified through ditching and contain some invasive species. The Arthur Kill itself has been dredged numerous times for shipping, bulkheaded for development up to its waters edge and contains toxic sediments from industries. In the Old Place Creek Complex, directly adjacent to the creek where disturbance has been at a minimum, wetlands contain little invasive species, and although ditched, contain tidal marsh species such as *Spartina alterniflora* and *Spartina patens*. Areas along the Arthur Kill have been affected by petroleum spills, damaging tidal marsh vegetation.

Several wetland areas within the RSA have undergone restoration, including: areas of Old Place Creek, below and around the Goethals Bridge and south of the KeySpan facility; the Bridge Creek area, east of Western Ave; and Goethals Pond, north of the Goethals Bridge toll plaza.

Biotic Communities – Terrestrial wildlife in the RSA consists of upland invertebrates, amphibians, reptiles, birds, and mammals, previously described in detail in Section 4.14.5.5. On the New Jersey side of the Arthur Kill, the reduction of natural habitat has occurred to the extent that only the most disturbance-tolerant species such as pigeons and squirrels are common. In northwest Staten Island, transportation and commercial development has fragmented and reduced the quality of habitat to varying degrees. Despite being surrounded by various types of development, Old Place Creek and its associated wetlands and adjacent uplands still support relatively diverse wildlife communities.

Upland invertebrates reported in the RSA include carpenter ants, crickets, termites, grasshoppers, yellow jackets, mosquitoes, dragonflies, honeybees, and butterflies. Amphibians observed include the spring peeper and the Fowler's toad, while other amphibians likely to occur in the RSA include red-backed salamanders, green frogs, and southern leopard frogs. Reptiles identified in the RSA include the northern brown snake, snapping turtle, and northern diamondback terrapin. Other reptiles that may occur in the RSA include garter snakes, northern water snakes, painted turtles, box turtles, and possibly eastern mud turtles.

Mammals occurring in the RSA include muskrats, Norway rat, and meadow vole, which have been identified by signs along Old Place Creek (e.g., muskrat lodges, muskrat and meadow vole runways, and rat tracks). Observations and signs of white-footed mice, raccoon, opossum, unidentified species of bats, eastern cottontail rabbit, gray squirrel, house mice, and white-tailed deer have also been made in the area.

One hundred and seventy-one bird species have been observed in the RSA since 1990. These observations include year-round residents, as well as birds using the area for breeding, overwintering, and migratory stopovers. Major avian groups observed in the area include: passerines (76 species); shorebirds (17 species); gulls and terns (9 species); waterfowl (20 species); wading birds (13 species); and raptors (9 species). Among these species are the peregrine falcon, listed by New York State and New Jersey as endangered, and the northern harrier, listed as threatened in New York and New Jersey.

Old Place Creek is located within three miles of three historically productive wading bird rookeries (Shooters Island, Pralls Island, and Isle of Meadows), and provides foraging and resting habitat for a

variety of wading bird species. Over 1,100 nesting pairs of wading birds were observed on Shooters Island, Pralls Island, and Isle of Meadows in 1990 and 1994 (Parsons, 1994). To protect foraging habitat for herons nesting at these islands, NYSDEC established the Harbor Herons Bird Conservation Area, which consists of part of Old Place Creek, Bridge Creek, and Goethals Bridge Pond. However, the number of wading birds nesting on the Arthur Kill islands decreased in the late 1990s, and the rookeries have since been abandoned, possibly because of human disturbance. In recent years, periodic Black-crowned and Yellow-crowned Night-Heron nesting attempts have been noted in dense areas of gray birch trees on the northern end of Prall's Island; however, efforts to control Asian Longhorned Beetle populations on the island in March-April 2007 resulted in the removal of most suitable nesting trees (Bernick 2007). Trees and shrubs were replanted on Pralls Island in the spring and fall of 2008. Annual surveys will be conducted for the next three years to determine whether the beetle has been eradicated.

Aquatic communities in the resource study area are composed of phytoplankton, zooplankton, benthic and epibenthic organisms, and fish, previously described in detail in Section 4.14.4. The Arthur Kill, its tributaries and associated wetlands supports highly functional aquatic communities, despite the intense development and aquatic habitat degradation in the area. However, historic contamination in the Arthur Kill and its tributaries has resulted in fish consumption advisories which recommend limitations on the consumption of some species of fish and crustaceans in both New Jersey and New York state waters because of risks to human health.

Phytoplankton, the microscopic primary producers of the aquatic environment of the Arthur Kill, have very limited mobility and primarily drift with the current. Zooplankton are small aquatic animals ranging in size from single-cell protozoa to fish larvae several millimeters in length. In general, zooplankton have limited mobility and are transported primarily by currents.

The benthic community consists of a diversity of small aquatic invertebrates which live burrowed into or in contact with the bottom and cycle nutrients from the sediment and water column to higher trophic levels. The benthic community in the Arthur Kill is primarily comprised of polychaetes, amphipods, and bivalves, while the dominant benthic organisms in Old Place Creek are polychaetes, oligochaetes, and isopods. Epibenthos, which live in close association with the bottom, include sessile suspension feeders (mussels), free swimming crustaceans (amphipods, shrimp, and blue crabs) and tube-dwelling polychaete worms found around the base of attached organisms (e.g., mussels). The epibenthic fouling community is a highly complex community found on hard surface habitat in the Arthur Kill area, such as pier piles and bulkheads.

Twenty-four fish species have been collected in the main channel of the Arthur Kill, with winter flounder, Atlantic tomcod, weakfish, striped bass, and grubby being the most abundant. Twelve fish species were collected from Old Place Creek, although catches consisted of small numbers of just a few species, dominated by the forage species, mummichog. Eight species were caught in the interpier basin along the New Jersey waterfront, with Atlantic silversides, bay anchovy, and winter flounder comprising most of the catch in this area.

Traffic – The Goethals Bridge currently operates close to capacity, at LOS E, in the peak directions of travel in both the AM and PM peak commutation hours. The majority of local intersections in the RSA currently operate at acceptable levels during both of the Goethals Bridge's peak travel hours. Along the I-278 corridor, traffic congestion is generally caused by ramp merges and weaving sections along the mainline. The freeway analyses conducted for the GBR EIS indicate that traffic conditions are currently generally acceptable, as defined by LOS, in both directions and during both AM and PM peak hours on I-278 in New Jersey and on the Staten Island Expressway in New York in the vicinity of Goethals Bridge. However, several sections of the Staten Island Expressway east of the West Shore Expressway are beginning to approach capacity conditions in both directions of travel. At New Jersey Turnpike Interchange 13, congestion already occurs during some peak travel hours at the approaches to the toll plaza, in both directions and along some of the exit ramps to the local streets.

Air Quality – Both the New Jersey and New York portions of the RSA currently comply with the National Ambient Air Quality Standards (NAAQS) for carbon monoxide, but do not comply with the ozone and $PM_{2.5}$ standards. In addition, Manhattan does not comply with the PM_{10} standard.

Nationally, levels of the pollutants of concern that are applicable for the Proposed Project have been decreasing, as follows:

- average ozone levels declined in the 1980s, leveled off in the 1990s, and have shown a notable decline after 2002;
- average carbon monoxide levels declined by 57 percent from 1980 to 2007; and
- average particulate levels declined by 11 percent from 2000 to 2007.

5.24.6 Step 4 – Identify Impact Causing Activities of the Proposed Action (Indirect Effects)

5.24.6.1 Introduction

A complete cumulative impact analysis requires an understanding of the indirect effects of a proposed action that may come into conflict with the goals identified in Step 2 or the notable features identified in Step 3. As introduced in Section 5.24.1, the definition of indirect effects (i.e., effects caused by the project, but occurring later in time or farther removed in distance than direct impacts), can be divided into three categories: 1) encroachment-alteration effects; 2) induced growth effects; and 3) induced growth related effects. These categories are further discussed below.

5.24.6.2 Encroachment-Alteration Effects

Encroachment-alteration effects are defined as indirect effects that alter the behavior and functioning of the physical environment and are caused by project encroachment on the environment. Transportation corridors have unique impacts on ecosystems associated with their linear form. These corridors may function as specialized habitats, conduits of movement, barriers or filters to movement, or sources of effects on the surrounding habitats. Transportation project actions can have indirect effects on ecosystems such as: habitat fragmentation from physical alteration of the environment; reproduction effects and degradation of habitat from pollution; disruption of ecosystem functioning from direct mortality impacts; and disruption of natural process from altered energy flows.

5.24.6.3 Induced Growth Effects

Induced growth effects are defined as changes in the intensity of land use that is caused by the project. If changes in access (e.g., reductions in the time it takes to reach an area, and/or increases in the volume of traffic able to reach it) are sufficient to make it feasible to develop a property which otherwise would not have been developed, an induced impact can be said to have occurred. However, the assessment of induced growth effects depends upon the relative prominence of the highway project in the context of all factors affecting the feasibility of development. Many factors besides access/transportation can affect development feasibility, including population and employment growth (market factors), land availability, parcel configuration and environmental suitability (supply factors), availability of municipal services, zoning and land use plans, and local political considerations.

There are three general categories of induced growth effects: (1) projects planned to serve a specific development; (2) projects that would likely stimulate land development having complementary functions;

and (3) projects that would likely influence intraregional land development decisions. [43] These are discussed further below:

- *Projects Planned to Serve a Specific Development* – This category occurs when the proposed transportation facility would serve a specific development at an existing or proposed activity center (e.g., a highway interchange for a planned residential subdivision). This type of effect is common when land development is used as a selling point for the project and the highway and land development projects are interdependent. The land development proposal is an indirect effect of the highway project.

- *Projects That Would Likely Stimulate Land Development Having Complementary Functions* – This category occurs when the proposed transportation facility would likely stimulate supporting and/or complementary land uses such as gas stations, restaurants and hotels at highway interchanges. These developments and their related effects are indirect effects of the highway project. Research has suggested that highway oriented businesses such as these figure more prominently at rural interchanges rather than suburban or urban interchanges, where land values typically support higher density uses.[44]

- *Projects That Would Likely Influence Intraregional Land Development Location Decisions* – This category of induced growth occurs when the proposed transportation facility would likely influence decisions about the location of growth and development among various locations within a region (intraregional development shifts). This category is associated with highway and transit modes. If conditions in a region are generally favorable for growth, a highway project becomes one of the many factors that influence where development would occur. The general tendency is toward relatively high density commercial or multi-family residential development up to one mile around a freeway interchange and up to between two and five miles along major feeder roadways to the interchange.

