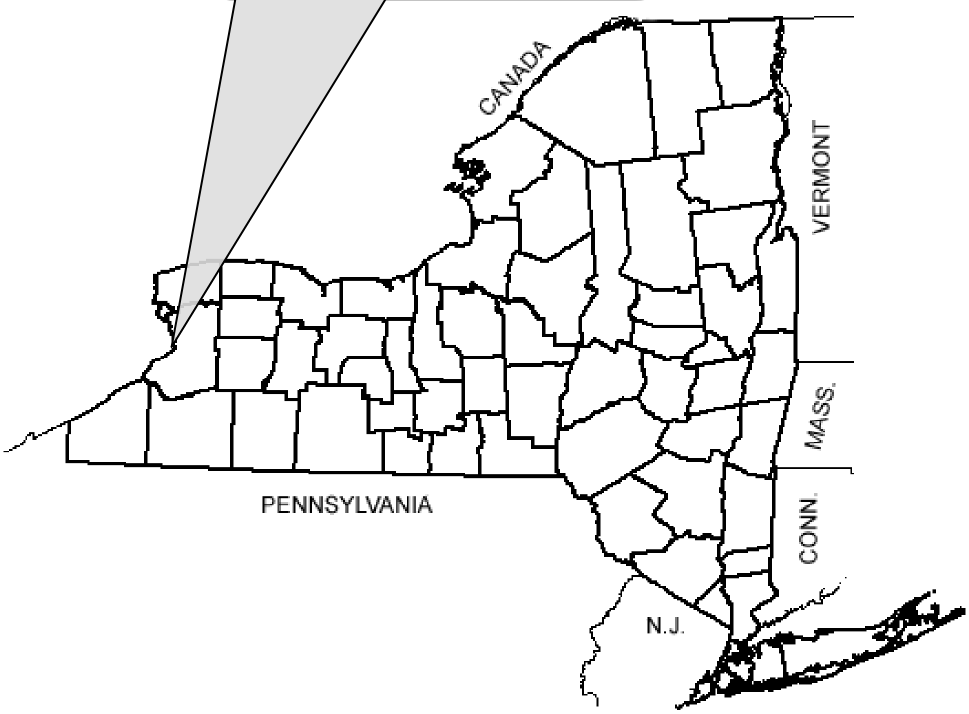
TRANSPORTATION PROJECT REPORT

Kensington Expressway Concept Design Study
Evaluation of Project Alternatives

August 2012

NY Route 33, Kensington Expressway
(Rev. Dr. Martin Luther King Jr.
Expressway)

P.I.N. 5512.52
City of Buffalo, Erie County



U.S. Department of Transportation Federal Highway Administration

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Description of Work Performed by Firm: Directed the preparation of the Feasibility Report in accordance with established standards, policies, regulations and procedures, except as otherwise explained in this document.

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Chapter I – Introduction

1.1 Project Background

The project is located in the City of Buffalo, Erie County and includes NY Route 33 (Kensington Expressway) and Humboldt Parkway between Best Street and E. Ferry Street. This feasibility report has been commissioned to examine the engineering attributes of a variety of project proposals to construct enhancements within the identified corridor. Commonly referred to as the "Cover the Kensington" project, this report examines five (5) alternatives (Null / Maintenance alternative plus four build alternatives), which have been identified through Department and community input as having the ability to improve the quality of life within the NY Route 33 corridor. As such, concept level designs have been completed for the four (4) build alternatives and are documented in this report. As identified below and further explored in subsequent chapters, the alternatives range in scope from rehabilitating and enhancing the existing infrastructure to undertaking a full reconstruction of the expressway which includes covering a portion of the expressway to re-establish or re-envision the Frederick Law Olmsted designed parkway.

Refer to Figure 1.1 – Project Location Map (below).

The original Humboldt Parkway, designed by Frederick Law Olmsted, was a grand tree-lined boulevard that connected Humboldt Park (now Martin Luther King, Jr. Park) with Delaware Park. The boulevard served as a focal point for the adjacent neighborhoods, providing a link between the various local streets and nearby recreational attractions, cultural and religious institutions, and businesses. The construction of NY Route 33 (Kensington Expressway) in the 1950s and 1960s resulted in the removal of the historic Olmsted-designed parkway. The neighborhood is now divided by a below-grade expressway but does have five bridges that carry the local street network (E. Ferry St, E. Utica St, Northampton St, Dodge St and Best St) across the expressway. This project has been initiated to examine the feasibility of various alternatives that would restore part or all of the original Olmsted vision for the Humboldt Parkway and improve the connectivity in the neighborhoods.

The project area was originally part of a NYSDOT project (PIN 5512.46) to rehabilitate the retaining walls along NY Route 33, upgrade the railing systems on top of the retaining walls, and install landscape enhancements along Humboldt Parkway bordering the expressway on either side. The original project limits for PIN 5512.46 extended from the Elm-Oak Arterial to NY Route 198. In May 2009, the scope of PIN 5512.46 was reduced to only include the section of NY 33 between the Elm-Oak Arterial and Best Street, so that the section of NY Route 33 between Best Street and NY Route 198 could be further analyzed as part of this study.

The project was initiated at the request of stakeholders including former New York State Senator Antoine Thompson, State Assembly Member Crystal Peoples-Stokes, the Olmsted Parks Conservancy, and many other local officials and community organizations.

1.2 Purpose of this Report

The purpose of this study is to better define the technical feasibility and cost of various alternatives to enhance the identified corridor along Humboldt Parkway and improve connectivity across NY Route 33 (Kensington Expressway).

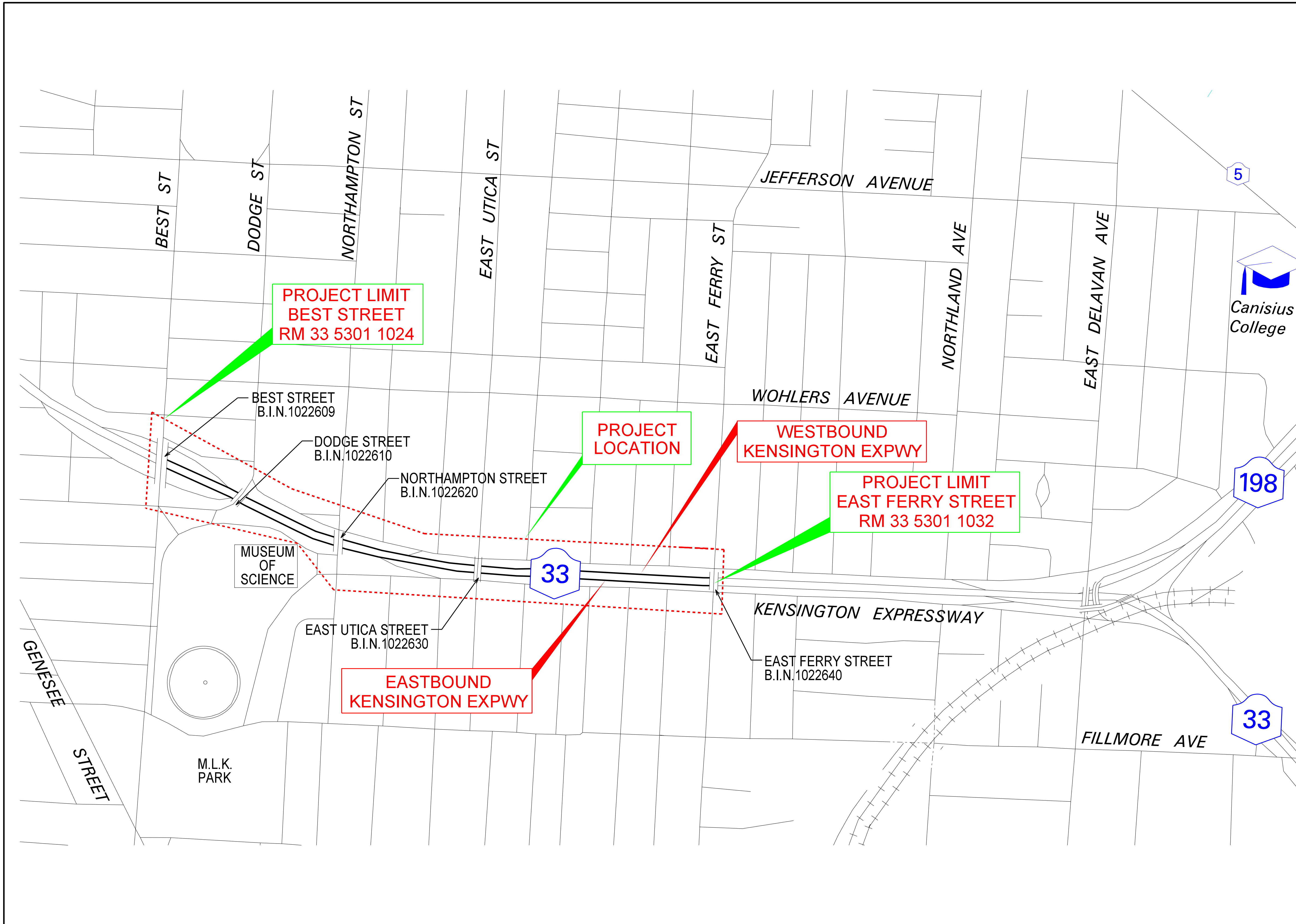

FIGURE 1-1
PROJECT LOCATION MAP

KENSINGTON EXPRESSWAY CONCEPT DESIGN STUDY
NEW YORK STATE DEPARTMENT OF TRANSPORTATION
CITY OF BUFFALO, ERIE COUNTY
P.I.N. 5512.52

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...\Fig 1-1 Location Map.dgn
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The selection of alternatives for this study was guided by the following goals and objectives identified in coordination with stakeholders in the community:

- Re-establishing or re-envisioning the Frederick Law Olmsted designed parkway (Historic re-interpretation of the Olmsted design)
- Re-establishing park land (green space)
- Increasing recreational opportunities
- Improving pedestrian and bicycle mobility
- Providing and maintaining an acceptable Level of Service (LOS) through the corridor
- Addressing the deterioration of the existing retaining wall and railing system within the project corridor

As part of this report, concept drawings have been prepared to help depict the alternatives under consideration and conceptualize the finished surface treatments. They are included in Appendix A under separate cover. Associated construction costs have also been quantified. Together they begin to provide perspective on the benefits and cost of varying degrees of investment.

The drawings that accompany this report provide illustration of possible surface restoration, taking into account the vision of the project stakeholders, specifically for Alternatives C and D. However, at this stage in project development, these plans are conceptual. Significant stakeholder and public input would be necessary should a decision be made to advance further design studies.

It should be noted that this report does not recommend a "preferred" alternative, nor does it attempt to provide a comparison of cost and benefits for purposes of selecting one alternative over another. Its intent is to provide a factual basis to understand the engineering characteristics of each alternative so that informed decision-making can occur at a later time.

1.3 Alternative(s) Identified

Five alternatives have been identified that can meet some or all of the project objectives. They have been analyzed with regard to engineering implications, constructability, environmental concerns, risk and cost. Several sub-alternatives have also been identified. General descriptions of the alternatives are identified below. Detailed descriptions of each alternative are included in Chapter II.

Alternative A - Null / Maintenance: A capital project would not be undertaken, and normal routine maintenance of the existing infrastructure would continue.

Alternative B - Humboldt Parkway Enhancements: Improvements would be made to Humboldt Parkway, similar to P.I.N. 5512.46 that was completed south of the project area in 2011. Humboldt Parkway would be rehabilitated with an emphasis on street enhancements, addressing infrastructure needs including repairs to the retaining walls and railings, improving the pedestrian realm, and upgrading traffic operation.

- **Sub-Alternative B1 - Bridge Rehabilitation with Widening:** A more comprehensive rehabilitation of the bridges would occur to provide pedestrian oriented enhancements such as wider sidewalks and green space, in addition to all of the improvements included with Alternative B.

- **Sub-Alternative B2 - Bridge Replacement:** Bridges would be completely replaced with a new wider structure to include improved sidewalks and green space, in addition to all of the improvements included with Alternative B.

Alternative C - Partial Decking of the Expressway with Corridor Enhancements: A decking system would be constructed over four segments of the Kensington Expressway, with landscaping and recreational space on top of the decking. Enhancements would also be made to Humboldt Parkway as part of a rehabilitation project.

- **Sub-Alternative C1 – Roundabouts:** A roundabout type intersection would be built on top of the decking instead of a conventional intersection.

Alternative D - Full Reconstruction of the Expressway within a Tunnel Structure: The Kensington Expressway would be reconstructed within a tunnel through the project area. Humboldt Parkway would be reconstructed with a wide landscaped median.

- **Sub-Alternative D1 - Removal of NY Route 33 Eastbound Off-Ramp:** In addition to the improvements included under Alternative D, the NY Route 33 Eastbound off-ramp to Humboldt Parkway would be removed, and modifications would be made to the surface streets between Best St and Northampton St to maintain access to Humboldt Parkway from NY Route 33 eastbound.

Alternative E - Replacement of the Expressway with a Multiway Boulevard: The below grade portions of the Kensington Expressway would be filled in and replaced with an at-grade multiway boulevard with signalized intersections. Humboldt Parkway would continue to operate as a frontage (collector) road serving local traffic along either side of the boulevard.

- **Sub-Alternative E1 – Alternate Multiway Boulevard Design:** An alternate design would be utilized where the frontage roads are merged in and out of the main boulevard between each cross street, instead of the frontage roads carrying through the major cross streets.

1.4 Historical Setting and Vision for Recreating Humboldt Parkway

The Humboldt Parkway was part of the 1870 Olmsted design to connect "The Park" (now Delaware Park, completed in 1876) with "The Parade" (later Humboldt Park and now Martin Luther King, Jr. Park, completed in 1910). The parkway was 200 feet wide and included two tree-lined, one-way boulevards and a wide landscaped median. In addition to connecting the two Olmsted parks, the Humboldt Parkway provided green space and recreational opportunities for the adjacent neighborhoods. The Buffalo Museum of Science was completed in 1929 at the southern terminus of the Humboldt Parkway. Additional parkways in the Olmsted design include Bidwell Parkway, Chapin Parkway and Lincoln Parkway, all similar in design to the original Humboldt Parkway.

The majority of the original Humboldt Parkway was modified or removed to accommodate the construction of the Kensington Expressway in the 1950s and 1960s. The median of the original parkway was carved out to construct the below-grade travel lanes of the expressway, and the alignments of the original boulevards were pushed back to make room for the retaining walls and ramps to and from the expressway. Many buildings that were constructed along the original parkway remain; however, right-of-way takings for the expressway diminished the size of the properties and much of the original Olmsted landscaping has been removed. Within the project area, crossings are maintained at E. Ferry Street, E. Utica Street, Northampton Street, Dodge Street and Best Street.

A small piece of the original Humboldt Parkway remains intact at the entrance to Martin Luther King, Jr. Park and the Science Museum. The parkway's intersection with Northampton Street, the one-way entrance and exit to the park, and the island between the entrance and exit are part of the original Olmsted design. The majority of the original trees and landscaping in this area have been removed.

The Buffalo Olmsted Parks Conservancy (BOPC) is an important organization dedicated to preserving, restoring and maintaining Olmsted resources in the community. They have created a vision for fully recreating Humboldt Parkway which necessitates that the Kensington Expressway is completely enclosed (Alternative D) or removed. Figure 1-3 (included below) is a concept drawing prepared by the BOPC for Humboldt Parkway which illustrates a full re-creation of the corridor.

1.5 Existing Setting

1.5.1 Adjacent Neighborhoods

The land use along the project corridor is made up of urban residential neighborhoods generally constructed in the early 1900s. The properties along Humboldt Parkway are primarily residential in nature, including single and multi-family houses. Several churches (including Tried Stone Baptist, Cedar Grove Missionary, Humboldt Parkway Baptist and Memorial Baptist) and assembly buildings are present, particularly along the block between E. Ferry and E. Utica Streets. A medical facility (the Deaconess Center) is located on Humboldt Parkway southbound near Northampton Street. At the southern terminus of the Humboldt Parkway are Martin Luther King, Jr. Park and the Buffalo Museum of Science, a property listed on the National Register of Historic Places.

Refer to Figure 1-2: Aerial Photograph of Project Area (below)

It is important to recognize the unique character of the existing neighborhoods adjacent to the expressway corridor. They were constructed adjacent to the original Humboldt Parkway which was part of the historic Frederick Law Olmsted designed system of parks, parkways, and circles within the City of Buffalo. The parkway has been removed, and the Buffalo Olmsted Parks Conservancy has stated that “The negative impacts of losing an element of the parkway system can be seen in surrounding neighborhoods, such as along the former Humboldt Parkway. These neighborhoods have generally experienced decades of disinvestment and are in a state of deterioration.”

1.5.2 Humboldt Parkway

The Humboldt Parkway, a thoroughfare owned and maintained by the City of Buffalo, serves as an important link in the City street network. It functions as collector road for the local cross streets and provides access to and from the Kensington Expressway via entrance and exit ramps at several locations. In the southbound (NY Route 33 westbound) direction, an exit ramp

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SCALE: 1"=2000'

FIGURE 1-2
AERIAL PHOTOGRAPH OF PROJECT AREA

KENSINGTON EXPRESSWAY CONCEPT DESIGN STUDY
NEW YORK STATE DEPARTMENT OF TRANSPORTATION
CITY OF BUFFALO, ERIE COUNTY
P.I.N. 5512.52

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Buffalo Olmstead Parks Conservancy. http://www.bfloparks.org/ n.p., August 2009. Web. October 2011.

NO SCALE

N

FIGURE 1-3

PROPOSED HUMBOLDT PARKWAY CONCEPT (BUFFALO OLMSTEAD PARKS CONSERVANCY)

KENSINGTON EXPRESSWAY CONCEPT DESIGN STUDY
NEW YORK STATE DEPARTMENT OF TRANSPORTATION
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is located north of E. Ferry St, and an entrance ramp is located south of E. Utica St. In the northbound (NY Route 33 eastbound) direction, there is an exit ramp to Humboldt Parkway north of Northampton St. The Best St intersection also has entrance and exit ramps for both directions of travel. These connections to NY Route 33 allow neighborhood traffic to reach regional destinations such as downtown Buffalo and major highways including the NYS Thruway (I-90). Humboldt Parkway also connects several neighborhood and regional cultural attractions such as Martin Luther King, Jr. Park, Delaware Park, the Buffalo Museum of Science, several churches, and local businesses.

Each one-way boulevard has a typical width of 32 feet. Although travel lanes are not designated with striping, vehicles typically utilize the pavement as a two-lane roadway through mid-block segments and a three-lane roadway at intersection approaches. Parking is permitted along the outside curb line, though occasionally vehicles are parked along both curbs in the vicinity of several churches. Traffic volumes (Average Annual Daily Traffic) taken in 2006 range from a high of 9366 to a low of 3500 vehicles per day. Refer to Appendix B for photographs of Humboldt Parkway.

The primary deficiencies within the project area are a lack of pedestrian accommodations and a lack of connectivity between the neighborhoods on either side of NY Route 33. The below-grade expressway creates a significant barrier because crossing the grade-separated Kensington Expressway is only provided at the E. Ferry St, E. Utica St, Northampton St, Dodge St and Best St bridges. These structures have narrow sidewalk widths which are generally 5 ft wide and lack sidewalk ramps. Also, in many cases travel lanes on the structures do not provide sufficient width to accommodate shared vehicle and bicycle use.

There are deficiencies on Humboldt Parkway as well. The boulevards lack pavement striping to delineate travel lanes, parking lanes and turn lanes at intersections. Most of the pedestrian crossings are not ADA-compliant (lacking sidewalk ramps) and the signalized intersections lack pedestrian phases and pedestrian signal equipment. Visual inspections and engineering judgment suggests that the corridor also needs rehabilitation or replacement of various elements, including the pavement surface, sidewalks, bridge and retaining wall railing systems, traffic signals, signage and lighting.

1.5.3 Kensington Expressway (NY Route 33)

The Kensington Expressway (NY Route 33) is classified as an urban principal arterial expressway and is part of the national highway system. It is also designated as a qualifying highway, though it is not on the 16 foot minimum vertical clearance network. Within the project area, NY Route 33 is a limited access expressway nearly 20 feet below the grade of the surrounding neighborhood. It consists of three 12 ft wide travel lanes in each direction. Shoulder widths vary, but the inside shoulders are generally 4 feet wide (2 ft wide minimum) and each outside shoulder has a minimum width of 8 feet. Concrete median barrier separates the two directions of travel and concrete retaining walls are adjacent to each outside shoulder. Refer to Appendix A for a Typical Section of the Kensington Expressway and Appendix B for photographs of the expressway corridor.

This section of NY Route 33 functions as an important link in the regional transportation system. It provides a direct link to downtown Buffalo from major routes such as NY Route 198 and the New York State Thruway (I-90), and is an established commuter route between downtown Buffalo and the city's northern and eastern neighborhoods as well as many suburban communities. In the eastbound direction the average annual daily traffic (AADT) volume is

34,653 vehicles per day (2010) and in the westbound direction the AADT is 35,739 vehicles per day (2010). Many regional destinations are located along the Route 33 corridor, such as Martin Luther King, Jr. Park, the Buffalo Museum of Science, the Erie County Medical Center, and the Greater Buffalo International Airport. The expressway also provides links for more localized travel between adjacent City of Buffalo neighborhoods via access ramps at several locations within the project limits.

For regional and truck traffic traveling in and out of Downtown Buffalo, there are two alternative expressway routes. The closest alternate route to the north is I-290 between I-90 and I-190 (approximately four miles north of the project). The closest route to the south (approximately 3.5 miles) is I-190 between I-90 and downtown.

There are five NYSDOT owned bridge structures that carry cross street traffic over NY Route 33. They include bridges at E. Ferry St, E. Utica St, Northampton St, Dodge St and Best St. The following table summarizes some of the key features for each bridge structure:

BIN	Feature Carried	Type	Year Built	Min/Max Clearance	Condition Rating (1)	Planned Work	No. of Lanes on Bridge
1022640	E. Ferry St	Two-span steel girder	1970	15'-4" 15'-8"	4.819	(2)	4
1022630	E. Utica St	Two-span steel girder	1970	15'-0" 15'-3"	4.972	(2)	4
1022620	Northampton St	Two-span steel girder	1963	14'-10" 16'-1"	5.264	(2)	2
1022610	Dodge St	Two-span steel girder	1963	14'-2" 14'-4"	4.958	(2)	2
1022609	Best St	Four-span steel girder	1963	15'-2" 16'-1"	4.250	(2)	5

(1) Condition ratings range from 1 to 7, with 7 being a new bridge. Generally a condition rating between 4 & 5 indicates a candidate for rehabilitation.
(2) Region 5's capital program includes PIN 5512.49 which is planned to rehabilitate the bridge deck of five structures within the project limits (as well as two outside the project limits) as indicated in the table. The letting date is unknown.

Each of the alternatives under consideration has varying degrees of impact on the Expressway pavement. For example, Alternative B - Humboldt Parkway Enhancements requires very little work on the expressway itself. In contrast, Alternatives D (Tunnel) & E (Multiway Boulevard) require complete reconstruction of the expressway on different vertical alignments and at a considerable cost. Alternative C – Decking assumes that the expressway remains at its current horizontal and vertical alignment, and as a result the pavement would not necessarily require complete reconstruction. Common to each of the alternatives is the premise that three lanes of traffic in the eastbound and westbound directions will continue to provide adequate service over the design life of the project. In other words, additional travel lanes on the Kensington are not considered in this study.

1.5.4 Environmental Stewardship

The NYSDOT recognizes the importance of environmental stewardship in the advancement of projects. It is likely that State and Federal funds will be used to construct this project. Therefore, Title 17 (Transportation) of the New York Code of Rules and Regulations, Part 15 must be followed with regard to the NYSDOT's implementation of the State Environmental Quality Review (SEQR) Act. Likewise, the Title 23 (Highways) of the Code of Federal Regulations, Part 771 must be followed with regard to the Federal Highway Administration's compliance with implementing regulations of the National Environmental Policy Act (NEPA). Additionally, should local funds from the City of Buffalo be used on the project, compliance with local laws (if any) relating to the implementation of SEQR will be required.

As part of the work completed to date, the Department has begun to identify areas of environmental concern associated with the project alternatives. For each of the alternatives presented in this report, a brief discussion of relevant environmental issues is provided. Given the size and complexity of Alternatives C, D and E, should one of these alternatives be selected, it is likely that an Environmental Assessment or Environmental Impact Statement would need to be prepared to document the degree of environmental impact and establish appropriate environmental mitigations.

In complying with environmental regulations, the Department is obligated to review and analyze the social, economic and environmental effects of projects being proposed as well as implement appropriate mitigations to reduce or alleviate adverse affect. A preliminary screening of each of the alternatives has identified a number of environmental areas of concern that will likely require study as well as a number of environmental issues of no consequence to this project. The following list identifies those environmental categories where environmental documentation and analysis is likely required:

- Social impacts involving land use, neighborhoods, community cohesion, social groups benefited or harmed, school districts, recreational areas, churches and businesses
- Economic impacts involving regional and local economies, business districts, and highway related businesses
- Storm water management
- General ecology and wildlife resources
- Historic and cultural resources
- Parks and recreational resources
- Visual resources
- Air quality
- Energy
- Noise
- Asbestos
- Contaminated and hazardous materials
- Construction impacts
- Secondary and cumulative impacts.

The following list identifies those environmental categories where there is not expected to be any involvement:

- State and Federal wetlands
- Surface water bodies and watercourses
- Wild, scenic and recreational rivers
- Aquifers, wells and reservoirs
- NYSDEC Critical Environmental Areas
- Farmlands

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2.1 Description of Alternatives and Major Assumptions

2.1.1 Alternative A – Null / Maintenance

Under this alternative, no improvements would be made to NY Route 33 or the Humboldt Parkway and routine maintenance would continue to be performed.

2.1.2 Alternative B – Humboldt Parkway Enhancements

Alternative B – Humboldt Parkway Enhancements involves rehabilitation of the corridor to address a number of deficiencies. Alternative B may include some or all of the following improvements:

- Rehabilitation of the Humboldt Parkway pavement, including milling and resurfacing, narrowing the pavement, curb replacement and the installation of curb extensions (bump-outs) to delineate parking areas and pedestrian crossings.
- Replacement of sidewalks and installation of sidewalk ramps at intersections along Humboldt Parkway.
- Replacement of traffic signals, pavement markings and signage along Humboldt Parkway.
- Construction of a landscaped buffer of trees and other improvements between Humboldt Parkway and the Kensington Expressway retaining wall.
- Replacement of the railing along the top of the retaining walls with Texas Aesthetic Barrier. With regard to cross streets over the Kensington, the existing bridge railing at E. Ferry Street, E. Utica Street, Northampton Street and Dodge Street will be replaced with concrete Texas aesthetic barrier at the time each bridge is rehabilitated.
- Repair to the retaining walls, as necessary, including re-facing the bottom portion to address deterioration, repair along the top of the walls, and aesthetic improvements such as applying paint or stain to the walls.
- Replacement of the lighting system along Humboldt Parkway. Expressway lighting fixtures that are mounted to the retaining walls will likely require replacement as well, in order to accommodate the retaining wall rehabilitation.

Some of the improvements proposed as part of Alternative B were originally programmed to be implemented under P.I.N. 5512.46, including the Texas Aesthetic Barrier, Humboldt Parkway pavement rehabilitation, landscape buffer areas and retaining wall rehabilitation. The limits of P.I.N. 5512.46 were modified when this study was initiated to only include the section of NY Route 33 between Best Street and the Elm-Oak Arterial.

The replacement of bridge rail with Texas barrier at E. Ferry St, E. Utica St, Northampton St and Dodge St would be completed as part of the next programmed capital improvement of each bridge. The Region 5 Capital Program currently includes P.I.N. 5512.49, which proposes bridge deck rehabilitation at the E. Ferry St, E. Utica St, Dodge St, Northampton and Best St bridges. The construction schedule of the rehabilitation project is unknown at this time.

Alternative B – Humboldt Parkway Enhancements would incorporate the City of Buffalo's "Complete Streets" design philosophy, which serves as a guiding principle for infrastructure projects. The policy encourages projects to improve the safety and mobility for all users including motorists, pedestrians, bicyclists, transit users, and persons with disabilities. As such, some of the improvements considered on Humboldt Parkway include curb bump-outs, ADA-compliant sidewalks, landscape and streetscape enhancements, a narrowed pavements section, and new street lighting.

A portion of the work proposed for Alternative B - Humboldt Parkway Enhancements is considered a betterment and would be funded by the City of Buffalo. The betterment would include the following work along Humboldt Parkway:

- Replacement of curbing (residential side only)
- Work within the snow storage area (residential side), including driveway replacement and the installation of trees and landscaping
- Sidewalk and ramp replacement
- Replacement of traffic signals
- Replacement of the Humboldt Parkway lighting system

At this stage in project planning, Alternative B has not been prepared in consultation with the City of Buffalo or the neighborhood groups. If it is determined that Alternative B will be advanced, the project will be coordinated with NYSDOT, the City of Buffalo, and neighborhood groups.

Refer to Appendix A for plans depicting the work proposed for Alternative B.

2.1.2.a Sub-Alternative B1 - Bridge Rehabilitation with Widening

Alternative B (base project) does not include bridge work, aside from replacing existing steel bridge rail with concrete Texas Aesthetic Barrier and installing sidewalk ramps. A sub-alternative was investigated that would rehabilitate and widen the existing bridge crossings in order to provide pedestrian-oriented enhancements, such as wider sidewalks and green space. Accordingly, Sub-Alternative B1- Bridge Rehabilitation involves construction of an independent bridge on each side of the existing structure. The new spans would be independent from the existing structure and would be directly adjacent to a bridge fascia line. They would allow for a widened sidewalk (from 5 ft. to 10 feet) and a 15 feet wide landscaped green space. The total width of the new structure would be approximately 20 feet. The superstructure would consist of adjacent prestressed concrete box beams, while the substructure would include new bridge abutments and a hammerhead median pier. A longitudinal joint system would separate the existing bridge from the new independent bridge. The existing bridge structure would be rehabilitated as necessary as part of this sub-alternative. Preliminary investigations indicate that Sub-Alternative B1 could be constructed at any of the bridges within the project limits.

Sub-Alternative B1 would also include the above-mentioned rehabilitation and enhancements to the Humboldt Parkway corridor. Refer to Appendix A for a plan depicting Alternative B1.

