DETROIT RIVER INTERNATIONAL CROSSING

Engineering Report

VOLUME 4: INTERCHANGE STRUCTURE STUDY

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Under agreement with: CORRADINO
The lateral earth pressure on the high wall abutment allowing the lateral earth pressure to be resisted by the pile batter and not depend on the stiffness of the soil below the footing.

Additional soil borings and the geotechnical report will confirm the backfill and foundation assumptions used to compute the preliminary cost of the structure.

The high wall abutments will be supported on piles. The front row of piles will be battered to resist the lateral loads. The proposed pier is located in the I-75 median at the existing Pier 2 location. The existing piles may be reused and supplemented with additional battered piles, driven between existing piles to resist lateral loads. The use of semi-integral or independent back wall with sliding approach slabs abutments can be investigated during preliminary design to eliminate expansion joints on the bridge.

The existing structure carries 4 lanes of traffic accommodating bi-directional movement along Springwells Avenue over I-75 (12’ inner lanes and 17’-0” outer lanes). A single 17’-9” Service Drive U-tum lane, on the east side of the bridge, accommodates movements from the northbound and southbound service drives. This lane is separated from the Springwells Avenue traffic by a 10’ wide median. A 10’ wide sidewalk exists on the west side of the bridge. A 1’-9” brush block with a concrete parapet and bridge railing is present along the east edge of the bridge and a 1’-0” concrete parapet with a bridge railing and pedestrian fencing is present along the west edge of the bridge. The out-to-out deck width of the existing structure is 96’-0 ½”.

The new alignment of Springwells Avenue crosses I-75 at approximately a 0° skew. The proposed bridge will also carry 4 lanes of Springswells Avenue (12’ inner lanes and 14’-0” outer lanes). A 20’ Service Drive U-tum lane is proposed along the east side of the bridge. It is separated from through traffic by a 10’ median. The median also functions as a sidewalk to handle pedestrian traffic. A 17’ sidewalk is proposed on the west side of the bridge. A 1’-6” concrete parapet, with a bridge railing and pedestrian fencing is proposed along both the west and east sides of the bridge. The out-to-out deck width of the proposed structure is 95’-3”.

The structure depth has increased slightly due to longer span lengths from the elimination of the piers.

The proposed profile currently shown on the General Plan of Site accommodates the expected Springwells Avenue profile grade. A 2.0% deck cross slope is recommended.

The existing structure currently has a minimum vertical under clearance of 15’-6” based on the vertical under clearance posted on the bridge. I-75 at the project location is considered a special route. In this case, a 14’-5” minimum under clearance is required for the proposed bridge. Currently, the I-75 roadway is posted for 55 MPH. However, based on the current vertical geometry, the roadway is designed for 50 MPH. MDOT has requested that the preferred alignment for the Detroit River International Crossing (DRIC) accommodate a 60 MPH design speed on I-75, so that I-75 can be upgraded with future improvements to a 60 MPH design speed. Therefore, the vertical profile was set at 15’-3” to account for these future modifications to the I-75 vertical geometry. The following characteristics of the proposed road and bridge design affect the underclearance:

1. Springwells Avenue is being realigned.
2. The existing grade on Springwells Avenue is 5.0%. The grade will be improved to 3%.
3. The existing bridge is skewed compounding the problem of improving the grade since the existing total length of the existing bridge is longer than the proposed.
4. The structure depth has increased slightly due to longer span lengths from the elimination of the piers.
5. Accommodation of future I-75 improvements to upgrade the vertical design speed from 50 MPH to 60 MPH.

The proposed profile currently shown on the General Plan of Site accommodates the expected Springwells Avenue profile grade. A 2.0% deck cross slope is recommended.

**Maintaining Traffic**

Springwells Avenue traffic, one lane in each direction, will be maintained during reconstruction of the proposed Springwells Avenue Bridge over I-75. Earth retention will be required to stage the removal of existing abutments and construct the new abutments while maintaining traffic. Due to the abutment height, the earth retention will need to be braced or tie-back with earth anchors. As mentioned earlier, lightweight cellular concrete will be required as backfill behind the abutment. In addition to reducing lateral loads, the cellular concrete will provide a stable base for traffic during staged construction.

Traffic control along I-75 for the structure replacement will require shoulder and temporary single lane closures to remove the existing piers and construct the new pier. Temporary freeway closures will be necessary during removal and erection of the beams.
Structure Options

Three superstructure alternatives were investigated in this study:

- 39" Spread PPC Box Beam
- 39" Side-by-Side PPC Box Beam
- 34" Web Steel Plate Girder

Two-span arrangements with full-height abutments were considered for the three alternatives listed above. See Appendix A for the span arrangement and cross sections of the alternatives listed above.

Preliminary beam design was completed for each superstructure type utilizing AASHTO LRFD, 2007 Edition as directed by MDOT. The MDOT HL-93 Modified loading was used for the design loading for each alternative.

A single span option was not investigated based on the significant increase in construction depth required and the limited increase available due to the vertical geometric constraints of the nearby service drives.

The 39" Spread PPC Box Beam Alternative will result in a slightly deeper construction depth than the 39" Side-by-Side PPC Box Beam or the 34" Web Steel Plate Girder Alternatives. However, the greater construction depth will have a negligible impact to the Springwells Avenue profile and will not impact the adjacent service drive intersections with Springwells Avenue.

Cost

The cost for the 39" Spread PPC Box Beam Alternative is less than the cost for the 39" Side-by-Side PPC Box Beam or the 34" Web Steel Plate Girder Alternatives.

Cost estimates for each alternative are included in Appendix B.

The cost estimates assume full-height cantilever abutments supported on piles. The median pier is a multi-column concrete pier supported on piles. Geotechnical investigation will need to confirm these recommendations.

The following is a cost comparison between the different alternatives:

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Superstructure Depth</th>
<th>Total Cost</th>
<th>Cost/SF Deck</th>
</tr>
</thead>
<tbody>
<tr>
<td>39&quot; Spread PPC Box Beam</td>
<td>52&quot;</td>
<td>$4,447,800</td>
<td>$240</td>
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<tr>
<td>39&quot; Side-by-Side PPC Box Beam</td>
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<td>$279</td>
</tr>
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<td>34&quot; Web Steel Plate Girder</td>
<td>44&quot;</td>
<td>$5,466,670</td>
<td>$308</td>
</tr>
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The costs shown are for the bridge only and do not include approach cost associated with raising the Springwells Avenue profile. The Total Cost includes the removal of the existing structure. The Cost/SF does not include removal of the existing structure. Also, a 15% design contingency has been added to costs above.

Utilities

Several utilities are attached to the Springwells Street structure. PLD conduits are located in the west sidewalk and the median of the existing structure. These conduits feed the street lighting masts located on sidewalk and median. A 12" gas main is located below the deck under the west sidewalk. 12-4" diameter Detroit Edison ducts are supported by diaphragms under the northbound lanes. 6-4" diameter PLD ducts are supported on diaphragms under the median. These 6 ducts are enased with concrete and carry live electric service with voltage between 110 and 220 volts.

Relocation of the gas main will be required prior to construction. If the relocation of this gas main is restricted based on seasonal usage this information will be provided to the contractor in the specifications for coordination during construction. The spread box beam alternative can accommodate the relocation of all the existing utilities by supporting the utilities from the underside of the deck between the beams. The Detroit Edison Conduits and PLD ducts can be embedded in the sidewalk or median. The gas main would need to be relocated off the structure if the side-by-side box beam alternative was used.

Bridge lighting conduits can be placed in the concrete parapet or the raised median, depending on the location of the street lighting. The location of the lighting will be investigated during preliminary design.

Drainage

It is assumed that drainage will be collected off the bridge on the roadway and scuppers will not be required on the bridge based on the following:

1. The tributary width of bridge deck is relatively small.
2. The longitudinal grades are relatively steep.
3. Scuppers are not present on the existing bridge, which has a longer total span length and a wider pavement than the proposed bridge.

Aesthetics

Aesthetic treatments, including concrete texturing of the concrete parapet and concrete surface coating, are anticipated for the proposed structure. The aesthetic treatment can be accommodated by both alternatives and will have approximately the same cost. The limits of the texturing are unknown at this time. However, an aesthetic cost equaling 1% of the bridge cost was included in the Preliminary Cost Estimate for all bridges. Any specific aesthetic requirements are to be determined by MDOT through the Context Sensitive Solutions (CSS) process with the public and in consultation with the City of Detroit and will be incorporated into the Final Design plans.

Recommendations

Based on estimated costs the 39" Spread PPC Box Beam Alternative is the recommended alternative for the Springwells Avenue Bridge over I-75. Also, the recommended alternative will accommodate the existing 12" diameter gas main attached to the existing Springwells Avenue Bridge.
The purpose of this study is to investigate different structure types for the replacement of the Green Avenue Bridge over I-75. The preferred alignment of the Detroit River International Crossing (DRIC) Project requires reconfiguration of the existing I-75 interchange at Livernois/Dragoon. The Northbound and Southbound I-75 exit ramps are to be relocated and will be located under Green Avenue, which will conflict with the existing piers.