5.24.6.4 Induced Growth Related Effects

Induced growth related effects include the alteration of the behavior and function of the affected environment attributable to induced growth. Induced growth and land development themselves can affect the environment in many ways; however, the amount of information available and the reliability of that information regarding potential land developments will determine the extent to which the corresponding related effects can be examined.

5.24.7 Step 5 – Identify Potential Impacts for Analysis

5.24.7.1 Introduction

In order for the indirect and cumulative impact analysis to be meaningful, it is desirable that the range of potential impacts considered in depth be limited to those that have the highest potential to be significant. This section identifies and explains the rationale for the potential impacts selected for analysis, and those potential impacts not warranting detailed analysis.

[43] *Guidance for Estimating the Indirect Effects of Proposed Transportation Projects*, Transportation Research Board, National Cooperative Highway Research Program Report No. 403, 1998.

[44] Bascom, S.E., Cooper K.G., Howell M.P., Makrides A. C., and Rabe F.T., *Secondary Impacts of Transportation and Wastewater Investments: Research Studies* (July 1975)

5.24.7.2 Potential Impacts Not Warranting Analysis

Projects that Would Likely Influence Intraregional Land Development Decisions – Transportation improvements can change the location of future growth by making some areas relatively more or less attractive. However, the Goethals Bridge is located in a region with a highly developed existing highway network. In addition, the Proposed Project is a replacement of an existing bridge; it does not provide new access to a previously undeveloped area. Land use in the areas immediately surrounding the Goethals Bridge is well established as commercial/industrial and transportation, although large areas are currently and likely to remain undeveloped due to existence of wetlands in the Old Place Creek and other tidal systems which are considered non-developable given their environmentally-sensitive nature. While sites for redevelopment exist near the bridge, especially at the former GATX site, there is low potential for other new development in the area. Therefore, analysis of intraregional development shifts in the regional study area as a whole is not warranted.

Projects That Would Likely Stimulate Land Development Having Complementary Functions – Since the Proposed Project is a bridge replacement project, it is not expected to have the potential to stimulate land development that is complementary to the bridge in the way that highway projects may stimulate land development to compliment the highway at interchanges. The Goethals Bridge Replacement does not involve the construction or reconstruction of any highway interchanges and no new access is being created. Therefore, complementary development near interchanges is not a potential indirect effect warranting detailed analysis.

5.24.7.3 Potential Impacts Warranting Analysis

Induced Growth Effects (Projects Planned to Serve a Specific Development) – This type of effect is common when land development is used as a selling point for the project, and the transportation and land development projects are interdependent. The land development proposal is an indirect effect of the highway project.

As stated in Section 2.3.6 of the Purpose and Need for the Proposed Project:

> *The forecasted trend of continued, robust cargo volume growth in the Port, and notably at the New York Container Terminal despite its recent improvements in rail-based cargo-carrying capacity, heightens the Goethals Bridge's importance for accommodating goods movement in the region.*

This statement necessitates the need for a discussion on induced growth as it applies to projects that are planned with the intent of serving a specific development, specifically the growth of the New York Container Terminal and how that growth relates to the Proposed Project.

Encroachment-Alteration Effects – Encroachment-alteration effects, also known as indirect effects, warrant additional evaluation in order to determine impacts on habitat as a result of the Proposed Project. The resources previously identified as vulnerable elements of the natural environment that will be included in this analysis are described above in Step 3.

Cumulative Impacts – Cumulative impacts need to be analyzed to determine the combined environmental effects of the Goethals Bridge Replacement with other No-Build Scenario transportation projects, and projected future population and employment growth.

5.24.8 Step 6 – Analyze Impacts

The purpose of Step 6 is to determine the magnitude and location of the potential impacts selected for analysis in Step 5. This section describes the analysis methodology (including respective assumptions and results of the indirect and cumulative impact analyses). While the results of this analysis are discussed in detail in the following sections, a summary of the indirect effects and cumulative impacts is presented in Table 5.24-1.

5.24.8.1 Induced Growth Effects (Projects Planned to Serve a Specific Development)

For the purposes of discussing induced growth, a total of six TAZs directly connected to the Goethals Bridge were selected within the cities of Elizabeth and Linden in Union County and the Borough of Staten Island in New York City. These six TAZs were selected out of over 3,000 TAZs that are included in the GTM and together will serve as the RSA for the purposes of discussing induced growth (see Figure 5.24-1).

Using the socioeconomic data that has been projected to the year 2034 by the GTM, a qualitative assessment of potential induced growth impacts was done by considering the trends predicted for the six TAZs that make up this RSA. The focus of such qualitative analysis was on types of development such as transportation (notably maritime freight), warehousing and manufacturing developments, as these types of development tend to be located around areas providing good connectivity to a regional highway network. Additionally, these are the types of development that are most prevalent in the resource study area.

First and foremost, it is important to recognize that the proposed Goethals Bridge Replacement, regardless of its Build Alternatives, would occur in a dense metropolitan area with an already-developed transportation network (as described in Step 2), and that it would not provide any new access points[45] between I-278, the NJ Turnpike, and the local roadway network. It is also important to note that any induced-growth within the Goethals Bridge and its environs would primarily be dictated by market and supply factors such as population and employment growth, land availability, parcel configuration and environmental suitability, municipal infrastructure availability (i.e., sewer/water), adopted plans and policies, and/or local politics. These combined factors in New Jersey and New York would contribute to the already existing development trends in the transportation, warehousing and manufacturing sectors, which would continue independently and regardless of the Proposed Project. In addition, the Proposed Project is intended to address an already existing and foreseeable traffic congestion problem and it is more accurately described as a growth-serving type of transportation project, rather than as a growth-inducing type of transportation project.

The proposed Goethals Bridge Replacement is not expected to trigger land use or zoning changes that would contribute to induced or accelerated growth in the area. In addition, due to the fact that the committed and planned developments in the vicinity of the Goethals Bridge are largely consistent with the local land use plans and associated zoning regulations, no unanticipated or induced land use activity and related population and employment changes are expected to occur as a result of any of the Build Alternatives being considered.

However, as noted in Step 5 above, the Proposed Project could potentially facilitate some nearby developments to occur in response to the previously-stated market and supply conditions since the enhanced mobility and safer truck crossing associated with the Goethals Bridge Replacement could further facilitate the robust growth of maritime and freight transport, notably at the NYCT facilities in

[45] New access points for transportation projects are typically the type of accessibility changes most likely to influence development patterns.

Howland Hook and Port Ivory. Despite the NYCT's on-going program expansion and the recent nearby improvements in rail-based cargo-carrying capacity (i.e., SIRR and Arlington Yards reactivations), it is anticipated that the Proposed Project would improve the trucking of goods to and from Staten Island, which in turn may further promote the demand for infrastructure developments and direct truck connectivity to and from the NYCT. Specifically, the development of the new NYCT egress ramp (also known as the Westbound Ramp[46]) in order to provide a direct access for trucks to westbound thoroughfare of I-278 (directly to the new bridge) would be contingent upon the Proposed Project's implementation in order to handle anticipated growth in truck traffic at NYCT. Therefore, the program expansion at NYCT should be considered when analyzing potential cumulative impacts on natural resources.

Given the large tract of re-developable upland area at the former GATX site (with the exception of its non-developable wetlands), the Proposed Project with its improved connectivity between New York and New Jersey could influence the development timing at such site. Of course, the intense market pressures that exist for such sizeable vacant industrial land in Staten Island are likely to move forward anyway with an as-of-right redevelopment, but such project should also be considered when analyzing potential cumulative impacts to natural resources in the area. Given the uncertain future at the former GATX site, it should be noted that the Proposed Project would not further induce any development pressures for a maritime terminal since the navigational clearance of the new Goethals Bridge would be the same as currently existing.

5.24.8.2 Encroachment Alteration Effects (Indirect Effects)

Introduction

Encroachment alteration effects (indirect effects) for each resource are presented below. The analysis of each resource provides a snapshot of the impacts of past actions on the resource, the No-Build Scenario for that resource and an analysis of the indirect effects on that resource resulting from the Proposed Project.

Wetlands

Impacts of Past Actions **–** As the wetland communities in the RSA have been altered over years of filling and ditching, the size and health have diminished considerably. Wetlands in the RSA consist of intertidal marsh, mudflats, open water (Arthur Kill, Old Place Creek and Bridge Creek), and freshwater emergent/scrub-shrub wetlands (located in New Jersey). A more detailed description of these wetland/open water resources is described in Section 4.14.5.3, *Regulated Wetlands.*

In viewing the New Jersey side of the RSA (west of the Arthur Kill), the majority of the historic wetlands have been filled and the Arthur Kill has been bulkheaded, thus removing the natural progression from open water, to tidal wetland, to upland. Two rivers flow into the Arthur Kill from New Jersey and include Morses Creek and the Elizabeth River. These three water courses have been dredged, straightened, and bulkheaded at various points within the RSA, thus affecting the quality of the water courses with the removal of adjacent wetland, which would provide stream bank stabilization and nutrient removal.

The New York side of the RSA is much larger and also has been historically altered by roadways, railroads, commercial and residential development. The wetlands have been filled and ditched (which has allowed invasive species such as *Phragmites* to become established), and the water courses have been dredged, straightened, relocated and bulkheaded at various points along their reaches. The Old Place Creek Complex, directly adjacent to the creek has experienced minimal disturbance with the exception of

[46] To that respect, the parallel plans for an Eastbound Ramp off the NY Toll Plaza to NYCT (as identified in the PANYNJ's Ten-Year Capital Plan) could advance regardless of the Goethals Bridge Replacement.

