

## **KINGSLAND AVENUE BRIDGE CONCEPTUAL ALTERNATIVES – 10/29/19**

The Alternatives Analysis process examines the ability of each alternative to meet the Purpose and Need of the proposed project; while still taking practicable measures to avoid, minimize, and mitigate potential impacts to the built and natural environment. This process involves the development and evaluation of specific impact criteria that is essential to the decision-making process and the selection of a Preliminary Preferred Alternative. Descriptions of these alternatives, as well as a No-Build, are provided below.

### **NO BUILD**

The No Build Alternative serves as the benchmark to measure the costs and benefits of each build alternative evaluated. This alternative assumes that no improvements would be made to upgrade the existing structure; however, maintenance and minor rehabilitation of the existing bridge would be completed to preserve the structural integrity and extend its useful life. Work to be performed includes supplementing deteriorated structural steel deck beams in the fascia beams of the approach spans; repairing deteriorated stringer bearings in the approach spans; repairing localized web holes in bottom chord steel truss members; and completing minor repairs to the mechanical and electrical systems.

This Alternative does not address the overall poor condition and structural deficiencies of the existing bridge. The bridge is over 100 years old and is in an advanced state of structural deterioration, with a Sufficiency Rating of 23.35 out of 100. The bridge has been classified as structurally deficient due to the overall poor condition of the superstructure. The bridge also has antiquated mechanical and electrical systems that which are in overall fair to poor condition and in need of major rehabilitation or replacement. The bridge has required frequent repairs for many years to keep the structure in service.

The structure is now conditionally past the point where cost effective repairs can be undertaken without taking the structure out of service or weight restricting the bridge due to a decrease in capacity. Load posting of the bridge will result in a permanent detour for trucks, emergency vehicles and school buses.

The bridge has required frequent repairs resulting delays to traffic. Without major mechanical and electrical repairs, the bridge will soon no longer be operational for marine traffic. As the result, the bridge will be closed to vehicular traffic and left permanently open for the passage of marine traffic until the major repairs are completed or the bridge demolished, as Federal law gives marine traffic right of way over vehicular traffic.

The No Build option does not correct any of the controlling substandard design elements; or address the high rate of vehicular crashes and traffic signals operating with peak hour congestion at the bridge approach intersections. Bicycle compatibility and connectivity to adjacent roadways cannot be provided as the truss system does not allow for the structure to be widened in rehabilitation, so the existing curb to curb width of approximately 27 feet would remain with two-13.5 foot wide lanes of travel.

Since there are no changes to the project site under this alternative, there are very few impacts, other than the minor impacts when the bridge is eventually demolished and removed.

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### **MAJOR REHABILITATION**

Upon review of the 16<sup>th</sup> Cycle Bridge Re-evaluation Survey Report, the existing bridge is structurally deficient due to the poor condition of the superstructure. There is severe localized advanced material loss to steel truss members below the deck level, and also to gusset plates, floor beams and stringers in all four spans. Previously observed fatigue cracks in the swing span floor beams have been arrested with drilled holes and holes filled with bolts. The bottom chord of the trusses are fracture critical members. The deck is in fair condition due to locations of deteriorated transverse deck beams. The substructure is in satisfactory condition with locations of fractured and/or cracked stones in the masonry abutments. The mechanical span drive machinery is in fair to poor condition while the condition of the electrical system and traffic safety operating equipment are in poor operating condition with many obsolete parts.

Based the condition of the superstructure, extensive repairs are needed to the over 110-year bridge to address the structurally deficiencies and to extend the service life of the bridge for at least 75 years. Rehabilitation work for the trusses includes replacement and/or strengthening of steel members by post tensioning methods and sand blasting and painting overhead and under-deck members. Several floor beams need to be replaced and repairs to gusset plates, bearing stiffeners, and lower truss chords are needed. Steel stringers and the swing span steel grid deck should also be replaced given the extent of the superstructure rehabilitation work. Deck replacement will include new deck joints and new parapets and bridge railings meeting current standards.

The bridge fender system is in very poor condition and requires complete replacement. To bring the bridge to current AASHTO and NJDOT design standards including seismic code and scour protection, seismic retrofit of the center pivot pier is required and requires the installation of new foundation members, most likely drilled shafts, around the perimeter of the existing pier and structurally tying to the existing pier. Scour countermeasures are needed for the abutments and piers.