2.1.2.b Sub-Alternative B2 - Bridge Replacement

Sub-Alternative B2 – Bridge replacement includes replacing the existing bridge structures at E. Ferry St., E. Utica St, Northampton St and Dodge St with new, wider 2-span bridges to provide pedestrian-oriented enhancements such as wider sidewalks and green space. The bridge superstructures would range in width from around 85 feet to107 feet, each approximately 50 feet wider than the existing bridge. The bridges at Northampton St and Dodge St are narrower as turn lanes are not needed for both directions of travel. The recommended superstructure of the new bridge would consist of adjacent prestressed concrete box beams with a composite deck, and the substructure would include new bridge abutments and median piers. The landscaped green space portion of the bridge would contain three feet of soil, which is considered the minimum depth needed to support the growth of typical street trees. Texas aesthetic concrete barrier with fencing would be installed in place of traditional bridge rail. The Texas rail will match the treatment proposed along the expressway retaining walls.

Sub-Alternative B2 would also include the above-mentioned rehabilitation and enhancements to the Humboldt Parkway corridor. Refer to Appendix A for a plan depicting Alternative B2 – Bridge Replacement.

2.1.3 Alternative C – Partial Decking of Expressway with Corridor Enhancements

Alternative C involves covering sections of NY Route 33 (Kensington Expressway) with a concrete decking system. The decking would be covered with a sufficient depth of soil (3 feet minimum) to allow for trees, landscaping and pedestrian amenities to be installed. The finished surface elevation would be approximately 2 feet higher than the adjacent Humboldt Parkway Boulevard. Decking is proposed over the following sections of NY Route 33:

- Dodge Street to 450 ft north of Dodge Street
- 50 ft south of Northampton Street to 600 ft north of Northampton Street
- 450 ft south of E. Utica Street to 350 ft north of E. Utica Street
- 700 ft south of E. Ferry Street to 100 ft north of E. Ferry Street

Each of the sections where decking is proposed is approximately 800 feet in length, which is a general guideline for the maximum length that a roadway may be enclosed without needing mechanical ventilation. The Kensington Expressway would remain at its current horizontal and vertical alignment, and the existing entrance and exit ramps would be maintained. The crossroads (Dodge Street, Northampton Street, E. Utica Street and E. Ferry Street) would be reconstructed atop the new decking.

The decking system would consist of two-span, adjacent prestressed concrete box beams with composite concrete overlay. The existing retaining walls along the expressway would be slightly truncated to facilitate the construction of new stub abutments located behind the existing retaining walls. A multi-column pier would be constructed along the median of the expressway to support the beams. The expected design life of the new decking components is 75 years.

Alternative C also includes many of the features proposed for Alternative B, including the rehabilitation of Humboldt Parkway, new landscaping and pedestrian amenities, installation of concrete Texas Aesthetic Concrete Barrier along the top of the existing retaining walls and repairs to the retaining walls.

Refer to Appendix A for plans depicting the work proposed for Alternative C.

2.1.3.a Sub-Alternative C1 - Roundabouts

Sub-Alternative C1 depicts the installation of a roundabout on top of the decking system in place of a conventional intersection. The same decking system and limits of decking (as described in Alternative C above) would be utilized. Preliminary analysis indicates that a roundabout could be installed at the E. Utica St and E. Ferry St intersections. Refer to Section 2.4.4.b for a discussion of the possible benefits and other considerations of constructing roundabouts at these locations.

Sub-Alternative C1 would also include the project elements of Alternative C as described above. Refer to Appendix A for a plan of Sub-Alternative C1.

2.1.4 Alternative D – Full Reconstruction of Expressway within a Tunnel Enclosure

This alternative includes the full reconstruction of NY Route 33 within a tunnel structure. Humboldt Parkway would also be reconstructed, and an at-grade median with landscaping and pedestrian amenities would be established as a re-interpretation of the original Olmsted design.

The 3,700 ft long tunnel would extend from Best Street to E. Ferry Street, while reconstruction of NY Route 33 would extend between High Street and the pedestrian overpass north of E. Ferry Street. The existing retaining walls would be removed, and a series of continuous precast structural arches would be installed over the eastbound and westbound travel lanes and median. Ventilation, fire suppression, lighting, drainage and emergency egress systems would be provided. The expressway would be constructed on a new vertical alignment up to 11 feet below the existing alignment. The horizontal alignment would be maintained, although the tunnel structure would be wider than the existing expressway, resulting in the outside travel lanes of the expressway being constructed directly underneath Humboldt Parkway. Access ramps to and from the expressway would be maintained and reconstructed as part of this alternative, however Sub-Alternative D1 is under consideration to remove the exit ramp north of Best Street from NY Route 33 eastbound to Humboldt Parkway (see discussion below). Existing cross street bridges would be removed, and new street crossings constructed atop the new tunnel structure.

The tunnel structure would be covered with soil (3 feet minimum) to accommodate the installation of trees and landscaping. The design of the new at-grade median between the Humboldt Parkway boulevards would reference the original Olmsted design.

Refer to Appendix A for plans and typical sections of the proposed tunnel structure and Humboldt Parkway.

2.1.4.a Sub-Alternative D1 – Removal of NY Route 33 Eastbound Off-Ramp

A sub-alternative is under consideration to remove the off-ramp from NY Route 33 eastbound to Humboldt Parkway (the ramp is between Northampton St and E. Utica St). One of the concerns related to this off-ramp is the weaving movement resulting from the ramp's proximity to the Best Street entrance ramp (the ramps are approximately 1000 ft apart). The weaving concern is likely to be exacerbated if the tunnel structure and retaining walls were to be built. Plus there is a concern regarding drivers that are adjusting from light to dark conditions and may be unfamiliar with the ramp geometry. Another concern with the off-ramp is the extent of impact to Humboldt Parkway resulting from the wider tunnel section and retaining walls needed to accommodate the ramp.

Sub-Alternative D1 proposes modifications to the above-ground street network in order to maintain access to Humboldt Parkway from NY Route 33 eastbound. Eastbound traffic would exit at Best St and continue north on a new Parade Ave alignment. Instead of turning west at Dodge St, Parade Ave would continue north on the new alignment and connect to Humboldt Parkway at Northampton Street.

Aside from the above-described ramp removal and surface street network modifications, Sub-Alternative D1 would include the project elements of Alternative D. Refer to Appendix A for a plan of Sub-Alternative D1.

2.1.5 Alternative E – Replacement of Expressway with a Multiway Boulevard

Alternative E proposes to replace NY Route 33 (Kensington Expressway) and Humboldt Parkway as a multiway boulevard, which is a mixed-use roadway including a main boulevard for through traffic, one-way frontage roads along each side, and landscaped medians down the center of the boulevard and between the main boulevard and frontage roads. The functional classification of the Kensington Expressway would change from *Urban - Principal Arterial Expressway* to *Urban – Principal Arterial – Other*. The expressway would be removed and the “bathtub” section filled in to allow for at-grade signalized intersections with E. Ferry St, E. Utica St, Northampton St and Dodge St. Humboldt Parkway would remain a one-way couple and function as frontage roads to the main boulevard. Pedestrians and bicyclists would be accommodated along the Humboldt Parkway frontage roads.

The new boulevard would include three travel lanes in each direction and would be constructed along the horizontal alignment of the existing expressway, while the vertical alignment would be raised up to the grade of the adjacent Humboldt Parkway and cross streets (the existing expressway pavement would be broken up and the retaining walls removed). The Humboldt Parkway boulevards would be reconstructed at approximately their current alignment and serve as frontage roads, including a single travel lane and parking lane. New drainage and utility systems would be provided as necessary.

Refer to Appendix A for Alternative E plans.

2.1.5.a Sub-Alternative E1 – Alternate Multiway Boulevard Design

Sub-Alternative E1 depicts an alternate multiway boulevard design where the frontage roads (Humboldt Parkway) are merged in and out of the main boulevard away from the major cross street intersections (i.e. instead of continuing through the major cross streets and operating as separate intersection). Traffic would turn right off of the Boulevard to enter the frontage road near the beginning of the block and merge back to the Boulevard just before the next crossroad.

Refer to Appendix A for plans depicting Sub-Alternative E1.

2.2 Design Criteria for Alternatives

Design criteria for NY Route 33 and Humboldt Parkway are summarized in the following tables:

Exhibit 2.2.A.1
Critical Design Elements for Humboldt Parkway

PIN:	5512.52	NHS (Y/N):	No
Route No. & Name:	Humboldt Pkwy	Functional Classification:	Urban - Collector
Project Type:	3R	Design Classification:	Collector, Urban
% Trucks:	3.2%	Terrain:	Rolling
ADT:	17000	Truck Access/Qualifying Hwy.	Neither

	Element	Standard	Existing Condition	Proposed Condition
1	Design Speed	40 mph[1]	30 mph posted	40 mph
2	Lane Width	10' minimum Turn Lane 9' min. Parking 8' min. HDM. Exhibit 7-8	12' 10' turn 8' parking	12'-14' 10'-11' turn lane 8' parking
3	Shoulder Width	Curbed Shoulder 0' HDM Exhibit 7-4	0'	0'
4	Bridge Roadway Width	Full Approach Roadway Width BM Sections 2.3.1, Table 2-1	N/A	N/A
5	Maximum Grade	No maximum grade HDM Section 7.5.2.2 E	2.8%	2.8%
6	Horizontal Curvature	154' (@ e = 4.0%) HDM Section 7.5.2.2 F, Exhibit 7-6	919' min	533' min.
7	Superelevation Rate	4% Maximum HDM Section 7.5.2.2 G	4% max.	4% max.
8	Stopping Sight Distance	305' Minimum HDM Section 7.5.2.2 H, Exhibit 7-7	185'	305' min.
9	Horizontal Clearance	greater of the shoulder width or 1.5' 3.0' at intersections HDM Section 7.5.2.2 I	1.5' Min, 3.0' at int.	1.5' Min, 3.0' at int.
10	Vertical Clearance	14' minimum; 14'-6" desirable BM Section 2.4.1, Table 2-2	Unlimited	Unlimited
11	Pavement Cross Slope	Travel Lanes: 1.5% Min. to 3% Max. Parking Lanes: 1.5% Min. to 5.0% Max. HDM Section 7.5.2.2 K	2.0% and varies	2.0%
12	Rollover	4% between lanes 8% at Edge of Traveled Way HDM Section 2.7.3.2.L	4% between lanes	4% between lanes
13	Structural Capacity	AASHTO HL-93 Live Load and NYSDOT Design Permit Vehicle BM Section 2.6.1	N/A	N/A
14	Level of Service	N/A	N/A	N/A
15	Control of Access	N/A	N/A	N/A
16	Pedestrian Accommodation	5' Highway 5.6' Bridge Complies with HDM Chapter 18 and ADAAG	Varies	5' Highway 5.6' Bridge
17	Median Width	N/A	N/A	N/A

(1) The Design Speed of 40 mph was selected based on engineering judgment and is consistent with the anticipated off-peak 85th percentile speed within the range of functional class speeds for the terrain and volume.

Exhibit 2.2.A.2
Critical Design Elements for Bridges over Humboldt Parkway

PIN:	5512.52	NHS (Y/N):	No
Route No. & Name:	Humboldt Pkwy	Functional Classification:	Urban - Collector
Project Type:	New Construction	Design Classification:	Collector, Urban
% Trucks:	3.2%	Terrain:	Rolling
ADT:	Varies	Truck Access/Qualifying Hwy.	Neither

	Element	Standard	Existing Condition	Proposed Condition
1	Design Speed	40 mph[1]	30 mph posted	40 mph
2	Lane Width	10' minimum, 12' desirable Adjacent to curb 12' min., 14' des. Turn Lane 11' min., 12' des. Parking 7' min., 8' des. HDM. Section 2.7.3.2.B	12'-14' 12' turn 8' parking	12'-14' 12' turn lane 8' parking
3	Shoulder Width	0' HDM Section 2.7.3.2.C, Exhibit 2-6	0'	0'
4	Bridge Roadway Width	Full Approach Roadway Width BM Sections 2.3.1, Table 2-1	Best 72' Dodge 30' Northampton 48' E Utica 52' E Ferry 52'	Best 72' Dodge 30' Northampton 48' E Utica 52' E Ferry 52'
5	Maximum Grade	10% HDM Section 2.7.3.2 E, Exhibit 2-6	2.8%	2.8%
6	Horizontal Curvature	533' (@ e = 4.0%) HDM Section 2.7.3.2 F, Exhibit 2-6	Unlimited	533' min.
7	Superelevation Rate	4% Maximum HDM Section 2.7.3.2 G	4% max.	4% max.
8	Stopping Sight Distance	305' Minimum HDM Section 2.7.3.2 H, Exhibit 2-6	185'	305' min.
9	Horizontal Clearance	0.0' with barrier, 1.5' without barrier, 3.0' at intersections HDM Section 2.7.3.2 I	1.5' Min, 3.0' at int.	1.5' Min, 3.0' at int.
10	Vertical Clearance	14' minimum; 14'-6" desirable BM Section 2.4.1, Table 2-2	Unlimited	Unlimited
11	Pavement Cross Slope	Travel Lanes: 1.5% Min. to 2% Max. Parking Lanes: 1.5% Min. to 5.0% Max. HDM Section 2.7.3.2 K	2.0% and varies	2.0%
12	Rollover	4% between lanes 8% at Edge of Traveled Way HDM Section 2.7.3.2.L	4% between lanes	4% between lanes
13	Structural Capacity	AASHTO HL-93 Live Load and NYSDOT Design Permit Vehicle BM Section 2.6.1	HS-20	AASHTO HL-93 Live Load and NYSDOT Design Permit Vehicle
14	Level of Service	N/A	N/A	N/A
15	Control of Access	N/A	N/A	N/A
16	Pedestrian Accommodation	5' Highway 5.6' Bridge Complies with HDM Chapter 18 and ADAAG	Varies	5' Highway 5.6' Bridge
17	Median Width	N/A	N/A	N/A

(1) The Design Speed of 40 mph was selected based on engineering judgment and is consistent with the anticipated off-peak 85^{th} percentile speed within the range of functional class speeds for the terrain and volume.

Exhibit 2.2.B
Alternatives B & C Critical Design Elements for Route 33

PIN:	5512.52	NHS (Y/N):	Yes
Route No. & Name:	NY Route 33 Kensington Expressway	Functional Classification:	Urban – Principal Arterial Expressway
Project Type:	3R with New Bridges	Design Classification:	Freeway
% Trucks:	5%	Terrain:	Rolling
ADT:	90000	Truck Access/Qualifying Hwy.	Qualifying

	Element	**Standard**	**Existing Condition**	**Proposed Condition**
1	Design Speed	70 mph[1]	55 mph posted	70 mph
2	Lane Width	12' Minimum HDM. Section 2.7.1.1.B	12'	12'
3	Shoulder Width	10' right 4' left HDM. Section 2.7.1.1.C, Exhibit 2-2	10' right 2.5' left	8'8" (min.) right 4.0' left
4	Bridge Roadway Width	Full Approach Roadway Width BM Table 2-1	N/A	N/A
5	Maximum Grade	4% HDM Section 2.7.1.1 E, Exhibit 2-2	3.8%	3.8%
6	Horizontal Curvature	1815' (@ e = 6.0%) HDM Section 7.6.3, Exhibit 7-10	2290' min	2290' min.
7	Superelevation Rate	6% Maximum HDM Section 2.7.1.1.G	6% max.	6% max.
8	Stopping Sight Distance	600' Minimum HDM Section 7.6.3, Exhibit 7-10	752'	752'.
9	Horizontal Clearance	Greater of Shoulder Width or 4' with barrier, 15' without barrier HDM Section 2.7.1.1.I	2.5' Min. at barrier, 15' min. with no barrier	2.5' Min. at barrier, 15' min. with no barrier
10	Vertical Clearance	14'-0" Minimum, Highway 14'-6" Minimum, Highway BM Section 2.4.1, Table 2-2	Best 15' Dodge 14' Northampton 14' E. Utica 15' E. Ferry 15'	Best 14.5' (2) Dodge 14.5' (2) Northampton 14.5' (2) E. Utica 14.5' (2) E. Ferry 14.5' (2)
11	Pavement Cross Slope	Travel Lanes: 1.5% Min. to 2% Max. HDM Section 2.7.1.1.K	2.0% and varies	2.0%
12	Rollover	4% between lanes; 8% at EOT; HDM Section 2.7.1.1.L	4% lanes, 8% max @ EOT	4% lanes, 8% max @ EOT
13	Structural Capacity	NYSDOT LRFD Specifications AASHTO HL-93 Live Load And NYSDOT Design Permit Vehicle HDM Section 2.7.3.2.M & BM Section 2.6.1	HS-20	HL-93 (3)
14	Level of Service	N/A	N/A	N/A
15	Control of Access	Fully Controlled	Frontage Road	Frontage Road
16	Pedestrian Accommodation	N/A	N/A	N/A
17	Median Width	4' Minimum HDM Section 7.6.3, Exhibit 7-10	4' Minimum	4' Minimum

(1) The Design Speed of 70 mph was selected based on engineering judgment and is consistent with the anticipated off-peak 85th percentile speed within the range of functional class speeds for the terrain and volume.
(2) Vertical Clearance assumes bridges are replaced per Alternative C. Alternative B retains existing bridges and corresponding vertical clearances.
(3) Structural Capacity assumes bridges are replaced per Alternative C. Alternative B retains existing bridges; Structural Capacity is HS-20.

*LOS is not a critical design element for an Urban Principal Arterial Expressway – Other (HDM Exhibit 2.7.1.2).

Exhibit 2.2.C
Alternative D Critical Design Elements for Route 33

PIN:	5512.52	NHS (Y/N):	Yes
Route No. & Name:	NY Route 33	Functional Classification:	Urban Principal Arterial Expressway
Project Type:	New Construction	Design Classification:	Freeway
% Trucks:	5%	Terrain:	Rolling
ADT:	90000	Truck Access/Qualifying Hwy.	Qualifying

	Element	Standard	Existing Condition	Proposed Condition
1	Design Speed	70 mph[1]	55 mph posted	70 mph
2	Lane Width	12' minimum HDM Section 2.7.1.1.B	12'	12'
3	Shoulder Width	Right: 10' minimum, 12' desirable Left: 4' minimum HDM Section 2.7.1.C Exhibit 2-2	Right: varies Left: 4'	Right: 10' Left: 4'
4	Bridge Roadway Width	Full approach roadway width BM Table 2-1	N/A	N/A
5	Maximum Grade (Mainline)	4% HDM Section 2.7.1.1.E, Exhibit 2-2	3%	4%
6	Maximum Grade (Ramps)	6% HDM Section 2.7.2.2.E, Exhibit 2-10	3.5%	6.73%[2]
7	Horizontal Curvature	1810' @ e=8% HDM Section 2.7.1.1.F, Exhibit 2-2	2280'	2256'
8	Superelevation Rate	8% HDM Section 2.7.1.1.G	6%	6%
9	Stopping Sight Distance	730' HDM Section 2.7.1.1.H, Exhibit 2-2	450'	450'
10	Horizontal Clearance	Greater of Shoulder Width or 4' with barrier, 15' without barrier HDM Section 2.7.1.1.I	4.5'	4'
11	Vertical Clearance	14' minimum, 14'-6" desirable BM Section 2.4.1, Table 2-2	14'-6" min.	14'-6"
12	Pavement Cross Slope	1.5% to 2% HDM Section 2.7.1.1.K	1.5% to 2%	2%
13	Rollover	4% between lanes; 8% at EOT HDM Section 2.7.1.1.L (If e > 6% and shoulder drainage is a concern, may use 10% for outer 4' of shoulder – see HDM 3.2.5.1)	4% between lanes; 8% at EOT	4% between lanes; 8% at EOT
14	Structural Capacity	NYSDOT LRFD Specifications AASHTO HL-93 Live Load and NYSDOT Design Permit Vehicle NYSDOT Standard Specifications AASHTO HS25 Live Load	HS-25	AASHTO HL-93 Live Load and NYSDOT Design Permit Vehicle
15	Level of Service	N/A	N/A	N/A
16	Control of Access	Fully Controlled	Full	Full
17	Pedestrian Accommodation	NFPA 502, 3'-6" clear egress walkway	N/A	3'-6" clear egress walkway
18	Median Width	10' minimum	11'	11'
19	Ventilation	Air quality standards listed in FHWA Road Tunnel Design Guidelines, Section 4-13 NFPA 502, Section 7	N/A	FHWA Section 4-13 NFPA 502 Sect.7
20	Lighting Standards	FHWA Road Tunnel Design Guidelines, Section 4-11(d), Table 4-11, 0.464 foot-candle (converted from CD/m^2)	N/A	0.464 ft-candle
21	Fire Suppression	Required for Category D Tunnel under NFPA 502, Section 7	N/A	NFPA 502 Section 7
22	Video Monitoring	FHWA Road Tunnel Design Guidelines, Section 4-11, NFPA 502, Section 7	N/A	FHWA Section 4-11 NFPA 502 Sect. 7

(1) The Design Speed of 70 mph was selected based on engineering judgment and is consistent with the anticipated off-peak 85^{th} percentile speed within the range of functional class speeds for the terrain and volume.
(2) The proposed grades of the eastbound on- and off- ramps are non-standard. The large grade change between Route 33 and Humboldt Parkway, coupled with the limited space between the on- and off-ramp requires steeper grades that exceed the standard criterion.

Exhibit 2.2.D Alternative E Critical Design Elements for Route 33				
PIN:	5512.52	NHS (Y/N):	Yes	
Route No. & Name:	NY Route 33	Functional Classification:	Urban – Principal Arterial - Other	
Project Type:	New Construction	Design Classification:	Arterial, Urban	
% Trucks:	5%	Terrain:	Rolling	
ADT:	90000	Truck Access/Qualifying Hwy.	Qualifying	

	Element	Standard	Existing Condition	Proposed Condition
1	Design Speed	50 mph[1]	N/A	50 mph
2	Lane Width	12' minimum, 12' desirable Adjacent to curb 12' min., 14' des. Turn Lane 11' min., 12' des. HDM. Section 2.7.2.2.B, Exhibit 2-4	N/A	12' 12' curb lane 11' turn lane
3	Shoulder Width	0'-4' minimum shoulder may be used with a 12' outside travel lane or separate provisions for bicyclists are provided HDM Section 2.7.2.2.C, Exhibit 2-4	N/A	2'
4	Bridge Roadway Width	Full Approach Roadway Width BM Table 2-1	N/A	N/A
5	Maximum Grade	7% HDM Section 2.7.2.2 E, Exhibit 2-4	N/A	7.0%
6	Horizontal Curvature	926' (@ e = 4.0%) HDM Section 2.7.2.2 I	N/A	926' min.
7	Superelevation Rate	4% Maximum HDM Section 2.7.2.2 G	N/A	4% max.
8	Stopping Sight Distance	425' Minimum HDM Section 2.7.2.2 H, Exhibit 2-4	N/A	425' min.
9	Horizontal Clearance	0.0' with barrier, 1.5' without barrier, 3.0' at intersections HDM Section 2.7.2.2 I	N/A	1.5' Min, 3.0' at int.
10	Vertical Clearance	14' minimum, 14'-6" desirable BM Section 2.4.1, Table 2-2	N/A	N/A
11	Pavement Cross Slope	Travel Lanes: 1.5% Min. to 2% Max. Parking Lanes: 1.5% Min. to 5.0% Max. HDM Section 2.7.2.2 K	N/A	1.5% to 2.0%
12	Rollover	4% between lanes, 8% at EOT HDM Section 2.7.2.2.K	N/A	4% between lanes
13	Structural Capacity	NYSDOT LRFD Specifications AASHTO HL-93 Live Load And NYSDOT Design Permit Vehicle HDM Section 2.7.3.2.M & BM Section 2.6.1	N/A	AASHTO HL-93 Live Load and NYSDOT Design Permit Vehicle
14	Level of Service	N/A	N/A	N/A
15	Control of Access	Parkway access at intersections	N/A	N/A
16	Pedestrian Accommodation	5' Highway 5.6' Bridge Complies with HDM Chapter 18 and ADAAG	N/A	5' Highway 5.6' Bridge
17	Median Width	N/A	N/A	N/A

(1) The Design Speed of 50 mph is was selected based on engineering judgment and is consistent with the anticipated off-peak 85th percentile speed within the range of functional class speeds for the terrain and volume.

2.3 Engineering Considerations for Alternative B - Humboldt Parkway Enhancements

2.3.1 Design Elements

2.3.1.a Comprehensive Street Rehabilitation

Alternative B - Humboldt Parkway Enhancements is designed to be a street rehabilitation project. As mentioned in Chapter 1, this alternative has been developed with the City of Buffalo's Complete Streets policy in mind. The following design elements are part of this project recommendation:

- <u>Curbing:</u> Granite curbing exists along Humboldt Parkway. In general, the condition of the curbing is good. The outside (right) curb line is anticipated to remain in its current location and may not require resetting and/or new curb (except at specific locations and street corners where bump-outs are proposed). A complete curb assessment would need to be made during design.

- <u>Traffic Signals:</u> A visual inspection of the traffic signal equipment suggests that the existing traffic signals and controllers are in need of replacement. Consideration should be given to utilizing decorative poles and mast arms.

- <u>Pavement:</u> The pavement appears to be in fair condition based on a visual inspection. A review of record drawings suggests that the pavement structure consists of 12“ granular subbase, 8” of reinforced concrete pavement and 3“ of asphalt courses. Engineering judgment suggests that this pavement is a good candidate for rehabilitation. Pavement rehabilitation would consist of milling with a two course overlay. A *Pavement Evaluation and Treatment Selection Report* (supported by geotechnical information from borings) would need to be prepared to determine the appropriateness of this recommendation.

- <u>Pavement Markings:</u> The existing pavement is virtually devoid of pavement markings. The completed project would include high visibility crosswalks, stop bars, symbols and longitudinal lane markings at intersection approaches.

- <u>Street Lighting:</u> The street lighting system consists of standard aluminum davit poles with cobra head luminaires. An opportunity exists to install a decorative street lighting system with pedestrian level lighting (sidewalks) and overhead street lighting (pavement).

- <u>Sidewalks:</u> 5 foot wide concrete sidewalks exist along the residential side (right) of Humboldt Parkway. Sidewalks appear to be in fair condition and spot replacement is anticipated. ADA compliant sidewalk ramps will be installed.

- <u>Storm Drainage</u>: Drainage along Humboldt Parkway is collected in catch basins generally located along the outside curb (the pavement generally slopes away from the expressway retaining walls towards the outside curb). The proposed lane configuration maintains the outside curb line, so it is assumed that the majority of the existing drainage system could be maintained, though it is expected that some catch basins will be replaced due to condition or where curb locations are changing. Televising the sewer system is recommended to confirm its condition. Certain sections of storm sewer piping may require repair or replacement.

- Utilities: as part of the design process, utility companies will be contacted to determine necessary improvements and/or upgrades. Other minor utility work may include resetting existing manhole or valve covers and the installation of conduit and pull boxes for the new traffic signal and pedestrian signal equipment.

- Landscaping: street trees are located between the curb line and sidewalk along the right side of the road. Tree sizes range from 3 inches to 18 inches in diameter. Approximately 50% of the corridor does not have street trees. This alternative calls for significant tree planting on both the left (expressway) side and right (residential) side. Along the expressway side, stamped concrete with tree pits are proposed.

- Retaining Walls: the project calls for replacement of the existing railing along the top of the expressway retaining wall. Texas aesthetic concrete barrier is proposed. The existing expressway light fixtures currently mounted to the retaining walls will likely be impacted by this work and will require replacement. Also, the expressway retaining walls will be repaired as necessary including re-facing the bottom portion (approximately 6 feet) to address surface spalling and applying stain to the walls to improve their appearance.

- Traffic: traffic volumes indicate that Humboldt Parkway is a candidate for a “road diet” (narrowing the curb to curb width to eliminate or better define lanes). The design hour volume of Humboldt Parkway ranges from 357 to 726 (2006 counts) with one area at 954 (southbound Humboldt between Butler Avenue and Golding Avenue). In general it is believed that traffic can be accommodated at one travel lane with auxiliary lanes for turning at major intersections.

- Safety analysis: At this time, a review of accident records (three years) has not been completed. As part of the project, accident history will be evaluated to determine the need for safety improvements.

Humboldt Parkway is a City of Buffalo owned and maintained street. As such, some of the improvements described above would be considered the responsibility of the city of Buffalo to fund. Improvements that are considered to be included in the City of Buffalo cost betterment are: street lighting, landscaping on the residential side of the street, sidewalk improvements and traffic signals.

2.3.2 Humboldt Parkway

2.3.2.a Proposed Typical Section

Alternative B includes the rehabilitation of Humboldt Parkway to provide a narrowed pavement section, delineated parking areas (right side only), a landscaped buffer between the left edge pavement and expressway retaining walls, and new concrete Texas Aesthetic Barrier installed along the top of the existing retaining walls.

The typical mid-block section for Humboldt Parkway includes one 14 feet wide travel lane, an 8 feet wide parking lane (right side), and a landscaped buffer (stamped concrete and trees) between the travel lane and new Texas barrier. The landscaped buffer varies in width but is generally greater than 11 feet wide. The 14 feet wide travel lane is designed as a shared lane to accommodate bicycle use.

At the Humboldt Parkway intersections with E. Ferry Street and E. Utica Street, the typical intersection approach includes a 14 feet wide shared thru/left turn lane and an 11 feet wide right turn lane. This configuration enables the landscaped area along the retaining walls to be extended all the way to each intersection, and also allows a separate lane for right turns (and right-on-red). The Humboldt Parkway southbound approach to E. Ferry St includes dedicated left, through and right turn lanes which are considered necessary to accommodate higher volumes on this approach due to the expressway ramp. Maintaining the existing pavement width of 32 feet at this location results in a 12 ft wide through lane and 10 ft wide turning lanes. A two-lane southbound approach (with standard lane widths) may provide adequate level of service; this would need to be confirmed through traffic analysis.

At the Humboldt Parkway southbound intersections with Northampton Street and Dodge Street, one 14 feet wide lane is proposed. Preliminary traffic analysis using the HCS2000 Urban Street Arterials Module and existing turning movement volumes indicates that this lane configuration would operate at acceptable levels of service. HCS2000 calculates LOS using the methodology of the Highway Capacity Manual, 2000 Edition.