TABLE 5.24-1 SUMMARY OF INDIRECT EFFECTS AND CUMULATIVE IMPACTS

Resource	Impacts of Past Actions	No-Build Scenario	Indirect Effects from the Proposed Project	Cumulative Impacts (Proposed Project & Other Reasonably Foreseeable Future Actions)
Land Use	Impacts of past actions (developments) have led to the study area being dominated by transportation (notably maritime freight), warehousing and manufacturing types of development.	The combined factors of population and employment growth, land availability, parcel configuration and environmental suitability, municipal infrastructure availability (i.e., sewer/water), adopted plans and policies, and/or local politics in New Jersey and New York would contribute to the already existing development trends in the transportation, warehousing and manufacturing sectors.	It is anticipated that the Proposed Project would improve the trucking of goods to and from Staten Island, which in turn may further promote the demand for infrastructure developments and direct truck connectivity to and from the New York Container Terminal (NYCT).	Cumulative impacts are not an aspect of the induced growth analysis. Induced growth is a type of indirect effect.
Wetlands	Altered wetland communities, filled, ditched and bulkheaded wetlands, dredged, straightened and relocated waterways have affected the quality of adjacent wetlands.	Potential for accidental fills and/or spills associated with existing bridge rehabilitation, repair and maintenance activities	Reduced wetland functions include; water quality, fish/wildlife habitat, sediment/toxicant/pathogen retention, nutrient removal/retention/ transformation, production export (nutrient), sediment/shoreline stabilization and flood storage capacity. Fragmentation of habitat will also occur.	All reasonably foreseeable future developments that involve the filling of wetlands will contribute to the cumulative impact of decreasing the quality and quantity of wetlands in the resource study area which provide valuable wetland functions.
Biotic Communities	Dredging and shoreline alteration have also resulted in permanent alterations of water currents, salinities, temperatures, and dissolved oxygen levels in the Arthur Kill. Invasive species and lower quality of habitat have resulted as well. Industrial, toxic contamination of water has led to bioaccumulation of chemicals in tissues of plankton, invertebrates, fish, and birds.	Required rehabilitation activities and routine repair and maintenance may impact local wildlife communities through visual and noise disturbance, as well as the potential presence of debris due to accidental fills or spills below or adjacent to the existing bridge.	Fragmentation, loss of habitat and restricted wildlife movement resulting from the security fence. Degraded heron foraging habitat as a result of increased truck traffic from NYCT (Northern alternatives). Possible effects on water quality resulting from sedimentation and stormwater runoff contaminants. Reduced water quality may affect the health of benthic organisms and those species that prey on these organisms.	Loss of upland wildlife habitat resulting from land development. Development also increases impervious surfaces which will result in increased stormwater runoff volumes, potentially degrading water and sediment quality which will adversely impact fish and benthic organisms. Parcel C development would result in loss of shallow water habitat for heron foraging. Increases in shipping activities increase the potential for accidental spills and invasive marine invertebrate species.
Traffic	n/a	During the peak hours, the peak direction of traffic will be operating at LOS F. LOS F is also forecast for Bayway Avenue in Elizabeth (AM and PM peak hours), several sections along the SIE, Gulf Avenue/Forest Avenue and Goethals Road North/Forest Avenue intersections in Staten Island. Longer queues than currently occur are forecast at the New Jersey Turnpike Interchange 13 toll plaza approaches.	The increase in traffic volume resulting from the new bridge would, in turn, impact several sections of the Staten Island Expressway (I-278) between the Goethals Bridge and Richmond Avenue, as well as some interchange areas. Indirect effects resulting from these increased queues could include increased wait time for emergency vehicles, increased commute times for workers using these routes and subsequent use of other routes, increased wait time and consequent increased vehicle idling time resulting in potentially decreased air quality locally.	Cumulatively, the Goethals Bridge replacement, in combination with the other programmed/committed and reasonably foreseeable projects, would improve overall traffic conditions in the resource study area. In addition to the project-specific traffic benefits that would be anticipated, the cumulative effect of all of the transportation improvements would be generally improved traffic conditions in the resource study area.
Air Quality	n/a	Future air quality levels would likely be somewhat improved over existing levels. While increases in traffic volumes are anticipated, increases in emissions from the additional traffic are anticipated to be more than offset by emission reductions resulting from the federally mandated use of cleaner vehicles. In addition, emission reduction programs being implemented by the states of New Jersey and New York for their State Implementation Plans (SIPs) are designed to achieve compliance with the National Ambient Air Quality Standards (NAAQS) for all of the criteria in future years.	No indirect air quality effects are anticipated with the Proposed Project.	Local and regional cumulative effects on air quality may occur as a result of changes in local traffic conditions, roadway alignments, signal timing, changes in regional traffic patterns, vehicular miles of travel, and/or vehicular speeds. Future traffic conditions in 2034 will exhibit either relatively small changes or improvements compared to No-Build conditions and to conditions with the Proposed Project. Consequently, the qualitative assessment of future cumulative air quality conditions predicts no deterioration, compared to No-Build conditions.

Source: Berger/PB, 2008.

ditching. Areas along the Arthur Kill have been affected by past petroleum spills (i.e. Exxon Bayway oil spill of 1990 in the Arthur Kill), which has damaged tidal marsh vegetation.

No-Build Scenario – No impacts to regulated wetlands are anticipated under the No-Build Alternative. Rehabilitation activities as well as routine repair and maintenance on the existing bridge are expected to occur on and from the existing decking and superstructure above ground level. It is anticipated that any required construction staging areas could be located on upland areas, rather than in wetlands. Under the No-Build Alternative, shading impacts to wetlands would be similar to those impacts that already exist under current conditions. Therefore, no additional reduction in sunlight would occur to wetlands beneath the bridge. However, minor impacts to wetland functions and values could potentially occur due to accidental fills or spills resulting from rehabilitation activities and bridge repair and maintenance.

Indirect Effects from the Proposed Project **–** The Proposed Project will result in the need to fill wetlands and open water associated with the bridge and access road. The wetland and open water impacts from the Proposed Project would be similar in nature for each of the alternatives, as they are in close relation to each other, in the amount of fill for the bridge piers and access road. The access road would consist of fill atop the tidal marsh wetlands with a trestle bridge over Old Place Creek where it crosses under the proposed bridge. In addition, security fencing would be placed outside the piers on both the New Jersey and New York sides of the Arthur Kill.

The bridge piers and access road would impact wetlands permanently, as well as create a barrier between the northern portion of the Old Place Creek Complex, and the southern portion of the Complex. Although the trestle over Old Place Creek would allow flow between the northern and southern portions of the Complex, a restriction of sediments, nutrients, wildlife and debris would be confined to pass under the trestle.

A similar effect would result with the security fence installed around the bridge piers, restricting flow of larger fish, wildlife and debris from the area around the piers and the Complex as a whole. This could cause the buildup of debris along the fence and smother the tidal wetland vegetation. Also, the debris and wave action from tidal events and boat wakes could cause the fence to become damaged, thus laying down or being dragged over the tidal wetland vegetation.

The wetland/open water impacts for the bridge alternatives for both permanent and long-term temporary (greater than six months) ranges from 5.27 to 5.59 acres (see Table 5.13-1 of this FEIS), with some variation to the location of the alternative, north or south of the existing bridge. Fill to freshwater wetlands in New Jersey will have an effect on water quality and the marginal wildlife habitat the wetlands provide.

The fill in the tidal vegetated wetlands and open waters of New Jersey and New York will affect water quality, fish/wildlife habitat, sediment/toxicant/pathogen retention, nutrient removal/retention/ transformation, production export (nutrient) and sediment/shoreline stabilization, and flood storage capacity. These direct impacts to wetland functions will be the result of local filling, and will cause indirect impacts over a wide area of the Arthur Kill and Old Place Creek Complex by reducing the acreage of wetlands in the RSA to provide these wetland functions.

Another indirect, albeit negligible effect of filling tidal wetlands/open waters will be an increase in sea level. Although not noticeable and hardly measurable, the fill will displace tidal water, and potentially contribute to sea level rise.

The two Southern Alternatives will result in impacts to the interpier basin on the New Jersey shoreline. Indirect impacts to this open water area would contribute to loss of open water adjacent to the Arthur Kill.

Biotic Communities

Impacts of Past Actions – The natural resources of the Arthur Kill area have previously been significantly altered in order to serve industrial and transportation needs within the NY/NJ harbor area. Historically, shipping was the primary mode of transportation used to export agricultural and industrial products from New York and New Jersey, necessitating the fill of extensive salt marshes, mudflats, and shallow water along the Arthur Kill. Much of the shoreline of this highly industrialized waterway is now bulkheaded or composed of riprap. Areas higher up in the watershed became largely dominated by commercial and residential land use, as well as transportation corridors, resulting in losses of freshwater wetlands and other inland wildlife habitats.

Once a relatively shallow waterway, the Arthur Kill has been dredged to accommodate navigation, and is currently being deepened to 40 feet. Dredging and shoreline alteration have also resulted in permanent alterations of water currents, salinities, temperatures, and dissolved oxygen levels in the Arthur Kill. Urban runoff, wastewater discharges, and combined sewer overflows (CSOs) have contributed to water quality problems associated with low dissolved oxygen levels, pathogenic bacteria, household chemicals, and floatable debris. Landfill leachate has also affected water quality in the Arthur Kill.

The operation of past and present industrial facilities in the Arthur Kill area, including oil refineries, petroleum distribution facilities, and chemical and plastics manufacturers, have resulted in considerable contamination of upland and aquatic habitats by a variety of toxins. Historically, a number of oil spills have had direct impacts on natural resources, most notably in 1990, when a ruptured underwater pipeline released 567,000 gallons of No. 2 fuel oil. Other industrial facilities along the Arthur Kill and elsewhere in the NY/NJ harbor have discharged toxic contaminants into local waterways, resulting in the accumulation of polychlorinated biphenyls (PCBs) and heavy metals in sediments. Many of these toxic contaminants are persistent chemicals that accumulate through the food chain in the tissues of plankton, invertebrates, fish, and birds, which is a phenomenon recognized as a significant environmental issue in the NY/NJ Harbor.

Although the Arthur Kill area is highly urbanized, numerous small areas of natural shoreline, wetlands, and upland habitat still remain. However, in many cases, these natural habitats are degraded due to past human use, invasion by non-native species, and habitat fragmentation, among other effects of development. Many tidal wetland areas have seen their water flow or tidal regimes severely altered and elevations raised by fill creating conditions that force out native species and encourage invasive species such as the common reed (*Phragmites australis*) and tree-of-heaven (*Ailanthus altissima*), which constitute a lower quality wildlife habitat. Corridors for utilities, highways, and railroads have fragmented much of the remaining natural areas along the Arthur Kill.

No-Build Scenario – Recognizing the existing deficiencies of the Goethals Bridge and the need for continued and increasing repair and maintenance of the existing bridge structure, the No-Build Alternative includes future rehabilitation activities in addition to routine repair and maintenance. This work is anticipated to include the replacement of the existing deck as well as various superstructure and substructure maintenance repairs. It is anticipated that the rehabilitation, repair and maintenance work would be conducted on and from the existing decking and superstructure above ground level. As a result, no impacts to the aquatic community are expected, nor are impacts to the special concern species alewife and blueback herring or the candidate species Atlantic sturgeon expected under the No-Build Alternative.

The No-Build Alternative would not result in any wildlife mortality or displacements since construction of bridge piers, construction access roads, and temporary cofferdams would not occur. Required rehabilitation activities and routine repair and maintenance may impact local wildlife communities through visual and noise disturbance, as well as the potential presence of debris due to accidental fills or spills below or adjacent to the existing bridge.