Based on the 16<sup>th</sup> Cycle Type I Electrical Inspection Report, complete replacement of the bridge electrical system is required to extend the service life of the bridge operation for at least 75 years. The electrical system replacement includes a new control system (comprised of programmable logic controller (PLC) and control desk), a new motor control center (MCC) and power distribution equipment, new vector duty span motors with variable frequency drives, new span locks and jacks, all new instrumentation and limit switches, new conduit/wire, new submarine cables and terminal cabinets, new navigational lighting, a new traffic safety system (traffic signals, gongs, warning/pedestrian and barrier gates), and a new standby generator and transfer switch. The electrical room located on the span above the roadway level will be expanded to provide enough space to house all the necessary electrical equipment with code compliant working clearances. The existing traffic control devices will be replaced with provisions for single operator control of the gates from the span control room. New power distribution equipment will also be provided, including a new stand by generator, a new submarine cables provided for power a control. New lighting facilities will also be provided.

Based on the 16<sup>th</sup> Cycle Type I Mechanical Inspection Report, major rehabilitation of the bridge mechanical system is required to extend the service life of the bridge operation for at least 75 years. The mechanical work includes re-furbishing rim bearing assemblies, complete replacement of the end lifts and span lock

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machinery, and replacement of the primary gearbox, motors, and brakes. The rim bearing retrofit requires the bridge to be jacked and the roller bearings replaced systematically.

Staged construction for a major rehabilitation of the bridge is not possible due to the existing bridge type (through truss swing movable span) resulting in the need for a temporary bridge on an alignment upstream or downstream of the existing bridge to maintain traffic during construction or the implementation of a detour.

The Major Rehabilitation alternative does not correct any of the controlling substandard design elements; or address the high rate of vehicular crashes and traffic signals operating with peak hour congestion at the bridge approach intersections. Bicycle compatibility and connectivity to adjacent roadways cannot be provided as the truss system does not allow for the structure to be widened in rehabilitation, so the existing curb to curb width of approximately 27 feet would remain with two-13.5 foot wide lanes of travel.

### **MODIFIED REHABILITATION**

The Kingsland Avenue Bridge has not been formally evaluated for National Register eligibility. As part of the cultural resources survey work, the eligibility of the bridge is being assessed. It is anticipated that the New Jersey Historic Preservation Office (NJHPO) will determine the bridge eligible for National Register listing under Criterion C as an excellent example of a rim-bearing Warren through truss swing span bridge.

Portions of the existing superstructure, substructure and machinery are anticipated to be found in contributing to the bridge's significance including the Warren thru truss swing span, the Warren pony truss fixed approach spans, the abutments, and the center and quarter piers. In keeping with the ***Secretary of the Interior's Standards for the Treatment of Historic Properties-Rehabilitation***, a Modified Rehabilitation Alternative will be considered which would protect and preserve the historic fabric of the bridge to the greatest extent possible in retaining and repairing contributing and non-contributing elements; or replacing elements in kind with compatible materials, if feasible.

Consultation with the NJHPO is ongoing to determine whether the Modified Rehabilitation Alternative can meet the Secretary of the Interior's Standards.

### **BRIDGE REPLACEMENT CONCEPTS**

For the development of all conceptual bridge replacement alternatives, the following information was used:

- Based on the Navigation Impact Report completed for the Kingsland Avenue, Clay Street and Bridge Street Bridges over the Passaic River in October 2016, the following vertical clearances were developed for the low-level fixed bridge alternatives:
  - 12 foot vertical clearance over mean high water (highest clearance that can be achieved without impacts to the adjacent Park Avenue and Route 21 Northbound Ramps signalized intersection as well as the Kingsland Avenue and Riverside Avenue signalized intersection)
  - 16 foot vertical clearance over mean high water (can accommodate the Passaic Valley Sewerage Commission skimmer vessels but not Newark City Fire Boats)

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- 18 foot vertical clearance over mean high water (can accommodate the Passaic Valley Sewerage Commission skimmer vessels and the Newark City Fire Boats)
- The High-level fixed bridge alternatives that was developed include the following:
  - 30 foot vertical clearance over mean high water (the vertical clearance of the upstream Route 3 Bridge over the Passaic River)
- The existing bridge has a 7 foot vertical clearance above mean high water in the closed position.
- Additional eastbound and westbound lanes for the new bridge are justified by the traffic analyses completed for the Design Year 2045 AM and PM Peak Hours.