The existing structure carries 2 through lanes in each direction (44’ face-to-face curb), two 10’ sidewalks, and a 1’-0” concrete barrier with a bridge railing and pedestrian fencing along each side of the bridge. The out-to-out width of the existing bridge is 66’-5”. Intersections with the Northbound and Southbound Service Drives are present south and north of the bridge. The existing superstructure consists of spans consisting of 36’ Wide Flange rolled steel beam section with an 8” composite reinforced concrete deck. The spars are 68’-10”, 74’-11”, 74’-11” and 68’-10” for a total length of 287’-6”. Top and bottom flange cover plates are located over the center pier. Pin and link hangers support the end spars at the exterior piers. The substructure consists of cap and column piers and stub abutments. Lightweight backfill was used behind the existing abutments because of poor soil conditions. All substructure units are supported on 60-ton cylindrical piles. The pier piers are driven vertically. The front row of abutment piers are driven at a 1H:3V batter. There are existing reinforced concrete struts, under I-75 roadway, between the existing piers to resist lateral loads.

The alignment of Green Avenue will not change. The proposed bridge will carry two through lanes in each direction (52’ clear roadway width). A 207 Service Drive U-turn lane is proposed along the east side of the bridge to accommodate the Northbound and Southbound Service Drive traffic movements. The U-turn lane is separated from the through lanes with a 10’ wide raised median. The raised median will function as a sidewalk to handle the pedestrian traffic. A 10’ sidewalk is proposed on the west side of the bridge. 1-6” concrete parapets with bridge railing and pedestrian fencing is present along the west and east sides of the bridge. The proposed structure has an out-to-out deck width of 95’-3”. The proposed bridge will be a 287’-6” long structure with High wall abutments. The span arrangement will accommodate tapers and standard shoulders for the new plaza ramps. See the General Plan of Site Plan and Cross Sections, in Appendix A for details and geometry. The structure design is to be completed based on current AASHTO LRFD specifications. The design live load is the AASHTO HL-93 Modified used by MDOT.

Replacement of the Green Avenue Bridge is to be coordinated with the planned improvements to the I-75 ramp alignments and the service drive work. The structure requires replacement based on the elimination of the exterior columns due to the proposed I-75 ramp modifications.

Green Avenue traffic will be detoured during reconstruction of the proposed Green Avenue Bridge.

Currently, geotechnical information is not available for the bridge. From the soil information shown on the existing bridge record plans there is soft clay for approximately 70 feet below the existing pile caps.

Preliminary soils investigations propose that a lightweight fill, Expanded Polystyrene (EPS) blocks be placed as backfill behind the abutments. The use of EPS blocks will minimize settlement of the bridge approach pavement and reduce the lateral earth pressure on the high wall abutment allowing the lateral earth pressure to be resisted by the pile batter and not depend on the stiffness of the soil below the footing.

Additional soil borings and the geotechnical report will confirm the backfill and foundation assumptions used to compute the preliminary cost of the structure.

The high wall abutment will be supported on piles. The front row of piles will be battered to resist the lateral loads. The proposed pier is located in the I-75 median at the existing Pier 2 location. The existing piers may be reused and supplemented with additional battered piles, driven between existing piles to resist lateral loads. High wall abutments are proposed. The use of semi-integral or independent back wall with sliding approach slabs abutments can be investigated during preliminary design to eliminate expansion joints on the bridge.

Under Clearance and Grade Raise

The existing structure currently has a minimum vertical under clearance of 14'-10” based on the vertical under clearance posted on the bridge. I-75 at the project location is considered a special route. In this case, a 14'-9” minimum under clearance is required for the proposed bridge. Currently, the I-75 roadway is posted for 55 MPH; however, based on the current vertical geometry, the roadway is designed for 50 MPH. MDOT has requested that the preferred alignment for the DRIC accommodate a 60 MPH design speed on I-75, so that I-75 can be upgraded with future improvements to a 60 MPH design speed. Therefore, the vertical profile was set at 15'-3” to account for these future modifications to the I-75 vertical geometry.

The following characteristics of the proposed road and bridge design affect the underclearance:

1. The existing vertical clearance is less than 15'-3”.
2. The proposed structure depth increase due to the increased span length.
3. Accommodation of future I-75 improvements to upgrade the vertical design speed from 50 MPH to 60 MPH.

The proposed profile currently shown on the General Plan of Site accommodates the expected Green Avenue profile grade. A 2.0% deck cross slope is recommended.

Maintaining Traffic

Traffic along Green Avenue traffic will be detoured during the reconstruction of the Green Avenue Bridge.

Traffic control along I-75 for the structure replacement will require shoulder and temporary single lane closures to remove the existing pier and abutments and to construct the new pier and abutments. Temporary freeway closures will be necessary during removal of the existing and erection of the new beams.

Structure Options

Three superstructure alternatives were investigated in this study:

- 42’ Spread PPC Box Beam
- 39’ Side-by-Side PPC Box Beam
- 34’ Web Steel Plate Girder

Two-span arrangements with full-height abutments were considered for the three alternatives listed above. See Appendix A for the span arrangement of the alternatives listed above.
Preliminary beam design was completed for each superstructure type utilizing AASHTO LRFD, 2007 Edition as directed by MDOT. The MDOT HL-93 Modified loading was used for the design loading for each alternative.

A single span option was not investigated based on the significant increase in construction depth required and the limited increase available due to the vertical geometric constraints of the nearby service drives.

The 42" Spread PPC Box Beam Alternative will result in a slightly deeper construction depth than the 39" Side-by-Side PPC Box Beam and 34" Web Steel Plate Girder Alternatives. However, the greater construction depth will have a negligible impact to the Green Avenue profile and will not impact the adjacent service drive intersections with Green Avenue.

Cost

The cost for the 42" Spread PPC Box Beam Alternative is less than the cost for the 39" Side-by-Side PPC Box Beam and 34" Web Steel Plate Girder Alternatives.

Cost estimates for each alternative are included in Appendix B.

The cost estimates assume full-height cantilever abutments supported on piles. The median pier is a multi-column concrete pier supported on piles. Geotechnical investigation will need to confirm these recommendations.

The following is a cost comparison between the different alternatives:

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Superstructure Depth</th>
<th>Total Cost</th>
<th>Cost/SF Deck</th>
</tr>
</thead>
<tbody>
<tr>
<td>42&quot; Spread PPC Box Beam</td>
<td>55&quot;</td>
<td>$4,207,360</td>
<td>$208</td>
</tr>
<tr>
<td>39&quot; Side-by-Side PPC Box Beam</td>
<td>48&quot;</td>
<td>$4,523,630</td>
<td>$226</td>
</tr>
<tr>
<td>34&quot; Web Steel Plate Girder</td>
<td>51&quot;</td>
<td>$5,379,840</td>
<td>$275</td>
</tr>
</tbody>
</table>

The costs shown are for the bridge only and do not include approach cost associated with raising the Green Avenue profile. The Total Cost includes the removal of the existing structure. The Cost/SF does not include removal of the existing structure. Also, a 15% design contingency has been added to costs above.

Utilities

Several utilities are attached to the Green Avenue Bridge. An existing 12" diameter MichCon Gas main is attached to the structural steel under the southbound lanes of the bridge. Twelve 4" diameter and a 120kV Detroit Edison conduit are attached to the underside of the deck under the southbound lanes. Four Public Lighting Department (P.L.D.) conduits are attached to the underside of the deck under the east sidewalk.

Relocation of the gas main will be required prior to construction. If the relocation of this gas main is restricted based on seasonal usage, this information will be provided to the contractor in the specifications for coordination during construction. The spread box alternative can accommodate the relocation of the existing gas main, while the side-by-side box beam alternative cannot accommodate the relocation of the gas main, requiring the gas main to be relocated off the bridge.

The Detroit Edison Conduits can be accommodated by attaching to the underside of the slab for the spread box beam alternative or can be embedded in the sidewalk for the side-by-side box beam alternative.

Bridge lighting conduits can be placed in the concrete parapet or the raised median, depending on the location of the street lighting. The location of the lighting will be investigated during preliminary design.

PLD conduits can be can be accommodated by attaching to the underside of the slab for the spread box beam alternative or can be embedded in the raised median for the side-by-side box beam alternative.

An abandoned 24" diameter sewer exists under the I-75 pavement at Clark Avenue. Piles for the pier and abutment footings should be spaced to miss this sewer.

Drainage

It is assumed that drainage will be collected off the bridge on the roadway and scuppers will not be required on the bridge based on the following:

4. The tributary width of bridge deck is relatively small.
5. The longitudinal grades are relatively steep.
6. Scuppers are not present on the existing bridge, which has a longer total span length than the proposed bridge.

Aesthetics

Aesthetic treatments, including concrete texturing of the concrete parapet and concrete surface coating, are anticipated for the proposed structure. The aesthetic treatment can be accommodated by all four alternatives and will have approximately the same cost. The limits of the texturing are unknown at this time. However, an aesthetic cost equaling 1% of the bridge cost was included in the Preliminary Cost Estimate for all bridges. Any specific aesthetic requirements are to be determined by MDOT through the Context Sensitive Solutions (CSS) process with the public and in consultation with the City of Detroit and will be incorporated into the Final Design plans.