Indirect Effects from the Proposed Project – Indirect effects to biotic communities are those impacts that would be later in time or farther removed in distance from the proposed Goethals Bridge replacement. Overall, the replacement of the Goethals Bridge with a bridge of relatively similar dimensions and alignment is not expected to have significant indirect impacts on biotic communities in the resource study area. However, notable differences from the existing bridge, such as a security fence and potential placement of bridge towers near the mouth of the interpier basin, could result in indirect impacts to biotic communities.

On Staten Island, wetlands along the replacement bridge alignment would be filled to support a permanent construction access and maintenance road. Under all alignment alternatives, the access road would include a trestle crossing of Old Place Creek. The access road and the trestle crossing would be protected by a nine-foot high security fence, composed of PVC-coated chain link wire, with a mesh size of one inch. The access road would create an elevation and habitat change that would functionally fragment the Old Place Creek wetlands and associated uplands along the bridge right-of-way. The access road itself would result in a loss of wetland habitat available to wildlife, ranging from approximately 3.80 to 4.43 acres, depending on the alternative that is chosen (see Table 5.13-2 of this FEIS). The security fence would surround an area of approximately 16 acres, consisting primarily of wetlands associated with Old Place Creek and/or the Arthur Kill. While small mammals and birds would be able to cross the access road and forage in wetlands within the fence, somewhat larger wildlife species (i.e., diamondback terrapins, raccoons, etc.) could be excluded from the area. Terrestrial wildlife may be prohibited from crossing under the access road trestle along the banks of Old Place Creek, depending on the design and span length of the trestle. The proposed access road would also fragment wetland foraging habitat for herons. Being relatively large birds, herons require a certain amount of horizontal distance in order to fly over a 9-foot tall obstacle, and such movement would impose additional energy expenditure, so overall, the fence would reduce the quality of adjacent wetlands as heron foraging habitat.

Despite the lack of nesting in the Arthur Kill, a variety of heron species continue to forage regularly along Old Place Creek and Goethals Bridge Pond and adjoining wetlands which encompass NYSDEC's Harbor Herons Bird Conservation Area. Either of the two Northern Alternatives for the Goethals Bridge Replacement includes the relocation of Goethals Road North along the western boundary of the Harbor Herons Bird Conservation Area (to the west of Goethals Bridge Pond). As this wetland is buffered from developed areas by a forest, and no road currently exists along this wetland edge, heron foraging habitat is relatively undisturbed, but would be adversely impacted under the Northern Alternatives due to constant passage of truck traffic from the New York Container Terminal. Disturbance to areas adjacent to heron foraging habitat may indirectly affect herons by degrading foraging habitat quality and potentially reducing the time herons spend foraging or otherwise impact their foraging efficiency.

Because of the lack of wetlands and vegetated upland habitats on the New Jersey side of the Arthur Kill, indirect impacts to terrestrial wildlife communities are expected to be negligible.

Indirect impacts to plankton, fish and benthic species would result from the placement of the New Jersey main span pier at the mouth of the interpier basin under the Existing Alignment South and New Alignment South alternatives. Placement of a pier at this location will significantly reduce tidal flushing of this shallow 3-acre area, permanently altering water quality and sedimentation patterns over time. The main pier will largely isolate the interpier basin's waters from the temperature-moderating effect of daily tidal flushing. Reduced water exchange with the Arthur Kill will result in reductions in dissolved oxygen and increased water retention times of the interpier basin, likely increasing sedimentation rates and the buildup of stormwater runoff contaminants. These physical habitat changes will likely result in reduced benthic species diversity and abundance in the interpier basin, with associated impacts to fish species which feed on benthic organisms. While fish use of the interpier basin appears to be limited to small numbers of just a few species, the water quality and habitat changes which would occur under either of the Southern Alternatives will further reduce habitat quality of this area for predatory and forage fish species.

Operationally, the increased impervious area of the wider bridge structure will result in significantly more stormwater runoff, which will ultimately be discharged to the Arthur Kill. Stormwater runoff from roadways contains contaminants including metals, phosphates, de-icing agents, suspended solids, oil and grease, rust, rubber particulates, and engine coolants. Discharge of untreated stormwater would result in the transport of these contaminants throughout the Arthur Kill, its tributaries and associated wetlands, thereby indirectly impacting aquatic communities beyond the immediate project area. These effects would be mitigated by implementation of a Stormwater Pollution Prevention Plan (SWPPP) which would ensure that most of the contaminants would be removed from bridge stormwater prior to discharge. Therefore, indirect effects to biotic communities from erosion and stormwater are expected to be negligible.

Traffic

No-Build Scenario – By 2034, No-Build travel demand at the Goethals Bridge is forecast to grow by 46 to 60 percent in the off-peak direction of travel and 19 to 23 percent in the peak direction. This would result in more directionally balanced flows during the peak hours than currently occurs, although the peak direction would remain the same as today. During the peak hours, the peak direction of traffic will be operating at LOS F. Much of Bayway Avenue in Elizabeth is also forecast to operate in the future No-Build condition at LOS F in both the AM and PM peak hours. Similarly, several sections along the SIE are forecast to operate at LOS F in the No-Build condition, while even longer queues than currently occur are forecast at the New Jersey Turnpike Interchange 13 toll plaza approaches. Both the Gulf Avenue/Forest Avenue and Goethals Road North/Forest Avenue intersections in Staten Island are forecast to operate at LOS F in the future No-Build condition.

Indirect Effects from the Proposed Project – The Proposed Project would significantly improve traffic operations at the Goethals Bridge, even with the increased demand that would be generated in response to the additional capacity at the crossing (i.e., three lanes in each direction on the Goethals Bridge replacement, compared to the current two lanes in each direction). However, the increase in traffic volume resulting from the new bridge would, in turn, impact several sections of the Staten Island Expressway (I-278) between the Goethals Bridge and Richmond Avenue, as well as some interchange areas. While several sections along this stretch of the Staten Island Expressway are forecast to operate at LOS F in the No-Build, i.e., absent the Proposed Project, the traffic demand and resulting queues would increase with the six-lane Goethals Bridge. Indirect effects resulting from these increased queues could include increased wait time for emergency vehicles, increased commute times for workers using these routes and subsequent use of other routes, increased wait time and consequent increased vehicle idling time resulting in potentially decreased air quality locally.

Locally in the New Jersey portion of the study area, on Bayway Avenue, Route 1, South Broad Street and Brunswick/Atlantic avenues, project-induced increases would be small (i.e., generally less than 5 percent), except at a few isolated locations along Broad Street and Atlantic Avenue. Most of the traffic forecast to use this corridor after project implementation is similarly forecast to use these routes in the No-Build condition. Project-induced traffic increases would also be small on the local streets in the vicinity of the Verrazano-Narrows Bridge, at the east end of the Goethals Bridge corridor, and somewhat larger in the HHMT area in the immediate vicinity of the Goethals Bridge.

Air Quality

No-Build Scenario – Future air quality levels in the RSA in the No-Build condition would likely be somewhat improved over existing levels. While increases in traffic volumes are anticipated, increases in emissions from the additional traffic are anticipated to be more than offset by emission reductions resulting from the federally mandated use of cleaner vehicles. In addition, emission reduction programs being implemented by the states of New Jersey and New York for their State Implementation Plans (SIPs)

are designed to achieve compliance with the National Ambient Air Quality Standards (NAAQS) for all of the criteria in future years.

Indirect Effects from the Proposed Project – Project-related air quality effects result from changes in local and regional traffic conditions. The Proposed Project would increase traffic volumes on several sections of the Staten Island Expressway (I-278) between the Goethals Bridge and Richmond Avenue, as well as some interchange areas. In the New Jersey portion of the study area, on Bayway Avenue, Route 1, South Broad Street and Brunswick/Atlantic, project-induced increases in traffic volumes would be small, generally less than 5 percent, except at a few isolated locations along Broad Street and Atlantic Street. Project-induced traffic increases would also be small on the local streets in the vicinity of the Verrazano-Narrows Bridge, at the east end of the Goethals Bridge corridor, and somewhat larger in the HHMT area in the immediate vicinity of the Goethals Bridge.

As discussed in Section 5.21, no significant air quality impacts, locally or regionally, are projected with the Proposed Project, although the GBR will affect traffic patterns and volumes on select local streets and regional highways. Similarly, no indirect air quality effects are anticipated with the Proposed Project.

5.24.8.3 Cumulative Impacts

Cumulative impacts are assessed by considering the total environmental impact resulting from the direct and indirect effects of project, past actions and reasonably foreseeable future actions. This section describes the cumulative impacts on each of the selected resources by first presenting the no-build scenario for that resource, and then describing the possible cumulative impacts to the resource.

Wetlands

Impacts from Other Reasonably Foreseeable Future Actions (No-Build Scenario) – The resource study area contains a highly developed nature around the Arthur Kill and associated streams/wetlands. Several reasonably foreseeable future actions could indirectly impact wetlands and/or open waters that are hydrologically connected to other wetland/water resources associated with the Proposed Project. Impacts by these other projects could have effects on the areas resources, including increased stormwater and sediment discharges to wetlands/open waters, and reduction and/or impairment of wildlife habitat in wetlands/open water.

The remediation and operation of the Jay Cashman dredged material processing facility (former Borne Chemical site) could potentially have discharges of sediments and pollutants into the Arthur Kill, thus affecting the health of the vegetation in tidal marshes.

Development of the former GATX site, which is directly south of and connected to Old Place Creek, would have the potential to introduce sediments and pollutants into the Creek. Also, as the site has a large number of wetlands, a developer may wish to fill some of these wetlands for a larger development site, thus reducing the acreage of wetlands in the RSA. However, it is anticipated that there is sufficient upland on the former GATX property to accommodate the as-of-right development that could occur on the property, thereby avoiding direct impacts to wetlands.

The New York Container Terminal's Howland Hook Program Expansion (including the Parcel C project) would result in the fill (approximately 17.66 acres anticipated) of wetlands located north of the existing Goethals Bridge along the Arthur Kill that are hydrologically connected to those wetlands and open waters of Old Place Creek. When combined with the Proposed Project, the cumulative impact would be a decrease in tidal wetland acreage and wildlife habitat.

Howland Hook Marine Terminal Eastbound Ramp Access Improvement would result in minor fill to wetlands associated with the Old Place Creek complex (estimated less than one acre).

As proposed by the U.S. Army Corps of Engineers, the Arthur Kill Channel Deepening Program will continue work on deepening the channel from its inception in 2003 through 2009. Potential impacts to the Arthur Kill would result in disturbed sediment being introduced to the water column in the form of turbidity, thus impacting tidal wetland vegetation, potentially in and around the Goethals Bridge by increasing sediment fill and decreasing the availability of light to wetland plant species. A decrease in light could inhibit the growth of these plant species which provide food for wildlife.