2.3.2.b Traffic and Pedestrian Improvements

This alternative includes the replacement of traffic signals at the Humboldt Parkway intersections with E. Ferry Street, E. Utica Street, and Northampton Street as part of a betterment funded by the City of Buffalo. Pedestrian signal equipment would be provided as well as sidewalk ramps, high-visibility crosswalks and new pavement striping. The Humboldt Parkway intersection with Dodge Street is proposed to remain unsignalized. Field observations and review of traffic volumes indicate that the Humboldt Parkway intersection with Northampton Street could also operate as an unsignalized intersection.

Curb extensions (bump-outs) are proposed throughout the project area to shorten pedestrian crossings. Other area-wide improvements include new pavement striping, signage, crosswalks, and sidewalk ramps. Sidewalk and ramp improvements may require minor right-of-way acquisitions.

2.3.3 Landscape and Enhancements

Alternative B includes many enhancements to the project area, including the following:

- Replacement of the existing steel railing along the top of the expressway retaining walls with new concrete Texas Aesthetic Barrier. Existing steel bridge railing would also be replaced with the new Texas barrier and decorative fencing as part of the next scheduled capital improvement for each bridge.

- Enhancing the look of the existing expressway retaining walls with concrete stain.

- Narrowing the existing pavement section to provide a landscaped buffer between Humboldt Parkway and expressway retaining wall with Texas barrier. The buffer area will be finished with a decorative surface such as stamped concrete, and trees will be planted at regular intervals.

- Installation of curb extensions (bump-outs) at intersections and other select locations to shorten pedestrian crossing distance, delineate parking areas and provide more room at street corners for pedestrian staging.

- Installation of sidewalk ramps at pedestrian crossings.

- Replacement of traffic signals and the addition of pedestrian signals at each signalized intersection (as part of a betterment funded by the City of Buffalo).
- Rehabilitation of the pavement surface and widening travel lanes to accommodate bicycle use. Striping will be installed to improve the delineation of travel and parking lanes, exclusive turn lanes and crosswalks.

- Upgrading the street lighting system with decorative poles and fixtures (as part of a betterment funded by the City of Buffalo).

Decorative materials could be used for many of the enhancements listed above, such as using patterned inlays or stamped concrete to delineate crosswalks, using brick or stamped concrete accents along sidewalks, or using decorative powder-coated poles.

2.3.4 Unique Considerations

2.3.4.a Sub-Alternative B1 - Bridge Rehabilitation with Widening

An opportunity exists to improve the existing bridge crossings at E. Ferry St, E. Utica St, Northampton St and Dodge St to provide additional sidewalk width and introduce landscaped areas. Sub-Alternative B1 - Bridge Rehabilitation with Widening proposes to construct an independent bridge on each side of the existing structure to provide a widened sidewalk (assumed to be 10 feet wide) and a landscaped area assumed to be 15 feet wide. Under this scenario, the total width of the new bridge structure is approximately 19 feet. Preliminary analysis indicates that a new structure could be constructed along both sides of each bridge within the project limits (E. Ferry St, E. Utica St, Northampton St and Dodge St). This sub-alternative will provide a minimum 14'-6" vertical clearance over the NY Route 33 (Kensington Expressway) underneath (assuming the existing vertical alignment of the expressway is maintained).

Should this option be chosen, it is recommended to rehabilitate the existing bridge superstrutures at the same time. Currently the Region 5 capital program includes PIN 5512.49 - bridge deck rehabilitation of BINs 1022640 (E. Ferry St), 1022630 (E. Utica St), 1022620 (Northampton St), 1022610 (Dodge St), and 1022609 (Best St). The construction schedule for this future project is unknown at this time.

The new independent bridge structure is similar to the proposed decking system for Alternative C, which includes a 3 foot layer of soil (to accommodate grass, trees, or landscaping) placed over a two-span, adjacent prestressed concrete box beam superstructure. The beams would be supported by new reinforced concrete, stub abutments on piles constructed behind the existing retaining walls and a hammerhead, reinforced concrete median pier supported on a drilled shaft socketed into rock. A longitudinal joint system would separate the existing bridge from the new independent bridge.

Construction of the independent bridges would require the following major work tasks:

- Remove the existing bridge railing, light poles and sign structures.
- Excavate for the new abutments utilizing either a temporary excavation support system or layed-back slope excavation.

- Remove an upper portion of the existing retaining walls (approximately 7 ft) and abutment wingwalls to provide for the new box beams.
- Behind the existing retaining walls and wingwalls, install drilled piles socketed into rock and construct the new stub abutments.
- Construct a new median pier (hammerhead with single column founded on a drilled shaft and socketed into rock).
- Install new prestressed concrete box beams and pour a 6" minimum composite concrete slab over the beams (concrete slab is required to structurally tie the parapet walls and sidewalk extension to the superstructure).
- Construct a vertical parapet wall along the fascia line and edge of extended sidewalk to retain the soil fill.
- Pour the extended concrete sidewalk and install a longitudinal joint system between the existing bridge and new independent bridge.
- Install the new green space material layers (waterproof membrane, protection board, drainage material, filter fabric, soil).
- Install a new concrete Texas aesthetic concrete barrier and decorative fencing on top of the parapet wall at the new fascia line.

A second option was evaluated to provide wider bridge structures. This option includes widening the existing bridge deck to achieve the same goal (widened sidewalk and green space). Considerations with this option include the following: the extended bridge deck must match the existing structural components to ensure compatible elastic and thermal properties; the new bridge bearings must match the existing bearing function, i.e., rotational and deflection characteristics; and, new abutments would need to be built on each side. Also, the extended bridge deck must be designed to distribute the widened sidewalk and green space superimposed loads to the existing bridge beams that were not originally designed to carry these loads. Remedial work to the existing beams would likely be required to carry the additional superimposed loads in conjunction with the existing live load. In order to avoid costly structural retrofitting of the existing bridges, this option was dismissed from further consideration.

2.3.4.b Sub-Alternative B2 – Bridge Replacement

Sub-Alternative B2 - Bridge Replacement proposes to completely replace each bridge with a new two-span bridge structure. This sub-alternative would address the deteriorated condition of the existing bridge superstructure and provide a widened sidewalk (assumed to be 10 feet wide) and a landscaped area (assumed to be 15 feet wide) flanking each side of the deck. The bridge superstructures would range in width from around 85 feet to107 feet, each approximately 50 feet wider than the existing bridge. This sub-alternative will provide a 3-foot layer of soil (to accommodate grass, trees, vegetation) and a minimum 14'-6" vertical clearance over the expressway underneath assuming the existing vertical alignment of the expressway is maintained.

Two superstructure types have been evaluated as possible replacement structures: steel multi-girder and prestressed box beam. The steel multi-girders under consideration are two-span continuous, fabricated from plates and composite with a 9 ½" thick deck slab. A girder section fabricated from plates offers a more efficient, shallower and economical section versus a rolled beam. The prestressed box beam superstructure under consideration is comprised of adjacent beam units and composite with a 6" thick deck slab. Installed as independent spans, the beams will be made continuous at the median pier for carrying live load. The beam units will incorporate internal diaphragms and transverse tendons.

A comparison of the two structure types has been made. The pre-stressed concrete box beam is recommended for the following reasons:

- Based on a preliminary cost comparison (bridge assumed to be 107 feet wide by 110 feet long, 2-span), the steel multi-girder superstructure is approximately $550,000 more costly than a pre-stressed box beam superstructure.

- The overall depth of the superstructure from the bottom of beam to top of composite deck varies with each structure type. The steel multi-girder superstructure is approximately 38 inches deep (fabricated steel plate girder) while the prestressed box beam superstructure is approximately 30 inches deep. The shallower section allows greater flexibility to increase vertical clearances if desired and/or minimize the height of knee-walls associated with the landscaped areas adjacent to the sidewalk.

- Either structure type would function satisfactorily in this application considering the relatively short spans with flat grades. However, the pre-stressed concrete beam units are less vulnerable to price fluctuations and can be manufactured locally in less time to offer faster delivery time.

The existing median piers are a reinforced concrete rigid frame type (cap beam and column) supported on spread footing on rock. The exception is at Northampton St which is supported on individual footings founded on piles to rock. The replacement median pier is recommended to be a reinforced concrete rigid frame type as it offers a more economical and open (less tunnel-like) appearance than a solid pier. To minimize excavation and disruption to expressway traffic, the pier columns are proposed to be founded on drilled shafts socketed into rock. The proposed column spacing can be located such as to fall between the existing median pier column footings. The option to construct spread footings on rock (similar to existing) will require a very costly temporary soldier pile and lagging wall system to support the excavation (soldier piles will require socketing into rock).

Construction of a replacement bridge would require the following major work tasks:

- Remove the existing bridge superstructure and the median pier to 2 feet below finished grade. Existing utilities will have to be temporarily taken out of service or supported in-place.
- Excavate for the new abutments utilizing either a temporary excavation support system or layed-back slope excavation.
- Remove an upper portion of the existing abutments and retaining walls (approximately 4 ft) to provide for the new superstructure.
- Behind the existing abutments and retaining walls, install drilled piles socketed into rock and construct new stub abutments.
- Construct a new rigid frame median pier (cap beam and columns founded on drilled shafts socketed into rock).
- Install the new superstructure framing and pour the concrete deck slab.
- Construct a vertical concrete parapet wall along the bridge fascia line and the back of sidewalk to retain the landscaped area soil fill.
- Install the bridge curbs and pour the concrete sidewalk.
- Install the new green space material layers (waterproof membrane, protection board, drainage material, filter fabric, soil).
- For the buried prestressed box beam superstructure option, extend the waterproof membrane across the entire bridge deck and install the asphalt pavement layers.

- Install a new concrete Texas aesthetic concrete barrier on top of the parapet wall at the new fascia line, topped with decorative fencing.

Refer to Figure 2-1 (below) which illustrates an existing bridge located in Philadelphia, PA (N. 19th St. over Interstate 676) with landscaped areas on either side.

2.3.5 Work Zone Traffic Control

Alternative B could be implemented with minimal impact to traffic and adjacent property owners. Work along the retaining walls and railings would require single lane and shoulder closures on the Kensington Expressway. Some of the daytime and nighttime work zone assumptions and strategies are described in the table included in Section 2.4.5. The benefits and drawbacks of performing work during nighttime hours should be considered, as night work is beneficial from a traffic volume standpoint but can result in noise and lighting impacts to the residential properties in the surrounding neighborhoods. Work along the Humboldt Parkway, including milling & paving, installation of the landscaped buffer area, sidewalk ramps and signal replacement could be accomplished with temporary lane closures and localized work zones. It is not anticipated that entire sections of the Humboldt Parkway or NY Route 33 would require closures or off-site detours, although temporary (off-peak or overnight) ramp closures may be required to accommodate paving and retaining wall work on the entrance / exit ramps.

2.3.6 Environmental Considerations

The scale of work proposed under this alternative will not have significant adverse impacts on the environment. At this time, the environmental classification for Alternative B - Humboldt Parkway Enhancements is assumed to be:

- SEQR Type II (categorical exclusion) - In accordance with 17 NYCRR Part 15.14, the action meets the criteria for classification as a Type II action. Type II actions are classes of actions which have been determined not to have a significant effect on the environment and do not require the preparation of an EIS.

- NEPA Class II (categorical exclusion) - In accordance with 23 CFR 771.117 (d) (1) the project is considered a Class II action in which the highway will be modernized by resurfacing, restoration, rehabilitation, reconstruction, adding shoulders, or adding auxiliary lanes (e.g. parking, weaving, turning, climbing). For this class of projects, documentation will be submitted to the FHWA which demonstrates that the specific conditions or criteria for categorical exclusions are satisfied and that the significant environmental effects will not result.

Environmental impacts relative to Alternative B are expected to be minimal. The following issues may require some documentation to confirm the categorical exclusion classification.

Storm Water Management: this alternative is not likely to impact more than 1 acre of land, therefore a NYS DEC Stormwater Pollution Discharge Elimination System (SPDES) general permit for storm water discharges from construction activity will not be needed. This must be confirmed.

General Ecology and Wildlife: There are no federally listed species in the project area. There are two State listed species in the project area; one is an endangered vascular plant species and one is an endangered Invertebrate animal species. Compliance and coordination with the

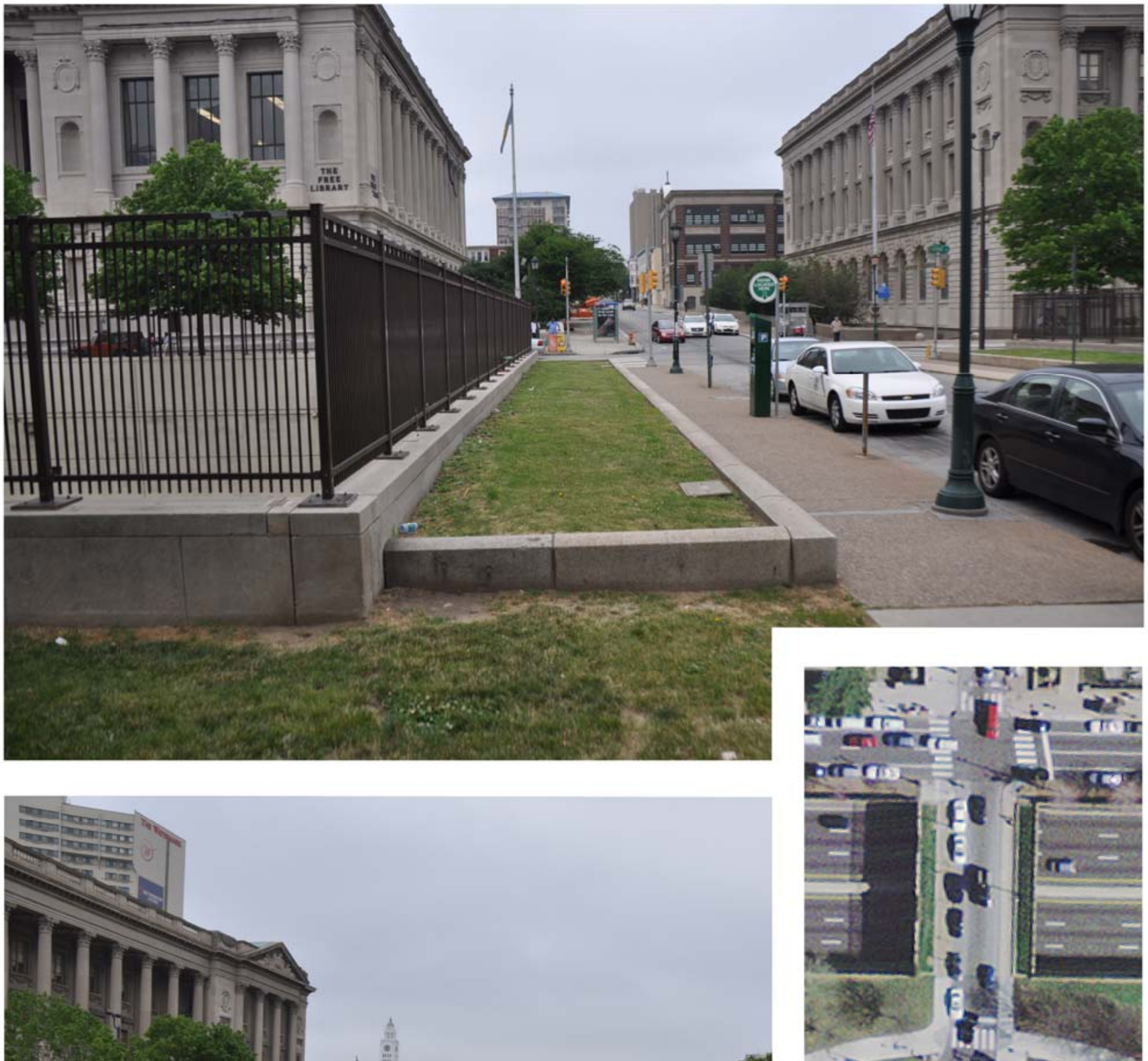

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FIGURE 2-1
WIDE BRIDGE WITH LANDSCAPING
N. 19th ST OVER I-676, PHILADELPHIA PA

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NYSDEC will be necessary for this project. As part of the Final Design Report, the NYSDEC will be contacted to identify the species and a site species assessment will be performed to confirm its presence. Also, the corridor will need to be assessed for the presence of invasive species and an analysis of existing and proposed roadside vegetation will be conducted with regard to reasonable management practices.

Historic And Cultural Resources: As a majority of the area within the project limits has been disturbed by the original construction of the Kensington Expressway, the chance of encountering prehistoric resources is minimal. With regard to historic and cultural resources, the project must comply with the State Historic Preservation Act (section 14.09) as well as the National Historic Preservation Act (section 106). A cultural resources survey will be conducted in the project area and will consist of a documentation of existing buildings and other resources (such as remaining Olmsted features) present in the project area. At present, the Buffalo Museum of Science is known to be listed on the national register of historic places and is located in Martin Luther King Jr. Park. Other structures adjacent to the project may be eligible for listing on the State or Federal register and the project's effect on its overall setting will need to be assessed.

In response to the survey, the NYSDOT regional cultural resources coordinator will make a determination regarding potential effects on historic and cultural resources, in consultation with the New York State office of Parks, Recreation and Historic preservation. It is believed that Alternative B - Humboldt Parkway Enhancements will improve conditions for most if not all of the historic resources within the project area.

Parks and Recreational Resources: Martin Luther King Jr. Park and the Buffalo Museum of Science are located adjacent to the project corridor between Northampton and Best Streets. Alternative B - Humboldt Parkway Enhancements will not impact this property. In general, landscape development on Humboldt Parkway (near this park) should provide a benefit.

Visual Resources: Alternative B - Humboldt Parkway Enhancements will improve the visual quality of the Parkway corridor. This alternative will not require a Visual Impact Assessment (VIA). Photo simulations may be helpful to demonstrate the positive effects of the project to the public.

Asbestos: An asbestos investigation will be necessary during the design of Alternative B. The original contract plans (F.A.C.59-19 and C68-2) indicate the use of compressed asbestos sheet packing on top of the abutment backwalls under the ends of the deck slabs. These concerns will need to be addressed by incorporating specific removal procedures within the contract documents.

Contaminated and Hazardous Materials: A hazardous waste / contaminated materials site screening will be conducted in accordance with NYSDOT's The Environmental Manual (TEM) Section 4.4.20, in order to determine the potential for encountering hazardous waste or contaminated materials during construction. If information from the screening/site visit indicates that contaminated materials might be encountered on the project, a hazardous waste and contaminated materials assessment involving testing of the suspected areas may be required.

A contaminated and hazardous materials investigation is necessary for all alternatives under consideration. The project area is mostly residential in nature and evidence of gas stations or other potential hazardous waste producers are not evident. Therefore, the likelihood of finding hazardous waste is believed to be relatively low. However, there is a strong likelihood there is lead-based paint or undercoats of lead-based paint on the existing bridge beams. In general, these types of environmental issues, if encountered, can be mitigated through appropriate measures (handling and disposal) included in construction contracts.

Construction Impacts: Short-term construction impacts will be minimal. It is expected that traffic can be maintained on-site; access to private property will be maintained.

The following agencies would likely have involvement:

- NYS Office of Parks Recreation and Historic Preservation - Work adjacent to cultural resources

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2.4 Engineering Considerations for Alternative C – Partial Decking of the Expressway with Corridor Enhancements

2.4.1 Design Elements

2.4.1.a Structure Types (General)

A new decking system is proposed to cover portions of NY Route 33, including segments near E. Ferry St, E. Utica St, Northampton St and Dodge St (the existing bridge superstructures and median piers are to be removed). Two structural decking system superstructure types were evaluated: steel multi-girder with composite concrete deck, and adjacent prestressed concrete box beam with composite concrete overlay. For each superstructure system, two scenarios were analyzed, including single-span (approximately 114 feet long) and two-span (approximately 57 feet long) with median pier. The new superstructure will be designed using current AASHTO LRFD criteria and the HL-93 design live load vehicle. The bottom of the new superstructure must maintain a 14'-6" minimum vertical clearance above the existing pavement of the Kensington Expressway.

2.4.1.b Steel Multi-Girder Decking System

Single-span and two-span continuous steel multi-girder systems were evaluated. Assuming a 6 ft girder spacing and 9 inch composite concrete deck slab, the superstructure depths for the single-span and two-span arrangements are 5'-9" and 3'-5" respectively. Topped with a 6" drainage layer and 3 feet of soil, the elevation of the green space on top of the decking system would be approximately 3 - 5 feet higher than the adjacent Humboldt Parkway (top of curb). This is not desirable given the project goal of keeping the top surface of the decking system as level with Humboldt Parkway as possible. As a result, the steel multi-girder decking system was dismissed from further consideration.

The NYS Thruway Authority has recently been constructing two-span, steel multi-girder bridges incorporating a rigid frame treatment at the abutments and median pier. This offers a shallow superstructure depth (approximately 30") utilizing closely-spaced fabricated steel plate girders. The median pier requires a heavily reinforced solid pier type. This bridge type is more costly than a conventional bridge but serves a purpose when superstructure depth is critical. The suitability of this bridge type at the NY Route 33 project site would require further evaluation during detailed design. The preliminary superstructure cost for this shallow steel multi-girder option is approximately $185/SF versus an adjacent prestressed concrete box beam superstructure at approximately $80/SF.

2.4.1.c Adjacent Prestressed Concrete Box Beam Decking System

Single-span and two-span adjacent prestressed concrete box beam decking systems were analyzed. The superstructure depths (including a 6" composite concrete overlay) for the single-span and two-span arrangements is 4'-6" and 2'-6", respectively. Including a 6" drainage layer and the 3 feet of soil on top of the decking system, the single-span and two-span arrangement would result in a higher surface elevation than the adjacent Humboldt Parkway (top of curb) of approximately 4 feet and 2 feet, respectively. Incorporating the composite concrete overlay offers a minimized box beam depth, continuity between adjacent beam units, additional barrier to prevent leakage through the longitudinal beam joints, and a means of structurally tying the decking's end parapet walls to the structure.

The preliminary analysis indicates that the adjacent prestressed concrete box beam decking system, constructed in a two-span arrangement with center median pier, would provide the shallowest superstructure and result in the smallest finished surface elevation height difference (approximately 2 feet or less) with the Humboldt Parkway, which is an important goal of this alternative. Therefore, this decking system is recommended for consideration and the remainder of the report discussion for Alternative C – Decking is based on the two-span, adjacent prestressed concrete box beam decking system. The box beam concrete composite overlay is proposed to be jointless at the abutments and create continuity for superimposed loads at the median pier.

Refer to Figure 2-2 which illustrates a decking system (I-696, Oak Park MI) with a developed park constructed on top.

2.4.1.d Abutments

Considerations for abutment type selection are based on attempting to avoid costly demolition of the existing retaining walls and bridge abutments, and minimize the excavation depth to avoid the use of a temporary excavation support system. Constructing a pile supported, reinforced concrete stub abutment behind the existing retaining walls and bridge abutments satisfies the above selection criteria. The stub abutment configuration consists of a footing, backwall and continuous pedestal. To minimize the span length of the box beam superstructure, vertical piles are considered (no batter) and the front row of piles is closely located behind the retaining wall's battered stem. This requires the front row of piles to be pre-augered through the retaining wall's footing to bear on rock. The result is the beam's centerline of bearings being located approximately 5 feet behind the face of the existing retaining wall, creating a 57-foot span to the centerline of the median pier.

At Ramp 'A' and other locations where there are currently no existing retaining walls, pile supported, reinforced concrete cantilever abutments are proposed. Due to geometric constraints along a portion of Ramp B, a full height, reinforced concrete cantilever abutment on spread footing on rock is required. This requires the demolition of the existing retaining wall (also on spread footing on rock).

Pile types considered include steel H-piles and cast-in-place concrete piles. The steel H-piles offer a higher point bearing capacity and thus a larger required spacing (less number of piles) than the cast-in-place concrete piles. However, due to the close proximity of residences, driving the steel H-piles can be noisy and transmit vibrations to adjacent buildings. The cast-in-place concrete piles can be constructed in augered holes; this process generates less noise and vibration. A geotechnical subsurface investigation may indicate the augered holes require a temporary casing liner to prevent the holes from collapsing.

2.4.1.e Median Pier

The median pier is proposed to be a reinforced concrete, multi-column, bent-type pier. Each pier column is proposed to be supported on a drilled shaft socketed into rock. A drilled shaft foundation offers a shallow excavation depth which can utilize either a layed-back slope or minimal temporary excavation support system to maintain traffic on the expressway. Pier columns supported on spread footing on rock would require a deep excavation and a temporary soldier pile and lagging wall socketed into rock to maintain traffic on the expressway.

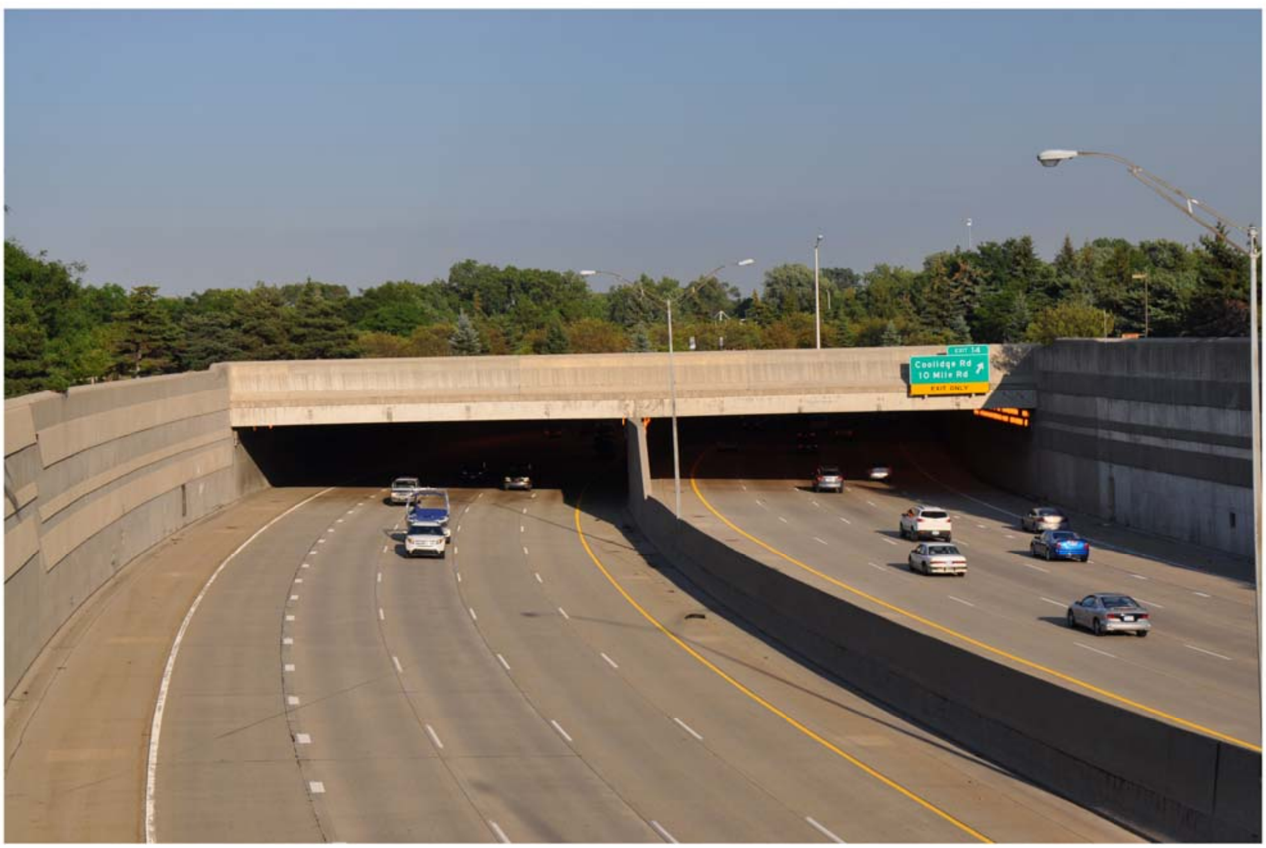

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FIGURE 2-2A
DECKING SYSTEM WITH DEVELOPED PARKLAND ON TOP
I-696, OAK PARK MI

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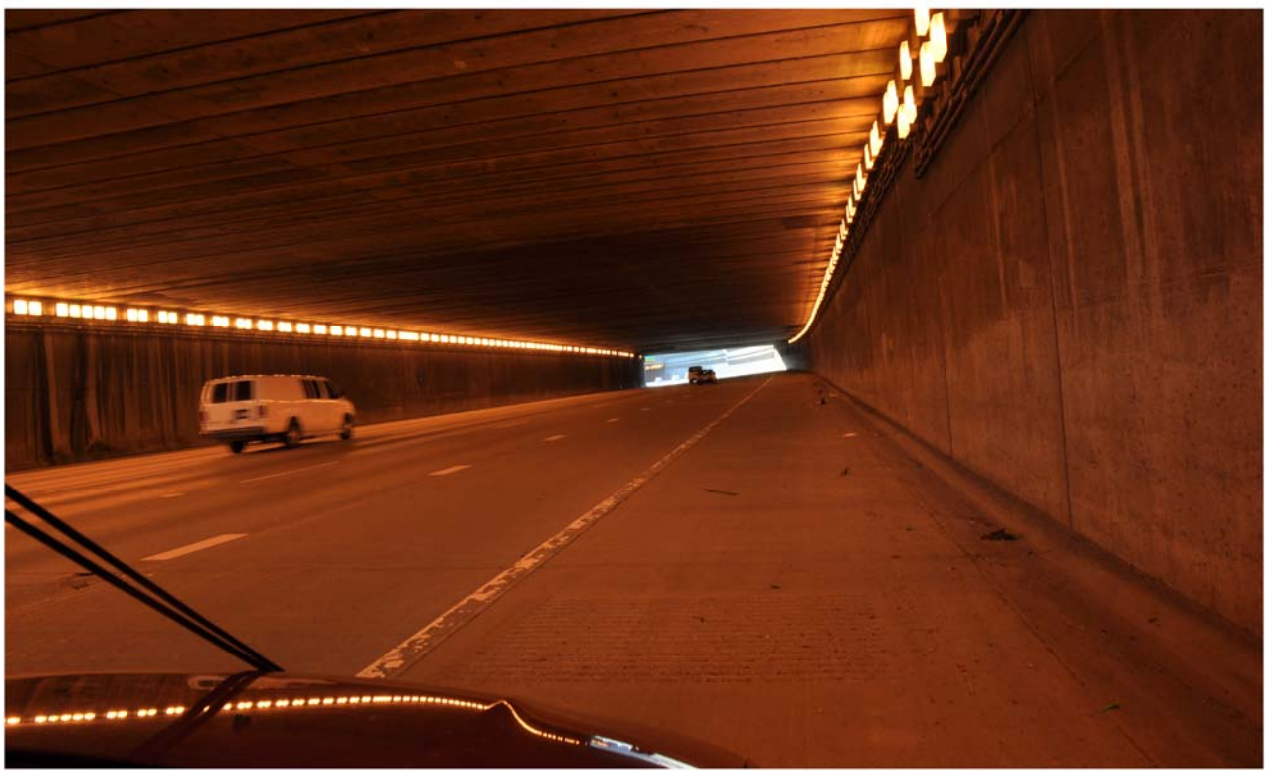

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FIGURE 2-2B
DECKING SYSTEM WITH DEVELOPED PARKLAND ON TOP
I-696, OAK PARK MI

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It is noted that previous NYSDOT construction work in the project area has encountered rock that is shallow and very difficult to penetrate. Therefore, anything that requires socketing into rock (such as drilled shafts or soldier piles) is anticipated to be very costly.