Recommendations

Based on costs the 42" Spread PPC Box Beam Alternative is the recommended alternative for the Green Avenue Bridge over I-75. Also, the recommended alternative will accommodate the existing 12" diameter gas main attached to the existing Green Avenue Bridge.
General

The purpose of this study is to investigate different structure types for the replacement of the Livernois Avenue Bridge over I-75. The Preferred Alignment of the Detroit River International Crossing (DRIC) Project requires reconfiguration of the existing I-75 interchange at Livernois/Dragoon. The Northbound and Southbound I-75 exit ramps are to be relocated and will be located under Livernois, which will conflict with the existing piers.

The existing structure carries 4 (12' wide) lanes of southbound traffic along Livernois Avenue over I-75. A 10'-wide sidewalk with a 1'-0" concrete parapet, a bridge railing and pedestrian fencing is present along both the west and east sides of the bridge. The out-to-out deck width of the existing structure is 70'-5". The bridge crosses I-75 on a skewed alignment (approximately 8.5 degrees). Intersections with the Northbound and Southbound Service Drives are present south and north of the bridge. The superstructure consists of a four span rolled steel beam with a 9" composite reinforced concrete deck. The spans are 37'-8 7/8", 75'-9", 75'-9", 37'-8 7/8". The end spans are W27's and the interior spans are W36 rolled sections. Top and bottom flange cover plates are located over the center pier. Pin and link hangers support the end spans at the exterior pier locations. The substructure consists of cap and column piers and stub abutments. Lightweight backfill was used behind the existing abutments because of poor soil conditions. All substructure units are supported on 60 ton cylindrical piles. The front row of the existing abutment piles have been driven at a 1H:3V batter. All existing pier piles have been driven vertically. There are existing concrete struts, under the I-75 roadway, between the existing piers to resist lateral loads.

The alignment of Livernois Avenue will not change. The proposed bridge will carry one 12' wide lane in each direction with 12' wide median left hand turn lane at each end of the bridge. Service drive U-turn lanes are present along the west and east sides of the bridge to accommodate the Northbound and Southbound Service Drive traffic movements. The U-turn lanes are separated from the through lanes with 10’ wide raised medians. The medians function as sidewalks to handle the pedestrian traffic. The proposed structure has an out-to-out deck width of 103'-5". Livernois Avenue is posted 25 MPH and designed for 30 MPH traffic. Therefore, 2’ wide shy distances are provided between the through lanes and the medians. See the General Plan of Site and Cross Sections for details and geometry located in Appendix A. The structure design is to be completed based on current AASHTO LRFD specifications. The design live load is the AASHTO HL-93 Modified used by MDOT.

Replacement of the Livernois Avenue Bridge is to be coordinated with improvements to the I-75 ramp alignments and the service drive work. The structure requires replacement based on the elimination of the exterior piers due to the proposed I-75 ramp modifications.

Currently, geotechnical information is not available for the bridge. From the soil information shown on the existing bridge record plans there is soft clay for approximately 60 feet below the existing pile caps.

Preliminary soils investigations propose that a lightweight fill (Lightweight Aggregates, Slag, LM) be placed as backfill behind the abutments. The use of the lightweight fill will reduce the lateral earth pressure on the high wall abutment allowing the lateral earth pressure to be resisted by the pile batter and not depend on the stiffness of the soil below the footing.

Additional soil borings and the geotechnical report will confirm the backfill and foundation assumptions used to compute the preliminary cost of the structure.

The proposed structure depth increase due to the increased span length.

Additional soil borings and the geotechnical report will confirm the backfill and foundation assumptions used to compute the preliminary cost of the structure.

The high wall abutment will be supported on piles. The front row of piles will be battered to resist the lateral loads. The proposed pier is located in the I-75 median at the existing Pier 2 location. The existing piles may be reused and supplemented with additional battered piles, driven between existing piles to resist lateral loads. High wall abutments are proposed. The use of semi-integral or independent back wall with sliding approach slabs abutments can be investigated during preliminary design to eliminate expansion joints on the bridge.

Under Clearance and Grade Raise

The existing structure currently has a minimum vertical under clearance of 15'-4" based on the existing record plans and the clearance posted on the bridge. I-75 at the project location is considered a special route. In this case, a 14'-9" minimum under clearance is required for the proposed bridge. Currently, the I-75 roadway is posted for 55 MPH; however, based on the current vertical geometry, the roadway is designed for 50 MPH. MDOT has requested that the preferred alignment for the DRIC accommodate a 60 MPH design speed on I-75, so that I-75 can be upgraded with future improvements to a 60 MPH design speed. Therefore, the vertical profile was set at 15'-3" to account for these future modifications to the I-75 vertical geometry. The following characteristics of the proposed road and bridge design affect the under clearance:

1. The proposed deck is being widened to accommodate two additional 20-foot U-turn lanes.
2. The proposed structure depth increase due to the increased span length.
3. Accommodation of future I-75 improvements to upgrade the vertical design speed from 50 MPH to 60 MPH.

The proposed profile currently shown on the General Plan of Site accommodates the expected Livernois Avenue profile grade. A 2.0% deck cross slope is recommended.

Maintaining Traffic

Livernois Avenue traffic will be detoured to allow for full width construction of the bridge.

Traffic control along I-75 for the structure replacement will require shoulder and temporary single lane closures to remove the existing piers and construct the new pier. Temporary freeway closures will be necessary during removal and erection of the beam.

Structure Options

Four superstructure alternatives were investigated in this study:

- 36" Wide Flange Steel Beam
- 34" Web Steel Plate Girder
- 42" Spread PPC Box Beam
- 42" Side-by-Side PPC Box Beam

Two-span arrangements with full-height abutments were considered for the four superstructure alternatives listed above. See Appendix A for cross sections of the alternatives listed above.

Preliminary beam design was completed for each superstructure type utilizing AASHTO LRFD, 2007 Edition as directed by MDOT. The MDOT HL-93 Modified loading was used for the design loading for each alternative.
A single span option was not investigated based on the significant increase in construction depth required and the limited increase available due to the vertical geometric constraints of the nearby service drives.

The required construction depth for the steel (Wide Flange or Plate Girder) and 42” Side-by-Side PPC Box Beam alternatives are approximately the same. The 42” Spread PPC Box Beam Alternative will result in a slightly deeper construction depth due to a thicker deck than the side-by-side alternative.

The proposed deck width is 103’-5”. This width is slightly greater than the maximum deck width of 100’-0” which requires a longitudinal/open expansion joint as stated in the MDOT Bridge Design Manual. If a joint is used, it should be placed in the median or at the crown of the roadway. If it is placed in the median, it would pose a tripping hazard to pedestrians. If it is placed at the crown, it would be subject to traffic passing over the joint, requiring the joint to be armored with steel plates to protect the edge of the deck. Regardless of the location, the joint will become a long-term maintenance issue. Furthermore, the longitudinal joint would require two stages of post tensioning the beams due to the discontinuity of the superstructure caused by the longitudinal joint. It is recommended to omit the longitudinal joint in the deck for these reasons.

Cost

The cost for the 42” Spread PPC Box Beam Alternative is lower than the cost for the 42” Side-by-Side PPC Box Beam Alternative and significantly lower than the Steel Alternatives listed above.

Cost estimates for each alternative are included in Appendix B. The cost estimates assume full-height cantilever abutments supported on piles and backfilled with a lightweight fill (Lightweight Aggregate, Slag, LM). The median pier is a multi-column concrete pier supported on piles. Geotechnical investigation will need to confirm these recommendations.

Because painting is not required for the concrete alternatives, long-term maintenance costs are lower for the recommended alternative than for the steel alternatives.

The following is a cost comparison between the different alternatives:

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Superstructure Depth</th>
<th>Total Cost ($K)</th>
<th>Cost/SF Deck ($)</th>
</tr>
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<tbody>
<tr>
<td>36” Wide Flange Steel Beam</td>
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<td>34” Web Steel Plate Girder</td>
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<tr>
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</table>

The costs shown are for the bridge only and do not include cost associated with raising the Livernois Avenue profile. The Total Cost includes the removal of the existing structure. The Cost/SF does not include removal of the existing structure. Also, a 15% design contingency has been added to costs above.

Utilities

Several utilities are attached to the existing Livernois Avenue Bridge. An existing 12” diameter MichCon Gas main is attached to the structural steel under the east sidewalk. Four - 4” diameter Detroit Public Lighting Department (P.L.D.) ducts are attached to the bottom of the slab under the easternmost lane and four - 4” P.L.D. ducts are attached to the bottom of the slab under the west sidewalk.

A 3” diameter conduit that feeds the bridge mounted street lights is located in the west sidewalk in spans 1 and 4.

Relocation of the gas main is assumed prior to construction. If the relocation of this gas main is restricted based on seasonal usage, this information shall be provided to the contractor in the specifications for coordination during construction. Any of the options investigated, with the exception of the side-by-side box beam can accommodate the gas main if the utility is to be attached to the new structure. If the side-by-side box beam alternative is used, the gas main needs to be bored or jacked under I-75 with the current recommendation, if it is to remain in service.

Bridge lighting conduits can be placed in the concrete parapet or the raised median, depending on the location of the street lighting. The location of the lighting will be investigated during preliminary design.