### **Concept 1 - Existing Alignment, Fixed Bridge with 10 feet Vertical Clearance over MHW, 4-Lane Section under Route 21**

Concept 1 includes replacement of the existing structure with a wider, fixed bridge which can accommodate 4 lanes of traffic, essentially on the same alignment as the existing roadway. The proposed structure is a low level fixed span bridge with a 10 foot vertical clearance over MHW for a single 65 foot wide waterway channel, or an 8 foot vertical clearance over MHW for two 65 foot wide waterway channels and results in minimal impacts at both roadway approaches. The structure has a total width of approximately 67 feet, and carries four lanes of travel which includes 11 foot wide inside lanes and 15 foot wide outside lanes for both eastbound and westbound traffic, as well as 6 foot wide sidewalk on both sides. The outside lane is designed to accommodate shared use by bicyclists and motor vehicles.

At the westerly approach of the bridge, the existing Park Avenue 4-lane roadway section under the Route 21 Bridge will be maintained. The existing eastbound dedicated left-turn lane at the Route 21 ramps intersection will be converted to a shared thru/left turn lane allowing two lanes of travel through the intersection. The westbound lane configuration at the River Road intersection will remain as a dedicated left turn lane and a shared thru/right turn lane. The lane configuration for all approaches at the Park Avenue and River Road intersection will remain unchanged.

At the Kingsland Avenue and Riverside Avenue intersection, the lane configuration for all approaches will also remain unchanged.

The existing walkway and parking lot for the southern property on Kingsland Avenue in the Township of Lyndhurst would be impacted by this concept. The northern driveway would be modified to accommodate the additional westbound lane along Kingsland Avenue.

### **Concept 2A - Existing Alignment, Fixed Bridge with 10 feet Vertical Clearance over MHW, 5-Lane Section under Route 21**

Concept 2A includes replacement of the existing structure with a wider, fixed bridge which can accommodate 4 lanes of traffic, essentially on the same alignment as the existing roadway. The proposed structure is a low level fixed span bridge with a 10-foot vertical clearance over MHW for a single 65 foot wide waterway channel, or an 8 foot vertical clearance over MHW for two 65 foot wide waterway channels and minimal impacts at both roadway approaches. The structure has a total width of

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approximately 67 feet, and carries four lanes of travel which includes 11 foot wide inside lanes and 15 foot wide outside lanes for both eastbound and westbound traffic, as well as 6 foot wide sidewalk on both sides. The outside lane is designed to accommodate shared use by bicyclists and motor vehicles.

At the westerly approach of the bridge, Park Avenue would become 5-lane roadway section under the Route 21 Bridge. A second eastbound thru lane will be introduced at the Route 21 ramps intersection for Park Avenue. The existing eastbound dedicated left-turn lane will still be maintained. The westbound lane configuration at the River Road intersection will remain as a dedicated left turn lane and a shared thru/right turn lane. The lane configuration for all approaches at the Park Avenue and River Road intersection will remain unchanged with minor restriping along Park Avenue.

At the Kingsland Avenue and Riverside Avenue intersection, the lane configuration for all approaches will also remain unchanged.

The property impacts along Kingsland Avenue in the Township of Lyndhurst are the same as Concept 1.

### **Concept 2B - Existing Alignment, Fixed Bridge with 18 feet Vertical Clearance over MHW**

Concept 2B includes replacement of the existing structure with a wider, fixed bridge which can accommodate 4 lanes of traffic, essentially on the same alignment as the existing roadway. The proposed structure is a low level fixed span bridge with an 18 foot vertical clearance over MHW for two 65 foot wide waterway channels. This profile increase would generate significant impacts at both roadway approaches along with adjacent properties. To maintain the required vertical clearance between Park Avenue and the Route 21 Bridge, the structure as well as portions of the Route 21 highway and ramps would have to be replaced. The entire Park Avenue and River Road intersection would have to be reconstructed. Impacts to River Road would extend approximately 150 feet beyond the intersection. Reconstruction improvements would also be required at the Kingsland Avenue and Riverside Avenue intersection.