Also, due to the proximity of the expressway to the top of rock, constructing the pier columns on a pile-supported footing, which requires no rock socketing, will not satisfy the NYSDOT 10-foot minimum pile length criteria.

The excavation and construction of the median pier will likely require replacement of drainage systems that are installed along the center of the expressway (refer to Section 2.4.1.h below)

2.4.1.f Existing Retaining Walls

For this study, it is assumed that the existing retaining walls along NY Route 33 and Humboldt Parkway will remain. If Alternative C is progressed, a comprehensive analysis of the retaining walls will be performed to estimate the remaining service life of the structures and determine if the existing walls should remain or be reconstructed. Constructing new retaining walls would add significant cost to this alternative. However, the service life of the existing walls may not compare well to the service life of the new decking system to be built adjacent to the walls.

The existing retaining walls along NY Route 33 are cast-in-place, reinforced concrete cantilever-type walls. The wall foundations vary between steel bearing pile supported and spread footing on soil or rock. The existing retaining walls along Humboldt Parkway at the ramps are of the same construction and either supported on steel bearing piles or spread footing on soil.

The new decking system would extend between the existing retaining walls along the expressway. In their current configuration, these walls cannot accept a decking superstructure. Retrofitting the tops of the walls with a bridge seat and backwall treatment was evaluated. The bridge seat spanned between the retaining wall stem and a drilled pier located behind the retaining wall's footing. This retrofit failed to satisfy AASHTO's overturning stability criteria (safety factor greater than 1.5) and location of the vertical load resultant (within middle half of footing width). Therefore, the existing retaining walls cannot be retrofitted to support a decking superstructure. The existing walls will be partially removed and new abutments will be constructed behind the walls. The lower portion of the walls would remain and continue to function as a retaining wall.

2.4.1.g Decking Typical Section

The decking typical section is comprised of a “bridge-like” superstructure topped with either a City street roadway section or soil overburden to create a green space.

The proposed superstructure is comprised of adjacent prestressed concrete box beams made composite with a 6” minimum concrete slab overlay. The overlay is topped with a membrane waterproofing system, protection board, a 6” layer of stone drainage material, and filter fabric. Constructed over this section is either a City street or a green space section. Transverse tendons at internal diaphragms will be provided to enhance continuity and prevent differential settlement between the adjacent beam units.

The City street roadway typical section is comprised of 11 ½” of asphalt (1 ½” top course, 2” binder course, and 8” base course) on top of 12” stone subbase material.

The green space typical section is comprised of 3 feet of soil (2'-8" of embankment material and 4" topsoil). The 3 feet thick soil layer selection is considered the minimum depth needed to sustain typical street tree species. This soil layer can easily accommodate grass and other vegetation.

To minimize the need for extensive underdrain piping, the box beams are proposed to be placed on a vertical curve to promote natural drainage toward the abutments off the superstructure. In the areas of decking bounded by parapet walls (i.e., adjacent to ramps), underdrain piping may be required.

The proposed decking system has been designed to accommodate the crossroads at E. Ferry Street, E. Utica Street, Northampton Street and Dodge Street. The AASHTO HL-93 design live load was considered, which is a typical expressway loading scenario associated with heavy vehicles including tractor trailers. The "base" Alternative C includes replacing the streets over the top of the decking system with a similar lane configuration and at approximately the same horizontal and vertical alignment as the existing bridge crossings. A typical section through the street crossing includes the decking system's concrete beams and slab, a waterproofing membrane and protection board, a 6" layer of stone drainage material, 12" of stone subbase material, and 11 ½" of asphalt pavement (asphalt base, binder and top courses). Curb, sidewalk and green space would be provided adjacent to the street crossings.

2.4.1.h Drainage, Utilities and Lighting

In general, Alternative C – Decking proposes to maintain existing drainage systems and outfalls, as the profile of the expressway will be unchanged through the sections of decking. In some areas, drainage systems will require replacement in order to accommodate excavation and construction of the central median pier, though the replacements would likely be routine and existing outfalls will be maintained. Between E. Ferry St and Northampton St, the storm sewer system in the center of the expressway ranges in size from 15" to 30" diameter RCP. Between Northampton St and Dodge St, there is approximately 150 ft of 15" RCP that would be impacted. Between Dodge St and Best St, the storm sewer in the center of the expressway is 15" and 18" RCP. Where disturbed by the median piers, the drainage systems would be reconstructed alongside the piers and tied into existing systems outside of the limits of decking.

Drainage work would also be performed along Humboldt Parkway as part of the street rehabilitation (as described in Alternative B – Humboldt Parkway Enhancements), including replacement of curb inlets and repairs to storm piping as needed. The re-alignment Humboldt Parkway between Northampton St and Riley St and the intersection of Dodge St / W. Parade Ave will also require new drainage systems.

Lighting systems are chosen on their life cycle costs and the amount of light required for nighttime and daytime illumination. In conjunction with the lighting system, a highly reflective surface on the walls and ceiling could be considered.

To provide the appropriate amount of light, fluorescent lights typically line the entire roadway tunnel length. At the portals, low-pressure sodium or high-pressure sodium luminaries are often combined with fluorescent lights to provide higher visibility when driver's eyes are adjusting to the decrease in natural light. The intermittent decking / open space associated with Alternative C will require special attention be given to the selected lighting system as drivers are exposed to a series of short length, alternating light / dark conditions.

New decorative lighting systems would also be provided along Humboldt Parkway and within the landscaped areas on top of the decking systems.

Alternative C – Decking is also anticipated to include utility work to reconnect or relocate existing utilities that are carried by the bridges at E. Ferry St, E. Utica St, Northampton St and Dodge St. These utilities include water, gas, electric and telephone. The utility crossings can remain at these locations, but the utilities would require replacement through the area of the proposed decking. Small utilities such as electric, gas, and communications could be installed in the layer of embankment on top of the concrete box beam superstructure. New watermains would need to be installed between two concrete box beams (the beams would be spread apart to leave room for the watermain) and insulated.

The extent of the above-listed utility work would be investigated further during preliminary and final design stages.

2.4.2 Humboldt Parkway

Improvements to Humboldt Parkway are proposed as part of Alternative C - Decking. Many of the enhancements described in Alternative B are included, such as narrowing and rehabilitating the pavement, replacing traffic signals, lighting, signs and pavement striping, sidewalk replacement and curb extensions. In addition to these enhancements, an at-grade median would be re-established between the Humboldt Parkway boulevards on top of the proposed decking system. The medians provide significant areas for public recreation and allow for trees and landscaping to be installed to reference the original Olmsted design (see Section 2.4.3 below).

In addition, the section of Humboldt Parkway southbound between Riley St and Northampton St is proposed to be re-aligned to follow the original Olmsted-designed alignment. The re-alignment not only references an historic Olmsted element, but allows for additional green space and landscaping adjacent to the Museum of Science and Martin Luther King Jr. Park.

2.4.3 Landscape and Enhancements

The installation of decking over sections of the expressway allows for significant areas of landscaping to be re-established along the project corridor. The decking would be topped with a layer of stone for drainage and 3 feet of soil, which is considered minimally sufficient to accommodate grass, vegetation and most types of typical street trees. The conceptual landscaping depicted on the plans is intended to delineate the structured, tree-lined parkway areas from the more informally-landscaped, recreational areas. A more detailed landscape design including the selection of plant species would be completed during the preliminary and final design stages.

The sections of decking between E. Ferry Street and Northampton Street are adjacent to the Humboldt Parkway and allow for the re-establishment of an at-grade median between the northbound and southbound boulevards. The conceptual landscape plan for these sections of decking includes four rows of trees in the median, which references the original Olmsted design. A more informal landscape design is proposed for the section of decking near Dodge Street, as well as the area outside the Humboldt Parkway median between Kingsley Street and Northampton St. The informal landscaping proposed for the Dodge Street section of decking is in keeping with the landscape of the adjacent Martin Luther King Jr. Park. The decked section bounded by Kingsley Street, Humboldt Parkway southbound, and Northampton Street would provide an informal area for public enjoyment and recreation.

2.4.4 Unique Considerations

2.4.4.a Ventilation

The partial decking proposed with Alternative C assumes natural ventilation (no mechanical control). Natural ventilation relies primarily on atmospheric conditions and the piston effect created by moving traffic pushing the stale air through the tunnel. This effect is minimized for a bi-directional traffic condition which is the condition along NY Route 33. Limits on the amount of area that can be decked are influenced by climate and temperature control, contaminant level control and emergency smoke management. The main factors affecting the decked area environment are the pressure differential created by differences in elevation, ambient air temperature and wind effects at the boundaries of the decked area. Additional factors can include tunnel cross section, and traffic volume, direction and mix. Most of these factors are highly variable with time, thus making the resultant natural ventilation neither reliable nor consistent. These general issues are addressed in FHWA's Highway & Rail Transit Tunnel Maintenance & Rehabilitation Manual and ASHRAE Handbook, 2011 HVAC Applications, *Chapter 15, Enclosed Vehicular Facilities*.

The National Fire Protection Association (NFPA) *Standard 502, Standard for Road Tunnels, Bridges & Other Limited Access Highways*, recommends tunnels over 800 feet in length require engineering analysis to determine the need for emergency ventilation to extract smoke and hot gases. Reliance on natural ventilation to maintain required carbon monoxide levels for tunnels greater than 800 feet also needs to be thoroughly evaluated. For this concept study, it is assumed the maximum length of decking coverage over NY Route 33 is 800 feet. During detailed design, this length will need to be confirmed based on the factors noted above through the use of computational fluid dynamics (CFD) software.

The minimum open space between two adjacent tunnel portals is influenced by cross pollution and the sidewise natural wind. Air pollutants are exuded from the exit of one tunnel by piston wind and may diffuse towards the entrance of the adjacent tunnel portal or be carried into it. Guidelines on determining this minimum open space distance are difficult to find. An internet web search found research performed for two railway adjacent tunnels. The research concluded cross pollution should be considered when the distance between the two tunnel openings is less than 100 meters (approximately 330 feet). For this concept study, it is assumed the minimum open space distance between adjacent decked areas is 300 feet. During detailed design, this distance will need to be confirmed through the use of computational fluid dynamics (CFD) software.

2.4.4.b Sub-Alternative C1 - Roundabouts

Sub-Alternative C1 proposes to reconstruct the existing signalized intersections along Humboldt Parkway with roundabouts. Preliminary analysis indicates that the proposed decking systems at E. Utica St and E. Ferry St could accommodate the roundabout design, although the decking at E. Ferry St may require an alternate design to extend the limit of decking to the north. There could be many benefits to installing a roundabout, including the following:

- At each location, the Humboldt Parkway operates as a one-way couple and results in two signalized intersections very close together, separated by a bridge over NY Route 33. A roundabout would replace the two intersections with a single intersection.
- A roundabout would eliminate the need for left turns from E. Ferry Street and E. Utica Street (currently there is limited storage space on the bridges for left turns), as all traffic would be moving in the same direction and all turns from the roundabout would be right turns.
- The operation of traffic through the roundabout would be more efficient (better level of service) than can be expected with the signalized intersections.
- Roundabouts typically result in a significant improvement to safety, as traffic is moving at slow speeds in the same direction. A reduction in right-angle and rear-end crashes would be expected.
- Roundabouts result in a reduction of fuel usage and emissions, as vehicles are constantly moving through the intersection instead of waiting (idling) at a red light. Noise may also be reduced as vehicles operate at lower (but more constant) speeds instead of braking and accelerating.

There are a few considerations for installing roundabouts at these locations. An important goal of this project is to improve pedestrian circulation and access between the neighborhoods on either side of the expressway. Roundabouts can be slightly less pedestrian-friendly than a signalized intersection, as they require pedestrians to cross the “legs” of a roundabout where vehicles aren’t required to stop, and there are not pedestrian signals to aid in the crossings. Roundabouts are also not as bicycle-friendly, although bicyclists have the option to ride through the roundabout or walk bikes along the sidewalk.

Another consideration of installing roundabouts at these locations is evaluating how the roundabouts relate to the original Olmsted design. While the Olmsted system of parks and parkways did include the use of traffic circles (which are quite different than the design of a modern roundabout), the circles were typically used to emphasize the entrance to a park or a major intersection along a parkway. The original Humboldt Parkway did not include traffic circles or roundabouts within the project corridor. The parkway itself was the feature being emphasized, and the side street crossings were minor elements of the design. The installation of roundabouts at E. Ferry Street and E. Utica Street may contradict the original Olmsted vision for the parkway.

Additionally, in the event a project including roundabouts is advanced by the Department, a long-term maintenance plan and agreement for the care of the roundabout central island will be required.

2.4.5 Work Zone Traffic Control and Construction Staging

Construction of the proposed decking system would require multiple construction seasons and extensive work zone traffic control (WZTC) along NY Route 33 and Humboldt Parkway. Important goals of the WZTC plan are identified in the following table:

Project Goal		WZTC Strategies & Assumptions
1	Minimize construction duration	- Consider A+B Bidding - Consider letting two contracts, each including two sections of decking
2	Maintain traffic on NY Route 33 to the maximum extent possible with satisfactory level of service	- During daytime construction, assume minimum two (2) travel lanes in each direction must be operational - During nighttime construction (9pm-5am), assume minimum one (1) travel lane in each direction must be operational
3	When the expressway mainline must be closed, minimize impacts to local roads	- Daily expressway closures must be during nighttime hours only (9pm-5am) (pending evaluation of benefits & concerns with night work) - If local streets are posted as detour, use Minor Arterials or greater - Improve local roads as necessary to accommodate likely increase in traffic - For closure over an extended time, institute a regional Traffic Management Plan and inform the public
4	Minimize time when cross streets (E. Ferry, E. Utica, Northampton, Dodge) are closed	- Consider phasing construction so that only two of the four crossings are severed during one construction season - Utilize local street detours for City traffic
5	Minimize short-term construction impacts on Humboldt Parkway	- Maintain at least one travel lane for access to properties - Temporarily restrict or relocate parking - Close affected expressway ramps and maintain only local traffic on Humboldt Pkwy

<u>Construction Duration and Phasing</u>

Alternative C – Decking includes four separate decking locations ranging in length from 450 feet to 800 feet. It is estimated that each deck would require one construction season to substantially complete (i.e. have all the new concrete beams set). If two decks are constructed simultaneously during one season (March through December), it is anticipated that all the decks could be completed in two (2) construction seasons with a third season to complete all of the surface work such as landscaping and Humboldt Parkway rehabilitation. Therefore, it is believed that Alternative C – Decking can be constructed over the course of three years.

Several strategies are available to the Department to ensure that a reasonable construction duration is met and not exceeded. First, there are time-related contract provisions that are typically used as a matter of standard practice, such as establishing a start and completion date for the work, including liquidated damage provisions in the contract and establishing interim milestone dates (with liquidated damages). Several other options are as follows:

- Award Multiple Contracts: There may be advantages to splitting the project into smaller pieces and bidding each part separately. Under this scenario, contractors could be working simultaneously on different sections of decking.
- A+B Bidding: The use of A+B provisions is primarily intended for critical projects or project phases where traffic inconvenience and delays must be held to a minimum. A+B bidding is an effective way to reduce construction-induced congestion and delays by allowing the cost of the work and time to be balanced through the open competitive bidding process. A+B bidding may be appropriate when the expressway must be closed over a period of time to set concrete beams.
- Incentive/Disincentive (I/D) Provisions: The I/D amount must be sufficient to encourage the contractor to develop innovative ideas and ensure the profitability of meeting tight deadlines.

Construction Considerations

The sequence of construction for each decking system would include the following general tasks:

- Remove existing bridge and utilities: It is assumed that the majority of this work can be progressed while maintaining expressway traffic on NY Route 33. The work would likely be accomplished at night (between 9pm and 5am) when traffic on the expressway can be accommodated in one (1) travel lane, thereby leaving enough room to work beneath the bridge during demolition of the superstructure. However, the use of night work should be evaluated based on the potential for noise and lighting impacts to residential properties in the surrounding neighborhoods. The removal of existing steel bridge beams will require closure of one direction of travel (eastbound or westbound, depending on which beams are being removed) and detouring traffic on other regional State highways or interstates. A local road detour will need to be established once the cross street is severed (refer to detour discussion below). It is recommended that work begins at the end of the decking system furthest away from the existing bridge, which would allow the cross street to remain in service for as long as possible.

- Remove the top portion of retaining walls and construct new abutments and median piers: It is assumed that this work can be progressed while maintaining traffic on NY Route 33. Construction of the new abutments would require closure of the outside travel lane and shoulder. Construction of the median piers would require closure of the inside travel lane on one side and the inside shoulder on the other side, making it possible to work on the abutments along one side of the expressway and median piers simultaneously while maintaining two lanes of traffic in each direction.

  Construction of the new abutments and median piers is expected to progress at a rate of approximately 50 linear feet per month per crew. Multiple crews would be required to complete the longer sections of decking in one construction season. Some of the tasks could be completed simultaneously with multiple crews. For example, as the top portion of the existing retaining walls is removed, a crew can follow behind and install the new abutments and median piers. With the abutments and median piers in place, a crew can begin lifting the beams.

- Install concrete beams and concrete slab over the beams: The installation of concrete beams for the decking system will require closing either the eastbound or westbound travel lanes on the Kensington Expressway (depending on which beams are being installed). Lifting and setting the new concrete beams cannot be accomplished while maintaining traffic on the expressway. One option would be to accomplish this work using daily nighttime closures (9 pm to 5 am) with expressway traffic advised (using advance warning) to use alternate routes. Installing the beams at night when traffic is the lightest would minimize inconvenience and reduce the impact on the local road system which would likely be used by some transient expressway traffic. The WZTC required to close the expressway between Best street and E. Ferry St. would be set up each night and taken down before the morning peak travel period. Once the beams are in place, nighttime closures will no longer be needed and traffic can be maintained on Route 33 while work continues overhead (including concrete slab installation and the surface treatment of the decking system).

  Under the scenario identified above, the new concrete beams could be installed at a rate of approximately six beams per 8 hr. night shift. Assuming an 800 ft long deck section and a four foot wide concrete beam, each half of the decking system (eastbound and westbound) would contain approximately 200 beams, which would require approximately seven weeks to be lifted into place. An entire decking system, with approximately 400 beams, would require approximately fourteen weeks of lifting for the largest deck section. This time frame could be shortened by utilizing 7 day work weeks (instead of 5) or longer work days.

  Another option to expedite the process of lifting beams into place would be to maintain inbound (westbound) traffic while detouring outbound (eastbound traffic). Eastbound traffic would be detoured to other regional State and Interstate highways such as I-190, I-290, I-90 Thruway, and NY Route 198. This scenario would allow beams and/or other work to be installed during the daytime and nighttime hours. It is assumed that the point of closure for the eastbound direction would at Best Street with local traffic only maintained between the Elm-Oak Arterial and Best Street.

- Install surface treatments, landscaping and re-establish cross streets: This work can be accomplished using local work zones. All travel lanes on NY Route 33 could remain open to traffic. The enhancement work, including retaining wall repair, Texas barrier installation, and lighting replacement would require periodic closure of the outside travel lane and shoulder (this work would likely be completed during off-peak daytime hours).

- Humboldt Parkway Traffic can be maintained along Humboldt Parkway during construction of the decking systems, although lane closures, temporary loss of on-street parking, and short-duration ramp closures will be necessary. It is expected that at least one travel lane can remain open as the decking systems are constructed. The partial removal of the existing retaining walls and construction of the new abutments will require closure of the travel lane adjacent to the retaining wall (closure of two travel lanes may be periodically needed). Temporary lane closures will also be needed to complete the Humboldt Parkway enhancements, including pavement narrowing and rehabilitation, retaining wall repairs, Texas barrier installation, and landscaping. Ramps to and from NY Route 33 will require temporary closure to complete certain tasks such as paving. The closures could be accomplished during nighttime hours to minimize disruption to traffic.

  On-street parking needs and traffic volumes should be evaluated and individual staging plans developed for each section of decking.

Pedestrian accommodations will remain in place throughout construction, except at cross streets that are temporarily out of service while the decking systems are constructed. The sidewalk along the residential side of Humboldt Parkway can remain open (aside from temporary closures as the sidewalk is replaced). Temporary pedestrian accommodations would be provided or pedestrian detours posted.

Detour Routes

Establishing an effective WZTC plan for Alternative C – Decking will require the establishment of appropriate detour routes. This will involve both local and regional strategies. From a local traffic perspective, detours will be required to maintain city traffic when cross street bridges over the Kensington Expressway (E. Ferry St, E. Utica St, Northampton St and Dodge St) are removed and new decking is constructed. When the expressway requires closure either in the eastbound or westbound direction, a regional traffic management plan will be required. Traffic will need to be detoured either on local roads or the interstate highway system. Improvements to expressway ramps (to ease the flow of detoured traffic on and off of the expressway) and local streets along the detour routes may be necessary, as determined by a traffic analysis of the detour routes.

Closure of one direction of travel on the Kensington Expressway will be required to complete the removal of existing cross street bridge beams and installation of new concrete beams for the decking systems. This work is expected to be completed during nighttime hours to minimize disruption to traffic on NY Route 33. The detour plan should be developed early on and will require coordination between NYSDOT, the City of Buffalo, GBNRTC, NFTA (bus routes), and local emergency service providers. The detour should also be heavily publicized through the local media, NYSDOT website, and the regional ITS system (fixed and portable dynamic message boards).

When closure of one direction of expressway traffic is required, the intent is to have the majority of traffic utilize alternate interstate routes, including I-90 (Thruway) to I-190 or I-290. The use of dynamic message boards is essential for advance notification. For local traffic, one side of the expressway would be closed between Best St and E. Ferry St, and Jefferson Ave would be a likely detour route. When NY Route 33 Eastbound requires closure, traffic would exit at Best St, travel west to Jefferson Ave, north to Delavan Ave, then east to the Route 33 entrance ramp. When NY Route 33 Westbound is closed, traffic would use the exit ramp near E. Ferry St, travel west on Ferry to Jefferson Ave, south to Best St, then east to the expressway entrance ramp. Other possible detour routes include using Fillmore Ave instead of Jefferson Ave, or detouring westbound traffic to NY Route 198 to Main St (NY Route 5). Other State and Federal highways further to the east could also be suitable, including Harlem Rd (NY Route 240) or Bailey Ave (US Route 62) to Genesee St to Best St.

Local street detours required for the temporary closure of bridges over the Kensington Expressway would likely utilize Jefferson Ave and Fillmore Ave to travel north or south to a cross street that remains open (a project goal is to have two cross streets remain open at all times).

Characteristics of the local streets to be part of the detour routes, including functional classification, number of travel lanes, and AADT volumes are included in the following table:

Street	Functional Classification	Number of Travel Lanes	AADT (Year), Segment
Best St	Urban Minor Arterial	1 each direction	10,200 (2008), Wohlers to Fillmore
			8,700 (2008), Jefferson to Wohlers
Jefferson Ave	Urban Minor Arterial	1 each direction	7,500 (2006), Best to Ferry
Fillmore Ave	Urban Minor Arterial	1 each direction (some sections have two lanes in each direction)	6,850 (2006), Best to Parade
			7,675 (2006), Parade to Utica
			7,800 (2004), Utica to Ferry
			8,225 (2009), Ferry to Delavan
E. Ferry St	Urban Minor Arterial	1 each direction	8,300 (2009), Jefferson to Wohlers
			9,700 (2009), Wohlers to Humboldt
			7,800 (2009), Humboldt to Fillmore
E. Delavan Ave	Urban Minor Arterial	1 each direction	5,900 (2007), Jefferson to Humboldt
			8,600 (2008), Humboldt SB to NB
			8,300 (2006), Humboldt to Fillmore

Should a project be advanced, a traffic analysis should be performed to ensure the detour route can accommodate the additional traffic and identify improvements to pavement, traffic signals and signage that may be needed along the detour route.

2.4.6 Environmental Considerations

The scale of work proposed under this alternative may have significant impacts on the environment in a number of ways, both positive and negative. At a minimum, an environmental assessment will be required, while a more formal environmental impact statement EIS may still be necessary if significant adverse environmental impact(s) are present that are difficult to mitigate. At this time, the environmental classification for Alternative C – Decking is assumed to be:

- SEQR Non-Type II (Environmental Assessment) - In accordance with 17 NYCRR Part 15.6, the action exceeds the criteria for classification as a Type II action therefore it is considered Non-Type II. The preparation of an environmental assessment is the likely course of action (versus preparation of an environmental impact statement which may be determined to be necessary at a later time).

- NEPA Class III - In accordance with 23 CFR 771.115 the project is considered a Class III action in which the significance of the environmental impact is not clearly established. Projects progressed as a class III generally require the preparation of an environmental assessment to determine the appropriate environmental document required.

The impacts of the proposed work on the environment would need to be analyzed in relation to the following areas:

Social: Social issues generally addressed as part of an EA include: land use, neighborhoods, community cohesion, social groups benefited or harmed, school districts, recreational areas, churches and businesses. From a social standpoint, the construction of decking will allow the potential to reconnect neighborhoods, add parkland, and restore Olmsted features will likely have a positive effect on the surrounding communities.

Economic: Economic issues generally addressed as part of an EA include regional and local economies, business districts, and highway related businesses. From an economic standpoint, the project is not likely to create any long-term adverse impacts. In fact, the construction of decking could have a positive effect on the local economy and may spur new investment both in commercial and residential development. The overall economic impact from this project is anticipated to be positive. Short-term construction impacts will need to be addressed to ensure that local businesses can survive during the construction period.

Storm Water Management: Since this alternative is likely to impact more than 1 acre of land, a NYS DEC Stormwater Pollution Discharge Elimination System (SPDES) general permit for storm water discharges from construction activity will be needed. This project will assess the requirements for storm water management practices and will include an analysis to determine the requirement for permanent storm water quality and quantity practices. This DEC permit also ensures that temporary and permanent storm water measures are provided.

General Ecology and Wildlife: There are no federally listed species in the project area. There are two State listed species in the project area; one is an endangered vascular plant species and one is an endangered Invertebrate animal species. Compliance and coordination with the NYSDEC will be necessary for this project. As part of the EA, the NYSDEC will be contacted to identify the species and a site species assessment will be performed to confirm its presence. Also, the corridor will need to be assessed for the presence of invasive species and an analysis of existing and proposed roadside vegetation will be conducted with regard to reasonable management practices.

Historic And Cultural Resources: As a majority of the area within the project limits has been disturbed by the original construction of the Kensington Expressway, the chance of encountering prehistoric resources is minimal. With regard to historic and cultural resources, the project must comply with the State Historic Preservation Act (Section 14.09) as well as the National Historic Preservation Act (Section 106). A cultural resources survey will be conducted in the project area and will consist of a documentation of existing buildings and other resources (such as remaining Olmsted features) present in the project area. At present, the Buffalo Science Museum is known to be listed on the national register of historic places and is located in Martin Luther King Jr. Park. Other structures adjacent to the project may be eligible for listing on the state or federal register and the projects affect on their overall setting will need to be assessed.

In response to the survey, the NYSDOT regional cultural resources coordinator will make a determination regarding potential effects on historic and cultural resources, in consultation with the New York State office of Parks, Recreation and Historic preservation. It is believed that Alternative C - Decking will improve conditions for most if not all of the historic resources within the project area.

Parks and Recreational Resources: Martin Luther King Jr. Park and the Buffalo Museum of Science are located adjacent to the project corridor between Northampton and Best Streets. It may be necessary to conduct a 4(f) evaluation for Alternative C - Decking should the project impact the park.

In general, Alternative C - Decking provides opportunities for landscape development around this park and does not physically alter the property. Therefore, the environmental effect on this existing resource is likely to be positive.

Visual Resources: Alternative C - Decking has the potential for visual quality impacts. A project of this scope and magnitude is likely to require a full Visual Impact Assessment (VIA) as part of the design process. If required, it will evaluate impacts to existing visual resources, the relationship of the impacts to potential viewers of and from the project, as well as measures to avoid and minimize or reduce the adverse impacts. The VIA will give consideration to design quality, art and architecture as part of the project planning.

In general, this alternative provides opportunities for improving existing viewsheds within the corridor. Therefore the environmental effect to visual resources is likely to be positive.

Air Quality: In general, projects that are classified as requiring environmental assessments or environmental impact statements often require an air quality analysis.

A microscale air quality analysis is appropriate to predict concentrations of carbon monoxide on a localized or microscale basis. Carbon monoxide impacts are local in nature and high concentrations are generally limited to within a relatively short distance of heavily traveled roadways. There are two levels of an air-quality analysis - Level I and Level II analysis. All projects requiring a microscale carbon monoxide analysis should start with a Level I analysis. This analysis is a standard screening analysis using the computer software CAL3QHC for modeling carbon monoxide concentrations near roadways with standard worst-case assumptions. If the Level I analysis indicates that either one hour or eight hour carbon monoxide national ambient air quality levels are exceeded, a Level II analysis may be considered. For Alternative C – Decking, a microscale air analysis may be appropriate to predict concentrations of carbon monoxide at the deck openings. Computational fluid dynamics software may be useful to model the natural ventilation of fumes within each deck segment and through the open sections.

A mesoscale air quality analysis may be required if a project significantly affects traffic conditions over a large area. A mesoscale analysis considers the regional effects for three pollutants: carbon monoxide, volatile organic compounds and nitrous oxides. These emissions from motor vehicles are of concern primarily because of their role as precursors in the formation of ozone which results from a series of complex reactions in the presence of sunlight. For Alternative C – Decking, a mesoscale air analysis may be appropriate for assessing short-term impacts associated with surrounding highway segments used for detouring Kensington traffic.