The West Shore Expressway Corridor/Service Road Improvements, as well as the reconstruction of the West Shore Expressway/Staten Island Expressway Interchange, as proposed by NYSDOT could have impacts associated with fill to wetlands that are currently and formerly part of the Old Place Creek Complex to the east of the Goethals Bridge.

A proposed NYSDEC Old Place Creek Site Access plan is being considered on a parcel of land south of the Port Authority's toll plaza on Staten Island. The proposed site access would entail a canoe launch area and wildlife view platforms as well as connecting trails. Potential impacts to the Old Place Creek Complex could be earth disturbance and sediment runoff into the creek and erosion/vegetation loss of the tidal wetland by pedestrian traffic using the area for fishing and other recreation activities.

Identify and Assess Cumulative Impacts – Those projects that are directly adjacent to the Goethals Bridge project area and the Old Place Creek Complex will have a more significant impact on the Old Place Creek Wetlands than those projects that are expected to affect wetlands that are hydrologically further removed from the Complex. However, in assessing cumulative impacts to wetlands in the RSA, it is important to take into consideration all incremental impacts in the RSA. The incremental impacts of all these projects (if constructed) and the impacts resulting from replacement of the Goethals Bridge will result in cumulative impacts to wetlands, wetland habitat and open waters in the RSA.

The reasonably foreseeable future projects discussed above would each result in either the disturbance of wetlands in the RSA by introducing sediment and pollution, and/or filling of wetlands for development which would result in the loss of wetlands and associated wetland habitat. These impacts combined with the impacts resulting from the replacement of the Goethals Bridge would have the cumulative impact of decreasing the quality and quantity of the remaining wetlands in the resource study area. However, with the proper implementation of wetland mitigation for impacts associated with each of these projects, with the goal of achieving no net loss of wetlands, it is expected that cumulative impacts would be minor.

Biotic Communities

Impacts from Other Reasonably Foreseeable Future Actions (No-Build Scenario) – Because the resource study area for biotic communities is densely urban and industrialized, ongoing and future activities, including the proposed Goethals Bridge replacement, may cumulatively affect terrestrial and aquatic communities. Development projects recently completed or proposed for the area include the As-of-Right Development of the Former GATX Site, the New York Container Terminal expansion (including the Parcel C project), the West Shore Expressway Corridor/Road Service Improvement Project in Staten Island, and the Jay Cashman Dredged Material Processing Facility in Elizabeth, NJ. Regional transportation projects in the Goethals Bridge Study Area include the Staten Island Freight Rail Reactivation, completed in 2006, and the Arthur Kill Channel Deepening Program, which will deepen the 35-foot channel to 40 feet. For more information on these projects, please refer to Appendix C of this FEIS.

Future habitat restoration projects in the resource study area are likely to include wetlands restoration and enhancement efforts at sites in western Staten Island and may include forest restoration of the former heron rookeries on the Arthur Kill islands. While the former heron nesting sites at Shooters Island, Pralls Island, and Isle of Meadows are not currently active, there are a number of heron rookeries in the NY/NJ

Harbor. As habitat restoration projects in the NY/NJ harbor are undertaken in the future, these rookeries could become re-established. Due to the nearness of the Old Place Creek wetlands to the former heron rookeries in the Arthur Kill, the permanent loss of wetlands in the immediate project area could affect the likelihood or timing of these rookeries becoming active in the future.

Identify and Assess Cumulative Impacts – Virtually all development at upland sites in the area will result in the loss of upland wildlife habitat. Upland development will also lead to increases in the amount of impervious surfaces in the area, in the form of asphalt, concrete, rooftops etc., which will result in increased stormwater runoff volumes. These contaminants would ultimately be discharged to wetlands and waters of the Arthur Kill and Old Place Creek, degrading water and sediment quality and adversely impacting fish and benthic organisms.

Development of the GATX site, which borders Old Place Creek, will likely impact both terrestrial and aquatic communities through impacts to water quality. Increases in impervious surface areas and vehicle traffic would increase stormwater and contaminant runoff from the site, degrading water quality of receiving waters. Increased runoff would also increase sedimentation in Old Place Creek, affecting benthic communities. As aquatic species in the area (i.e., fish, crabs) are a significant food source for local wildlife, degraded water quality would affect the condition this resource. Also, natural succession following the cessation of industrial activity at this site has resulted in habitat that supports some wildlife species. Development of the site would result in loss of this habitat and the wildlife it contains. Impacts to aquatic wildlife and habitats from the proposed Goethals Bridge replacement project would be largely limited to the period of construction, as any wetland losses must be mitigated on a per-acre basis. However, the Proposed Project would result in the permanent loss of up to 4.04 acres of upland habitat, depending on the specific alignment alternative (see Table 5.13-1 of this FEIS). While this upland habitat is generally disturbed and represents a small area relative to the GATX site, it is a measurable loss of habitat for terrestrial wildlife in the area.

Dredging the Arthur Kill for the 40-foot deepening program, along with any in-water work done in conjunction with improvements and expansion of the New York Container Terminal and the proposed Jay Cashman Dredged Material Processing Facility, will cause the resuspension of considerable volumes of sediment. Stormwater runoff and potential spillage during the offloading and processing of dredged materials at the proposed Jay Cashman Dredged Material Processing Facility could increase turbidity as well as release historic contaminants to waters and sediments of the Arthur Kill and its tributaries. While these activities would be short-lived, they would result in periods of increased turbidity and sediment deposition, causing physiological stress on fish and invertebrates which support herons and other waterbirds. In-water construction and demolition activities for the proposed Goethals Bridge replacement project would be confined to areas within cofferdams, and would be very short-lived in comparison to the above-mentioned projects, and so would only constitute a very minor amount of cumulative impacts to water quality that could affect biotic communities.

Development of Parcel C would result in the loss of upland wildlife habitat. Since commercial activity at this site ceased, it has been colonized by trees, shrubs, and herbaceous species which, although disturbed, serves as important habitat amidst an active industrial area. Because much of the shoreline in NY/NJ harbor has been developed, there is a limited amount of shallow water habitat remaining for species such as mummichugs and crabs. Herons and other waterbirds depend upon these shallow water prey species. Development of Parcel C would result in the loss of shallow water habitat available to herons, other waterbirds, and their fish and crustacean prey.

Increases in the numbers of ships and barges tied up at the proposed new or expanded facilities along the Arthur Kill will increase shading of the water, impairing foraging for fish requiring sight and light for feeding. Increases in ship traffic will likely result in proportionate increases in the accidental discharges of oils and other ship-based pollutants and accidental spills to the Arthur Kill and associated wetlands and tributaries. Increases in shipping traffic, especially vessels which spend time tied up in the area, increases

the potential for introduction of invasive marine invertebrate species through ballast water discharge or transportation via fouling hull communities. Increased shipping and barge activity for the Proposed Project would be limited to the period of construction, constituting a very minor amount of potential cumulative shipping-related water quality and habitat-related impacts in the resource study area.

Excavation of soils during the construction of future commercial developments in the area creates the potential for erosion and resultant sediment transport to waters of the Arthur Kill and Old Place Creek. Expansion of NYCT and development of Parcel C would increase impervious surface areas, increasing stormwater runoff and the transport of contaminants and sediments to wetlands and waters of the Arthur Kill system, impacting aquatic communities and the terrestrial wildlife that they support. Likewise, construction of development-related roadways would cause increases in stormwater runoff and associated impacts to area surface waters. If development is not properly designed and managed, other impacts on area waters could result from increased sedimentation and other pollutants. As mentioned previously, the proposed Goethals Bridge replacement project would result in permanent losses of up to 4.04 acres of upland habitat, depending on specific alignment alternative (see Table 5.13-1 of this FEIS). While this represents a small area relative to Parcel C, it still would represent a loss of habitat for terrestrial wildlife in the area. The Proposed Project would also result in the loss of some shallow water habitat (due to the construction of tower footings) available to herons, waterbirds, and their prey; however, the removal of the existing bridge would result in the restoration of a similar amount of such habitat. While the Proposed Project would result in an increase of stormwater runoff, expansion of NYCT and development of Parcel C would result in considerably more land cover by impervious surface. Additionally, the proposed replacement bridge's stormwater increases would be mitigated by implementation of a Stormwater Pollution Prevention Plan (SWPPP) which would ensure that most of the solids would be removed from the stormwater prior to discharge.

Traffic

Impacts from Other Reasonably Foreseeable Future Actions (No-Build Scenario) – In addition to the Proposed Project, the following projects have been identified as programmed and committed to be implemented by the future design year (2034), and have been assumed to be constructed with or without the construction of the proposed Goethals Bridge replacement:

- Staten Island Expressway median bus lane, extending from the Verrazano-Narrows Bridge to Slosson Avenue;
- West Shore Expressway Service Road improvements;
- Staten Island Railroad reactivation to/from HHMT;
- Various ferry services (Elizabeth, Bayonne, South Amboy) to Lower Manhattan;
- HHMT build-out (Parcel C); and
- As-of-right development on the former GATX property.

Several other projects have also been identified as reasonably foreseeable and, therefore, have been considered in the forecasting of potential future cumulative traffic conditions in the RSA:

- Eastbound HHMT access improvements;
- I-278 / U.S. Route 1&9 Interchange Ramps Studies (formerly known as the Missing Links Study); and
- Staten Island Expressway mainline and interchange improvements from the Goethals Bridge to Richmond Avenue.

The No-Build Scenario for traffic is presented in Section 5.20, *Traffic and Transportation*.

Identify and Assess Cumulative Impacts – A qualitative assessment of future cumulative traffic conditions in 2034, assuming implementation of the Proposed Project as well as other programmed and committed and reasonably foreseeable projects, indicates the following conditions at key crossings and at other key locations:

- on the new 6-lane Goethals Bridge, the managed-use lane (MUL with one lane in each direction, operating during peak commuting periods, for buses and HOVs) would have free-flowing travel conditions, while the two general-use lanes in each direction would be moderately congested, compared to heavily congested conditions on the existing Goethals Bridge with the No-Build Alternative;
- the Outerbridge Crossing and the Verrazano-Narrows Bridge, both forecast to be heavily congested in the future without the Proposed Project, would also be heavily congested with the cumulative effects of the Proposed Project and other future projects affecting regional travel;
- the Bayonne Bridge is forecast to be only lightly congested in 2034 in any scenario;
- in the New York portion of the RSA:
  - on the Staten Island Expressway, the general-use lanes would be moderately to heavily congested, while NYSDOT's bus/managed lanes (one in each direction) would be free-flowing in any scenario; and
  - local roadways in the Goethals Bridge and HHMT vicinity are forecast to be uncongested as a cumulative consequence of future projects, compared to moderately to heavily congested in the future without the Proposed Project;
- in the New Jersey portion of the RSA:
  - New Jersey Turnpike Interchange 13 would continue to be heavily congested, as is forecast under any scenario;
  - the Route 1&9 corridor would be moderately to heavily congested as a consequence of the cumulative effects of future projects, similar to its condition in the future without the Proposed Project; and
  - in the Bayway Avenue/Circle corridor, traffic conditions would improve to uncongested conditions with the cumulative effects of the future projects.