PLD conduits can be relocated in the raised median.

Drainage

It is assumed that drainage will be collected off the bridge on the roadway and scuppers will not be required on the bridge based on the following:

1. The tributary width of bridge deck is relatively small.
2. The longitudinal grades are relatively steep.
3. Scuppers are not present on the existing bridge, which has a longer total span length and a wider pavement than the proposed bridge.

Aesthetics

Aesthetic treatments, including concrete texturing of the concrete parapet and concrete surface coating, are anticipated for the proposed structure. The aesthetic treatment can be accommodated by all four alternatives and will have approximately the same cost. Concrete surface sealers will be slightly greater for the concrete beam alternatives. The limits of the texturing are unknown at this time. However, an aesthetic cost equaling 1% of the bridge cost was included in the Preliminary Cost Estimate for all bridges. Any specific aesthetic requirements are to be determined by MDOT through the Context Sensitive Solutions (CSS) process with the public and in consultation with the City of Detroit and will be incorporated into the Final Design plans.

Recommendations

Based on costs the 42” Spread PPC Box Beam Alternative is the recommended alternative for the Livernois Avenue Bridge over I-75. The 42” Spread PPC Box Beam Alternative will accommodate the relocation of the 12” diameter gas main attached to the existing Livernois Avenue Bridge.
Detroit River International Crossing
Engineering Report

Additional soil borings and the geotechnical report will confirm the backfill and foundation assumptions used to compute the preliminary cost of the structure.

The high wall abutment will be supported on piles. The front row of piles will be battered to resist the lateral loads. The proposed pier is located in the I-75 median at the existing Pier 2 location. The existing piles may be reused and supplemented with additional battered piles, driven between existing piles to resist lateral loads. High wall abutments are proposed. The use of semi-integral or independent back wall with sliding approach slabs abutments can be investigated during preliminary design to eliminate expansion joints on the bridge.

Under Clearance and Grade Raise

The existing structure currently has a minimum vertical clearance of 14'-11" based on the vertical under clearance posted on the bridge. I-75 at the project location is considered a special route. In this case, a 14'-9" minimum under clearance is required for the proposed bridge. Currently, the I-75 roadway is posted for 55 MPH; however, based on the current vertical geometry, the roadway is designed for 50 MPH. MDOT has requested that the preferred alignment for the DRIC accommodate a 60 MPH design speed on I-75, so that I-75 can be upgraded with future improvements to a 60 MPH design speed. Therefore, the vertical profile was set at 15'-3" to account for these future modifications to the I-75 vertical geometry.

The following characteristics of the proposed road and bridge design affect the underclearance:

1. The existing vertical clearance is less than 15'-3".
2. The proposed structure depth increase due to the increased span length.
3. Accommodation of future I-75 improvements to upgrade the vertical design speed from 50 MPH to 60 MPH.

The proposed profile currently shown on the General Plan of Site accommodates the expected Clark Avenue profile grade. A 2.0% deck cross slope is recommended.

Maintaining Traffic

One lane of traffic in each direction along Clark Avenue traffic will be maintained during the reconstruction of the Clark Avenue Bridge. See Appendix A for the staging configuration.

Traffic control along I-75 for the structure replacement will require shoulder and temporary single lane closures to remove the existing pier and abutments and to construct the new pier and abutments. Temporary freeway closures will be necessary during removal of the existing and erection of the new beams.

Structure Options

Three superstructure alternatives were investigated in this study:

- 42' Spread PPC Box Beam
- 42' Side-by-Side PPC Box Beam
- 34' Web Steel Plate Girder
Two-span arrangements with full-height abutments were considered for the three alternatives listed above. See Appendix A for the span arrangement of the alternatives listed above.

Preliminary beam design was completed for each superstructure type utilizing AASHTO LRFD, 2007 Edition as directed by MDOT. The MDOT HL-93 Modified loading was used for the design loading for each alternative.

A single span option was not investigated based on the significant increase in construction depth required and the limited increase available due to the vertical geometric constraints of the nearby service drives.

The 42" Spread PPC Box Beam Alternative will result in a slightly deeper construction depth than the 42" Side-by-Side PPC Box Beam and the 33" Wide Flange Steel Beam Alternatives. However, the greater construction depth will have a negligible impact to the Clark Avenue profile and will not impact the adjacent service drive intersections with Clark Avenue.

Cost

The cost for the 42" Spread PPC Box Beam Alternative is less than the cost for the 42" Side-by-Side PPC Box Beam and 34" Web Steel Plate Girder Alternative.

Cost estimates for each alternative are included in Appendix B.

The cost estimates assume full-height cantilever abutments supported on piles. The median pier is a multi-column concrete pier supported on piles. Geotechnical investigation will need to confirm these recommendations.

The following is a cost comparison between the different alternatives:

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Superstructure Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>42&quot; Spread PPC Box Beam</td>
<td>55'</td>
</tr>
<tr>
<td>42&quot; Side-by-Side PPC Box Beam</td>
<td>51'</td>
</tr>
<tr>
<td>34&quot; Web Steel Plate Girder</td>
<td>47'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Depth</th>
<th>Total Cost</th>
<th>Cost/SF Deck</th>
</tr>
</thead>
<tbody>
<tr>
<td>55'</td>
<td>$4,586,380</td>
<td>$193</td>
</tr>
<tr>
<td>51'</td>
<td>$5,395,720</td>
<td>$231</td>
</tr>
<tr>
<td>47'</td>
<td>$5,941,250</td>
<td>$257</td>
</tr>
</tbody>
</table>

The costs shown are for the bridge only and do not include approach cost associated with raising the Clark Avenue profile. The Total Cost includes the removal of the existing structure. The Cost/SF does not include removal of the existing structure. Also, a 15% design contingency has been added to costs above.

Utilities

Several utilities are attached to the Clark Avenue Bridge. An existing 16" diameter MichCon Gas main is attached to the structural steel under the southbound lanes of the bridge. Twelve - 4" diameter Detroit Edison conduits are attached to the underside of the deck under the northbound lanes. Six - 4" diameter Public Lighting Department (P.L.D.) are attached to the underside of the deck under the median on the east side of the bridge.

Relocation of the gas main will be required prior to construction. If the relocation of this gas main is restricted based on seasonal usage, this information will be provided to the contractor in the specifications for coordination during construction. The spread box beam alternative can accommodate the relocation of the existing gas main, while the side-by-side box beam alternative cannot accommodate the relocation of the gas main, requiring the gas main to be relocated off the bridge.

Bridge lighting conduits can be placed in the concrete parapet or the raised median, depending on the location of the street lighting. The location of the lighting will be investigated during preliminary design.

Detroit Edison and P.L.D. conduits can be relocated in the raised median.

Drainage

It is assumed that drainage will be collected off the bridge on the roadway and scuppers will not be required on the bridge based on the following:

1. The tributary width of bridge deck is relatively small.
2. The longitudinal grades are relatively steep.
3. Scuppers are not present on the existing bridge, which have longer spans and wider pavement than the proposed bridge.

Aesthetics

Aesthetic treatments, including concrete texturing of the concrete parapet and concrete surface coating, are anticipated for the proposed structure. The aesthetic treatment can be accommodated by both alternatives and will have approximately the same cost. The limits of the texturing are unknown at this time. However, an aesthetic cost equaling 1% of the bridge cost was included in the Preliminary Cost Estimate for all bridges. Any specific aesthetic requirements are to be determined by MDOT through the Context Sensitive Solutions (CSS) process with the public and in consultation with the City of Detroit and will be incorporated into the Final Design plans.

Recommendations

Based on costs the 42" Spread PPC Box Beam Alternative is the recommended alternative for the Clark Avenue Bridge over I-75. Also, the recommended alternative will accommodate the existing 16" diameter gas main attached to the existing Clark Avenue Bridge.
General

The purpose of this study is to investigate different structure types for the proposed Ramp A over Fort Street and Ramp F. Ramp A is part of the Detroit River International Crossing (DRIC) Plaza Project which requires reconfiguration of the existing I-75 interchange at Livernois/Dragoon. Ramp A exits the DRIC Plaza, crosses over the Norfolk Southern railroad tracks Fort Street and Ramp F. Ramp A then enters northbound I-75. This study investigated the spans over the Fort Street and Ramp F. The structure over the Norfolk Southern Railroad is not included in this study.

For details and geometry of the proposed Ramp A Bridge, see the General Plan of Site Plan and Cross Sections included in Appendix A.

The structure design is to be completed based on current AASHTO LRFD specifications. The design live load is the AASHTO HL-93 Modified used by MDOT.

Construction of the Ramp A Bridge is to be coordinated with improvements to the I-75 ramp alignments, the cross road bridge replacements and the service drive work.

Currently, the geotechnical study is not available for the bridge.

Lightweight backfill was used behind the abutments of existing bridges (Livernois and Dragoon Avenue Bridges) in the vicinity of Ramp A because of poor soil conditions. From the soil information shown on the existing bridge record plans there is soft clay for approximately 80 feet below the existing pile caps.

Preliminary soils investigations propose that a lightweight fill (Lightweight Aggregate, Slag, LM) be placed as backfill behind the abutments. The use of the lightweight fill will reduce the lateral earth pressure on the high wall abutment allowing the lateral earth pressure to be resisted by the pile batter and not depend on the stiffness of the soil below the footing.