The federal government cannot engage in supporting, financing or permitting a transportation project that does not conform to regional air quality goals. The “conformity rule” as it is called requires the MPO (in this case the Greater Buffalo Niagara Regional Transportation Council (GBNRTC)) and the US Department of Transportation to make conformity determinations on metropolitan long-range transportation plans and transportation improvement programs before they are adopted, approved, or accepted. The proposed project has not yet been reviewed by GBNRTC for conformity (i.e. it is not part of the regional emissions analysis to determine its effect on overall conformity).

Energy: Federal and state policies require transportation projects to promote energy efficiency. Because Alternative C - Decking is likely to change travel patterns along the project corridor, the proposed project has the potential to affect energy consumption. An Energy and Greenhouse

Gas Emissions report will need to be conducted. The energy analysis should be based on NYSDOT's *Draft Energy Analysis Guidelines for Project Level Analysis*, updated November 2003. The energy analysis should address direct and indirect energy consumption.

Noise: A noise study is required for all Type I projects as defined under section 772.5 (h) of 23 CFR 772 , Procedures For Abatement Of Highway Traffic Noise And Construction Noise. A Type I project is defined as a Federal-aid highway project for the construction of a highway on new location or the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment or increases the number of through-traffic lanes. Alternative C – Decking does not meet the criteria for a Type I project, therefore a noise analysis may not be required.

In general, the installation of decking will likely reduce noise levels for adjacent properties screened by the structure. However, a noise analysis may be prudent to model noise levels, gauge the beneficial effects and estimate the predicted noise levels at the openings between the decking systems.

Asbestos: A complete asbestos investigation will be necessary during the design of Alternative C – Decking. The original contract plans (F.A.C.59-19 and C68-2) indicate the use of compressed asbestos sheet packing on top of the abutment backwalls under the ends of the deck slabs. These concerns will need to be addressed by incorporating specific removal procedures within the contract documents.

Contaminated and Hazardous Materials: A hazardous waste/ contaminated materials site screening will be conducted in accordance with NYSDOT's The Environmental Manual (TEM) Section 4.4.20, in order to determine the potential for encountering hazardous waste or contaminated materials during construction. If information from the screening/site visit indicates that contaminated materials might be encountered on the project, a hazardous waste and contaminated materials assessment involving testing of the suspected areas may be required.

A contaminated and hazardous materials investigation is necessary for all alternatives under consideration. The project area is mostly residential in nature and evidence of gas stations or other potential hazardous waste producers are not evident. Therefore, the likelihood of finding hazardous waste is believed to be relatively low. However, there is a strong likelihood there is lead-based paint or undercoats of lead-based paint on the existing bridge beams. In general, these types of environmental issues, if encountered, can be mitigated through appropriate measures (handling and disposal) included in construction contracts.

Construction Impacts: Short-term construction impacts can be expected. In this instance, they may be considerable over a 3 year construction period. Some of the issues include:

- Noise levels and vibrations: The project area may experience a significant increase during construction due to the various construction activities, equipment and vehicles. A building condition survey should be performed for each structure within the project limits at the onset of construction and again once the project is complete. The survey will document the condition of each structure and identify any impacts resulting from construction-related activities such as vibration or blasting.

- Traffic Inconveniences: Short term traffic impacts associated with construction staging and phasing will be significant for Alternative C. These will occur when existing bridges are dismantled and the new concrete decking beams are installed as well as periodic lane closures along the expressway and Humboldt Parkway. As part of the design of Alternative C –Decking, extensive traffic analysis can be expected to identify local and regional traffic issues, quantify impacts to level of service and property access, and recommend mitigation that will alleviate some of the burden shouldered by the neighborhood as well as commuter traffic. The NYSDOT Traffic & Safety group and GBNRTC are resource groups that can assist with predictive traffic modeling and the development of reasonable traffic mitigation plans. Some of the mitigation that can be expected for Alternative C – Decking include: physical improvements to local streets and regional highways used as a detour routes, instituting a comprehensive traffic management plan that informs the public on a regular basis, maintaining access to private property at all times, and including contract provisions to ensure timely completion of critical stages.

- Air quality: Within the project area, air quality may decrease temporarily during construction due to an increase in particulates from diesel exhaust emissions from construction vehicles.

In general, temporary (short-term) construction impacts are usually mitigated sufficiently to avoid significant adverse impact.

Following is a summary of the additional studies likely needed for Alternative C - Decking:

- Hazardous Waste / Contaminated Materials
- Air Quality / Ventilation – Computational Fluid Dynamics
- Noise Analysis
- Energy and Greenhouse Gas Emissions report
- Cultural Resources Analysis
- Local and Regional Traffic Analysis – detour routes
- Building Condition Surveys

2.5 Engineering Considerations for Alternative D – Full Reconstruction of Expressway within a Tunnel Enclosure

2.5.1 Design Elements

2.5.1.a Structure Types

Several structure types were investigated for the proposed tunnel superstructure that would support the new Humboldt Parkway and landscaped median. The two feasible options included adjacent pre-stressed concrete box beams placed transversely across each direction of NY Route 33, and precast concrete arch sections, also placed transversely and spanning each direction of NY Route 33. Both superstructure options would be supported on cast-in-place, reinforced concrete abutments and a center 'pier' section that would include a utility tunnel. The NYSDOT originally investigated the precast arch option.

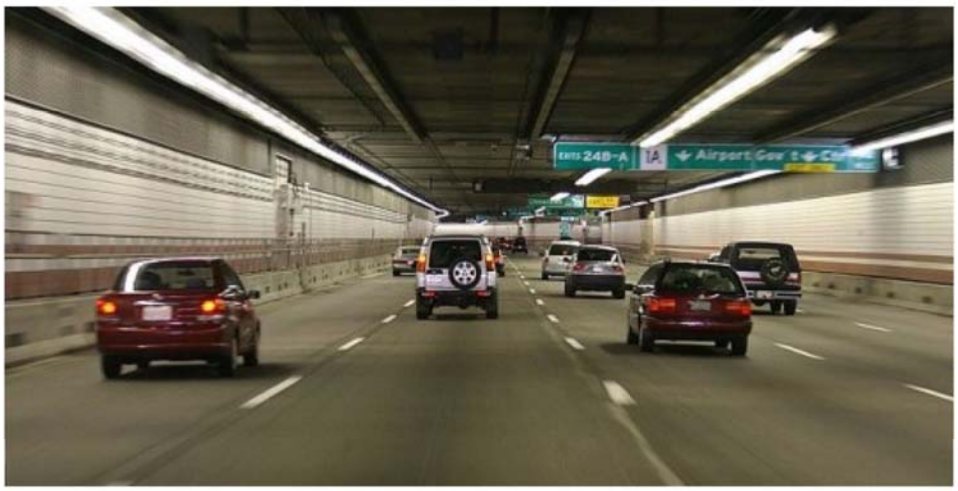
For the adjacent pre-stressed concrete box beam option, a beam depth of 33" was assumed based on several previous projects with similar span lengths. To ensure proper comparison between superstructure types, the top elevation of the box beams was assumed to be set at the top elevation of the arch sections. The resulting abutment section for the box beam option would be several feet taller than that required for the arch option. It is noted the savings in vertical offset are not significant associated with the box beam option versus the precast arch option, as the highway signs need to be placed under the box beams, while they are placed within the crown area of the arch.

The precast concrete arch sections were assumed to be standard "BEBO" arch system units that vary in span length from 56' for the typical highway section to 70' in the ramp areas. The rise varies slightly between these two span lengths, but was maintained at the maximum rise of 9'-4" for the 70' section to be conservative, and to also account for variations in superelevation along the expressway.

After evaluating both tunnel superstructure options, the precast concrete arch alternative is recommended for the following reasons:

- Minimal cost difference between the two options
- More aesthetically pleasing and creates the "tunnel" effect
- Ease and speed of installation
- Reduced impacts to Humboldt Parkway (excavation)

Refer to Figure 2-3, which depicts an expressway tunnel in Boston, MA including the below-grade expressway and the parkland that was created above the tunnel system.



LABELLA Associates, P.C.

300 State Street
Rochester, NY 14614
585.454.6110

FIGURE 2-3
EXPRESSWAY TUNNEL
I-93, "THE BIG DIG", BOSTON MA

KENSINGTON EXPRESSWAY CONCEPT DESIGN STUDY
NEW YORK STATE DEPARTMENT OF TRANSPORTATION
CITY OF BUFFALO, ERIE COUNTY
P.I.N. 5512.52

N.T.S.

2.5.1.b Tunnel Alignment and Typical Section

The required geometric constraints were analyzed to determine the proposed tunnel geometry. There are a number of geometric constraints within the project area that impacted the proposed tunnel design, including:

- Adequate overburden depth for tree planting in the re-created Olmsted Parkway
- Adequate utility tunnel width in the median to allow for double door emergency access from one tunnel to the other
- Vertical clearance and horizontal width standard design criteria to meet the interstate highway classification
- Adequate vertical clearance for the necessary signage within the tunnel
- Depth of proposed superstructure and geometry of arch section, i.e., arch curvature, crown height
- Impacts of maintaining the existing on- and off-ramps and their relation to NY Route 33 and Humboldt Parkway

Based on these geometric constraints, the total height from the surface elevation to the profile elevation along the expressway needs to be 28'-10" or greater. This includes 2' topsoil, 1' drainpipe for landscaping, 6" fill above arch sections, 18" concrete thickness of precast arch, 9'-4" arch bow and 14'-6" vertical clearance. To meet this 28'-10" dimension, the profile of NY Route 33 will need to be lowered between 9 and 11 feet throughout the section, which will result in significant rock excavation. These design requirements were developed after intense scrutiny of the minimum heights required to allow for a standard design. Note that no additional clearance was allocated for signage as the signs will fit within the 9'-4" arch bow.

The tunnel section would significantly widen NY Route 33 to the point where the outside shoulders will be directly underneath Humboldt Parkway. The existing cross section of the expressway includes two 12 ft and one 13 ft wide travel lane in each direction, 4 ft inside shoulders and approximately 11 ft outside shoulders. The total width between retaining walls is approximately 105 feet. The proposed lane configuration is similar to the existing, with three 12 ft travel lanes in each direction, 4 ft inside shoulders and 10 ft outside shoulders. A concrete barrier is required along the outside shoulder to protect the arch structure. The current 11 ft width between travel lanes in opposing directions (the 11 ft includes the inside shoulders and concrete median barrier) would increase to 29 ft to accommodate a 6 ft utility corridor, two abutment supports for the arch sections, 4 ft egress pathways in each tunnel, and 4 ft inside shoulders in each direction. Overall, the proposed section through the tunnel structure is approximately 130 ft wide, which is 25 ft wider than the existing section (approximately 12.5 ft wider on each side). The additional width results in the outside shoulders of the expressway being installed directly under existing Humboldt Parkway.

The existing retaining walls will be removed and replaced with new abutment sections that will provide the necessary support for the new arch sections. Preliminary structural analysis indicated that 10 ft wide footings would be required based on the overall height of the retaining wall, and the footings would need to be socketed into rock. In areas where there are no ramps adjacent to the tunnel section, the abutments would be approximately 18 ft tall. However, in ramp areas, the abutment would be used to retain the fill above the tunnel section in order to maintain the opening for the ramps. In these areas, an additional backwall ranging in height from approximately 11 ft to 15 ft will be needed.

In the center of the two directional tunnels, support for the precast arches will be provided by similar abutment sections. These abutment sections would be installed with a back-to-back dimension of 6 ft to maintain adequate space for the evacuation and utility tunnel. It is most cost-effective to support both abutment sections on a common footing approximately 19.5 ft wide. A structural analysis of the center abutments indicated the need for 3 ft wide stems based on the average height of 18 ft along the entire tunnel corridor.

Additional retaining walls would be required on the outside edges of the on- and off-ramps where the ramps are separated from the mainline travel lanes. These retaining walls effectively retain the fill necessary to keep the ramps open as they traverse in and out of the tunnel. The above-mentioned abutments retain the fill over the tunnel section, while the additional retaining walls will maintain the Humboldt Parkway structural support. Preliminary structural analysis indicates the need for a 10 ft wide footing. Retaining wall heights vary from a maximum of 33 ft (where ramps are nearly at the mainline expressway grade) to no height (where ramps meet Humboldt Parkway).

In the vicinity of the on- and off-ramps that will originate in the tunnels, arch sections of varying widths will be required to transition from three-lane sections to the wider four-lane section. Angled arch sections can be used to transition from the narrower section to the wider section, and the specific rate of increase needed for the ramp tapers can be accurately specified and fabricated.

The geometric constraints of tying into the proposed grades along NY Route 33 and maintaining the entrance and exit ramp termini will result in a proposed design with several non-standard features. Ramp profile grades will be slightly greater than 6%, which is the maximum permitted per the expressway design standards. The maximum grade of the eastbound entrance ramp from Best St would be 6.79%, while the eastbound off-ramp to Humboldt Parkway would have a maximum grade of 6.73%. The merge length between the two aforementioned ramps is approximately 960 ft, which is less than the design standard of 1000 ft. Although the differences between the proposed design versus the design standards are small, the unusual condition of merging traffic within a tunnel is a possible cause for concern. Vehicles will be entering the tunnel from behind a retaining wall (the wall separating the main line from the ramp) and will be required to merge within a limited timeframe, which may surprise or distract drivers along the main line. One option to counter this potential concern is the installation of ramp metering, which would improve the merging situation at a limited cost.

With the need for a temporary excavation support system to prevent impacts to the properties along Humboldt Parkway, temporary soldier pile and lagging walls will be needed. The soldier piles will need to be socketed into rock and their locations will need to be at least 6 feet behind the excavation for the proposed tunnel arch's abutments. This results in a majority of Humboldt Parkway being within the reconstruction limits. However, the proposed alternative was designed to maintain the existing outside curb lines on Humboldt Parkway. Impacts to properties along Humboldt Parkway would be temporary in nature during construction of the tunnel abutments and associated reconstruction of Humboldt Parkway.

2.5.1.c Drainage, Utilities and Lighting

The National Fire Protection Association (NFPA) provides the nationally recognized standards for tunnel life safety, and NFPA Section 502 is the applicable standard for lighting, security, fire protection and ventilation. Based on the 3700' approximate tunnel length, Category D standards (most stringent) are assumed.

The NFPA standards require a fully functional drainage system. Because of the significant lowering of NY Route 33 within the tunnel section, the existing drainage system will need to be completely removed, reconstructed and then re-connected into the existing drainage system 'downstream' of this project. Both the expressway and Humboldt Parkway drainage systems ultimately share the same outfalls. The two outfalls for the current drainage system include a 36" diameter pipe at the south end of the project and a 36" diameter pipe that empties into a pump station between Woodlawn Avenue and East Ferry Street. At both locations, the outlet elevations beyond the project limits are below the inlet elevations from the lowered Route 33 drainage network. The existing pump station can remain with minor modification at the intake to accommodate the lowered pipe. The pipe inlet will need to be lowered by approximately 10 feet, which places the inlet just above the grate separating the outlet from the maintenance walkway. Aside from constructing a new hole in the wall of the pump station and replacing the old hole, no additional work will be needed in the pump station.

The existing drainage system in the project area has been constructed in stages over several contracts and is relatively complex. Completely replacing this system affords the opportunity to simplify the overall design and efficiently convey all flows in a combined system that drains both the surface level as well as the tunnel section. The outfalls will be coordinated between the two systems, and the majority of inlets will be placed in similar locations to the existing structures. Consideration will be given to the placement of weep holes in the tunnel walls and in the design of the drainage system to account for possible groundwater infiltration. With the significant lowering of NY Route 33, the proposed profile will likely be below the groundwater elevation. As the capacity of the system will exceed its load, there will be no concerns with ponding or the collection of runoff in the travel lanes.

Drainage of the tunnel roadway will consist of a smaller size (18" +/-) drainage pipe that runs down the median of Route 33. This will collect drainage from inlets installed adjacent to the egress pathways at approximately 200 foot spacing.

Above deck, the landscaped parkway will be graded to drain outward, towards Humboldt Parkway. Humboldt Parkway will also be graded with a 2% cross slope that will facilitate drainage flow towards inlets installed along the outside curb lines. These will be connected to the expressway drainage system and flow to the two above-mentioned outfalls.

Approximately 9500 feet of the existing pipe will be removed and the proposed system will result in an approximate 20% reduction in new pipe required. Approximately 100 catch basins and 19 manholes will need to be replaced, and up to 50 catch basins and manholes will be adjusted or replaced along Humboldt Parkway.

Tunnel lighting will be designed in accordance with ANSI/IES RP-22-11, which details requirements for lighting within tunnels. The code delineates foot-candle levels at the threshold and transition zones, and also defines glare angles versus traffic flow. Selected light fixtures shall be designed specifically for tunnel lighting applications, with specific beam patterns to conform to IES requirements, and shall be fed with emergency power. A detailed lighting layout will be designed using AGI32 Lighting Simulation software in order to determine fixture quantities, and the entire lighting system will conform to ASHRAE 90.1, 2007 and the NEC. This design work would be performed during the detailed design phase.

The lighting system along Humboldt Parkway would also be replaced with decorative poles and fixtures.

Summary of Design Elements

- In order to maintain a similar surface elevation to Humboldt Parkway, excavation of up to 28'-10" will be required. The resulting expressway profile is up to 11 ft lower than existing.
- The proposed expressway cross section will be widened by approximately 25 ft to accommodate tunnel infrastructure. The outside shoulders of the expressway will be directly underneath Humboldt Parkway.
- Permanent impacts to Humboldt Parkway would be limited to ramp locations and at the project limits.
- Impacts to properties (excavation, grading, right-of-way) along Humboldt Parkway are not anticipated.
- Several non-standard features (ramp grades, merge length) are proposed.
- Ramp metering could be considered at on-ramps entering the tunnel structure to improve operation of merging traffic.
- Drainage outfall elevations are low enough to utilize with proposed system.
- The existing pump station can be utilized with minor modifications.
- The proposed drainage system will be consolidated to reduce excavation.

Refer to Appendix A for the plans and typical sections of the tunnel system.

2.5.2 Humboldt Parkway

The intent of the geometric design of the tunneled section of NY Route 33 and the Humboldt Parkway was to limit impacts to the properties outside of Humboldt Parkway. The design maintains the outside curb line along Humboldt Parkway and therefore can be constructed with little or no permanent disturbance to the adjacent properties (temporary, construction-related impacts would be necessary as the tunnel abutments are constructed and the Humboldt Parkway pavement is reconstructed). There would be several modifications to the curb lines adjacent to NY Route 33 that would impact the lane configuration on Humboldt Parkway.

For a majority of the project area, the existing widths on Humboldt Parkway will be maintained. The current cross section includes two travel lanes of varying widths, as well as a parking lane. However, in the areas of the off ramps, the widened section of NY Route 33 will have an impact on the available space. Within these areas, the proposed section will need to either be reduced to a single lane of traffic, or parking will need to be eliminated. With relatively low traffic volumes and the presence of driveways at many of the residences in the area, either option could be progressed without significant operational impacts.

It should be noted that Humboldt Parkway would also be modified at the south end of the project if the off-ramp from NY Route 33 eastbound near E. Utica St is eliminated. This would be needed to provide access to the neighborhoods for traffic that would now be required to exit the expressway at Best St. Some minor reduction in width would also be required at the north end of the project within the horizontal transition from the tunnel section back to the existing expressway section.

Sub-Alternative D1 would also result in modifications to Humboldt Parkway at the south end of the project. With the elimination of the off-ramp from NY Route 33 eastbound, modifications to the Humboldt Parkway geometry would be constructed to the south of Northampton Street in order to provide access to the neighborhoods for traffic that would now exit at Best Street.

There will likely be significant construction impacts to the Humboldt Parkway residents. Utilizing the pile and lagging temporary walls will allow one lane of traffic to remain open at all times during construction, but parking will be limited throughout the project area. Environmental aspects from construction will need to be monitored throughout the project (discussed further in Section 2.5.6) while the most significant may be from the potential of blasting operations being used for rock excavation. With the large extent of rock excavation, blasting should be considered as a removal option. However, significant investigation into external impacts from this process needs to be completed before such a decision is made. An inspection of the structures in the Humboldt Parkway neighborhood is needed, as well as additional geotechnical investigation to determine the rock characteristics, and an analysis of how the rock and soil will react to the impact forces generated by blasting operations.

2.5.3 Landscape and Enhancements

The main advantage to Alternative D is the opportunity to re-create the historic Olmsted-designed Humboldt Parkway in approximately the original configuration. The proposed design would incorporate sidewalks along Humboldt Parkway, adjacent to knee-walls that vary in height from 1' to 2'. The knee-walls would be used to maintain a relatively constant grade within the landscaped section between the two directions of Humboldt Parkway. This landscaped section would incorporate a distinct pattern of trees (rows of four trees) that references the original Olmsted design. A pedestrian path (or bridle path) would be relatively centered within the section and there would be lateral pathways that connect the existing cross-streets to the bridle path.

This design would be carried southward all the way to the entrance to the Buffalo Museum of Science. As the entire section of NY Route 33 will be covered, this allows for a “clean slate” in the area, and Humboldt Parkway would be able to intersect Northampton Street at its original configuration. Landscaping will also be added in the newly covered areas to the south of Northampton Street, with the option of providing additional parking or more parkland.

2.5.4 Unique Considerations

2.5.4.a Geotechnical Considerations

Based on the original record plans and subsurface borings taken at that time, the depth to rock is relatively shallow throughout a majority of the project area. Significant rock excavation will be required, especially to install the new drainage system. Depths of rock excavation vary through the project area, but would be as much as 6 feet for the entire cross section of NY Route 33 in some areas, and up to 12 feet deep in specific locations for drainage installation. Rock elevations at regular stationing have been added to the proposed cross sections to delineate the extent of excavation needed.

Recent NYSDOT experience in the project area indicates that the rock is fairly hard and difficult to remove. Considering the large amount of rock excavation expected to construct this alternative, the large cost associated with this excavation needs to be incorporated into the project estimate. If blasting is utilized, consideration should be given to the potential impacts of blasting to the Humboldt Parkway properties, both from an environmental and structural standpoint. Blasting through solid rock can result in greater impact damages, and the age and structural integrity of the area’s infrastructure is a concern.

The design of the excavation protection system also is affected by the presence of rock. The only temporary retaining wall method that is feasible to maintain the required earth excavation depths while bearing on rock is a steel H-pile and timber lagging design. The proposed design requires the piles be embedded approximately 10 feet into rock. In order to protect against the failure of the rock in front of the piles, a 6 feet horizontal offset between the H-pile wall and the face of the rock excavation is proposed. The resisting rock pressure in the pile was reduced in the concept design to account for a theoretical sloped grade in front of the piles, a conservative assumption. The resultant pile and lagging design includes HP 14x117, spaced at 4 ft, which is a fairly robust system and will be more expensive than a typical pile and lagging wall.

2.5.4.b Ventilation

The National Fire Protection Association (NFPA) provides the nationally recognized standards for tunnel life safety, and NFPA Section 502 is the applicable standard for lighting, security, fire protection and ventilation. The 3700' approximate tunnel length requires that Category D standards (most stringent) need to be used.

A specific ventilation analysis and design requires lengthy engineering modeling, and is beyond the scope of work for this initial investigation. However, the general parameters of the required ventilation system can be assumed. There are several options for providing ventilation within the tunnel, including fans spaced at approximately 100 ft intervals, tightly-spaced ventilation shafts at a similar spacing, and large ventilation shafts at a greater spacing. The optimal ventilation system was determined to be the large ventilation shafts. This system would effectively divide the tunnels into four quadrants and would require four large shafts spaced at approximately 900 feet. The shafts would be approximately 30 ft x 30 ft in area, and the fans would likely be around 400 horsepower. Advantages to this type of system include fewer fans and ventilation shafts, and impacts to vertical clearance within the tunnel would be eliminated. Disadvantages to using fewer fans include the need for larger shafts and larger / more powerful fans.

The system will need to be equipped with both fire and smoke modes, and the fans will need to be reversing to consolidate any fire or smoke. Ventilation in the amount of 3.28 ft/s is required in the direction of traffic, and a natural (piston effect) ventilation system could only be used if non-congested traffic is assumed.

The ventilation shafts will need to extend above the ground surface so that water, snow, leaves and rubbish cannot enter into the shafts. This may be in the form of small buildings with louvers. These could certainly be enhanced to maintain an attractive viewshed along the new Humboldt Parkway. The bottom of the shafts within the tunnel must be above the roadway, and dust separation measures may be required.

2.5.4.b Communications

Both radio and video communication systems are required to alert authorities to security and emergency issues within the tunnels. A closed circuit television (CCTV) system is recommended for tunnels of this size and will save the need for an automatic fire detection system, as long as it is monitored by 24/7 personnel. Duress stations with radio communications should be located at intervals throughout the tunnel to notify emergency responders of a security issue. All systems will require electrical infrastructure within the utility corridor.

2.5.4.c Intelligent Transportation Systems

Niagara International Transportation Technology Coalition (NITTEC) currently has ITS systems in operation within the project area. The current systems include closed circuit television (CCTV) cameras (including an existing camera at Northampton Street), vehicle detection stations, transmit transponder readers, dynamic message signs and a fiber optic communications system. With the addition of the tunnel section over NY Route 33, the current infrastructure can be used to notify travelers and emergency responders of accidents and security issues within the tunnels, though the system may require replacement or relocation in the project area to accommodate the tunnel system. Additional ITS elements, such as cameras or message boards, may also be needed.

2.5.4.d Emergency Evacuation

Emergency evacuation requirements are also covered under NFPA Section 502. Design parameters for spacing of emergency exits can be complicated, but some general criteria can be assumed. The general design of the egress system includes an egress pathway (similar to a bridge safety walk) within each tunnel and cross passageways that connect the tunnels. The egress pathway is a protected sidewalk located on the interior side of each tunnel. The pathways would be raised above the roadway surface and would provide a minimum clear width of 3’-6” with a pedestrian railing. This would be continuous throughout the length of the tunnel.

The egress pathways would lead directly to cross passageways between the tunnels that can be used as exits rather than evacuating to the surface. The NFPA code allows the assumption that an emergency only happens in one side of the tunnel and not both, as long as there are provisions in place to stop traffic in the adjacent tunnel during an emergency. The cross passageways need to be placed a minimum of 656 feet apart, or approximately six total along the length of the tunnel. Also, doors are required between each tunnel and the central utility corridor to ensure separation of the tunnels, and the doors must be swinging in the direction of egress from each tunnel. Therefore, the door configuration dictates the 6 foot width of the utility corridor.

2.5.5 Work Zone Traffic Control and Construction Staging

2.5.5.a Phasing Considerations

Three scenarios were investigated with regard to construction phasing. In general they are described as follows:

- Scenario No. 1: maintain the eastbound and westbound traffic through the project site during construction

- Scenario No. 2: Shut down the expressway between Best Street and E. Ferry St. thus giving the contractor full access to the entire project area. Eastbound and westbound traffic would be detoured on other urban expressways serving the greater Buffalo area.

- Scenario No. 3: Phase the project by constructing the tunnel one half at a time while maintaining one direction of traffic through the project site. The other direction of traffic would be detoured to alternate expressways.

Under Scenario No.1, it will not be feasible to maintain traffic in both directions (assuming a minimum of two lanes open in each direction) during construction. In general, the total excavation width of this alternative is approximately 140 ft, of which approximately 70 feet would be required to construct one of the tunnel sections. If both directions of travel were maintained on one side of the expressway, the remaining width would not be sufficient to maintain two travel lanes in each direction plus shoulders and temporary median barrier. Maintaining both directions of travel utilizing both sides of the expressway would not be feasible, as excavation is required along the outside of the expressway (to widen for the new tunnel structure) as well as along the inside to construct the new central utility tunnel. The remaining space would not be sufficient to maintain two travel lanes in each direction.

Under Scenario No. 2, NY Route 33 would be closed between Best Street and E. Ferry St. with eastbound and westbound traffic detoured to other regional highways. As construction would be able to be progressed in one phase, cost savings and time savings would be realized. Cost savings would result from reduced mobilization costs, continuous placement of both tunnel sections throughout the project length, reduction in excavation and placement costs for the center utility corridor, a better coordinated drainage system installation, and a more efficient mechanical/electrical design. Full closure of the roadway would also likely reduce the construction duration by at least a year, and potentially two years, resulting in a construction duration of approximately 2 to 3 years.

A traffic diversion analysis needs to be performed before the decision can be made, as the extent of traffic impacts from detouring both directions of NY Route 33 would be considerable to both the local traffic network and the interstate system. Refer to discussion below regarding detour routes.

Under Scenario No. 3, one direction of traffic would be maintained on site while constructing one half of the tunnel. The other direction of traffic would be detoured. Once the first half of the tunnel is constructed (including ventilation, lighting, emergency evacuation and all other tunnel related provisions as described above) it would then be available to accommodate traffic while allowing the other half of the tunnel to be constructed. Again, the opposite direction of traffic would be detoured. Since construction is completed in two phases, the duration of construction will effectively double. It is likely that two years of construction will be required for each half of the tunnel structure, resulting in a four year construction period.

Under Scenario No. 3, it would be beneficial to keep the same detour in place for both construction phases thereby maintaining the same traffic patterns throughout the entire construction duration. This would require the use of cross-overs beyond both ends of the project. However, the difference in grade between the existing and proposed expressway, tight spacing of overhead bridges and the proximity of the Route 198 interchange likely eliminates this option. As a result, traffic will likely need to be detoured in the opposite direction during Phase 2 while the second tunnel section is constructed. Refer to discussion below regarding detour routes.

Under Scenario No. 3, a pile and lagging wall protection system will be necessary in order to maintain traffic through the construction site. The wall protection system is necessary to support the expressway travel lanes that are in close proximity to the Phase 1 excavation limit. The grade change is approximately 9 to 11 feet. Such a protection system would need to extend the full length of the project, and result in significant additional costs - likely several million dollars. As an alternative to the pile and lagging wall protection system, the excavation of the proposed tunnel could be progressed with an open cut. A safe lay-back slope of 1:1.5 would extend from the toe of excavation outward. The laid-back slope would likely impact one of the three lanes of traffic being maintained through the site. Therefore a closure of the left (inside) lane would be required to keep traffic away from the construction. This would obviously result in additional traffic impacts at the same time o a full closure will be in place for the opposite direction.