The Goethals Bridge replacement, in combination with the other programmed/committed and reasonably foreseeable projects, would improve overall traffic conditions in the RSA. In addition to the project-specific traffic benefits that would be anticipated, the cumulative effect of all of the transportation improvements would be generally improved traffic conditions in the RSA.

Air Quality

Impacts from Other Reasonably Foreseeable Future Actions (No-Build Scenario) – Projects considered in the assessment of potential cumulative air quality effects are the same as those identified in the above cumulative assessment of traffic, which lists the programmed and committed projects and reasonably foreseeable projects that would occur by 2034.

Identify and Assess Cumulative Impacts – As the Goethals Bridge corridor is an important link in the regional transportation network, changes to the Goethals Bridge, as is proposed, when coupled with other past, present and reasonably foreseeable projects that could affect air quality levels in the regional study area, may result in cumulative air quality effects. These effects may occur both on a localized basis (resulting from changes in local traffic conditions, roadway alignments, and signal timing) and a regional basis (resulting from changes in regional traffic patterns, vehicular miles of travel, and/or vehicular speeds).

On the basis of forecasted traffic conditions at locations along each of these corridors both with and without the Proposed Project, locations with the greatest changes in pollutant levels and where the highest pollutant levels could be anticipated in 2034 were identified. Localized air quality levels were then estimated at the locations anticipated to be most affected by the Proposed Project. The result of those analyses is that localized air quality levels with the Proposed Project would be similar to levels without the Proposed Project (i.e., No-Build Alternative), and that the project would not cause or exacerbate a violation of the NAAQS. On a regional basis, emissions of the applicable air pollutants, as well as greenhouse gases, are forecast to decrease slightly with the Proposed Project. In addition, mobile source air toxic (MSAT) emissions in the study area are likely to be lower in the future, with or without the Proposed Project, than current levels (see Section 5.21).

Considering the cumulative effect of other reasonably foreseeable projects in conjunction with past and current projects, projects assumed in the future No-Build condition, and the proposed GBR, future traffic conditions in 2034 will exhibit relatively small changes on the Outerbridge Crossing, the Verrazano-Narrows Bridge, the Bayonne Bridge, the Staten Island Expressway, the New Jersey Turnpike, and along the Route 1&9 corridor. In other locations (e.g., local roadways in the Goethals Bridge and HHMT vicinity, Bayway Avenue/Circle corridor), future traffic conditions resulting from the cumulative effect of the GBR and other projects will be improved, compared to No-Build conditions and to conditions with the Proposed Project. Consequently, the qualitative assessment of future cumulative air quality conditions predicts no deterioration, compared to No-Build conditions.

5.24.9 Step 7 – Evaluate Analysis Results

The purpose of Step 7 is to evaluate the uncertainties in the methodology used to evaluate impacts, in order to better understand the analysis results. The major areas of uncertainty in the analysis include:

- Errors and uncertainty in source GIS data.
- Error in relying on past trends as indicator of future trends.
- Uncertainty of transportation forecasting models to accurately predict growth and travel patterns.
- Error in current and future vehicular emission rates under projected traffic conditions and uncertainty in the accuracy of the air quality dispersion model.

The assessment of cumulative impacts includes the uncertainties associated with the development of the No-Build Alternative, and the direct and indirect effects of the Build Alternatives. Cumulative impacts also include uncertainty associated with the potential interaction of project and non-project related effects on the environment (e.g., synergistic effects, non-linear responses). There is also substantial uncertainty in developing reasonable assumptions about future regulatory conditions that will serve to influence the location and type of future development. Therefore, it can be concluded that there is greater uncertainty associated with the cumulative impacts assessment than with any of its individual components (i.e., No-Build, direct impacts and indirect effects). Despite the uncertainty inherent to any cumulative impacts assessment, the evaluation of direct, indirect and cumulative impacts for the Goethals Bridge Replacement has followed the NEPA CEQ regulations at 40 C.F.R. § 1508, and the level of uncertainty does not alter the basic conclusions of the analyses.

The Goethals Transportation Model (GTM) was developed and detailed specifically for the Goethals Bridge corridor for use in forecasting travel demand and subsequently analyzing potential project-related traffic impacts for the GBR EIS. Traffic data, collected to characterize existing traffic conditions in the RSA, were used to calibrate the GTM's representation of the base traffic condition. Future traffic levels anticipated from major trip generators in the RSA and from programmed and committed projects were obtained from facility operators and project sponsors, in order to represent their contributions to future

traffic conditions as accurately as possible. However, as with all travel demand forecasting models, there is an inherent uncertainty in the degree to which the GTM can accurately forecast growth in travel demand and changes in travel patterns.

CO emission factors were estimated using USEPA's MOBILE 6.2.03 (EPA420-R-03-010), the most current version of the mobile emission factor algorithm model. USEPA's CAL3QHC mobile source dispersion model was used to estimate pollutant concentrations near the congested intersections and heavily traveled roadways that are predicted to be affected by the Proposed Project. While the results obtained using these models cannot be considered exact, both of these models were developed and are recommended for use by the USEPA and local environmental agencies, and both represent the state-of-the-art in estimating pollutant levels near roadways.

5.24.10 Step 8 – Assess Consequences and Develop Mitigation

The purpose of Step 8 is to assess the consequences of the impacts and to develop strategies to address unacceptable impacts, which occur when an impact identified in Step 6 conflicts with a goal identified in Step 2 or with a notable feature identified in Step 3. The cumulative impact analysis identified minor impacts to the notable features, such as wetland impacts and impacts to biotic communities. The majority of these impacts would be the result of continued development in the area and cannot be controlled or mitigated for solely by the Port Authority as the project sponsor, or by the lead Federal agency.

5.24.10.1 Wetland Mitigation

Indirect effects and cumulative impacts to wetlands in the RSA can result from the Proposed Project and other reasonably foreseeable future actions. Mitigation for wetland impacts is proposed via several components: 1) minimization and avoidance of wetlands/open waters where possible; 2) restoration of temporary impacts and plantings; and 3) on-site and off-site wetland restoration/enhancement for unavoidable permanent wetland impacts. Similarly, for those projects that would impact wetlands and are outside the direct control of the Port Authority, the project sponsor, impacts could be mitigated by those other project sponsors in a manner similar to that proposed for the Goethals Bridge Replacement Project. This includes restoration and/or enhancement to existing wetlands in the RSA by the other Proposed Project sponsors. It is recommended that compensatory mitigation for the direct and indirect project impacts be near existing or proposed wetland mitigation areas to increase the amount of enhanced habitat created.

Another example of mitigation that could take place in order to mitigate the indirect effects and cumulative impacts of other projects in the RSA include enhanced stormwater and sediment controls for remediation and construction projects in the RSA to further reduce impacts to wetlands and open water habitats.

5.24.10.2 Biotic Communities

Properly mitigated, indirect and cumulative impacts to biotic communities and their habitats within the resource study area, in concert with impacts stemming from the above-mentioned commercial and transportation development activities, are expected to be minimal. In-water work would be conducted within cofferdams, greatly minimizing sediment resuspension that can indirectly affect foraging habitat for wading birds and other shorebirds. During construction, appropriate soil erosion and sediment control measures would be implemented to minimize the loss of soil during excavation and grading. The implementation of a Stormwater Pollution Prevention Plan (SWPPP) would ensure that most contaminants in stormwater would be removed prior to discharge to local surface waters, minimizing indirect impacts to wildlife and their foraging habitat.

Habitat fragmentation of the expansive wetlands and adjacent uplands would occur from placement of a security fence along the New York portion of the alignment. This could be mitigated by designing the access road trestle crossing of Old Place Creek so that a continuous riparian corridor exists along both shorelines. Terrestrial wildlife would then be able to cross under the fenced-in access road between the north and south sides of the replacement bridge at all stages of the tide, reducing the impact of habitat fragmentation.

5.24.10.3 Traffic

As described in Section 5.20.4, mitigation measures proposed to address project-related traffic impacts comprise a combination of a managed use lane on the GBR and a series of transportation system management (TSM) measures. Implementation of the identified reasonably foreseeable projects, in addition to the programmed/committed projects and the Proposed Project, is anticipated to result in generally improved traffic conditions in the RSA. Thus, while mitigation for traffic impacts resulting from a given future project, e.g., the I-278 / U.S. Route 1&9 Interchange Ramps Studies (formerly known as the Missing Links Study), may be warranted, such mitigation would likely be local in scope, the details of which would need to be defined during those future projects' environmental review and approval processes.

5.24.10.4 Air Quality

As described in Section 5.21, since the Proposed Project would not cause a localized violation of a NAAQS or increase regional pollutant emission rates, no mitigation measures are warranted during the operation phase of the project. However, construction-phase mitigation measures will be implemented to mitigate localized impacts near construction areas. As the cumulative effect of past, present, and reasonably foreseeable projects, in concert with the Proposed Project and federal- and state-mandated programs for cleaner vehicles and emissions reductions are anticipated to result in improved air quality levels in the future, air quality-related mitigation is not expected to be necessary.

5.25 Unavoidable Adverse Impacts

The Proposed Project will result in unavoidable adverse impacts regardless of the Build Alternative to be selected. Unavoidable adverse impacts are generally referred to as impacts that are considered to be adverse in nature for which no reasonable mitigation measures can be applied to resolve or eliminate the magnitude or extent of impact to either the man-made or naturally-occurring environment, and for which no practical or feasible modifications to the project could be made that would still meet the project's purpose and serve to eliminate the impact without causing similar adverse impacts. The Proposed Project will result in several key unavoidable adverse impacts which are summarized in Table 5.25-1 and further detailed in the following sections.

5.25.1 Unavoidable Adverse Impacts to Residential and Business Properties

The Proposed Project will result in adverse impacts to local residential and business properties resulting in the displacement of local residents and/or business operations and employees.