Additional soil borings and the geotechnical report will confirm the backfill and foundation assumptions used to compute the preliminary cost of the structure.

The proposed abutment and pier foundations will likely be supported on piles due to large loads from the long span lengths.

Under Clearance

The vertical profile for Ramp A was set at 14'-9" minimum over Fort Street and Ramp F.

Structure Options

Several span arrangements have been investigated. The alignment is on curve (1340' radius). Precast concrete beams have been eliminated from consideration due to curvature and span lengths. Concrete Segmental box girders have also been eliminated from consideration because it is considered a non-redundant structure by MDOT. Tub girders have been investigated for the Ramp D flyover structure and were not recommended for economic reasons.

The superstructure will consist of a four-span continuous plate girder section. The span lengths are 166'-0", 166'-0", 212'-0" and 166'-0". The web depth is 84". The girders will be composite with a nine inch concrete deck for live load and superimposed dead load.

The ground can slope up from Fort Street at a 1 on 3 to allow the use of a stub abutment for Abutment A.

Retaining walls are present at Abutment B. Abutment B is shown as a high wall abutment. See the General Plan of Site – Elevation in Appendix A. The walls and abutments types should be studied after soil information is obtained and the geotechnical investigation is performed. Since the abutments are located in areas of fill, an MSE wall with a pile bent abutment should be investigated. If poor soils are present at the abutment and wall locations, soil modifications such as stone columns, vibro-compacted concrete columns or preloading soil with wick drains should be investigated to mitigate poor soils.

Due to large loads from the long span lengths and poor soils present, it is assumed that all piers and abutments will be supported on piles. Geotechnical Investigation needs to be performed to confirm these assumptions.

The General Plan of Site for the proposed span arrangement is included in Appendix A.

Preliminary superstructure designs were completed utilizing AASHTO LRFD, 2007 Edition as directed by MDOT. The MDOT HL-93 Modified loading was used for the design loading for each structure.

Utilities

Several utilities are present at the proposed substructure locations. There are many existing utilities that service existing buildings within the footprint of the proposed Ramp A. The utilities servicing existing buildings will be removed or abandoned, while utilities passing through the area will be relocated. The utilities located along existing streets that interfere with the bridge foundations will be relocated. See Appendix A for existing utility locations.
Drainage

Due to the length of the bridge and the span lengths, it is assumed that a closed drainage system is required. Downspouts located at the piers will empty into catch basins below that are tied into the local storm sewer system. Scupper locations and outlets will be determined during preliminary engineering design phase.

Aesthetics

Aesthetic treatments, including concrete texturing of the concrete parapet and concrete surface coating, are anticipated for the proposed structure. The limits of the texturing are unknown at this time. However, an aesthetic cost equaling 1% of the bridge cost was included in the Preliminary Cost Estimate for all bridges. Any specific aesthetic requirements are to be determined by MDOT through the Context Sensitive Solutions (CSS) process with the public and in consultation with the City of Detroit and will be incorporated into the Final Design plans.

Construction

The construction of the proposed bridge will be complex due to the span lengths, curvature and location of the bridge with respect to traffic. False work will be required for the steel plate girder erection to minimize deformations. The false work may need to remain in place until all the girders and cross frames are in place.

Recommendations

Based on cost comparison between the Curved Steel Plate Girder and the Dual Tub Girder Alternative, from the Ramp D Structure Study, the Curved Steel Plate Girder Alternative is recommended over the Tub Girder Alternative. The Curved Plate Girder is more typical and will allow more fabricators to bid on the fabricating contract. Also, more contractors are familiar with erection of the curved steel plate girder alternative than with the tub girder alternative.

The construction depth of the Curved Steel Plate Girder Alternative is 8'-6". The estimated cost for the Curved Steel Plate Girder Alternative is $9,146,000. The cost per square foot is $ 289. A 20% design contingency has been added to costs above. A Preliminary Cost Estimate is included in Appendix B.
Traffic control along I-75 for the structure replacement will require shoulder and temporary single lane closures to construct Abutment A, Pier 1 and place the girders.

Temporary closure of local streets such as Livernois Avenue and Fort Street may be necessary during construction of the proposed piers and erection of the proposed girders.

Structure Options

Several span arrangements have been investigated. The alignment is on curve (1500’ radius). Precast concrete beams have been eliminated from consideration due to curvature and span lengths. Concrete Segmental box girders have also been eliminated from consideration because it is considered a non-redundant structure by MDOT. Tub girders have been investigated for the Ramp D flyover structure and were not recommended for economic reasons.

Due to the angle of intersection between Ramp B and the Northbound Service Drive and the geometry of the Livernois Avenue/Fort Street intersection, excessive span lengths would be required to span the Northbound Service Drive and the Livernois Avenue/Fort Street intersection. By locating only one pier in the southwest quadrant of Livernois/Fort Street, spans would approach 350’. Locating two piers in the southwest quadrant of Livernois/Fort Street would result in unbalanced spans for a continuous girder.

To avoid these excessive lengths and unbalanced spans, a straddle bent is proposed over the Northbound Service Drive. The superstructure will be divided into two units. Unit 1 will consist of a four-span continuous plate girder section. The span lengths are 127'-6", 158'-9", 150'-3" and 110'-0". The web depth is 54". Unit 2 will consist of a two-span continuous plate girder section. The span lengths are 251'-6" and 151'-6". The web depth is 84". The girders for both units will be composite with a nine inch concrete deck for live load and superimposed dead load.

An expansion joint will be located above Pier 4 and the superstructure depth will increase to the south. Due to the lengths and the curvature, modular joints are required between Unit 1 and Unit 2 and at the abutments.

A deeper beam is required to span the Livernois Avenue / Fort Street intersection.

A high wall abutment is proposed for Abutment A. The bridge can be terminated south of Fort Street. The ground can slope up from Fort Street at a 1 on 3 to allow the use of a stub abutment for Abutment B.

Due to long spans and poor soils, it is assumed that all piers and abutments will be supported on piles. Geotechnical Investigation needs to be performed to confirm these assumptions.

A straddle bent would be required to reduce the span lengths. A minimum vertical of clearance of 17'-3" is required at the straddle bent due to the straddle bent being non-redundant. To achieve a minimum 17'-3" minimum vertical under clearance, the horizontal element of the straddle bent is included within the depth of the superstructure. A minimum vertical clearance of 14'-9" is required for the girders.

Retaining walls are present at Abutment A. Abutment A is shown as a high wall abutment as shown on the General Plan of Site – Elevation in Appendix A. The walls and abutments types should be studied after soil information is obtained and the geotechnical investigation is performed. Since the abutments are located in areas of fill, an MSE wall with a pile bent abutment should be investigated. If poor soils are present at the abutment and wall locations, soil
modifications such as stone columns, vibro-compacted concrete columns or preloading soil with wick drains should be investigated to mitigate poor soils.

The General Plan of Site for the proposed span arrangement for the proposed alternative is included in Appendix A.

Preliminary superstructure designs were completed utilizing AASHTO LRFD, 2007 Edition as directed by MDOT. The MDOT HL-93 Modified loading was used for the design loading for each structure.

Utilities

Several utilities are present at the proposed substructure locations. There are many existing utilities that service existing buildings within the footprint of the proposed Ramp B. The utilities servicing existing buildings will be removed or abandoned while utilities passing through the area will be relocated. The utilities located along existing streets that interfere with the bridge foundations will be relocated. See Appendix A for existing utility locations.

Drainage

Due to the length of the bridge and the span lengths, it is assumed that a closed drainage system is required. Downspouts located at the piers will empty into catch basins below that are tied into the local storm sewer system. Scupper locations and outlets will be determined during preliminary engineering design phase.

Aesthetics

Aesthetic treatments, including concrete texturing of the concrete parapet and concrete surface coating, are anticipated for the proposed structure. Concrete surface sealer will be slightly greater for the concrete beam alternatives. The limits of the texturing are unknown at this time. However, an aesthetic cost equaling 1% of the bridge cost was included in the Preliminary Cost Estimate for all bridges. Any specific aesthetic requirements are to be determined by MDOT through the Context Sensitive Solutions (CSS) process with the public and in consultation with the City of Detroit and will be incorporated into the Final Design plans.

Construction

The construction of the proposed bridge will be complex due to the span lengths, curvature and location of the bridge with respect to traffic. False work will be required for the steel plate girder erection to minimize deformations. The false work may need to remain in place until all the girders and cross frames are in place.

Recommendations

Based on cost comparison between the Curved Steel Plate Girder and the Dual Tub Girder Alternative, from the Ramp D Structure Study, the Curved Steel Plate Girder Alternative is recommended over the Tub Girder Alternative. The Curved Plate Girder is more typical and will allow more fabricators to bid on the fabricating contract. Also, more contractors are familiar with erection of the curved steel plate girder alternative than with the tub girder alternative.
**General**

The purpose of this study is to investigate different structure types for the proposed Ramp C Bridges over I-75, Livernois Avenue, Ramp E, and Fort Street. Ramp C is part of the Detroit River International Crossing (DRIC) Plaza Project which requires reconfiguration of the existing I-75 interchange at Livernois/Dragoon. Ramp C exits the DRIC Plaza crosses over the Norfolk Southern railroad tracks. The vertical profile for Ramp C was set at 14'-9" minimum over Fort Street, Ramp E, Livernois Avenue and I-75. Ramp C then enters southbound I-75. This study will investigate two structures:

1. Structure No. S39 of 82194: Ramp C over I-75, Livernois Ave., NB Service Drive and Fort Street
2. Structure No. S40 of 82194: Ramp C over Ramp D

The structures are separated with 400 feet of embankment.