Obviously, Scenarios 2 & 3 will significantly impact traffic. Significant traffic analysis is required to determine how best maintain traffic during construction, given the volume of traffic being detoured as well as the construction duration of multiple years (likely three years).

2.5.5.b Work Zone Traffic Control

Work zone traffic control considerations are described below:

<u>Removal of Existing Bridges</u>
Full closure of the cross streets at E. Ferry St, E. Utica St, Northampton St and Dodge St will be required. The existing bridges will be removed and the cross streets rebuilt over top of the new tunnel structure. During the construction period, the cross streets will be severed at NY Route 33 and detours will be required. An extensive detour analysis should be completed to assess the most suitable detour routes for each local street to be severed, including an analysis of traffic flow, improvements (including pavement, traffic signals and signage) needed along the detour route, and a user cost comparison.
With the bridges in the project area removed, the nearest streets crossing NY Route 33 are High Street and Jefferson Ave to the south and Delavan Ave to the north. Possible detour routes include the following:

- Best Street: Jefferson Ave to High St to Genesee St – 1.2 mile detour
- Northampton Street: Jefferson Ave to High St to Fillmore Ave – 1.7 mile detour
- East Utica Street: Jefferson Ave to High St to Fillmore Ave – 2.2 mile detour
- East Ferry Street: Jefferson Ave to E. Delavan Ave to Fillmore Ave – 2.0 mile detour

In order to maintain traffic on the cross streets for as long as possible, it is recommended that construction proceed from one end. Bridges would be removed when construction activities reach that area

Characteristics of the local streets under consideration for use as a detour route are included in the following table:

Street	Functional Classification	Number of Travel Lanes	AADT (Year), Segment
Best St	Urban Minor Arterial	1 each direction	10,200 (2008), Wohlers to Fillmore
			8,700 (2008), Jefferson to Wohlers
High St	Urban Collector	1 each direction	2,970 (2005), Jefferson to Genesee
Jefferson Ave	Urban Minor Arterial	1 each direction	7,500 (2006), Best to Ferry
Fillmore Ave	Urban Minor Arterial	1 each direction (some sections have two lanes in each direction)	6,850 (2006), Best to Parade
			7,675 (2006), Parade to Utica
			7,800 (2004), Utica to Ferry
			8,225 (2009), Ferry to Delavan
E. Ferry St	Urban Minor Arterial	1 each direction	8,300 (2009), Jefferson to Wohlers
			9,700 (2009), Wohlers to Humboldt
			7,800 (2009), Humboldt to Fillmore
E. Delavan Ave	Urban Minor Arterial	1 each direction	5,900 (2007), Jefferson to Humboldt
			8,600 (2008), Humboldt SB to NB
			8,300 (2006), Humboldt to Fillmore

Humboldt Parkway

The outside limit of excavation necessary to construct the tunnel extends to near the center of pavement on Humboldt Parkway. Since the curb to curb width of Humboldt Parkway is 32 feet, this leaves approximately 16 to 17 feet of remaining pavement to maintain traffic. A pile and lagging wall is proposed to retain the outside excavation face thereby providing structural support for Humboldt Parkway to remain in service. This will prevent the need for additional local detours. However, the current parking lanes will need to be eliminated during construction. This will affect parking availability for many of the residents, churches and businesses in the Humboldt Parkway neighborhoods, and may need to be mitigated since construction will likely last for several years.

NY Route 33 Detour Routes

Regardless of whether the tunnel is constructed in two halves (maintaining one direction of travel on NY Route 33) or all at once (full closure), regional detours will be required during some or all of the construction period. Closure of the expressway would require a regional traffic management plan and significant coordination between the NYSDOT, GBNRTC, NFTA, City of Buffalo, and local school districts and emergency providers. Commuter traffic would be directed to alternate interstate highways including I-90 Thruway, I-190 and I-290. Improvements to pavement, traffic signals and ramps along the detour routes may be required, as determined by a comprehensive traffic analysis of the detour routes.

When the westbound (inbound) direction requires closure, traffic would be detoured at NY Route 198, where there are several options to reach downtown Buffalo (NY Route 5 – Main St, NY Route 384 – Delaware Ave, or continue along NY Route 198 to I-190). A local traffic zone (likely a single travel lane and reduced speed limit) could be maintained between NY Route 198 and the ramp to Humboldt Parkway near E. Ferry St.

When the eastbound (outbound) direction is under construction, NY Route 33 would be closed between the Elm-Oak Arterial and NY Route 198. A local traffic zone could be maintained between the Elm-Oak Arterial and Jefferson Ave. Eastbound commuter traffic would be required to use alternate interstates or NY Route 198.

Once the tunnel structures and new pavement are installed, traffic can be restored along NY Route 33 while work continues overhead (landscaping, cross street and Humboldt Parkway restoration).

2.5.6 Environmental Considerations

The scale of work proposed under this alternative may have significant impacts on the environment in a number of ways, both positive and negative. At a minimum, an environmental assessment will be required, while a more formal environmental impact statement EIS may still be necessary if significant adverse environmental impact(s) are present that are difficult to mitigate. At this time, the environmental classification for Alternative D – Tunnel is assumed to be:

- SEQR Non-Type II (Environmental Assessment) - In accordance with 17 NYCRR Part 15.6, the action exceeds the criteria for classification as a Type II action therefore it is considered Non-Type II. The preparation of an environmental assessment is the likely course of action (versus preparation of an environmental impact statement which may be determined to be necessary at a later time).

- NEPA Class III - In accordance with 23 CFR 771.115 the project is considered a Class III action in which the significance of the environmental impact is not clearly established. Projects progressed as a class III generally require the preparation of an environmental assessment to determine the appropriate environmental document required.

The impacts of the proposed work on the environment would need to be analyzed in relation to the following areas:

Social: Social issues generally addressed as part of an EA include: land use, neighborhoods, community cohesion, social groups benefited or harmed, school districts, recreational areas, churches and businesses. From a social standpoint, the construction of the tunnel and the potential to reconnect neighborhoods, add parkland, and restore Olmsted features will likely have a positive effect on the surrounding communities.

Economic: Economic issues generally addressed as part of an EA include: regional and local economies, business districts, and highway related businesses. From an economic standpoint, the project is not likely to create any long-term adverse impacts. In fact, the tunnel construction could have a positive effect on the local economy and may spurn new investment both in commercial and residential development. The economic impact from this project is anticipated to be positive. Short-term construction impacts will need to be addressed to ensure that local businesses can survive the construction duration.

Storm Water Management: Since this alternative is likely to impact more than 1 acre of land, a NYS DEC Stormwater Pollution Discharge Elimination System (SPDES) general permit for storm water discharges from construction activity will be needed. This project will assess the requirements for storm water management practices and will include an analysis to determine the requirement for permanent storm water quality and quantity practices. This DEC permit also ensures that temporary and permanent storm water measures are provided.

General Ecology and Wildlife: There are no federally listed species in the project area. There are two State listed species in the project area; one is an endangered vascular plant species and one is an endangered Invertebrate animal species. Compliance and coordination with the

NYSDEC will be necessary for this project. As part of the EA, the NYSDEC will be contacted to identify the species and a site species assessment will be performed to confirm its presence. Also, the corridor will need to be assessed for the presence of invasive species and an analysis of existing and proposed roadside vegetation will be conducted with regard to reasonable management practices.

Historic And Cultural Resources: As a majority of the area within the project limits has been disturbed by the original construction of the Kensington Expressway, the chance of encountering prehistoric resources is minimal. With regard to historic and cultural resources, the project must comply with the State Historic Preservation Act (Section 14.09) as well as the National Historic Preservation Act (Section 106). A cultural resources survey will be conducted in the project area and will consist of a documentation of existing buildings and other resources (such as remaining Olmsted features) present in the project area. At present, the Buffalo Science Museum is known to be listed on the national register of historic places and is located in Martin Luther King Jr. Park. Other structures adjacent to the project may be eligible for listing on the State or Federal register and the project's effect on their overall setting will need to be assessed.

In response to the survey, the NYSDOT regional cultural resources coordinator will make a determination regarding potential effects on historic and cultural resources, in consultation with the New York State Office of Parks, Recreation and Historic preservation. It is believed that Alternative D – Tunnel would improve conditions for most if not all of the historic resources within the project area.

Parks and Recreational Resources: Martin Luther King Jr. Park and the Buffalo Museum of Science are located adjacent to the project corridor between Northampton and Best streets. It may be necessary to conduct a 4(f) evaluation for Alternative D - Tunnel should the project impact the park.

In general, this alternative provides opportunities for landscape development (including a comprehensive re-establishment of the Olmsted Parkway) around this park and does not physically alter the property. Therefore, the environmental effect on this existing resource is likely to be positive.

Visual Resources: Alternative D - Decking has the potential for visual quality impacts. A project of this scope and magnitude is likely to require a full Visual Impact Assessment (VIA) as part of the design process. If required, it will evaluate impacts to existing visual resources, the relationship of the impacts to potential viewers of and from the project, as well as measures to avoid and minimize or reduce the adverse impacts. The VIA will give consideration to design quality, art and architecture as part of the project planning.

In general, this alternative provides opportunities for improving existing viewsheds within the corridor. Therefore the environmental effect to visual resources is likely to be positive.

Air Quality: In general, projects that are classified as requiring environmental assessments or environmental impact statements often require an air quality analysis.

A microscale air-quality analysis is appropriate to predict concentrations of carbon monoxide on a localized or microscale basis. For Alternative D – Tunnel, an air quality analysis would be integral to the ventilation design for the tunnel. A goal of the ventilation design is to ensure that carbon monoxide and other pollutants do not exceed safe levels inside the structure. It is assumed that the microscale analysis will also examine the potential for exposure to fumes where exhaust is vented to the open-air

A mesoscale air quality analysis may be required if a project significantly affects traffic conditions over a large area. A mesoscale analysis considers the regional effects for three pollutants: carbon monoxide, volatile organic compounds and nitrogen oxides. These emissions from motor vehicles are of concern primarily because of their role as precursors in the formation of ozone which results from a series of complex reactions in the presence of sunlight. For Alternative D – Tunnel, a mesoscale air analysis may be appropriate for assessing short-term impacts associated with surrounding highway segments used for detouring both eastbound and westbound directions of NY Route 33 traffic.

The federal government cannot engage in supporting, financing or permitting a transportation project that does not conform to regional air quality goals. The “conformity rule” as it is called requires the MPO (in this case the Greater Buffalo Niagara Regional Transportation Council (GBNRTC)) and the US Department of Transportation to make conformity determinations on metropolitan long-range transportation plans and transportation improvement programs before they are adopted, approved, or accepted. The proposed project has not yet been reviewed by GBNRTC for conformity (i.e. it is not part of the regional emissions analysis to determine its effect on overall conformity).

Energy: Federal and State policies require transportation projects to promote energy efficiency. Because Alternative D - Tunnel is likely to change travel patterns along the project corridor, the proposed project has the potential to affect energy consumption. An Energy and Greenhouse Gas Emissions report will need to be conducted. The energy analysis should be based on NYSDOT’s *Draft Energy Analysis Guidelines for Project Level Analysis*, updated November 2003. The energy analysis should address direct and indirect energy consumption.

Noise: A noise study is required for all Type I projects as defined under section 772.5 (h) of 23 CFR 772 , Procedures For Abatement Of Highway Traffic Noise And Construction Noise. A Type I project is defined as a Federal-aid highway project for the construction of a highway on new location or the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment or increases the number of through-traffic lanes.

Alternative D – Tunnel does meet the criteria for a Type I project since the Kensington Expressway vertical alignment will be significantly changed (lowered). However, since the Expressway noise will likely be dampened by the tunnel structure and earth embankment, noise exposure may lessen for many of the properties located along Humboldt Parkway. Consideration may be given to examining the potential for increased noise at each of the tunnel openings.

Asbestos: A complete asbestos investigation will be necessary during the design of Alternative D – Tunnel. The original contract plans (F.A.C.59-19 and C68-2) indicate the use of compressed asbestos sheet packing on top of the abutment backwalls under the ends of the deck slabs. These concerns will need to be addressed by incorporating specific removal procedures within the contract documents.

Contaminated and Hazardous Materials: A hazardous waste/ contaminated materials site screening will be conducted in accordance with NYSDOT’s The Environmental Manual (TEM) Section 4.4.20, in order to determine the potential for encountering hazardous waste or contaminated materials during construction. If information from the screening/site visit indicates that contaminated materials might be encountered on the project, a hazardous waste and contaminated materials assessment involving testing of the suspected areas may be required.

A contaminated and hazardous materials investigation is necessary for all alternatives under consideration. The project area is mostly residential in nature and evidence of gas stations or other potential hazardous waste producers are not evident. Therefore, the likelihood of finding hazardous waste is believed to be relatively low. However, there is a strong likelihood there is lead-based paint or undercoats of lead-based paint on the existing bridge beams. In general, these types of environmental issues, if encountered, can be mitigated through appropriate measures (handling and disposal) included in construction contracts.

Construction Impacts: Short-term construction impacts can be expected. In this instance, they may be considerable over a 3 year construction period. Some of the issues include:

- Noise levels and vibrations: The project area may experience a significant increase during construction due to the various construction activities (blasting may be used), equipment and vehicles. A building condition survey should be performed for each structure within the project limits at the onset of construction and again once the project is complete. The survey will document the condition of each structure and identify any impacts resulting from construction-related activities such as vibration or blasting.

- Traffic Inconveniences: Short term traffic impacts associated with closing NY Route 33 while the tunnel is constructed will be significant for Alternative D. Eastbound and westbound traffic will be detoured to other expressway facilities serving the greater Buffalo region. As part of the design of Alternative D – Tunnel, extensive traffic analysis can be expected to identify local and regional traffic issues, quantify impacts to level of service and property access, and recommend mitigations that will alleviate some of the burden shouldered by the neighborhood as well as commuter traffic. The NYSDOT Traffic and Safety group and GBNRTC are resource groups that can assist with predictive traffic modeling and the development reasonable traffic mitigation plans. Some of the mitigations that can be expected for this alternative include: physical improvements to local streets and regional highways used as a detour routes, instituting a comprehensive traffic management plan that informs the public on a regular basis, maintaining access to private property at all times and including contract provisions to ensure timely completion of critical stages.

- Air quality: Within the project area, air quality may decrease temporarily during construction due to an increase in particulates from diesel exhaust emissions from construction vehicles. Another concern is the release of harmful gases from the bedrock when blasting is used. Air quality monitoring on private property, including basements of buildings, will be required as a safety precaution.

In general, temporary (short-term) construction impacts are usually mitigated sufficiently to avoid significant adverse impact.

Following is a summary of the additional studies likely needed for Alternative D - Tunnel:

- Hazardous Waste / Contaminated Materials
- Air Quality / Ventilation – Computational Fluid Dynamics
- Noise Analysis
- Energy and Greenhouse Gas Emissions report
- Cultural Resources Analysis
- Local and Regional Traffic Analysis – detour routes
- Building Condition Surveys

2.6 Engineering Considerations for Alternative E – Replacement of Expressway with Multiway Boulevard

2.6.1 Design Elements

2.6.1.a Multiway Boulevard Types

Alternative E proposes to reconstruct the Kensington Expressway and Humboldt Parkway. The expressway would be downgraded from an Urban Principal Arterial Expressway to an Urban Principal Arterial. For purposes of this report, this alternative will be referred to as a “multiway boulevard” which is a term used for similar projects in several states. This alternative includes constructing at-grade, signalized intersections at E. Ferry St, E. Utica St, Northampton St and Dodge St. The northern limit of the multiway boulevard is approximately the existing pedestrian bridge north of E. Ferry St while the southern limit is just north of Best St (Best St would remain a grade-separated intersection with access ramps).

Two types of multiway boulevards were analyzed. The first is a design where the frontage roads (Humboldt Parkway northbound and southbound) are continuous through the corridor and intersect the cross streets (Alternative E). The second is where the frontage roads are merged into and out of the main boulevard near the cross street intersections (Sub-Alternative E1). Both types of multiway boulevards have been successfully constructed in various parts of the country. The design of Alternative E - Replacement of Expressway with Multiway Boulevard is similar to projects including Octavia Blvd in San Francisco CA, Ocean Pkwy in Brooklyn NY, and the Benjamin Franklin Pkwy in Philadelphia PA, to name a few. The design of Sub-Alternative E1 has been used on such projects as Shattuck Ave in Berkeley CA and Palm Canyon Dr in Cathedral City CA.

Refer to Section 2.6.4.a for a discussion of Sub-Alternative E1 and Appendix A for plans depicting both multiway boulevard designs.

The continuous frontage roads proposed in Alternative E would essentially operate as separate intersections at the major cross streets, with their own traffic signals operating integrally with the signal operation for the main boulevard. Bicyclists would be directed to use the frontage roads, where a 14 ft wide travel lane is proposed for shared use. Sidewalks would be reconstructed along the outside of the frontage roads.

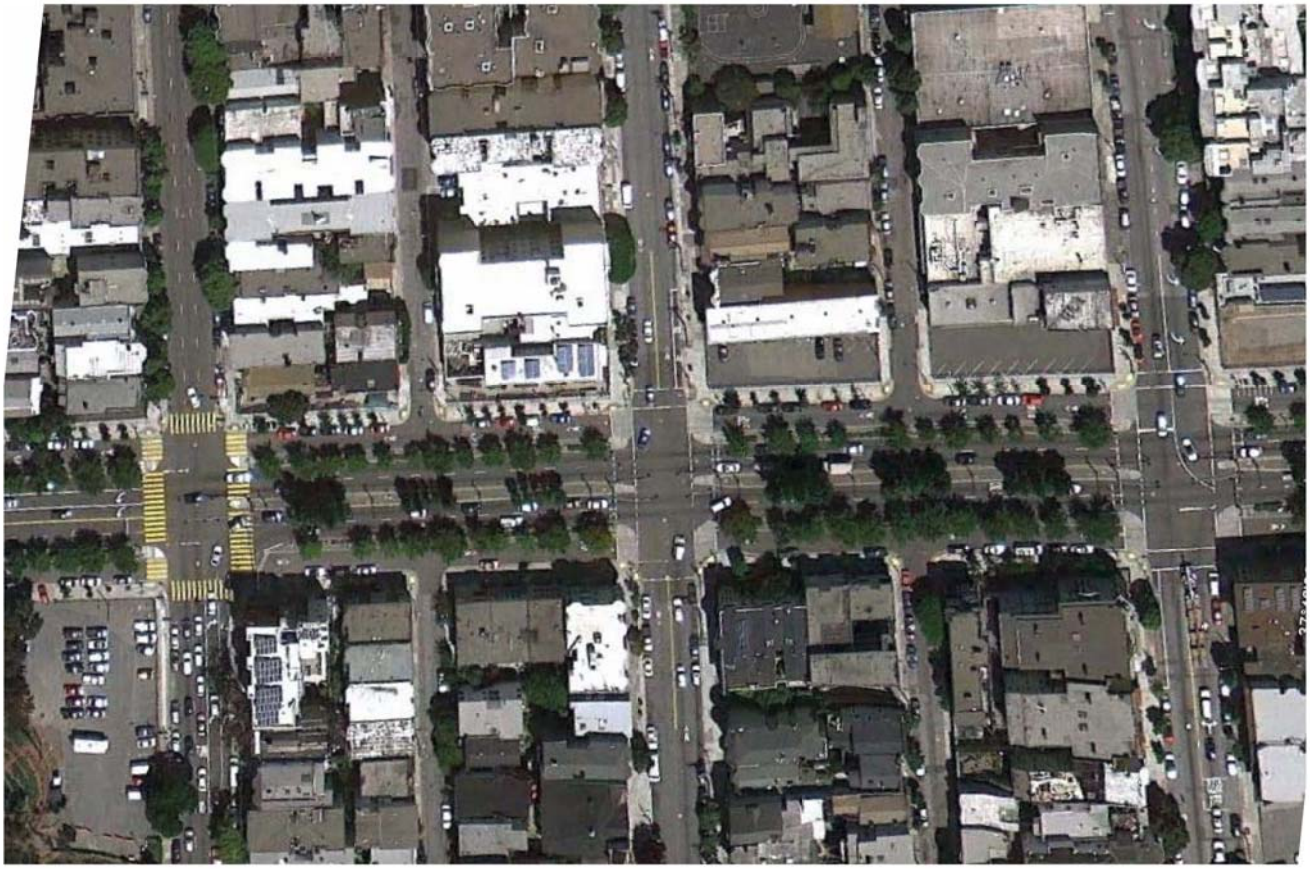
Refer to Section 2.6.1.f for a discussion on conceptual signal phasing and turn restrictions that would be necessary for the proposed multi-way boulevard design.

Figure 2-4 (below) depicts two examples of multiway boulevards currently in operation, including Octavia Blvd in San Francisco CA and the Benjamin Franklin Parkway in Philadelphia, PA.

2.6.1.b Typical Sections

Alternative E can be constructed within the existing 200 ft right-of-way. Incidental right-of-way takings may be required; the location and size of acquisitions would be determined during detailed design.

The typical section includes a main boulevard with three 12 ft wide travel lanes in each direction separated by a 16 ft wide center median. Auxiliary turn lanes are not included on the Route 33 mainline since left and right turns would likely be prohibited. Frontage roads along each side



LABELLA Associates, P.C.

300 State Street
Rochester, NY 14614
585.454.6110

FIGURE 2-4A
MULTIWAY BOULEVARD
OCTAVIA BLVD, SAN FRANCISCO CA

KENSINGTON EXPRESSWAY CONCEPT DESIGN STUDY
NEW YORK STATE DEPARTMENT OF TRANSPORTATION
CITY OF BUFFALO, ERIE COUNTY
P.I.N. 5512.52

N.T.S.

LABELLA Associates, P.C.

300 State Street
Rochester, NY 14614
585.454.6110

FIGURE 2-4B
MULTIWAY BOULEVARD
BENJAMIN FRANKLIN PKWY, PHILADELPHIA PA

KENSINGTON EXPRESSWAY CONCEPT DESIGN STUDY
NEW YORK STATE DEPARTMENT OF TRANSPORTATION
CITY OF BUFFALO, ERIE COUNTY
P.I.N. 5512.52

N.T.S.

consist of a 14 ft wide shared use travel lane and an 8 ft wide parking lane. A 23 ft wide median separates the main boulevard with the frontage roads on each side. Sidewalks would be reconstructed along the outside of each frontage road following a similar alignment of the existing sidewalks along Humboldt Parkway.

Given the volume and mix of expected traffic, engineering judgment suggests that the pavement section of the main boulevard is likely to include: 13" asphalt (2" top course, 2" binder course, 5" base course and 4" permeable base course) and 12" stone subbase material. A thinner pavement section is proposed for the frontage roads and may consist of 11 ½" asphalt and 12" stone subbase.

2.6.1.c Removal of Existing Expressway and Backfill

Alternative E involves the removal of the Kensington Expressway between Best St and the pedestrian bridge north of E. Ferry St. This process would include the following tasks:

- Removal of existing bridges within the project limits. Temporarily disconnect utilities carried by the bridges
- Removal of the top 7 ft of the retaining walls
- Abandonment of the existing storm sewer system
- Removal of signs and sign structures, guide rail, light poles, etc. along the expressway
- Break up existing Expressway pavement
- Removal / abandonment of utilities along the expressway
- Installation of embankment material (NYSDOT Item 203.03) to meet proposed grades
- Reconnect private utilities formerly carried by the bridges
- Temporarily re-establish major crossroads while the arterial is being constructed
- Construct arterial and frontage roads

2.6.1.d Drainage

New drainage systems would be required for the at-grade boulevard, and it is expected that the existing drainage systems along Humboldt Parkway would be replaced as well. An in-depth drainage analysis would be required during detailed design stages to determine if the existing drainage trunk lines that flow along the center of the expressway could be abandoned or removed. The existing pump station near E. Ferry St may also no longer be necessary. In general, though it is expected that the existing drainage outfalls can be utilized.

2.6.1.e Utilities

The magnitude of utility construction required for Alternative E would be determined during detailed design stages. At a minimum, utilities crossing NY Route 33 at the existing bridges (watermain and various private utilities) would be reconstructed under the new at-grade boulevard. New drainage systems along the main boulevard and each frontage road are required. Watermain and private utilities will likely also require replacement along the frontage roads. It is not anticipated that any sanitary sewers would be impacted.

2.6.1.f Traffic Operation, Level of Service and Intersection Control

Preliminary planning-level capacity analyses were conducted for Alternative E to determine the feasibility of replacing the Kensington Expressway with an at-grade, multiway boulevard from a traffic and operational perspective. The analysis assumes at-grade signalized intersections at the existing major cross streets (E. Ferry St, E. Utica St, Northampton St and Dodge St).

Four potential traffic options for a typical at-grade intersection were evaluated. For purposes of this analysis, E. Ferry St is the "typical" intersection chosen for analysis. As described below, the different options assume varying levels of access to and from NY Route 33 and Humboldt Parkway and different forms of intersection control.

Option 1: Alternative E with Left Turns from Main Boulevard

- 3 signalized intersections at each major cross street. They would be designed with adequate clearance so vehicles on the cross street are not stopped between signals. Each cross street would have a signal at Humboldt Parkway northbound, NY Route 33 and Humboldt Parkway southbound.
- Full access for all turning movements to/from NYS RT 33 and Humboldt Parkway and the major cross streets.

Option 2: Alternative E without Left Turns from Main Boulevard

- Left turns from NY Route 33 to major cross streets are eliminated
- Vehicles need to exit onto Humboldt Parkway at ramps and make a left turn from Humboldt Parkway to cross streets.

Option 3: Sub-Alternative E1

- One signalized intersection at NY Route 33 for each major cross street; Full access for all turning movements.
- Stop controlled right-in/right-out only access to and from Humboldt Parkway (feeder roads) which serve only adjacent properties.

Option 4: Modified Sub-Alternative E1 – Roundabout

- Full access for all turning movements between NY Route 33 and major cross streets is controlled by a roundabout rather than a signalized intersection.

Traffic data for NY Route 33, the Humboldt Parkway and cross streets was provided by the NYSDOT or obtained through the Greater Buffalo Niagara Falls Region Transportation Council (GBNRTC) 2011 Highway Database. The available traffic data was projected to 2016 (ETC) and 2036 (ETC+20) using a 0.5% growth rate (the growth rate was confirmed by NYSDOT and GBRNTC). Traffic volumes, including Average annual daily traffic (AADT) volumes for NY Route 33 and intersection turning movement counts, are included in Appendix D.

Options 1, 2 and 3 (signalized intersections at NY Route 33 with the major cross streets) were evaluated using the HCS2000 Urban Street Arterials Module – Planning Analysis. HCS2000 calculates LOS using the methodology of the Highway Capacity Manual, 2000 Edition. The Urban Street Arterials Module – Planning Analysis estimates the arterial level of service (LOS) based on average travel speeds along the corridor. A LOS 'A' is indicative of free flowing traffic conditions while a LOS 'F' represents a failure or breakdown of the infrastructure being analyzed. The LOS criteria for an arterial roadway like the proposed at-grade boulevard are shown below:

Arterial Level of Service (LOS) Criteria	
LOS Designation	**Speed (miles per hour)**
LOS A	> 35 mph
LOS B	34-28 mph
LOS C	27-22 mph
LOS D	21-17 mph
LOS E	16-13 mph
LOS F	< 13 mph

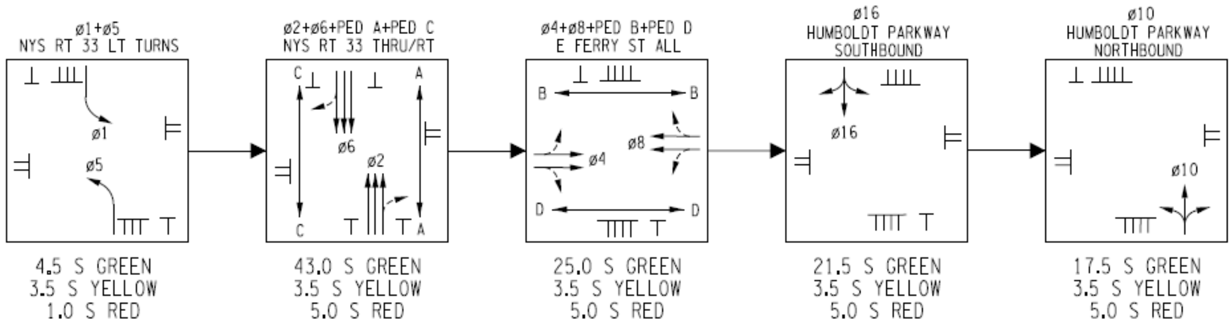
Along with the AADT, number of lanes, number of signals and other corridor characteristic information, the estimated amount of green time dedicated to the major movement along the corridor is needed to estimate the LOS. Since signal timing and phasing information was not provided as part of the alternative design, the percentage of green time was estimated by developing signal phasing and timing using SYNCHRO Version 7, another software program that implements the methods presented in the 2000 Highway Capacity Manual and can model more complex intersections.

In order to model how the future corridor may operate, a number of assumptions were made. A summary of assumptions is as follows:

- The Estimated Time of Completion (ETC) was assumed to be 2016. ETC+20 was assumed to be 2036.
- All traffic remains on NY Route 33, Humboldt Parkway or the major cross streets with redistribution only occurring between turning and through movement volumes.
- Approximately 75% of turning traffic along Humboldt Parkway was redistributed to turn onto or from NY Route 33 directly.
- For Option 3 (Sub-Alternative E1 – Alternate Multi-way Boulevard Design), it was assumed the volumes on Humboldt Parkway would reduce to only those vehicles accessing the properties that front NY Route 33 (20 vehicles for the peak hour). The remaining traffic was distributed to NY Route 33.
- The cycle length at the signal was assumed to be 150 seconds. This length was verified / approved as being reasonable by Angelo Borgese of the NYSDOT Region 5 traffic operations department.
- Signal timings and phasing were optimized to provide the best operations along NY Route 33.
- Pedestrian delays were not analyzed other than to include walk/don't walk time within the signal timing and phasing plans and to qualitatively assess how pedestrian crossings are affected for each option.