### **Concept 2C - Existing Alignment, Fixed Bridge with 30 feet Vertical Clearance over MHW**

Concept 2C includes replacement of the existing structure with a wider, fixed bridge which can accommodate 4 lanes of traffic, essentially on the same alignment as the existing roadway. The proposed structure is a high-level fixed span bridge with a 30 foot vertical clearance over MHW for two 65-foot wide waterway channels. This significant profile increase would generate extensive impacts at both roadway approaches along with adjacent properties. To maintain the required vertical clearance between Park Avenue and the Route 21 Bridge, the structure as well as portions of the Route 21 highway and ramps would have to be replaced. The entire Park Avenue and River Road intersection would have to be reconstructed. These impacts would extend approximately 300 feet beyond the intersection. Reconstruction improvements would also be required at the Kingsland Avenue and Riverside Avenue intersection and would extend approximately 200 feet beyond the intersection affecting all adjacent properties.

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### **Concept 3A - Existing Alignment, Fixed Bridge with 12 feet Vertical Clearance over MHW, 5-Lane Bridge Section (Additional Eastbound Lane)**

Concept 3A includes replacement of the existing structure with a wider, fixed bridge which can accommodate 5 lanes of traffic, essentially on the same alignment as the existing roadway. The structure has a total width of approximately 78 feet, and carries three eastbound lanes of travel which include two 11 foot wide lanes and one 15 foot wide outside lane with two westbound lanes of travel as well as 6 foot wide sidewalk on both sides. The outside lane is designed to accommodate shared use by bicyclists and motor vehicles.

The Passaic River Waterfront Walkway and the adjacent parking lot for the southern property on Kingsland Avenue would be impacted by this concept. The walkway would have to be realigned impacting the parking lot resulting in the reconfiguring of the layout and parking spaces. The northern driveway would be modified to accommodate the additional westbound lane along Kingsland Avenue.

The proposed intersection configurations at both roadway approaches are the same as Concept 2A.

### **Concept 3B - Existing Alignment, Fixed Bridge with 12 feet Vertical Clearance over MHW, 5-Lane Bridge Section (Additional Westbound Lane)**

Concept 3B includes replacement of the existing structure with a wider, fixed bridge which can accommodate 5 lanes of traffic, essentially on the same alignment as the existing roadway. The structure has a width of approximately 78 feet, and carries three westbound lanes of travel which include two 11 foot wide lanes and one 15 foot wide outside lane with two eastbound lanes of travel as well as 6 foot wide sidewalk on both sides of the bridge. The outside lane is designed to accommodate shared use by bicyclists and motor vehicles.

The Passaic River Waterfront Walkway and the adjacent parking lot for the southern property on Kingsland Avenue would be impacted by this concept. The northern driveway and parking lot would be modified to accommodate the additional two westbound lanes along Kingsland Avenue.

The proposed intersection configurations at both roadway approaches are the same as Concept 2A.

### **Concept 3C - Existing Alignment, Fixed Bridge with 12 feet Vertical Clearance over MHW, 5-Lane Bridge Section (Additional Westbound Lane), Park Ave Eastbound Left Turn Lane and 2 Westbound Lanes at River Road**

Concept 3C includes replacement of the existing structure with a wider, fixed bridge which can accommodate 5 lanes of traffic, with three westbound lanes of travel, same as Concept 3B including the intersection improvements at Kingsland Avenue and Riverside Avenue as well as Route 21 ramps and Park Avenue.

The Passaic River Waterfront Walkway and the adjacent parking lot for the southern property on Kingsland Avenue would be impacted by this concept. The northern driveway and parking lot would be modified to accommodate the additional two westbound lanes along Kingsland Avenue.

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At the Park Avenue and River Road intersection, a dedicated left-turn left turn will be introduced at the westerly approach of Park Avenue along with two thru lanes for eastbound traffic. For the easterly approach, a shared thru/left turn lane will be introduced along with a shared thru/right turn lane. The additional eastbound and westbound lanes would increase the overall roadway footprint for the westerly approach of Park Avenue thus impacting the Bank property to the north. The lane configuration for the River Road approaches will remain unchanged.

### **Concept 3D - Existing Alignment, Fixed Bridge with 12 feet Vertical Clearance over MHW, 5-Lane Bridge Section (Additional Westbound Lane), Park Ave Eastbound Left Turn Lane and 1 Westbound Lane at River Road**

Concept 3D includes replacement of the existing structure with a wider, fixed bridge which can accommodate 5 lanes of traffic, with three westbound lanes of travel, same as Concept 3B including the intersection improvements at Kingsland Avenue and Riverside Avenue as well as Route 21 ramps and Park Avenue.