The structure over the Norfolk Southern Railroad is not included in this study.

For details and geometry of the proposed Ramp C Bridge, see the General Plan of Site Plan and Cross Sections included in Appendix A.

The structure design is to be completed based on current AASHTO LRFD specifications. The design live load is the AASHTO HL-93 Modified used by MDOT.

Construction of the Ramp C Bridge is to be coordinated with improvements to the I-75 ramp alignments, the cross road bridge replacements and the service drive work.

Currently, the geotechnical study is not available for the bridge.

Lightweight backfill was used behind the abutments of existing bridges (Livernois and Dragoon Avenue Bridges) in the vicinity of Ramp C because of poor soil conditions. From the soil information shown on the existing bridge record plans there is soft clay for approximately 80 feet below the existing pile caps.

Preliminary soils investigations propose that a lightweight fill (Lightweight Aggregate, Slag, LM) be placed as backfill behind the abutments for Structure No. S39 of 82194 and Expanded Polystyrene (EPS) blocks be placed as backfill behind the abutments for Structure No. S40 of 82194. The use of EPS blocks will minimize settlement of the bridge approach pavement and reduce the lateral earth pressure on the high wall abutment allowing the lateral earth pressure to be resisted by the pile batter and not depend on the stiffness of the soil below the footing. The use of the lightweight fill will reduce the lateral earth pressure on the abutment.

Additional soil borings and the geotechnical report will confirm the backfill and foundation assumptions used to compute the preliminary cost of the structure.

The proposed abutment and pier foundations will likely be supported on piles due to large loads from the long span lengths.

**Under Clearance**

I-75 at the project location is considered a special route. In this case, a 14'-9" minimum under clearance is required for the proposed bridge. Currently, the I-75 roadway is posted for 55 MPH; however, based on the current vertical geometry, the roadway is designed for 50 MPH. MDOT has requested that the preferred alignment for the DRIC accommodate a 60 MPH design speed on I-75, so that I-75 can be upgraded with future improvements to a 60 MPH design speed. Therefore, the vertical profile was set at 15'-3" to account for these future modifications to the I-75 vertical geometry. The vertical profile for Ramp C was set at 14'-9" minimum over Fort Street, Ramp E and Livernois Avenue. The vertical profile for Ramp D over Ramp C was set at 17'-3" minimum vertical under clearance at the straddle bent location.

**Maintaining Traffic**

Traffic control along I-75 for the structure replacement will require shoulder and temporary single lane closures to construct the new piers and the abutments. Temporary freeway night closures will be necessary during erection of the proposed girders.

Temporary closure of local streets such as Livernois Avenue and Fort Street may be necessary during erection of the proposed girders.

**Structure Options**

**Structure No. S39 of 82194**

Several span arrangements have been investigated. The alignment is on curve (1641' radius). Precast concrete beams have been eliminated from consideration due to curvature and span lengths. Concrete Segmental box girders have also been eliminated from consideration because it is considered a non-redundant structure by MDOT. Tub girders have been investigated for the Ramp D flyover structure and were not recommended for economic reasons.

Due to the angle of intersection between the ramp and the I-75 mainline and acceptable pier placement, the spans over I-75 become very long. Proposed piers are located within the clear zone and will require protection from traffic using concrete barriers. For the vertical clearance criteria, the minimum vertical clearance to a pier cap is 17'-6" while the minimum vertical clearance to a girder is 15'-3". The minimum vertical clearance for the pier cap is larger than a beam because the pier cap is considered non-redundant. Vehicular impact to the pier cap is much more likely to result in the loss of a span than impact to a girder. To reduce the construction depth the pier cap can be built integral with the superstructure. If the integral pier cap is located over traffic the effective maximum beam depth is reduced 2'-3" (the difference between 17'-6" and 15'-3''). When the beam depth is reduced, the maximum span length is reduced.
To minimize span lengths (and girder depth), straddle bents were investigated. The straddle bent will allow the superstructure to be supported at a point where a conventional pier cannot be located due to horizontal constraints. The straddle bent would be a viable option under different conditions but was not recommended based on the following reasons:

1. The straddle bent will need to span the entire I-75 southbound lanes and shoulders. The span of the straddle bent will approach 100'.
2. The benefit from reducing span length by using a straddle bent would be offset by the reduction in the allowable construction depth due to increased vertical clearance requirements as stated above.
3. The superstructure would need to be built integrally with the straddle bent. Details would be complex and construction would not be typical.
4. Costs for the straddle bent would add a substantial cost to the bridge.
5. Construction of the straddle bent would require longer complete closure of I-75 due to placement of the straddle bent and time required to complete connections of the superstructure to the straddle bent.

The proposed span arrangement consists of six spans crossing Fort Street and Ramp E. The span lengths are 152'-0", 257'-6", 192'-6", 186'-6" and 142'-0".  The girders are composite for live load and superimposed dead load with the 9" concrete deck. Expansion joints are located at each abutment. Due to large movements and curvature, modular expansion joints are proposed.

Pile bent abutments are proposed. The piers will be conventional piers or single column hammerhead piers when required. All piers will be supported on piles.

The minimum clearance point occurs over the southbound outside shoulder of I-75 just before Ramp C enters I-75. Pier 1 is located as close as possible to I-75 without encroaching over the I-75 SB outside shoulder. Pier 2 will be a single column pier located in the median of I-75. The column width is limited to six feet in diameter to maintain standard median shoulders. The median barrier will transition into the pier. The pier cap will support the superstructure and will be located over the I-75 median shoulders. A minimum vertical clearance greater than 17'-6" will be maintained.

Preliminary superstructure designs were completed for both structures utilizing AASHTO LRFD, 2007 Edition as directed by MDOT. The MDOT HL-93 Modified loading was used for the design loading for each structure.

Utilities

Several utilities are present at the proposed substructure locations. There are many existing utilities that service existing buildings within the footprint of the proposed Ramp C. The utilities servicing existing buildings will be removed or abandoned while utilities passing through the area will be relocated. The utilities located along existing streets that interfere with the bridge foundations will be relocated. See Appendix A for existing utility locations.

Drainage

Due to the length of the bridge and the span lengths, it is assumed that a closed drainage system is required. Downspouts located at the piers will empty into catch basins below that are tied into the local storm sewer system. Scupper locations and outlets will be determined during preliminary engineering design phase.

Aesthetics

Aesthetic treatments, including concrete texturing of the concrete parapet and concrete surface coating, are anticipated for the proposed structure. Concrete surface sealers will be slightly greater for the concrete beam alternatives. The limits of the texturing are unknown at this time. However, an aesthetic cost equaling 1% of the bridge cost was included in the Preliminary Cost Estimate for all bridges. Any specific aesthetic requirements are to be determined by MDOT through the Conted Sensitive Solutions (CSS) process with the public and in consultation with the City of Detroit and will be incorporated into the Final Design plans.

Construction

The construction of proposed Structure No. S39 of 82194 will be complex due to the span lengths, curvature and location of the bridge with respect to traffic. Falsework will be required for the steel plate girder option to reduce deformations during erection. The falsework may need to remain in place until all the girders and cross frames are in place.

Recommendations

Based on cost comparison between the Curved Steel Plate Girder and the Dual Tub Girder Alternative, from the Ramp D Structure Study, the Curved Steel Plate Girder Alternative is the recommended over the Tub Girder Alternative. The Curved Plate Girder is more typical and will allow more fabricators to bid on the fabricating contract. Also, more contractors are familiar with erection of the curved steel plate girder alternative than with the tub girder alternative. The construction depth of the Curved Steel Plate Girder Alternative is 8'-6" for Structure No. S39 of 82194 and 6'-0" for Structure No. S40 of 92194. The estimated cost for the Curved Steel Plate Girder Alternative is $22,463,000. The cost per square foot is $317. A 20% design contingency has been added to costs above. A Preliminary Cost Estimate is included in Appendix B.
Traffic control along I-75 for the structure replacement will require shoulder and temporary single lane closures to construct the new piers and the abutments. Temporary freeway night closures will be necessary during erection of the proposed girders.

Structure Options

Several span arrangements have been investigated. The alignment is on curve (1574’ radius). Precast concrete beams have been eliminated from consideration due to curvature and span lengths. Concrete Segmental box girders have also been eliminated from consideration because it is considered a non-redundant structure by MDOT.