The New Alignment South and the Existing Alignment South will both result in the displacement of an estimated 51 residential units in Elizabeth, with an estimated population of 130 persons. The New Alignment South and the Existing Alignment South will also both result in the displacement of up to eight active businesses, with an estimated employment loss of 110 jobs. Either of the Southern Alternatives will also result in operational impacts to two businesses and the relocation of two commercial billboards.

TABLE 5.25-1
SUMMARY OF KEY UNAVOIDABLE ADVERSE IMPACTS

Resources	New Alignment South	Existing Alignment South	New Alignment North	Existing Alignment North
Unavoidable Adverse Impacts to Residential and Business Properties				
Residential Units Displaced (estimated persons)	51 (130)		none	11 (29)
Active Businesses Displaced (estimated jobs)	8 (110)		3 (60)	4 (77)
Unavoidable Adverse Impacts to Historic Resources				
Direct (demolition) effects	1 (Goethals Bridge)			
Indirect (visual) effects	2 (SIRR Historic District & AK Lift Bridge)			
Unavoidable Adverse Impacts to Biotic Communities				
Long-Term Impacts to Aquatic Habitat of Interpier Basin	Yes		none	
Total Permanent Habitat Loss (acres)	9.63	8.48	8.35	8.12
Upland Habitats	4.04	3.21	2.78	2.58
Wetland Habitats **	5.59	5.27	5.57	5.54
Unavoidable Adverse Impacts to Traffic				
Unmitigated Traffic Locations at NJ Turnpike Int. 13	2			
Unmitigated Traffic Locations along SIE	7			

Note:
** These values include total permanent impacts to wetlands/open waters, including those long-term temporary ones that longer than six months (see Table 5.13-1 of this FEIS).
Source: Berger/PB, 2008

The Existing Alignment North will require the displacement of an estimated 11 residential units and approximately 29 persons in Elizabeth. The Existing Alignment North will also displace up to four active businesses, with an estimated employment loss of 77 jobs. Although the New Alignment North will not require the displacement of any residences, it will displace three active businesses, with an estimated employment loss of 60 jobs. Either of the Northern Alternatives will also result in several operational impacts within the New York Container Terminal (NYCT) and the relocation of three commercial billboards.

For authorized projects, the States of New Jersey and New York have empowered the Port Authority to acquire real property required for a public purpose by exercise the power of eminent domain by condemnation. Both the federal and New York and New Jersey Constitutions require payment of just compensation for private property taken by condemnation for a public purpose. It is anticipated that the Port Authority would acquire the real property interests necessary to effectuate the Proposed Project by negotiation and/or by condemnation. The exact timing of property acquisition cannot be predicted at this time as completion of the environmental impact review process, the issuance of permits and appropriate authorizations have not yet occurred. At the appropriate time (i.e., project authorization), the Port Authority's representatives would contact property owners in connection with the conduct of site investigations, including surveys and appraisals to assist in the evaluation of the fair market value of the properties.

While programs are in place to compensate residential and business owners for their incurred costs related to displacement and/or relocation, these impacts are still considered to be adverse and unavoidable. In addition, although the construction of the Proposed Project will generate new construction employment opportunities and result in increased local spending that could further generate or support new

employment opportunities, the displacement of employees from their current employers as a result of the Proposed Project is still considered to be an adverse and unavoidable impact.

In New Jersey, the Proposed Project will result in the displacement of some residences that are considered to be low-income and/or minority households. Although impacts to low-income and minority residents are considered to be unavoidable and adverse, they are not considered to be disproportionate.

5.25.2 Unavoidable Adverse Impacts to Historic Resources

The Proposed Project will have an adverse effect on three historic properties (i.e., the Goethals Bridge, the Staten Island Railroad District in Elizabeth and the Staten Island Railway Lift Truss Bridge over the Arthur Kill). All of the Build Alternatives will result in the demolition and replacement of the existing Goethals Bridge. As a result, the Proposed Project will result in an unavoidable and adverse impact to the Goethals Bridge structure, a National Register Eligible structure. Although consultation between the US Coast Guard and the New Jersey and New York State Historic Preservation Offices (SHPOs) will serve to identify mutually agreed upon mitigation, the impact to this historic structure is still considered to be adverse and unavoidable.

Although the Proposed Project would not cause physical damages, alter the character-defining features of, or change the character of either the Staten Island Railroad Historic District in Elizabeth or the Staten Island Railway Lift Truss Bridge over Arthur Kill, the visual elements surrounding and adjacent to these two historic resources would be changed whereas new physical features would be introduced. The proposed removal and replacement of the Goethals Bridge, regardless of alignment, would also result in an adverse and unavoidable visual effect on both the Staten Island Railroad Historic District and the Staten Island Railway Lift Truss Bridge over Arthur Kill. Although mitigation measures will be coordinated with the representative SHPO offices, the impacts are considered to be adverse and unavoidable.

5.25.3 Unavoidable Adverse Impacts to Biotic Communities

Potential impacts to biotic communities could result from the construction and operation of a new bridge and the demolition of the existing bridge. Potential impacts will include those to uplands, wetlands, and open waters; wetland restoration sites; wildlife; endangered and threatened species and/or their habitat; and aquatic communities, particularly essential fish habitat.

Upland habitats in the Goethals Bridge Study Area that will be affected by the Proposed Project consist primarily of successional shrubland, with lesser amounts of urban non-native forest and mowed lawn. Permanent impacts will result from increases in areas that would be paved or permanently lost as a result of the bridge's pier footings, the proposed permanent construction, maintenance and security access road, and the proposed fencing. Permanent losses of upland habitats due to the four Build Alternatives would range from 2.58 to 4.04 acres (see Table 5.25-1 of this FEIS). These impacts are considered to be adverse and unavoidable.

The Goethals Bridge Study Area contains a number of wetland habitat types, including low and high salt marsh, mudflats, freshwater wetlands and open water. The majority of wetlands/open waters which would be impacted by the Proposed Project are on the New York side of the Arthur Kill, where Old Place Creek and its associated salt marsh wetlands is a dominant feature. Permanent wetland impacts would primarily result from the placement of fill along the proposed bridge alignment for the construction and maintenance of the replacement bridge and the placement of bridge pier footings.

Permanent impacts (including those long-term temporary impacts longer than six months) to wetlands/open waters will range from 5.27 to 5.59 acres, depending on the Build Alternative selected (see Table 5.25-1 of this FEIS). These impacts would primarily be to low salt marsh habitat and/or high salt

marsh habitat. Although these acreages are treated as permanent takings per state and federal policies because they would all be in place for more than six months, impacts caused by the access road fingers under the proposed bridge would be temporary in nature since they would be removed and the wetland habitat restored after existing bridge demolition and construction of the new bridge is completed. As a result, a total of 1.00 to 1.71 acres of the total permanent acreage presented above are actually temporary in nature (see note of Table 5.13-1 of this FEIS). Temporary impacts due to fill placement of less than six months which is attributed to the construction of cofferdams would range between 0.20 and 0.27 acres, depending on the Build Alternative selected (see Table 5.13-2 of this FEIS). Furthermore, the four Build Alternatives are expected to impact existing wetland restoration sites. Impacts to these sites would range from 0.14 acres to 0.45 acres of wetlands (see Section 5.13.4.4 of this FEIS).

Although Best Management Practices would be used to minimize potential impacts to wetlands and wetland mitigation would compensate for permanent impacts to wetlands, these impacts are considered to be adverse and unavoidable. Depending on the Alternative, the Proposed Project would result in a permanent habitat loss of uplands and wetlands combined ranging from 8.12 to 9.63 acres (see Table 5.25-1 of this FEIS).

A variety of estuarine aquatic habitats are present in the Goethals Bridge Study Area. These habitats support diverse biotic communities, including phytoplankton, zooplankton, benthic and epibenthic invertebrates, and fish communities. The proposed construction of a new bridge under any of the four Build Alternatives and removal of the existing bridge would result in comparatively limited and largely temporary impacts to aquatic communities. The placement of a main span pier at the mouth of the interpier basin under the New Alignment South and Existing Alignment South alternatives would reduce tidal flushing in the interpier basin, resulting in reduced dissolved oxygen levels and increased sedimentation and water temperatures in this area. While fish use of the interpier basin appears to be limited to small numbers of just a few species, these water quality and habitat changes would reduce habitat quality of the interpier basin, likely resulting in reduced use of this area by fish, particularly forage fish such as bay anchovy and Atlantic silverside.

Construction of either of the Southern Alternatives would reduce water exchange between the Arthur Kill and the interpier basin, with probable adverse effects on water quality, benthic habitat, and fish and benthic abundance and diversity in this shallow three-acre area. This impact is considered to be permanent, adverse and unavoidable.

5.25.4 Unavoidable Adverse Impacts to Traffic

At several locations in New Jersey and New York, the construction of any of the four Build Alternatives would experience traffic impacts due to reductions in level of service (LOS) or a further deterioration within LOS F. However, as a result of the inclusion of a Managed Use Lane (MUL) in each direction of the bridge during peak travel periods and the implementation of transportation system management (TSM) strategies as mitigation measures, most impacted locations would return back to No-Build levels of service. Even with mitigation, there are a few locations that would exhibit LOS conditions that are worse than the No-Build condition in 2034. These include: two locations in the New Jersey Turnpike Interchange 13 complex and seven locations along the Staten Island Expressway between the Goethals Bridge Replacement and Richmond Avenue. These impacts are considered to be adverse and unavoidable.

5.26 Commitment of Resources

5.26.1 Introduction

This section presents a discussion of the comparison between the permanent commitment of resources and the benefits of the Proposed Project. This discussion includes an evaluation of the potential "costs" of consumption of environmental resources during the short-term construction phase of the Proposed Project compared to the longer term productivity and environmental benefits associated with the operation of the Proposed Project.

In accordance with the National Environmental Policy Act (NEPA) and the Council on Environmental Quality's implementing procedures under Title 40, Part 1502 of the Code of Federal Regulations (C.F.R.), any Environmental Impact Statement (EIS) prepared pursuant to NEPA must include an analysis of both the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity, and of any irreversible or irretrievable commitments of resources that would occur should the action be implemented (see 40 C.F.R. 1502.16).

5.26.2 Irreversible and Irretrievable Commitment of Resources

Resources that would be irreversibly and irretrievably committed to the Proposed Project include construction materials, energy, labor, funds and land. However, based on social and economic studies undertaken for the analysis of potential impacts as a result of the Proposed Project, these are not considered to be in limited supply. Thus, the use of such resources in the construction of the Proposed Project would not adversely impact the availability of such resources for other projects both now and in the future. It is estimated that between 5,555 and 5,906 construction-related and secondary jobs would be generated over the estimated 52- to 78-month construction period, depending on which Build Alternative is selected. Thus, the use of labor for the construction of the Proposed Project would be considered a positive effect and consistent with Federal, State and local plans for the redevelopment of the Goethals Bridge Study Area and nearby region.