<u>Operation of Option 1 (Alternative E with Left Turns from Main Boulevard)</u>

Option 1 would include three signals working together in a 5-phase operation at the intersection of E. Ferry St (used as the "study" intersection for examining level of service) with Humboldt Parkway southbound, NY Route 33 (the main boulevard), and Humboldt Parkway northbound. All turning movements would be allowed from each roadway. The signal timing and phasing was developed to provide the highest LOS for the intersection as a whole while maintaining a reasonable cycle length and safe operations for vehicles and pedestrian crossings. Timings allow for pedestrian walk/don't walk time to cross NY Route 33 within the vehicular phases (without a dedicated pedestrian phase). The assumed phasing plan is shown below:



Based on this phasing, optimized timings and the 2016 and 2036 intersection traffic volumes, the intersection is expected to operate at a LOS 'F' with an average intersection delay of over 15 minutes. It is assumed that the other intersections along the corridor would operate similarly with slight variations due to differences in volumes for the cross streets. The LOS for each movement at the intersection of East Ferry Street with NYS RT 33 and Humboldt Parkway is shown in the table below:

			Option 1 Level of Service (Delay in seconds)	
Roadway	**Direction**	**Movement**	**2016**	**2036**
E. Ferry St	Eastbound	LT/Thru/RT	D (35)	D (38)
E. Ferry St	Westbound	LT/Thru/RT	D (39)	D (40)
Humboldt Parkway	Northbound	LT/Thru/RT	F (388)	F (465)
Humboldt Parkway	Southbound	LT/Thru/RT	F (600)	F (651)
NY Route 33	Eastbound	LT	F (465)	F (499)
		Thru/RT	F (1,015)	F (1,202)
NY Route 33	Westbound	LT	F (741)	F (774)
		Thru/RT	F (1,195)	F (1,427)

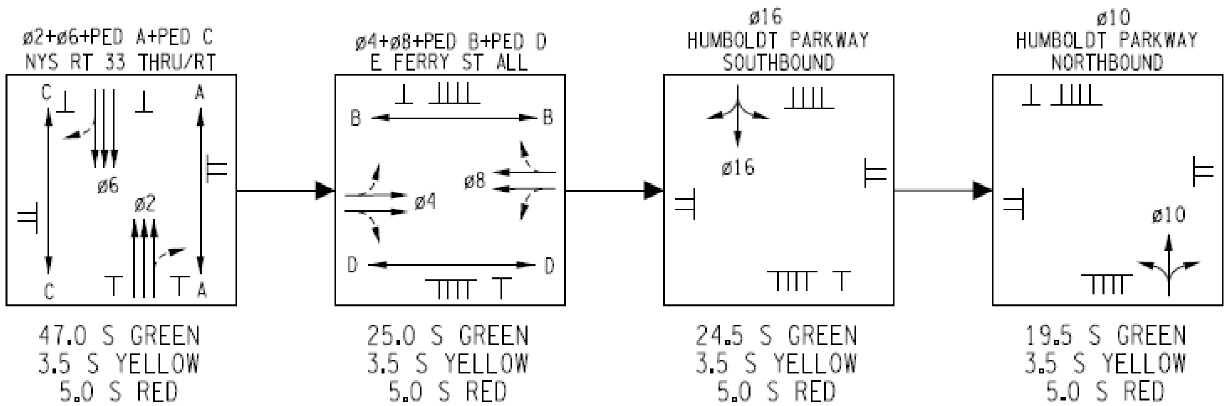
Maximizing the cycle length at 150 seconds, the optimized timings allocated approximately 30% of the cycle to the through movements on NY Route 33. Assuming this allocation would apply to all the signals along the corridor, the HCS2000 Arterials analysis results indicate the LOS of the arterial as a whole would be a LOS F with an average travel speed along the corridor of approximately 5 mph with both 2016 and 2036 volumes. The Synchro and HCS2000 analysis results are included in Appendix C.
A summary of the key considerations associated with Option 1 is listed below:

- Full access to and from NY Route 33 / Humboldt Parkway and major cross streets
- 5-phase traffic signal across three intersections
- Arterial analysis and intersection capacity analysis indicate excessive vehicular delays for NY Route 33 and Humboldt Parkway
- Multiple signal phases and wide pavement areas (9 travel lanes) create significant delays and a perceived boundary for pedestrians crossing NY Route 33

- Increased vehicular and pedestrian conflict points due to the introduction of turning movements and pedestrians crossing NY Route 33 may increase the number of accidents
- Increased vehicle delay and associated emission of greenhouse gases will impact air quality

Operation of Option 2 (Alternative E without Left Turns from Main Boulevard)

Option 2 eliminates left turning movements from NY Route 33 but allows for right turns at the intersections. The signal timing and phasing was revised to remove the protected left turn phase from NY Route 33 and the remaining available green time was distributed to the other phases. The phasing plan for this option is shown below:



Option 2 level of service for the intersection movements is shown the following table:

Roadway	Direction	Movement	Option 2 Level of Service (Delay in seconds) 2016	Option 2 Level of Service (Delay in seconds) 2036
E. Ferry St	Eastbound	LT/Thru/RT	E (63)	E (65)
E. Ferry St	Westbound	LT/Thru/RT	E (68)	F (80)
Humboldt Parkway	Northbound	LT/Thru/RT	F (385)	F (460)
Humboldt Parkway	Southbound	LT/Thru/RT	F (621)	F (725)
NY Route 33	Eastbound	Thru/RT	F (923)	F (1,064)
NY Route 33	Westbound	Thru/RT	F (1,109)	F (1,269)

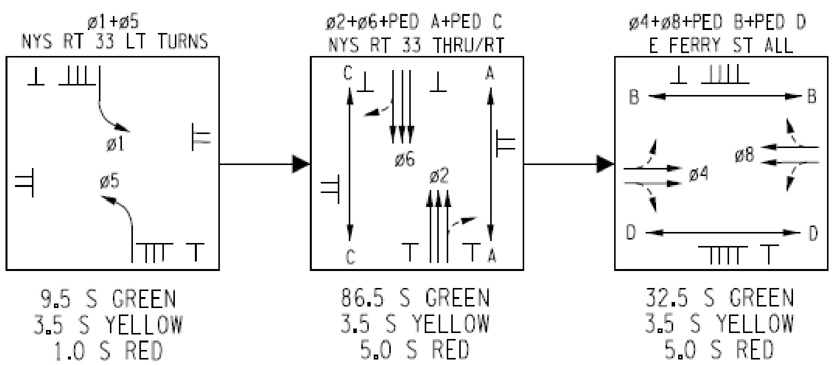
Maintaining the cycle length at 150 seconds, the optimized timings allocated just over 30% of the cycle to the through movements on NY Route 33 in Option 2. Assuming this allocation would apply to all the signals along the corridor, the HCS2000 Arterials analysis results indicate the LOS of the arterial as a whole would be a LOS F with an average travel speed along the corridor of 12 mph based on the 2016 volumes as well as 2036.

A summary of the key considerations associated with Option 2 is listed below:

- Increased access to and from NY Route 33 (except for left turns from the main boulevard), Humboldt Parkway and major cross streets
- 4-phase traffic signal across three intersections
- Arterial analysis and intersection capacity analysis indicate excessive vehicular delays for NY Route 33, Humboldt Parkway and major cross streets
- Multiple signal phases and wide pavement areas (8 travel lanes) create significant delays and a perceived boundary for pedestrians crossing NY Route 33
- Increased vehicular and pedestrian conflict points due to the introduction of turning movements and pedestrians crossing NY Route 33 (except for left turns from the main boulevard) may increase the number of accidents
- Increased vehicle delay and associated emission of greenhouse gases will impact air quality

<u>Operation of Option 3 (Sub-Alternative E1- Alternate Multi-way Boulevard Design)</u>

Option 3 provides a right-in/right-out only access from NY Route 33 onto Humboldt Parkway (frontage roads) near the major cross roads. This configuration eliminates the need for a signal on either side of NY Route 33 which will make the intersection with each cross road operate more efficiently with less phases and increased green time available to traffic on NY Route 33. The phasing plan for Option 3 is shown below:



The following table summarizes the intersection approach level of service for Option 3:

			Option 3 Level of Service (Delay in seconds)	
Roadway	**Direction**	**Movement**	**2016**	**2036**
E. Ferry St	Eastbound	LT/Thru/RT	F (182)	F (217)
E. Ferry St	Westbound	LT/Thru/RT	F (115)	F (138)
NY Route 33	Eastbound	LT	F (290)	F (341)
		Thru/RT	F (346)	F (442)
NY Route 33	Westbound	LT	F (295)	F (354)
		Thru/RT	F (430)	F (538)

While the LOS for E. Ferry St is significantly worse in Option 3, the delays on NY Route 33 are approximately 75% less than what is projected for Options 1 and 2. The Synchro results also indicate that delays on Humboldt Parkway (frontage roads) for vehicles waiting to turn onto NY Route 33 would reach a LOS ‘F’ with over 60 seconds of delay by 2036, but would be a LOS ‘E’ or better based on the 2016 volumes.

Again maintaining the cycle length at 150 seconds, the optimized timings were able to allocate approximately 60% of the cycle to the through movements on NY Route 33. Assuming this allocation would apply to all the signals along the corridor, the HCS2000 Arterials analysis results indicate the LOS of the arterial as a whole with both the 2016 and 2036 volumes would be a LOS ‘D’ with an average travel speed along the corridor of almost 20 mph. While the corridor analysis indicates an acceptable LOS and travel speed, the individual intersections would be expected to experience unacceptable LOS as per the Synchro results shown above.

A summary of the key considerations associated with Option 3 is listed below:

- Full access to and from NY Route 33 and major cross streets with restricted access from Humboldt Parkway
- Single 3-phase traffic signal at each cross street
- Arterial analysis indicate delays on NY Route 33 with an average speed of approximately 20 mph and LOS ‘D’
- Intersection capacity analysis indicate excessive vehicular delays for NY Route 33 and major cross streets
- Excessive delays for vehicles entering the main boulevard from Humboldt Parkway (feeder roads)
- Wide pavement areas (7 travel lanes) create significant delays and a perceived boundary for pedestrians crossing NY Route 33
- Introduces conflict points between pedestrians and vehicles due to NY Route 33, but conflicts with Humboldt Parkway are removed
- Increased vehicle delay and associated emission of greenhouse gases will impact air quality

Option 4 (Roundabout)

Per Exhibit 3-1 in *Roundabouts: An Informational Guide* published by the FHWA, the maximum AADT capacity of a typical two-lane urban roundabout is approximately 52,000 vehicles. Since the AADT of NY Route 33 alone (not including side road or feeder road traffic) is projected to vary from 68,985 to 80,139 vehicles in 2036, it can be assumed that roundabouts will not be feasible to control the intersections along the at-grade boulevard. A roundabout with three or more lanes was not evaluated, but it was assumed that space requirements and geometric characteristics of the roundabout would make this option not feasible.

Analysis of Traffic Diverted to Alternate Routes

Considering the significant delays along NY Route 33 based on the traffic analyses described above, an analysis was performed to estimate the extent of anticipated traffic diversion that would result from these delays. In each analysis, traffic volumes were reduced at 10% intervals to see if the Synchro analysis showed any improvement in Level of Service for NY Route 33 at the study intersection. It was determined that a 60% reduction in traffic would still result in unacceptable levels of service – there was a decrease in delay of approximately 50% at year 2036, but delays were still above 10 minutes with a LOS “F”.

The above-described incremental analysis is not the same as saying 60% of traffic on NY Route 33 would be diverted. An analysis to estimate the amount of diverted traffic would be very complex and require in-depth study of trip origins and destinations and other modeling. However, the incremental analysis does indicate that a diversion of more than 60% of traffic on NY Route 33 would be necessary for the intersections to function at a reasonable Level of Service.

A supplemental analysis was performed to see if the failing LOS conditions only occur during peak design periods or if they are consistent throughout the day. It was determined that the LOS was acceptable only between 9pm and 6am. Throughout most of the day, unacceptable delays and LOS will be experienced.

Traffic and Operation Conclusions

Preliminary planning level analyses indicated that due to excessive pedestrian and vehicle delays and anticipated impacts to safety and air quality, the conversion of NY Route 33 as an at-grade, multiway boulevard between E. Ferry St and Dodge/Parade St does not appear feasible.

With a 60% reduction in traffic volume, there was a decrease in delays for NY Route 33 traffic by about 50%, but the delay was still over 10 minutes and the LOS remained at ‘F’. Therefore, it is assumed that even with significant traffic redistribution to alternate routes, the at-grade boulevard concept would not provide acceptable intersection operation.

Significant, in-depth analysis is required to fully predict the impacts of Alternative E – Multiway Boulevard on traffic operations in the project area. It may be possible to utilize GBRNTC’s regional traffic model (and staff assistance) to predict traffic volumes, LOS, and percentage of diverted traffic to alternate routes. Discussions have been initiated with GBNRTC, and they are enthused and willing to assist in this effort.

Refer to Appendix D for the capacity analysis reports for each of the options described above.

2.6.2 Humboldt Parkway

The proposed multiway boulevard design includes reconstructing Humboldt Parkway as one-way frontage roads along the main boulevard. The frontage roads would be along approximately the same alignments as the existing parkway, and the function of Humboldt Parkway would be similar to the existing function as frontage roads along the Kensington Expressway. However, the character of the parkway will be quite different, in both positive and negative ways. Properties along Humboldt Parkway would now be at the same grade as traffic along NY Route 33, instead of the below-grade Kensington Expressway. A multiway boulevard and associated landscaping may be more appealing to look at, but residents will be exposed to significant traffic volumes along NY Route 33 instead of the grade-separated expressway traffic.

Access to the Humboldt Parkway frontage roads would be maintained at the major cross streets (E. Ferry St, E. Utica St, Northampton St and Dodge St), but the projected traffic operation along the boulevard would result in significant delays at each of these intersections. Turn restrictions to and from the main boulevard would also likely be necessary. As a result, it may be more difficult to access properties along Humboldt Parkway.

There are also positive and negative considerations regarding pedestrian access along Humboldt Parkway and the NY Route 33 corridor. Additional pedestrian amenities are proposed, such as new sidewalks along the median between the main boulevard and each frontage road and also along the outside of each frontage road. Additional landscaping and enhancements will also make the corridor more appealing to pedestrians. However, crossing NY Route 33 would be more difficult than the current grade-separated situation, as pedestrians would be required to cross six lanes of traffic plus the frontage roads.

Another consideration for Alternative E – Replacement of Expressway with Multiway Boulevard is how well the multiway boulevard design fits with the original character of the historic Humboldt Parkway. Although the proposed multiway boulevard would include trees, landscaping and pedestrian paths along the frontage roads, which were elements of the original Olmsted design, the six-lane main boulevard down the center contradicts Olmsted's vision for the parkway. The original parkway featured a wide landscaped median with significant areas for landscaping, recreation and public enjoyment. Because of the number of travel lanes needed on the main boulevard, there isn't sufficient space to provide significant usable areas for recreation or landscaping.

2.6.3 Landscape and Enhancements

Alternative E would include landscaping and upgraded amenities, including the following:

- Trees planted in the central median as well as medians between the main boulevard and each frontage road
- Upgraded pedestrian amenities, including sidewalks between the main boulevard and each frontage road and along the outside (residential side) of each frontage road, ADA accessible ramps
- Decorative materials including light fixtures, signal poles, crosswalks, sidewalk treatments

2.6.4 Unique Considerations

2.6.4.a Sub-Alternative E1 – Alternate Multiway Boulevard Design

Sub-Alternative E1 depicts a design where separate parallel frontage road segments would be constructed between each of the cross streets. The frontage roads would be tied into the main boulevard at the beginning and end of each block (traffic would enter the frontage road at the beginning of the block and exit just before the next crossroad) and therefore would not be part of the crossroad intersections. The main boulevard includes three 12 ft wide travel lanes in each direction with a 2 ft (outside) curb offset separated by a 16 ft wide center median. At the intersection approaches, 12 ft wide left turn lanes are provided. However, as discussed earlier, the complex signal phasing plan and predicted poor levels of service suggest that turn restrictions may be warranted at major cross roads in which case auxiliary turn lanes would not be built. Frontage roads with a 12 ft wide travel lane and 8 ft wide parking lane run along each side of the main boulevard. 23 ft wide medians, which include 8 ft wide sidewalks and 15 ft green space, separate each frontage road from the main boulevard. Sidewalks would also be reconstructed along the outside of the frontage roads, and a multi-use path is proposed through the medians separating the main boulevard from each frontage road. Pavement sections are the same as described in Alternative E - Replacement of Expressway with Multiway Boulevard, and this sub-alternative can also be constructed within the existing 200 ft right-of-way.

Refer to Appendix A for plans depicting Sub-Alternative E1.

Advantages to this type of multiway boulevard design include simplified cross street intersections, as the frontage roads do not continue through the cross streets from block to block. Instead of three signalized intersections (northbound frontage road, main boulevard and southbound frontage road) at each cross street, Sub-Alternative E1 - Alternate Multiway Boulevard Design results in only one intersection at each cross street. This allows for a simplified signal phasing sequence with more green time available for traffic on the main boulevard and would eliminate some of the turn restrictions at each intersection.

Disadvantages to this multiway boulevard design are the potential operational and safety concerns for traffic entering and exiting the frontage roads. The large volume of traffic along the main boulevard combined with the location of the frontage road “exit” onto the main boulevard will make it very difficult for local traffic on the frontage road to access the main boulevard. The frontage road exits would be very close to each cross street intersection, leaving little room for queuing or lane changing maneuvers for traffic exiting the frontage road. Delays will likely be excessive and mainline traffic may often block the frontage road exit. There is also a potential safety concern with traffic entering the frontage roads so close to the cross street intersections.

2.6.5 Work Zone Traffic Control and Construction Staging

Construction of Alternative E – Replacement of Expressway with Multiway Boulevard would likely require two seasons and extensive work zone traffic control (WZTC) along NY Route 33 and Humboldt Parkway. Goals and strategies of the WZTC plan are summarized in the following table:

Project Goal		WZTC Strategies & Assumptions
1	Minimize construction duration	- Consider A+B Bidding - Consider utilizing incentives and/or liquidated damage provisions
2	When the expressway mainline must be closed, minimize impacts to regional expressways and local roads used as detour route	- Assume NY Route 33 is closed between NY Route 198 and the Elm-Oak Arterial - Commuter traffic detoured to alternate Interstate highways - Local traffic detoured to alternate City streets (Minor Arterials or greater) - Improve local roads as necessary to accommodate detour traffic - Institute a regional Traffic Management Plan and inform the public
3	Minimize time when cross streets (E. Ferry, Utica, Northampton, Dodge) are closed	- Consider phasing construction so that only two of the four crossings are severed during one construction season - Utilize local street detours for City traffic
4	Minimize short-term construction impacts on Humboldt Parkway	- Maintain at least one travel lane for access to properties - Temporarily restrict or relocate parking - Close (remove) expressway ramps and maintain only Local traffic on Humboldt Pkwy

Construction Duration and Phasing

It is estimated that two seasons would be required to complete the new multiway boulevard. The first season would involve removing and/or abandoning the existing infrastructure (bridge crossings, utilities, breaking up pavement on NY Route 33) and placing embankment material to bring the mainline up to grade with the adjacent Humboldt Parkway. Paving and surface treatments would be completed during the second season. It may be possible to install temporary pavement at the local street crossings once the embankment material is in place (likely at the end of the first season) in order to re-establish traffic on the cross streets as quickly as possible.

It is anticipated that closing NY Route 33 to traffic will be necessary to construct the multiway boulevard. Closure of the expressway would allow for the project to be completed in a single phase, which would be more efficient and cost-effective than constructing the project in sections. The significant elevation difference between the existing expressway and proposed boulevard is the primary reason that staged construction is considered not to be practical. However, consideration has been given to construction methods that would allow at least one direction of travel to be maintained along the expressway while detouring the other. It would be possible to install a retaining system along the center of the expressway and maintain traffic on one side while the other is raised up to grade. Possible systems include Geosynthetic Reinforced Earth System (GRES), Mechanical Stabilized Earth (MSE), or the use of a sheeting wall. These methods would be very costly (installation costs plus the additional cost to maintain and protect traffic through the work zone). Once the embankment material is in place on one side, traffic would be maintained (on temporary pavement) on that side while the other side is raised up. Once both sides are raised to grade, the retaining system would no longer be necessary and would likely be abandoned in place. Although maintaining traffic on one side of the expressway could be a significant benefit, using a staged approach would likely require an additional year of construction and add significant costs to the project.

Construction Considerations

The sequence of construction would include the following tasks:

- Closure of Kensington Expressway: The expressway would be closed to commuter traffic between NY Route 198 and the Elm-Oak Arterial in downtown Buffalo. Commuter traffic would be encouraged to use alternate interstate highways such as I-190 or I-290. Local traffic could be allowed to use westbound Rte. 33 and between NY Route 198 and the E. Ferry St off-ramp and also between Best St and the Elm-Oak Arterial. Eastbound local traffic could be maintained between the Elm-Oak Arterial and Best St. These local traffic zones would likely include one travel lane in each direction, a reduced speed limit, and would be in place to maintain access to the Humboldt Parkway neighborhoods and the Museum of Science (as well as providing access for construction-related traffic). Refer to the discussion below regarding detour routes for local and commuter traffic.

- Removal or abandonment of existing infrastructure: With the expressway closed to traffic, existing features (signs & sign structures, guide rail, light fixtures) would be removed, and drainage & utility systems along the expressway would be removed or abandoned as necessary. The expressway pavement would be broken up but remain in place. This work could be accomplished with minimal impact to traffic along Humboldt Parkway.

- Partial removal of existing retaining walls and removal of bridge crossings: The top seven (7) feet of the retaining walls will be removed, while the remaining portion will be abandoned in place. The existing bridge structures at E. Ferry St, E. Utica St, Northampton St and Dodge St will be removed and local traffic detoured (see discussion below regarding detour routes). This work could be accomplished with temporary work zones and lane closures along Humboldt Parkway.

- Installation of embankment material: The embankment material could be placed with minimal disruption to Humboldt Parkway. It is estimated that approximately 300,000 cubic yards (cy) of material would be needed to construct the embankment. Assuming a 12 cy dump truck, 25,000 trips would be required. A large number of trucks will be required to import the fill material, and a plan should be implemented to minimize or prohibit the usage of local streets by construction traffic. With the material in place, temporary pavement could be installed to re-establish street crossings at E. Ferry St, E. Utica St, Northampton St and Dodge. St (though the mainline NY Route 33 would remain closed).

- Construction of main boulevard and frontage roads: It would be most efficient to continue the detour of NY Route 33 mainline traffic while the new boulevard is constructed. This stage of construction will also require temporary work zones and lane closures as Humboldt

Parkway is reconstructed to function as frontage roads to the main boulevard. It is assumed that at least one travel lane could remain open on Humboldt Parkway for property access, though temporary parking relocations or restrictions will be necessary.

Many of these tasks could be completed concurrently, as the contractor would likely start at one end of the project and work towards the other. For example, the removal and abandonment of existing infrastructure along the expressway and partial retaining wall removal could progress together. As the demolition and removal is completed, the installation of embankment material could begin. It is recommended that the existing bridges not be removed until the construction operations have reached that area so that the cross streets can remain open to traffic as long as possible.

Detour Routes

Significant regional and local coordination will be required to establish appropriate detour routes for traffic on NY Route 33 and the local street crossings that will be severed during construction. Route 33 would be closed to traffic between NY Route 198 and the Elm-Oak Arterial (as described above, local traffic zones could be maintained between the Elm-Oak Arterial and Best St and between Route 198 and E. Ferry St). The detour plan will require coordination between NYSDOT, the City of Buffalo, GBNRTC, NFTA (transit routes), school districts (bus routes), and local emergency providers. An extensive traffic analysis of the detour routes would be required to assess traffic operation and the need for improvements along the detour routes.

Commuter traffic on NY Route 33 would be encouraged to use alternate interstate highways such as I-90 Thruway, I-190 or I-290. Westbound (inbound) traffic could also utilize NY Route 198 to Main St (NY Route 5), Delaware Ave (NY Route 384) or remain on NY 198 to reach I-190. Eastbound (outbound) traffic would be required to use alternate interstates or NY Route 198. The detour plan will require significant public notification including the use of fixed and portable variable message signs, other construction signage, NYSDOT website, and local media coverage.

The street crossings at E. Ferry St, E. Utica St, Northampton St and Dodge St would be severed and local traffic detoured to alternate local streets. The nearest streets crossing NY Route 33 would be Delavan Ave to the north and Best St to the south. Traffic would utilize Jefferson Ave or Fillmore Ave to reach these cross streets. Pedestrian access would also be severed in the project area. Pedestrians would be required to cross NY Route 33 at Best St or Delavan Ave or utilize the pedestrian bridge north of E. Ferry St.

A detour analysis would be required to estimate the volume of traffic expected to use the detour routes, evaluate the operation of intersections along the routes, and identify any improvements needed to streets or intersections to maintain acceptable traffic operations.

2.6.6 Environmental Considerations

The scale of work proposed under this alternative is likely to have significant impacts on the environment in a number of ways. At this time, the environmental classification for Alternative E – Multiway Boulevard is assumed to be:

- SEQR Non-Type II (Environmental Impact Statement) - In accordance with 17 NYCRR Part 15.6, the action exceeds the criteria for classification as a Type II action therefore it is considered Non-Type II. The preparation of an environmental impact statement is the likely course of action versus preparation of an environmental assessment. This environmental classification is based on the criteria contained in 17 NYCRR Part 15.11 which is used for determining whether an action is likely to have a significant effect on the environment. For this alternative, a substantial change in traffic and / or noise levels can be expected when the Kensington Expressway is downgraded from an expressway to a principal arterial and reconstructed on a different vertical alignment. The anticipated traffic impacts (and likely change in travel patterns) associated with this action are considered significant.

- NEPA Class I- In accordance with 23 CFR 771.115, the project is assumed to be a Class I action. As defined in the regulation, "a highway project of four or more lanes on a new location" is typically a Class I project. In this instance, the horizontal alignment is not changed however the vertical alignment is significantly changed and the facility, which was originally funded with federal money, will be downgraded to a principal urban arterial.

The impacts of the proposed work on the environment would need to be analyzed in relation to the following areas:

Social: Social issues generally addressed as part of an EIS include: land use, neighborhoods, community cohesion, social groups benefited or harmed, school districts, recreational areas, churches and businesses. If Alternative E is progressed, these social issues would require evaluation. .

Economic: Economic issues generally addressed as part of an EIS include regional and local economies, business districts, and highway related businesses. From an economic standpoint, the project is not likely to create any long-term adverse impacts. In fact, the construction of a multiway boulevard could have a positive effect on the local economy and may spur new investment both in commercial and residential development. The economic impact from this project is anticipated to be positive. Short-term construction impacts will need to be addressed to ensure that local businesses can survive the construction duration.

Storm Water Management: Since this alternative is likely to impact more than 1 acre of land, a NYSDEC Stormwater Pollution Discharge Elimination System (SPDES) general permit for storm water discharges from construction activity will be needed. This project will assess the requirements for storm water management practices and will include an analysis to determine the requirement for permanent storm water quality and quantity practices. This DEC permit also ensures that temporary and permanent storm water measures are provided.

General Ecology and Wildlife: There are no federally listed species in the project area. There are two State listed species in the project area; one is an endangered vascular plant species and one is an endangered Invertebrate animal species. Compliance and coordination with the NYSDEC will be necessary for this project. As part of the EIS, the NYSDEC will be contacted to identify the species and a site species assessment will be performed to confirm its presence. Also, the corridor will need to be assessed for the presence of invasive species and an analysis of existing and proposed roadside vegetation will be conducted with regard to reasonable management practices.

Historic And Cultural Resources: As a majority of the area within the project limits has been disturbed by the original construction of the Kensington Expressway, the chance of encountering prehistoric resources is minimal. With regard to historic and cultural resources, the project must comply with the State Historic Preservation Act (Section 14.09) as well as the National Historic Preservation Act (Section 106). A cultural resources survey will be conducted in the project area and will consist of a documentation of existing buildings and other resources (such as remaining Olmsted features) present in the project area. At present, the Buffalo Science Museum is known to be listed on the national register of historic places and is located in Martin Luther King Jr. Park. Other structures adjacent to the project may be eligible for listing on the state or federal register and the project's effect on their overall setting will need to be assessed.

In response to the survey, the NYSDOT regional cultural resources coordinator will make a determination regarding potential effects on historic and cultural resources, in consultation with the New York State office of Parks, Recreation and Historic preservation. It is not clear whether Alternative E - Multiway Boulevard will impact historic resources within the project area.

Parks and Recreational Resources: Martin Luther King Jr. Park and the Buffalo Museum of Science are located adjacent to the project corridor between Northampton and Best Streets. It may be necessary to conduct a 4(f) evaluation for Alternative E – Multiway Boulevard if the project impacts the park.

At this time, Alternative E does not appear to physically alter the property. Therefore, the environmental effect on this existing resource is likely to be minor.

Visual Resources: Alternative E – Multiway Boulevard has the potential for visual quality impacts. A project of this scope and magnitude is likely to require a full Visual Impact Assessment (VIA) as part of the design process. If required, it will evaluate impacts to existing visual resources, the relationship of the impacts to potential viewers of and from the project, as well as measures to avoid and minimize or reduce the adverse impacts. The VIA will give consideration to design quality, art and architecture as part of the project planning.

Air Quality: In general, projects that are classified as requiring environmental assessments or environmental impact statements often require an air quality analysis.

A microscale air quality analysis is appropriate to predict concentrations of carbon monoxide on a localized or microscale basis. Carbon monoxide impacts are local in nature and high concentrations are generally limited to within a relatively short distance of heavily traveled roadways. There are two levels of an air-quality analysis - Level I and Level II analysis. All project requiring a microscale carbon monoxide analysis should start with a Level I analysis. This analysis is a standard screening analysis using the computer software CAL3QHC for modeling carbon monoxide concentrations near roadways with standard worst-case assumptions. If the Level I analysis indicates either one hour or eight hour carbon monoxide national ambient air quality levels are exceeded, a Level II analysis may be considered. For Alternative E – Multiway Boulevard, a microscale air analysis is appropriate to predict concentrations of carbon monoxide at adjacent receptors (houses and pedestrians) since the "source to receptor" distances have been decreased.

A mesoscale air quality analysis will be required since the project has the potential to significantly affect traffic conditions over a large area. A significant volume of traffic will redistribute to other existing thoroughfares because the new boulevard cannot physically accommodate the current Expressway traffic volumes at a reasonable level of service. A mesoscale analysis considers the regional effects for three pollutants: carbon monoxide, volatile organic compounds and nitrous oxides. These emissions from motor vehicles are of concern primarily because of their role as precursors in the formation of ozone which results from a series of complex reactions in the presence of sunlight. For Alternative E –Multiway

Boulevard, a mesoscale air analysis may be appropriate for assessing long-term impacts associated with possible redistribution of traffic in the greater Buffalo area.