Due to the angle of intersection between the ramp and the I-75 mainline and acceptable pier placement, the spans over I-75 became very long. Proposed piers are located within the clear zone and will require protection from traffic using concrete barriers. For the vertical clearance criteria, the minimum vertical clearance to a pier cap is 17'-6" while the minimum vertical clearance to a girder is 15'-3". The minimum vertical clearance for the pier cap is larger than a beam because the pier cap is considered non-redundant. Vehicular impact to the pier cap is much more likely to result in the loss of a span than impact to a girder. To reduce the construction depth the pier cap can be built integral with the superstructure. If the integral pier cap is located over traffic the effective maximum beam depth is reduced 2'-3" (the difference between 17'-6" and 15'-3'). When the beam depth is reduced, the maximum span length is reduced.

To minimize span lengths (and girder depth), straddle bents were investigated. The straddle bent will allow the superstructure to be supported at a point where a conventional pier cannot be located due to horizontal constraints. The straddle bent would be a viable option under different conditions but was not recommended based on the following reasons:

1. The straddle bent will need to span the entire I-75 southbound lanes and shoulders. The span of the straddle bent will approach 100'.
2. The benefit from reducing span length by using a straddle bent would be offset by the reduction in the allowable construction depth due to increased vertical clearance requirements as stated above.
3. The superstructure would need to be built integrally with the straddle bent. Details would be complex and construction would not be typical.
4. Costs for the straddle bent would add a substantial cost to the bridge.
5. Construction of the straddle bent would require longer complete closure of I-75 due to placement of the straddle bent and time required to complete connections of the superstructure to the straddle bent.

The proposed span arrangement of the structure consists of two units. Unit 1 consists of six spans crossing Fort Street and Ramp E. The span lengths of Unit 1 are 181'-2", 170'-10", 170'-10" and 149'-10". Unit 2 consists of three spans crossing I-75. The span lengths of Unit 2 are 241'-6", 357'-6" and 241'-6". The girders are composite for live load and superimposed dead load with the 9" concrete deck. Expansion joints are located at each abutment and between Unit 1 and Unit 2. Due to large movements and curvature, modular expansion joints are proposed.

Pile bent abutments are proposed. The piers will be conventional piers or single column hammerhead piers when required. All piers will be supported on piles.

The minimum clearance point occurs as the ramp ascends and starts to cross I-75. Pier 7 is located as close as possible to I-75 without encroaching over the I-75 SB outside shoulder. Pier 6 will be a single column pier that will be in the median of I-75. The column width is limited to six feet in diameter to maintain standard median shoulders. The median barrier will transition into the pier. A conventional cantilevered pier cap will support the superstructure and will be located over the I-75 median. A minimum vertical under clearance greater than 17'-6" will be maintained. Pier 5 will...
also be a single column pier and will be pulled in as close as possible to the I-75 northbound outside shoulder to minimize span lengths. The column of the pier will be protected from traffic with a concrete barrier. The pier cap will overhang the I-75 NB outside shoulder. Since the ramp is still ascending, a minimum vertical under clearance greater than 17'-6" will be maintained. An expansion joint will be located above Pier 5 and the superstructure depth will decrease to the south. For economy, shorter spans are recommended south of Pier 5.

Two superstructure alternatives were investigated in this study:
- 144" Web Curved Steel Plate Girder
- 110" Dual Tub Girders (with a longitudinal flange splice)

Curved steel plate girders and tub girders are both feasible alternatives for the proposed span lengths. Tub girders have been used on select projects in the state of Michigan. For a dual tub girder bridge, MDOT requires a continuous longitudinal bottom flange splice to ensure redundancy. The longitudinal bottom flange splice is also required for transportation to the site. The General Plan of Site for the proposed span arrangement for the alternatives listed above is included in Appendix A.

Preliminary superstructure designs were completed for each superstructure alternative type for Unit 2, utilizing AASHTO LRFD, 2007 Edition as directed by MDOT. The MDOT HL-93 Modified loading was used for the design loading for each alternative.

Comparative Cost
A comparative cost analysis for the fabrication and delivery of the structural steel was prepared for both alternatives for Unit 2 and are included in Appendix C. Unit 2 was chosen due to the longest span lengths and the location of the point of minimum vertical clearance over I-75. For shorter spans, steel plate girders are typically more economical than tub girders.

The estimated fabrication cost for the Curved Steel Plate Girder is $6,539,415. The estimate fabrication cost for the steel tub girder is $8,278,767. Erection costs can vary based on several factors. While the weight of steel for the Tub Girder Alternative is lower, the pick for each girder is heavier which would require heavier equipment and more room for crane placement. Installation of the longitudinal bottom flange splice would also increase erection costs. Deck forming costs and deck reinforcement would be greater for the tub girder option due to much greater flange spacing.

Utilities
Several utilities are present at the proposed substructure locations. There are many existing utilities that service existing buildings within the footprint of the proposed Ramp D. The utilities servicing existing buildings will be removed or abandoned while utilities passing through the area will be relocated. The utilities located along existing streets that interfere with the bridge foundations will be relocated. See Appendix A for existing utility locations.

Drainage
Due to the length of the bridge and the span lengths, it is assumed that a closed drainage system is required. Downspouts located at the piers will empty into catch basins below that are tied into the local storm sewer system. Scupper locations and outlets will be determined during preliminary engineering design phase.

Aesthetics
Aesthetic treatments, including concrete texturing of the concrete parapet and concrete surface coating, are anticipated for the proposed structure. Concrete surface sealer will be slightly greater for the concrete beam alternatives. The limits of the texturing are unknown at this time. However, an aesthetic cost equaling 1% of the bridge cost was included in the Preliminary Cost Estimate for all bridges. Any specific aesthetic requirements are to be determined by MDOT through the Context Sensitive Solutions (CSS) process with the public and in consultation with the City of Detroit and will be incorporated into the Final Design plans.

Construction
The construction of both alternatives proposed will be complex due to the span lengths, curvature and location of the bridge with respect to traffic. Falsework will be required for the steel plate girder option to reduce deformations during erection. The falsework may need to remain in place until all the girders and cross frames are in place. Falsework may be required for erection of the tub girders. While the tub girders are more rigid than plate girders, due to the long spans, the curved boxes may rotate or warp making sequential field erection difficult.

Erection of the plate girders is more typical than erection of tub girders. More contractors are likely to bid on a curved steel plate girder bridge than a curved tub girder bridge. As discussed previously, the pick for a tub girder is much heavier than a pick for a steel plate girder requiring larger equipment and more space for crane placement.

Recommendations
Based on cost comparison between the Curved Steel Plate Girder and the Dual Tub Girder Alternative the Curved Steel Plate Girder Alternative is the recommended over the Tub Girder Alternative. The Curved Plate Girder is more typical and will allow more fabricators to bid on the fabricating contract. Also, more contractors are familiar with erection of the curved steel plate girder alternative than with the tub girder alternative. The Ramp D profile will accommodate both alternatives.

The construction depth of the Curved Steel Plate Girder Alternative is 8'-6" for unit 1 and 11'-6" for Unit 2. The estimated cost for the Curved Steel Plate Girder Alternative is $23,163,000. The cost per square foot is $306. A 20% design contingency has been added to costs above. A Preliminary Cost Estimate is included in Appendix B.
General

The purpose of this study is to investigate different structure types for proposed Ramp E over Ramp F. Ramps E and F are part of the Detroit River International Crossing (DRIC) Plaza Project which requires reconfiguration of the existing I-75 interchange at Livernois/Dragoon. Ramp E is braided with Ramp F. Ramp E is an I-75 NB entrance ramp. It enters I-75 from Livernois Avenue, passes over Ramp F and then enters I-75. Ramp F exits I-75 NB at Livernois Avenue and passes under Ramp F, and then enters the plaza. Ramp E enters I-75 NB from Livernois Avenue and passes under Ramp E and enters the plaza.

For details and geometry of the proposed Ramp E over Ramp F, see the General Plan of Site Plan and Cross Sections included in Appendix A.

The structure design is to be completed based on current AASHTO LRFD specifications. The design live load is the AASHTO HL-93 Modified used by MDOT.

Construction of the Ramp E Bridge over Ramp F is to be coordinated with improvements to the I-75 ramp alignments, the cross road bridge replacements and the service drive work.

Currently, the geotechnical study is not available for the bridge.

Lightweight backfill was used behind the abutments of existing bridges (Livernois and Green Avenue Bridges) in the vicinity of the Ramp E / Ramp F crossing because of poor soil conditions. From the soil information shown on the existing bridge record plans there is soft clay for approximately 80 feet below the existing pile caps.

Preliminary soils investigations propose that a lightweight fill (Lightweight Aggregate, Slag, LM) be placed as backfill behind the abutments. The use of the lightweight fill will reduce the lateral earth pressure on the high wall abutment allowing the lateral earth pressure to be resisted by the pile batter and not depend on the stiffness of the soil below the footing.

Additional soil borings and the geotechnical report will confirm the backfill and foundation assumptions used to compute the preliminary cost of the structure.

The proposed abutments will likely be supported on piles due to superstructure loads large overturning forces due the abutment height.

Under Clearance

The vertical profile for Ramp E was set at 14'-9" minimum over Ramp F.