The No-Build Alternative would result in an irreversible or irretrievable commitment of resources associated with maintenance and rehabilitation activities that would be required over the short- and long-term. The No-Build Alternative would require a greater commitment of a variety of resources in the future as the deficiencies of the existing bridge structure and approach roadways would continue and the opportunity would be lost to contribute to the ongoing redevelopment of the Goethals Bridge Study Area and the need to expand the capacity of the existing bridge and its approach roads. A total cost of $804 million (2007 dollars) for ongoing maintenance and rehabilitation of the existing bridge is anticipated to be required to extend the life of the bridge an additional 100 years.

With the Proposed Project, the total commitment of Port Authority funds for the construction of the Proposed Project, excluding property interests and acquisitions, ancillary activities, etc., is estimated to be between $754 million and $802 million in 2007 dollars, depending on which Build Alternative is selected. This commitment of financial resources represents a substantial infusion of capital investment into the Cities of Elizabeth and Linden in New Jersey and the Borough of Staten Island in the City of New York, and would add to local and regional economic activity directly through labor and capital expenditures for construction and, secondarily, through the flow of these monies within the local economy. These benefits would take the form of increased demand for goods and services provided locally, earnings of local employees, jobs, and state and local tax revenues.

Construction of the Proposed Project will result in both direct and indirect commitments of resources. In many instances, the resources committed would be recovered within a relatively short period of time. In others, resources would be irreversibly or irretrievably committed by virtue of being consumed or by the

apparent limitlessness of the period of their commitment to a specific use. Irreversible and irretrievable commitments of resources can sometimes be compensated for by the provision of other resources with substantially the same use or value.

Implementation of the Proposed Project will involve a commitment of a wide range of natural, physical, human and fiscal resources. A total of approximately 21.1 to 30.0 acres of acquired land would be committed for the construction and operation of the Proposed Project, depending on which Build Alternative is selected (see Table 5.2-1 of this FEIS). The land used in the construction of the Proposed Project is considered to be an irreversible commitment during the time period that the land is used for construction and during the operational periods. Should, however, a greater need arise for the use of the land, or should the Proposed Project no longer be needed, the land can be converted and committed to another use, although at this time, there is no indication that such a need for conversion could develop or be desirable.

The Proposed Project will also require the use of various types of fossil fuels, electrical energy and other resources during the construction and operation of the Proposed Project. These resources are considered to be irretrievably committed to the project. At this time, these resources are not in short supply and considered to be readily available to the Proposed Project. As a result, the use of these resources is not expected to result in an adverse effect upon the continued availability of these resources. The Proposed Project will also require the commitment of various types of construction materials, including cement, aggregate, steel and asphalt (bituminous materials), electrical supplies, piping and other raw materials such as metal, stone, sand and fill material. Additionally, large amounts of labor and natural resources will need to be committed to the fabrication and preparation of these construction materials. This commitment of resources is considered to be irretrievable. However, these resources and materials are also not in short supply and their use will not result in any adverse effect upon their continued availability. Much of the material accumulated for construction may at some time be recycled or used for fill or for some other use. These resources should however, be viewed as irretrievably committed to the Proposed Project.

Depending on the alternative, the construction of the Proposed Project will require the commitment of an estimated annual average of 410 to 484 construction workers during the construction period. These workers will, by necessity, not be available for other projects during the construction period and should be considered as irretrievably committed to the Proposed Project.

Costs associated with the expansion, extension and provision of utility services to the Proposed Project would be offset by the direct economic impact upon the area by the labor and material expenditures associated with the Proposed Project's construction, which is estimated to be approximately $754 million to $802 million in 2007 dollars, depending on which Build Alternative is selected.

Direct losses to the local and county governments as a result of the Proposed Project include property tax payments which will be lost due to the acquisition of residential and commercial and undeveloped taxable properties within the proposed right-of-way. This loss in tax revenues, which would range from approximately $165,390 to $329,310 in the City of Elizabeth and from approximately $22,348 to $54,919 in the Borough of Staten Island, depending on the Build Alternative selected, is considered to be an irretrievable commitment associated with the Proposed Project; however, the loss will be offset by the economic benefits to the local and county governments through the generated employment opportunities as well as the economic benefits resulting from the expenditures for construction and new development that may occur in and around the Proposed Project area.

The construction and operation of the Proposed Project will require the commitment and expenditure of Port Authority funds which will not be available for other projects and activities. This commitment of resources is considered to be irretrievable.

Development of the Proposed Project would result in a temporary increase in energy and fuel consumption during construction. The operation of the Proposed Project may result in a slight increase in energy consumption when compared to the No-Build Alternative but would be expected to result in a long-term decrease in energy consumption, through increased travel efficiency along the new and approach roadways during operation.

While there are no other known resources that would be committed as a result of the construction of the Proposed Project, it is anticipated the project's Purpose and Need would outweigh the irretrievable and irreversible commitment of these resources discussed above. Overall, these committed resources used for the construction and operation of the Proposed Project would benefit not only local residents and businesses but also visitors and commuters using the corridor and nearby region as a result of better local and regional access and the overall improvement of the regional transportation road and transit network. These benefits would include improved regional and local accessibility and safety, savings in travel time and energy, improved access to many of the region's transportation, commercial, recreational, residential and cultural facilities, and enhanced air and noise quality, all of which are anticipated to outweigh the irretrievable and irreversible commitment of these resources discussed above.

5.26.3 Relationship between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

The construction of a project can result in short-term effects on the environment. Long-term effects relate to the maintenance and enhancement of long-term productivity — in particular, the consistency of the project with long-term economic, social, regional and local planning objectives, including sustainability. The short-and long-term effects of the Proposed Project are summarized below.

5.26.3.1 Short-Term Uses

The No-Build Alternative would not require new construction. It would only involve the maintenance of the existing bridge, and thus would not result in any short-term impacts.

The Proposed Project, under any of the four Build Alternatives being considered, would have greater impacts during the construction period than the No-Build Alternative. Short-term construction impacts of the Proposed Project would be predominantly associated with the economics of affected and displaced residences; traffic detours; noise and vibration; air quality, including dust; and the effects of these impacts on neighborhood character. The Port Authority would endeavor to reduce these impacts during construction wherever practicable. The construction of the Proposed Project would create economic benefits during construction in the form of jobs and the direct and indirect demand for goods and services associated with construction activities.

The region which the Proposed Project serves is one of the largest and most densely developed regions in the United States, with port, commercial and industrial development as the leading growth activities. As a result, the previously-built local road network and Goethals Bridge structure do not fully meet the local or regional transportation needs for which they were intended and designed. If the Proposed Project were not to be constructed, the existing bridge would remain one of the primary east-west facilities utilized by locally and regionally generated traffic between New York and New Jersey. As a result, the levels of service which currently are at unacceptable levels would decrease, and service to and from the area's traffic generators would continue to decline. In addition, the increase in traffic congestion would lead to a further deterioration of local and regional air quality, an increase in traffic generated noise and a general lower quality of life.

While further enhancement details related to the Proposed Project are also provided in Section 2.0 (*Purpose and Need)* the overall quality of life in the Goethals Bridge Study Area and throughout the adjoining region will be enhanced through the following improvements:

- Reduced roadway congestion and time delays, and enhanced mobility on the new bridge through the provision of additional capacity and improved levels of service.
- Improved and enhanced safety conditions for motorists and commercial traffic using the bridge, as well as improved access to emergency response vehicles on the new bridge shoulders.
- Improved efficiency and reliability in truck-based goods movements.
- Restored and enhanced pedestrian/bicycle travel across the bridge.
- Economic benefits to the local region through the generation of new employment and local expenditures during the construction of the Proposed Project.
- Improved local man-made setting through the reduction of automobile-related air pollution and noise.
- Improved regional access between New York and New Jersey.

During a construction period that ranges from 52 months to 78 months, depending on Build Alternative selected, approximately 21.1 to 30.0 acres of acquired land (see Table 5.2-1 of this FEIS) will be used as a construction site involving clearing and grubbing, cutting, the placement of fill, surfacing, paving, landscaping, fencing, lighting, signing, extension and placement of utilities and the erection of temporary and permanent roadway structures.

The construction of the Proposed Project will be phased and as a result, will require that only portions of the Proposed Project area be committed as a construction site at any one given time. Therefore, the land area to be used during the various construction phases is considered as a short-term use of the environment while during the operation of the Proposed Project, this land is considered to be a long-term use of the environment which will support the maintenance and enhancement of the long-term productivity.

The productivity of this land, in terms of its economic productivity in generating property and sales taxes would be lost during this period and in the long-term as a result of the Proposed Project.

The construction period will, however, generate new productivity in terms of new construction-related employment, new payrolls, induced personal income, and purchases of materials, supplies and services. The short-term generation of construction employment and the purchases of materials and supplies are considered to be inducements to the long-term productivity of the local and regional economy. As a result of the Proposed Project, non-construction-related employment would also be generated along with the addition of new purchases, both from construction-related activity and the added expendable income resulting from the generated part-time and permanent employment.

5.26.3.2 Long-Term Productivity

The operation of the Proposed Project would have similar, although long-lasting productivity impacts. Although the productivity of the land taken as part of the project would be lost, and the productivity of the adjacent land areas would be limited through the construction period, there would be short-term beneficial impacts upon the land and regional productivity by virtue of the estimated 5,555 to 5,906 full-time jobs (depending on the Build Alternative) which would be generated from the purchases and take-home expendable income generated by the construction of the Proposed Project. In addition, and as defined by the several goals of the Proposed Project (see Section 2.0 – Purpose and Need), it is anticipated that the Proposed Project would also result in long-term productivity gains from the combined effects of reduced roadway congestion and delays, enhanced mobility, as well as the improved flow of goods between Staten

Island and New Jersey and the region as a whole. Together, these productivity gains would be, for the most part, long-term given the projected 100-year life span of the facility.

The operation of the Proposed Project is considered as contributing to the overall enhancement of the quality of life in the Proposed Project area and throughout the region. As a result, the Proposed Project area and region would realize a long-term benefit by becoming a more desirable place in which to do business and/or reside.

The cumulative effect of the construction and operation of the Proposed Project would be to stimulate the nearby area and region to greater long-lasting productivity in terms of economic output, its improved perceived character by the business and residential community in reduced traffic congestion and traffic generating noise and an overall improvement to the environment through the reduction in local and regional concentrations of air pollution and traffic congestion.