The Federal government cannot engage in supporting, financing or permitting a transportation project that does not conform to regional air quality goals. The “conformity rule” as it is called requires the MPO (in this case the Greater Buffalo Niagara Regional Transportation Council (GBNRTC)) and the US Department of Transportation to make conformity determinations on metropolitan long-range transportation plans and transportation improvement programs before they are adopted, approved, or accepted. The proposed project has not yet been reviewed by GBNRTC for conformity (i.e. it is not part of the regional emissions analysis to determine its effect on overall conformity).

Energy: Federal and State policies require transportation projects to promote energy efficiency. Because Alternative E – Multiway Boulevard is likely to change travel patterns along the project corridor, the proposed project has the potential to affect energy consumption. An Energy and Greenhouse Gas Emissions report will need to be conducted. The energy analysis should be based on NYSDOT’s *Draft Energy Analysis Guidelines for Project Level Analysis*, updated November 2003. The energy analysis should address direct and indirect energy consumption.

Noise: A noise study is required for all Type I projects as defined under section 772.5 (h) of 23 CFR 772 , Procedures For Abatement Of Highway Traffic Noise And Construction Noise. A Type I project is defined as a Federal-aid highway project for the construction of a highway on new location or the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment or increases the number of through-traffic lanes. Alternative E – Multiway Boulevard does meet the criteria for a Type I project, and therefore a noise analysis is required.

Asbestos: A complete asbestos investigation will be necessary during the design of Alternative E –Multiway Boulevard. The original contract plans (F.A.C.59-19 and C68-2) indicate the use of compressed asbestos sheet packing on top of the abutment backwalls under the ends of the deck slabs. These concerns will need to be addressed by incorporating specific removal procedures within the contract documents.

Contaminated and Hazardous Materials: A hazardous waste / contaminated materials site screening will be conducted in accordance with NYSDOT’s The Environmental Manual (TEM) Section 4.4.20, in order to determine the potential for encountering hazardous waste or contaminated materials during construction. If information from the screening/site visit indicates that contaminated materials might be encountered on the project, a hazardous waste and contaminated materials assessment involving testing of the suspected areas may be required.

A contaminated and hazardous materials investigation is necessary for all alternatives under consideration. The project area is mostly residential in nature and evidence of gas stations or other potential hazardous waste producers are not evident. Therefore, the likelihood of finding hazardous waste is believed to be relatively low. However, there is a strong likelihood there is lead-based paint or undercoats of lead-based paint on the existing bridge beams. In general, these types of environmental issues, if encountered, can be mitigated through appropriate measures (handling and disposal) included in construction contracts.

Construction Impacts: Short-term construction impacts can be expected. In this instance, they may be considerable over a 3 year construction period. Some of the issues include:

- Noise levels and vibrations: The project area may experience a significant increase during construction due to the various construction activities, equipment and vehicles. A building condition survey should be performed for each structure within the project limits at the onset of construction and again once the project is complete. The survey will document the condition of each structure and identify any impacts resulting from construction-related activities such as vibration or blasting.

- Construction-related Traffic and Equipment: The significant volume of embankment material required to raise NY Route 33 up to grade will require many truckloads of material to be brought in from offsite locations. It is unknown where the fill material will be sourced; however, it is likely that the trucks will utilize NY Route 33 to access the site. A plan should be in place to establish construction traffic routes and avoid the usage of local streets.

- Traffic Impacts: Traffic issues associated with the construction of Alternative E will be significant. Both short-term (construction-related) and long-term (operational) will require detailed analysis. To raise the finished grade, embankment construction will require detouring eastbound and westbound Kensington traffic to other facilities. Plus, it is likely that traffic patterns will change permanently once the project is constructed. As part of the EIS, extensive traffic analysis can be expected to identify local and regional traffic issues, quantify impacts to level of service, and recommend solutions that can accommodate present and future traffic conditions on a regional level.

  The NYSDOT Traffic & Safety group and GBNRTC are resource groups that can assist with predictive traffic modeling and the development of reasonable traffic mitigation plans. Some of the traffic solutions that can be expected for Alternative E include: physical improvements to local streets and regional highways predicted to experience increased traffic on a short and long-term basis, instituting a comprehensive traffic management plan that informs the public on a regular basis during construction, maintaining access to private property at all times within the project corridor and adherence to contract provisions designed to ensure timely completion of critical stages.

- Air quality: Within the project area, air quality may decrease temporarily during construction due to an increase in particulates from diesel exhaust emissions from construction vehicles.

In general, temporary (short-term) construction impacts are usually mitigated sufficiently to avoid significant adverse impact. However, it is not clear whether post-construction traffic patterns will have an adverse environmental effect.

Following is a summary of the additional studies likely needed for Alternative E – Multiway Boulevard:

- Hazardous Waste / Contaminated Materials
- Air Quality / Ventilation – Computational Fluid Dynamics
- Noise Analysis
- Energy and Greenhouse Gas Emissions report
- Cultural Resources Analysis
- Local and Regional Traffic Analysis to examine construction impacts and long term traffic patterns
- Building Condition Surveys

CHAPTER 3

3.1 Estimating Parameters

Estimates were performed for Alternatives B, C, D, E and Sub-Alternatives B1 and B2. Sub-Alternatives C1, D1 and E1 are assumed to be approximately the same cost as the main Alternative. The methodologies and assumptions for the estimates are summarized below:

- Itemized estimates were performed for the pavement structures (milling, saw cutting, pavement, sub-base, underdrain, underdrain filter, curb), sidewalks, stamped concrete, trees, drainage, lighting, landscaping, retaining wall work, and Texas barrier. Refer to calculations in Appendix C.

- Average NYSDOT bid prices were utilized (updated to 2012 costs).

- Bridge costs were estimated using NYSDOT Structures Program Development Preliminary Cost Estimating Worksheet (dated 10/2011) with additional costs for Texas barrier and fencing using average bid prices.

- Costs of the tunnel are calculated from cost-per-foot information that was provided by a tunnel structure manufacturer.

- Estimates for signal work and ITS work are lump sum costs based on recent similar projects.

- Right-of-Way (ROW) costs are assumed based on the amount of property that may be impacted.

- Construction inspection costs are calculated from an assumed construction staff and construction duration; additional information is provided in Appendix C.

- Percentages were used to estimate utility costs, incidentals, survey, contingencies, and mobilization.

- Design costs were approximated using a percentage of 7% for Alternatives B and Alternative E, as well as Sub-Alternative B1 and B2, and a percentage of 4% for Alternatives C and D.

- Work zone traffic control (WZTC) costs were approximated using an assumed amount of design required for each alternative based on the impacts that it may have.

- The estimate includes a NYSDOT share and Betterment share. The betterment share is for upgrades to infrastructure owned and maintained by the City of Buffalo where the infrastructure is not directly impacted by the work NYSDOT is undertaking. It is assumed that the betterment share includes the curb, sidewalk, driveways, lighting, trees, and landscaping on the residential side of Humboldt Parkway. It also is assumed to include signal upgrades for Alternatives B, C, and D as well as Sub-Alternatives B1 and B2.

- Estimates are projected to an expected award amount based on an assumed midpoint of construction date, which is different for each alternative.

- An inflation rate of 3% per year was used based on the current design report shell from NYSDOT (dated 10/2011).

3.2 Estimate of Probable Construction Cost

Cost Summary Table						
Alternative	Total 2012 Cost	Expected Award Amount	Construction Inspection Cost	ROW Cost	Design Cost	Total Project Cost
Alternative B - Humboldt Parkway Enhancements	$27,865,212	$30,373,081 2015 DOLLARS	$1,119,059	$10,000	$1,950,565	$33,452,705
Sub-Alternative B1 - Bridge Rehabilitation with Widening	$34,829,406	$37,964,052 2015 DOLLARS	$1,938,196	$10,000	$2,438,058	$42,350,307
Sub-Alternative B2 - Bridge Replacement	$44,119,894	$48,090,684 2015 DOLLARS	$2,291,048	$10,000	$3,087,665	$53,479,397
Alternative C - Partial Decking of Expressway with Corridor	$135,562,991	$159,964,330 2018 DOLLARS	$4,431,859	$50,000	$5,422,104	$169,868,292
Alternative D - Full Reconstruction of Expressway	$486,773,726	$574,392,997 2018 DOLLARS	$6,658,959	$100,000	$19,470,949	$600,622,905
Alternative E - Replacement of Expressway with a Multiway	$46,364,656	$54,710,294 2018 DOLLARS	$4,683,773	$50,000	$3,245,526	$62,689,593

3.2.1 Alternative A – Null / Maintenance

No estimate was developed for this alternative.

3.2.2 Alternative B – Humboldt Parkway Enhancements

Alternative B - Humboldt Parkway Enhancements					
Activities		NYSDOT Share	Betterment Share	Total Cost	Comments
Construction Costs	**Bridges**				
	Dodge Street	$218,976.27		$218,976	Bridge Railing Replacement with Texas Barrier and Chain Link Fence
	Northampton Street	$189,525.65		$189,526	Bridge Railing Replacement with Texas Barrier and Chain Link Fence
	East Utica Street	$176,312.84		$176,313	Bridge Railing Replacement with Texas Barrier and Chain Link Fence
	East Ferry Street	$167,177.28		$167,177	Bridge Railing Replacement with Texas Barrier and Chain Link Fence
	Humboldt Parkway				
	Pavement mill & overlay, Curb and Underdrain on Route 33 side	$1,465,311		$1,465,311	
	Curb and Underdrain Residential side		$654,547	$654,547	
	Stamped concrete Route 33 Side	$633,741		$633,741	
	Sidewalk Residential Side		$202,271	$202,271	
	Drainage	$314,015	$255,968	$569,982	
	Driveways		$93,816	$93,816	
	Lighting	$474,781	$696,553	$1,171,334	
	Signs	$115,665		$115,665	
	Trees	$93,052	$85,478	$178,530	
	Landscaping	$197,800	$220,739	$418,539	
	Traffic Signals		$1,480,000	$1,480,000	
	Restore ITS System	$300,000		$300,000	
	Environmental, Erosion and Sediment Control	$14,653		$14,653	
	Incidentals	$590,820		$590,820	Field Office, Pavement Stripes, Price Adjustments, Unknowns etc
	Route 33				
	Texas Barrier	$2,667,544		$2,667,544	
	Top Wall Repairs	$2,997,748		$2,997,748	
	Fascia Repairs	$6,623,250		$6,623,250	
	Painting	$463,628		$463,628	
Subtotal (2012 Dollars)		$17,703,999	$3,689,372	$21,393,371	
Work Zone Traffic Control		$360,000	$90,000	$450,000	
Subtotal (2012 Dollars)		$18,063,999	$3,779,372	$21,843,371	
Survey (3%)		$541,920	$113,381	$655,301	
Subtotal (2012 Dollars)		$18,605,919	$3,892,753	$22,498,672	
Contingency (15% @ Design Approval)		$2,790,888	$583,913	$3,374,801	
Subtotal (2012 Dollars)		$21,396,807	$4,476,666	$25,873,473	
Field Change Order ($900,000+0.02*(SUBTOTAL-25,000,000)) ROUNDED UP TO NEAREST $10,000		$830,000	$90,000	$920,000	
Subtotal (2012 Dollars)		$22,226,807	$4,566,666	$26,793,473	
Mobilization (4%)		$889,072	$182,667	$1,071,739	
Subtotal (2012 Dollars)		$23,115,880	$4,749,332	$27,865,212	
Expected Award Amount (Inflated @ 3%/yr to midpoint of construction) (2015 Dollars)		$25,196,309	$5,176,772	$30,373,081	
Construction Inspection		$1,119,059		$1,119,059	1 year of construction
ROW Costs (2012 Dollars)		$10,000		$10,000	
Preliminary and Final Design Costs (7% of 2012 Dollars)		$1,618,112	$332,453	$1,950,565	
Total Project Costs		**$27,943,479**		**$33,452,705**	

3.2.2.1 Sub - Alternative B1 – Bridge Rehabilitation with Widening

Sub-Alternative B1 - Bridge Rehabilitation with Widening					
Activities		NYSDOT Share	Betterment Share	Total Cost	Comments
Construction Costs	**Bridges**				
	Dodge Street	$1,381,641		$1,381,641	Two 19' wide bridges either side of existing structure with modification to the existing bridge sidewalk and railing
	Northampton Street	$1,214,976		$1,214,976	Two 19' wide bridges either side of existing structure with modification to the existing bridge sidewalk and railing
	East Utica Street	$1,158,976		$1,158,976	Two 19' wide bridges either side of existing structure with modification to the existing bridge sidewalk and railing
	East Ferry Street	$1,158,976		$1,158,976	Two 19' wide bridges either side of existing structure with modification to the existing bridge sidewalk and railing
	Humboldt Parkway				
	Pavement mill & overlay, Curb and underdrain Route 33 side	$1,555,543		$1,555,543	
	Curb and Underdrain Residential side		$654,547	$654,547	
	Stamped concrete Route 33 Side	$720,698		$720,698	
	Sidewalk Residential Side		$202,271	$202,271	
	Drainage	$876,327	$255,968	$1,132,295	(NYSDOT Share Includes re-doing the drainage in the Route 33 median due to the new Piers)
	Driveways		$93,816	$93,816	
	Lighting	$472,396	$704,238	$1,176,634	
	Signs	$115,665		$115,665	
	Trees	$119,020	$85,478	$204,498	
	Landscaping	$253,000	$220,739	$473,739	
	Traffic Signals		$1,480,000	$1,480,000	
	Restore ITS System	$300,000		$300,000	
	Environmental, Erosion and Sediment Control	$15,555		$15,555	
	Incidentals	$590,820		$590,820	Field Office, Pavement Stripes, Price Adjustments,and Unknowns etc
	Route 33				
	Texas Barrier	$2,589,486		$2,589,486	
	Top Wall Repairs	$2,910,031		$2,910,031	
	Fascia Repairs	$6,623,250		$6,623,250	
	Painting	$463,628		$463,628	
	Utilities on Existing Bridges	$169,880		$169,880	Relocating Existing hanging bridge utilities
Subtotal (2012 Dollars)		$22,689,869	$3,697,057	$26,386,925	
Work Zone Traffic Control		$800,000	$200,000	$1,000,000	
Subtotal (2012 Dollars)		$23,489,869	$3,897,057	$27,386,925	
Survey (3%)		$704,696	$116,912	$821,608	
Subtotal (2012 Dollars)		$24,194,565	$4,013,968	$28,208,533	
Contingency (15% @ Design Approval)		$3,629,185	$602,095	$4,231,280	
Subtotal (2012 Dollars)		$27,823,749	$4,616,064	$32,439,813	
Field Change Order ($900,000+0.02*(SUBTOTAL-25,000,000)) ROUNDED UP TO NEAREST $10,000		$960,000	$90,000	$1,050,000	Used calc, for cost including Betterment
Subtotal (2012 Dollars)		$28,783,749	$4,706,064	$33,489,813	
Mobilization (4%)		$1,151,350	$188,243	$1,339,593	
Subtotal (2012 Dollars)		$29,935,099	$4,894,306	$34,829,406	
Expected Award Amount (Inflated @ 3%/yr to midpoint of construction) (2015 Dollars)		$32,629,258	$5,334,794	$37,964,052	
Construction Inspection		$1,938,196		$1,938,196	1.5 years of construction
ROW Costs (2012 Dollars)		$10,000		$10,000	
Preliminary and Final Design Costs (7% of 2012 Dollars)		$2,095,457	$342,601	$2,438,058	
Total Project Costs		**$36,672,911**		**$42,350,307**	

3.2.2.2 Sub - Alternative B2 – Bridge Replacement

Sub-Alternative B2 - Bridge Replacement					
Activities		NYSDOT Share	Betterment Share	Total Cost	Comments
Construction Costs	**Bridges**				
	Dodge Street	$2,768,912		$2,768,912	New bridge the same width as the combined existing and proposed bridges from Alternative B1
	Northampton Street	$2,793,049		$2,793,049	New bridge the same width as the combined existing and proposed bridges from Alternative B1
	East Utica Street	$2,670,049		$2,670,049	New bridge the same width as the combined existing and proposed bridges from Alternative B1
	East Ferry Street	$2,670,049		$2,670,049	New bridge the same width as the combined existing and proposed bridges from Alternative B1
	Humboldt Parkway				
	Pavement mill & overlay, Curb and underdrain Route 33 side	$1,323,076		$1,323,076	
	Curb and Underdrain Residential side		$654,547	$654,547	
	Stamped concrete Route 33 Side	$720,698		$720,698	
	Sidewalk Residential Side		$202,271	$202,271	
	Drainage	$1,476,811	$255,968	$1,732,779	(NYSDOT Share Includes re-doing the drainage in the Route 33 median due to the new Piers)
	Driveways		$93,816	$93,816	
	Lighting	$472,396	$704,238	$1,176,634	
	Signs	$115,665		$115,665	
	Trees	$119,020	$85,478	$204,498	
	Landscaping	$253,000	$220,739	$473,739	
	Traffic Signals		$1,480,000	$1,480,000	
	Restore ITS System	$300,000		$300,000	
	Environmental, Erosion and Sediment Control	$13,231		$13,231	
	Incidentals	$627,390		$627,390	Field Office, Pavement Stripes, Price Adjustments,and Unknowns etc
	Route 33				
	Texas Barrier	$2,589,486		$2,589,486	
	Top Wall Repairs	$2,910,031		$2,910,031	
	Fascia Repairs	$6,623,250		$6,623,250	
	Painting	$463,628		$463,628	
	Utilities on Existing Bridges	$169,880		$169,880	Relocating Existing hanging bridge utilities
Subtotal (2012 Dollars)		$29,079,621	$3,697,057	$32,776,678	
Work Zone Traffic Control		$1,600,000	$400,000	$2,000,000	
Subtotal (2012 Dollars)		$30,679,621	$4,097,057	$34,776,678	
Survey (3%)		$920,389	$122,912	$1,043,300	
Subtotal (2012 Dollars)		$31,600,010	$4,219,968	$35,819,978	
Contingency (15% @ Design Approval)		$4,740,001	$632,995	$5,372,997	
Subtotal (2012 Dollars)		$36,340,011	$4,852,964	$41,192,975	
Field Change Order ($900,000+0.02*(SUBTOTAL-25,000,000)) ROUNDED UP TO NEAREST $10,000		$1,130,000	$90,000	$1,230,000	
Subtotal (2012 Dollars)		$37,470,011	$4,942,964	$42,422,975	
Mobilization (4%)		$1,498,800	$197,719	$1,696,919	
Subtotal (2012 Dollars)		$38,968,812	$5,140,682	$44,119,894	
Expected Award Amount (Inflated @ 3%/yr to midpoint of construction) (2015 Dollars)		$42,476,005	$5,603,344	$48,090,684	
Construction Inspection		$2,291,048		$2,291,048	1.5 years of construction
ROW Costs (2012 Dollars)		$10,000		$10,000	
Preliminary and Final Design Costs (7% of 2012 Dollars)		$2,727,817	$359,848	$3,087,665	
Total Project Costs		**$47,504,870**	**$5,963,191**	**$53,479,397**	

3.2.3 Alternative C – Partial Decking of Expressway with Corridor Enhancements

Alternative C - Partial Decking of Expressway with Corridor Enhancements					
Activities		NYSDOT Share	Betterment Share	Total Cost	Comments
Construction Costs	**Bridges**				
	Dodge Street	$12,215,049		$12,215,049	
	Northampton Street	$19,696,009		$19,696,009	
	East Utica Street	$20,871,858		$20,871,858	
	East Ferry Street	$19,456,133		$19,456,133	
	Humboldt Parkway				
	Pavement mill & overlay, Curb and underdrain Route 33 side	$2,076,698		$2,076,698	
	Curb and Underdrain Residential side		$654,547	$654,547	
	Stamped concrete Route 33 Side	$535,004		$535,004	
	Sidewalk Residential Side		$202,271	$202,271	
	Drainage	$3,995,321	$255,968	$4,251,289	(NYSDOT Share Includes re-doing the drainage in the Route 33 median due to the new Piers)
	Driveways		$93,816	$93,816	
	Lighting	$472,396	$704,238	$1,176,634	
	Signs	$115,665		$115,665	
	Trees	$194,760	$85,478	$280,238	
	Landscaping	$414,000	$220,739	$634,739	
	Traffic Signals		$1,480,000	$1,480,000	
	Utilities	$41,534		$41,534	
	Restore ITS System	$300,000		$300,000	
	Environmental, Erosion and Sediment Control	$83,068		$83,068	
	Incidentals	$970,845		$970,845	Field Office, Pavement Stripes, Price Adjustments,and Unknowns etc
	Route 33				
	Texas Barrier	$1,805,119		$1,805,119	
	Top Wall Repairs	$2,028,599		$2,028,599	
	Fascia Repairs	$6,623,250		$6,623,250	
	Painting	$463,628		$463,628	
	Lighting	$724,830		$724,830	Bridge Lighting
	Utilities on Existing Bridges	$169,880		$169,880	Relocating Existing hanging bridge utilities
Subtotal (2012 Dollars)		$93,253,646	$3,697,057	$96,950,703	
Work Zone Traffic Control		$1,600,000	$400,000	$2,000,000	
Subtotal (2012 Dollars)		$94,853,646	$4,097,057	$98,950,703	
Survey (3%)		$2,845,609	$122,912	$2,968,521	
Subtotal (2012 Dollars)		$97,699,256	$4,219,968	$101,919,224	
Contingency (25% @ Design Approval)		$24,424,814	$1,054,992	$25,479,806	
Subtotal (2012 Dollars)		$122,124,069	$5,274,961	$127,399,030	
Field Change Order ($900,000+0.02*(SUBTOTAL-25,000,000)) ROUNDED UP TO NEAREST $10,000		$2,850,000	$90,000	$2,950,000	
Subtotal (2012 Dollars)		$124,974,069	$5,364,961	$130,349,030	
Mobilization (4%)		$4,998,963	$214,598	$5,213,961	
Subtotal (2012 Dollars)		$129,973,032	$5,579,559	$135,562,991	
Expected Award Amount (Inflated @ 3%/yr to midpoint of construction) (2018 Dollars)		$153,368,178	$6,583,880	$159,964,330	
Construction Inspection		$4,431,859		$4,431,859	2.5 years of construction
ROW Costs (2012 Dollars)		$50,000		$50,000	
Preliminary and Final Design Costs (4% of 2012 Dollars)		$5,198,921	$223,182	$5,422,104	
Total Project Costs		**$163,048,958**		**$169,868,292**	

Cost of Alternative C1 was assumed to be similar in cost to Alternative C since the only change is removing landscaping and standard intersections and installing roundabouts at East Ferry Street and East Utica Street.

3.2.4 Alternative D – Full Reconstruction of Expressway within a Tunnel Structure

Alternative D - Full Reconstruction of Expressway within a Tunnel Structure					
Activities		NYSDOT Share	Betterment Share	Total Cost	Comments
Construction Costs	**Bridges**				
	Dodge Street Northampton Street East Utica Street East Ferry Street	$295,550,761		$295,550,761	Tunnel
	Humboldt Parkway				
	Pavement, Curb and Underdrain Route 33 Side	$4,159,634		$4,691,303	Complete Humboldt roadway section(curb and underdrain on the residential side is includded in a betterment)
	Curb and Underdrain Residential Side		$531,669		
	Sidewalk	$741,228	$329,760	$1,070,987	NYSDOT Share is the sidewalk over the tunnel, Betterment is the residential sidewalk
	Drainage	$1,145,838		$1,145,838	New Humbolt Draiange System
	Driveways		$85,568	$85,568	
	Lighting	$240,646	$1,057,542	$1,298,188	Humboldt and new roadway lighting
	Signs	$115,665		$115,665	
	Trees	$246,856	$85,478	$332,334	
	Landscaping	$692,108	$220,739	$912,847	
	Traffic Signals		$1,480,000	$1,480,000	
	Utilities	$83,193		$83,193	Miscellaneous Humboldt utilities
	Restore ITS System	$300,000		$300,000	
	Environmental, Erosion and Sediment Control	$332,771		$332,771	Will require SPEDES mitigation
	Incidentals	$953,794		$953,794	Field Office, Pavement Stripes, Price Adjustments,and Unknowns etc
	Route 33				
	Pavement Costs	$27,917,540		$27,917,540	Pavement structure, including excavation not included in the structure excavation
	Ramps	$13,944,662		$13,944,662	Pavement structure and Retaining walls
	Drainage	$200,000		$200,000	Pump Station Modifications, lowered Drainage system
	Lighting	$4,200,000		$4,200,000	Tunnel lighting
	Chain-link Fencing	$12,870		$12,870	Over tunnel entrance/exit and ramp entrances/exits
	Overhead Signs	$600,000		$600,000	Replacement of existing overhead sign structures as tunnel mounted structures
	Utilities on Existing Bridges	$169,880		$169,880	Relocating Existing hanging bridge utilities
	Environmental, Erosion and Sediment Control	$418,622		$418,622	Will require SPEDES mitigation
Subtotal (2012 Dollars)		$352,026,068	$3,790,756	$355,816,823	
Work Zone Traffic Control		$4,000,000	$1,000,000	$5,000,000	
Subtotal (2012 Dollars)		$356,026,068	$4,790,756	$360,816,823	
Survey (3%)		$10,680,782	$143,723	$10,824,505	
Subtotal (2012 Dollars)		$366,706,850	$4,934,478	$371,641,328	
Contingency (25%)		$91,676,712	$1,233,620	$92,910,332	
Subtotal (2012 Dollars)		$458,383,562	$6,168,098	$464,551,660	
Field Change Order = $3,500,000		$3,500,000		$3,500,000	
Subtotal (2012 Dollars)		$461,883,562	$6,168,098	$468,051,660	
Mobilization (4%)		$18,475,342	$246,724	$18,722,066	
Subtotal (2012 Dollars)		$480,358,904	$6,414,822	$486,773,726	
Expected Award Amount (Inflated @ 3%/yr to midpoint of construction) (2018 Dollars)		$566,823,507	$7,569,490	$574,392,997	
Construction Inspection		$6,658,959		$6,658,959	3 years of construction
ROW Costs (2012 Dollars)		$100,000		$100,000	
Preliminary and Final Design Costs (4% of 2012 Dollars)		$19,214,356	$256,593	$19,470,949	
Total Project Costs		**$592,796,822**		**$600,622,905**	

Assumptions were made for this Alternative since drawings are not complete. Rock excavation was assumed to cost 70% more than standard excavation.

.2.5 Alternative E – Replacement of Expressway with a Multiway Boulevard

Alternative E - Replacement of Expressway with a Multiway Boulevard					
Activities		NYSDOT Share	Betterment Share	Total Cost	Comments
Construction Costs	**Bridges**				
	Dodge Street	$0.00			At grade Parkway
	Northampton Street	$0.00			
	East Utica Street	$0.00			
	East Ferry Street	$0.00			
	Humboldt Parkway				
	Pavement, Curb and Underdrain Route 33 side	$3,007,168.21		$3,007,168.21	
	Curb and Underdrain Resisdential Side		$742,360.22	$742,360.22	
	Sidewalk		$287,725.73	$287,725.73	
	Drainage	$1,145,837.70		$1,145,837.70	
	Driveways		$85,568.39	$85,568.39	
	Lighting		$717,774.00	$717,774.00	
	Signs	$115,665.00		$115,665.00	
	Trees	$128,217.00	$85,478.00	$213,695.00	
	Landscaping	$272,550.00	$181,700.00	$454,250.00	
	Traffic Signals	$1,720,000.00		$1,720,000.00	
	Humboldt Utilities	$60,143.36		$60,143.36	
	Restore ITS System	$300,000.00		$300,000.00	
	Environmental, Erosion and Sediment Control	$120,286.73		$120,286.73	
	Incidentals	$686,986.80		$686,986.80	Field Office, Pavement Stripes, Price Adjustments,and Unknowns etc
	Route 33				
	Pavement Costs	$5,066,818.22		$5,066,818.22	
	Ramps	$159,662.17		$159,662.17	
	Removal and fill	$6,255,955.00		$6,255,955.00	Remove Existing Structures, top 7' of Retaining wall, Crack and Seat Existing Pavament, and fill up to subgrade of new Road
	Drainage	$5,874,673.57		$5,874,673.57	
	Trees	$43,821.00		$43,821.00	
	Lighting	$376,567.00		$376,567.00	New Parkway Lighting
	Additional Signs	$44,660.00		$44,660.00	New Route 33 Signing
	Overhead Signs	$605,000.00		$605,000.00	Replacement of existing overhead sign structures
	Landscaping	$241,491.94		$241,491.94	
	Environmental, Erosion and Sediment Control	$329,345.94		$329,345.94	Will require SPEDES mitigation
Subtotal (2012 Dollars)		$26,554,849.62	$2,100,606.34	$28,655,455.96	
Work Zone Traffic Control		$4,000,000.00	$1,000,000.00	$5,000,000.00	
Subtotal (2012 Dollars)		$30,554,849.62	$3,100,606.34	$33,655,455.96	
Survey (3%)		$916,645.49	$93,018.19	$1,009,663.68	
Subtotal (2012 Dollars)		$31,471,495.11	$3,193,624.53	$34,665,119.64	
Contingency (25%)		$7,867,873.78	$798,406.13	$8,666,279.91	
Subtotal (2012 Dollars)		$39,339,368.89	$3,992,030.66	$43,331,399.55	
Field Change Order ($900,000+0.02*(SUBTOTAL-25,000,000)), ROUNDED UP TO NEAREST $10,000		$1,190,000.00	$60,000.00	$1,270,000.00	
Subtotal (2012 Dollars)		$40,529,368.89	$4,052,030.66	$44,581,399.55	
Mobilization (4%)		$1,621,174.76	$162,081.23	$1,783,255.98	
Subtotal (2012 Dollars)		$42,150,543.65	$4,214,111.89	$46,364,655.53	
Expected Award Amount (Inflated @ 3%/yr to midpoint of construction) (2018 Dollars)		$49,737,642	$4,972,652	$54,710,294	
Construction Inspection		$4,683,773.25		$4,683,773.25	2.5 years of construction
ROW Costs (2012 Dollars)		$50,000.00		$50,000.00	
Preliminary and Final Design Costs (7% of 2012 Dollars)		$2,950,538	$294,988	$3,245,526	
Total Project Costs		**$57,421,952.81**		**$62,689,592.67**	

Cost of Alternative E1 was assumed to be similar in cost to Alternative E since the changes are minor.