The Passaic River Waterfront Walkway and the adjacent parking lot for the southern property on Kingsland Avenue would be impacted by this concept. The northern driveway and parking lot would be modified to accommodate the additional two westbound lanes along Kingsland Avenue.

At the Park Avenue and River Road intersection, a dedicated left-turn left turn will be introduced at the westerly approach of Park Avenue along with two thru lanes for eastbound traffic. For the easterly approach, the lane configuration will remain unchanged with a dedicated left-turn lane and a shared thru/right turn lane. The additional eastbound lane would increase the overall roadway footprint for the westerly approach of Park Avenue thus impacting the Bank property to the north. The lane configuration for the River Road approaches will remain unchanged.

### **Concept 4A - Existing Alignment, Movable Bridge with one 65 feet Waterway Channel**

Concept 4A includes replacement of the existing structure with a wider, moveable bridge which can accommodate 4 or 5 lanes of traffic, essentially on the same alignment as the existing roadway. The movable bridge would be a single leaf bascule or vertical lift bridge that maintains a single 65 foot wide waterway channel under the bridge, and minimal impacts at both roadway approaches.

The intersection configurations at both roadway approaches are the same as Concept 1 and 2A.

### **Concept 4B - Existing Alignment, Movable Bridge with 100 feet Waterway Channel**

Concept 4B includes replacement of the existing structure with a wider, moveable bridge which can accommodate 4 or 5 lanes of traffic, essentially on the same alignment as the existing roadway. The movable bridge would be a single leaf bascule or vertical lift bridge that maintains a single 100 foot wide waterway channel under the bridge, and minimal impacts at both roadway approaches.

The intersection configurations at both roadway approaches are the same as Concept 1 and 2A.

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### **Concept 4C - Existing Alignment, Movable Bridge with two 65 feet Waterway Channels**

Concept 4B includes replacement of the existing structure with a wider, moveable bridge which can accommodate 4 or 5 lanes of traffic, essentially on the same alignment as the existing roadway. The movable bridge would be a swing bridge that preserves two 65 foot wide waterway channels, similar to existing conditions, and minimal impacts at both roadway approaches.

The intersection configurations at both roadway approaches are the same as Concept 1 and 2A.

### **Concept 5 – New Location, Southern Alignment, Fixed Bridge with 9 feet Vertical Clearance over MHW**

Concept 5 includes replacement of the existing structure with a wider, fixed bridge which can accommodate 4 lanes of traffic, along an alignment south of the existing bridge. This concept may allow the existing bridge to remain in service to vehicular traffic during a portion of the total construction duration as one half of the proposed bridge on the new alignment is constructed. However, the existing bridge would be un-operative for marine traffic during most of the construction period which requires approval from the US Coast Guard. The existing alignment is maintained under the Route 21 Bridge but shifts south about 35 feet from the center of the existing bridge. The proposed alignment ties into existing before the Kingsland Avenue and Riverside Avenue intersection. The property and parking lot to the south in the Township of Lyndhurst would be impacted by this shift. The proposed structure is a low level fixed span bridge with a 9 foot vertical clearance over MHW for a single 65 foot wide waterway channel, or a 7 foot vertical clearance over MHW for two 65 foot wide waterway channels.

### **Concept 6 – New Location, Northern Alignment, Fixed Bridge with 9 feet Clearance over MHW, Existing Bridge Maintained**

Concept 6 includes replacement of the existing structure with a wider, fixed bridge which can accommodate 4 lanes of traffic, along an alignment north of the existing bridge. This concept allows for the existing swing bridge to continue to operate and maintain vehicular traffic while the proposed bridge is constructed. The existing alignment for Park Avenue west of the River Road is held. As a result, the Park Avenue and River Road intersection is relocated approximately 30 feet to the north. The existing Route 21 Bridge, as well as portions of the Route 21 highway and ramps would have to be replaced. The proposed alignment ties into existing at the Kingsland Avenue and Riverside Avenue intersection. Properties north of Kingsland Avenue would be significantly impacted by this shift. The proposed structure is a low level fixed span bridge with a 9 foot vertical clearance over MHW for a 65 foot wide waterway channel, or a 7 foot vertical clearance over MHW for two 65 foot wide waterway channels.