Structure Options

Two alternatives were investigated in this study:

• 42" Spread PPC Box Beam
• 42' Wide 3-Sided Precast Concrete Culvert

The two alternatives listed above have been studied. The 42" Spread Box Beam Alternative is a bridge that carries Ramp E over Ramp F. The bridge is a single span bridge. The abutments can be skewed slightly to reduce the span length without affecting the performance of the bridge. The Ramp E alignment is tangent along approximately three quarters of the bridge length. A 1285-foot radius is introduced on the bridge. The deck can be slightly widened to allow the use of straight, parallel beams with constant bridge overhangs. Minimum shoulder widths will be maintained.

Due to the severe skew, the 42' Wide 3-Sided Precast Concrete Culvert Alternative was investigated. The culvert would allow ramp F to be tunnel under Ramp E. Structurally, the culvert would span Ramp F at right angles. It would span Ramp F at right angles. The precast section offers the advantage of speed erection. However, the alternative has the following disadvantages:

• Segment lengths are limited to six feet due to transportation limitations
• Because of the short culvert segment length, the ends segments cannot be skewed.
• The difference between the point of minimum clearance and the top of the precast culvert is in excess of 4'-6". This will require Ramp F to be lowered to accommodate this difference and provide a minimum clearance between the top of the culvert and Ramp E roadway to allow a roadway cross slope, pavement, sub-base, under drains and roadway drainage.
• Ramp F is in cut. The more that Ramp F is lowered, the wing walls become longer. Lowering Ramp F also compounds the drainage issues for Ramp F pavement.
• The clear width of the precast sections comes in standard widths. The smallest standard section that meets the roadway clear width minimum requirements is 4'-10" wider than required.

Cost

The cost for the 42" Spread PPC Box Beam Alternative is less than the cost for the 42' Wide 3-sided Precast Concrete Culvert Alternative.

Cost estimates for each alternative are included in Appendix B.

The cost estimate assumes full-height cantilever abutments supported on piles for the 42" Spread PPC Box Beam Alternative. The cost estimate for the 42' Wide 3-Sided Precast Concrete Culvert Alternative assumes a pile supported pedestal for the culvert. Both alternatives require wing walls. The wing walls for the 42" Spread PPC Box Beam Alternative are shorter due to a shallower effective construction depth.

Geotechnical investigation will need to confirm these recommendations.
The following is a cost comparison between the different alternatives:

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Superstructure Depth</th>
<th>Total Cost</th>
<th>Cost/SF Deck</th>
</tr>
</thead>
<tbody>
<tr>
<td>42&quot; Spread PPC Box Beam</td>
<td>55’</td>
<td>$1,394,770</td>
<td>$323</td>
</tr>
<tr>
<td>42’ Wide Three-Sided Precast Concrete Culvert</td>
<td>78’</td>
<td>$1,573,300</td>
<td>$365</td>
</tr>
</tbody>
</table>

The costs shown are for the bridge only and do not include approach cost. The Cost/SF for the culvert alternative does not include the cost of the roadway above the culvert. The Cost/SF for the 42’ Wide Three-Sided Precast Concrete Culvert Alternative is based on the 42" Spread PPC Box Beam Alternative Bridge Area. The costs for the wing walls are included in the cost estimate for both alternatives. A 20% design contingency has been added to costs above.

Utilities

Several utilities are present near the proposed substructure location. The utilities interfering with the proposed substructure shall be relocated. See Appendix A for existing utility locations.

Drainage

It is assumed that drainage will be collected off the bridge on the roadway and scuppers will not be required on the bridge based on the following:

1. The tributary width of bridge deck is relatively small.
2. The longitudinal grades are relatively steep.

Aesthetics

Aesthetic treatments, including concrete texturing of the concrete parapet and concrete surface coating, are anticipated for the proposed structure. The aesthetic treatment can be accommodated by both alternatives (wing walls only for the 42’ Wide 3-Sided Precast Concrete Culvert Alternative). The limits of the texturing are unknown at this time. However, an aesthetic cost equaling 1% of the estimated cost was included in the Preliminary Cost Estimate for all bridges. Any specific aesthetic requirements are to be determined by MDOT through the Context Sensitive Solutions (CSS) process with the public and in consultation with the City of Detroit and will be incorporated into the Final Design plans.

Recommendations

Based on lower estimated costs, the 42" Spread PPC Box Beam Alternative is recommended for the Ramp E Bridge over Ramp F. The 42" Spread PPC Box Beam Alternative will also minimize the cut for Ramp F required to maintain a 14’-9" minimum vertical clearance.
The purpose of this study is to investigate different structure types for the proposed Ramps B and D Bridge over the Norfolk Southern Railroad and the Plaza Drive. Ramps B and D are part of the Detroit River International Crossing (DRIC) Plaza Project which requires reconfiguration of the existing interchange at Livernois/Dragoon. Ramp D exits I-75 SB and crosses over I-75 SB and NB, proposed Ramp F and Fort Street then proceeds over the Norfolk Southern Railroad tracks and enters the DRIC Plaza. Ramp B exits northbound I-75 crosses over the northbound Service Drive, the Livernois Avenue / Fort Street intersection, Norfolk Southern railroad tracks and enters the DRIC Plaza.

A separate Structure Study has been prepared for the Ramp B Bridge over the NB Service Drive, Livernois Avenue and Fort Street and for the Ramp D Bridge over I-75, Ramp F and Fort Street. For details and geometry of the proposed Ramps B and D Bridge over the Norfolk Southern Railroad, see the General Plan of Site Plan and Cross Sections included in Appendix A.

The structure design is to be completed based on current AASHTO LRFD specifications. The design live load is the AASHTO HL-93 Modified used by MDOT.

Construction of the Ramps B and D Bridge is to be coordinated with improvements to the I-75 ramp alignments, the cross road bridge replacements and the service drive work.

Currently, the geotechnical study is not available for the bridge.

Lightweight backfill was used behind the abutments of existing bridges (Livernois and Green Avenue Bridges) in the vicinity of Ramps B and D because of poor soil conditions. From the soil information shown on the existing bridge record plans there is soft clay for approximately 80 feet below the existing pile caps.

Preliminary soils investigations propose that a lightweight fill, Expanded Polystyrene (EPS) blocks be placed as backfill behind the abutments. The use of EPS blocks will minimize settlement of the bridge approach pavement and reduce the lateral earth pressure on the high wall abutment allowing the lateral earth pressure to be resisted by the pile batter and not depend on the stiffness of the soil below the footing.

Additional soil borings and the geotechnical report will confirm the backfill and foundation assumptions used to compute the preliminary cost of the structure.

The proposed abutments will likely be supported on piles due to superstructure loads large overturning forces due the abutment height.

Under Clearance

The vertical profile for Ramps B and D were at 23'-0" minimum over the Norfolk Southern Railroad.
Aesthetics

Aesthetic treatments, including concrete texturing of the concrete parapet and concrete surface coating, are anticipated for the proposed structure. The limits of the texturing are unknown at this time. However, an aesthetic cost equaling 1% of the bridge cost was included in the Preliminary Cost Estimate for all bridges. Any specific aesthetic requirements are to be determined by MDOT through the Context Sensitive Solutions (CSS) process with the public and in consultation with the City of Detroit and will be incorporated into the Final Design plans.

Recommendations

Straight steel girders are proposed for the structure. The bridge will be slightly wider than required by utilizing chorded fascias rather than curved girders. Minimum required shoulder widths will be maintained.

The construction depth of the proposed section is 4'-6". The estimated cost for the proposed structure is $5,315,000. The cost per square foot is $440. A 15% design contingency has been added to costs above. Wing walls have been included in the cost estimate and in the cost per square foot. A Preliminary Cost Estimate is included in Appendix B.
General

The purpose of this study is to investigate different structure types for the proposed Ramps A and C Bridge over the Norfolk Southern Railroad and the Plaza Drive. Ramps A and C are part of the Detroit River International Crossing (DRIC) Plaza Project which requires reconfiguration of the existing I-75 interchange at Livernois/Dragoon. Ramp A exits the DRIC Plaza, crosses over the Norfolk Southern Railroad, Fort Street and Ramp F, and then enters I-75 Northbound. Ramp C exits the DRIC Plaza, crosses over the Norfolk Southern Railroad, Ramp D, Fort Street, Ramp E, Livernois Avenue and I-75 NB and SB then enters I-75 SB.

A separate Structure Study has been prepared for the Ramp A Bridge over Fort Street and Ramp F and for the Ramp C Bridge over Ramp D, Fort Street, Ramp E, Livernois Avenue and I-75 NB and SB. For details and geometry of the proposed Ramps A and C Bridge over the Norfolk Southern Railroad, see the General Plan of Site Plan and Cross Sections included in Appendix A.

The structure design is to be completed based on current AASHTO LRFD specifications. The design live load is the AASHTO HL-93 Modified used by MDOT.

Construction of the Ramps A and C Bridge is to be coordinated with improvements to the I-75 ramp alignments, the cross road bridge replacements and the service drive work.

Currently, the geotechnical study is not available for the bridge.

Lightweight backfill was used behind the abutments of existing bridges (Livernois and Green Avenue Bridges) in the vicinity of Ramps A and C because of poor soil conditions. From the soil information shown on the existing bridge record plans there is soft clay for approximately 80 feet below the existing pile caps.

Preliminary soils investigations propose that a lightweight fill, Expanded Polystyrene (EPS) blocks be placed as backfill behind the abutments. The use of EPS blocks will minimize settlement of the bridge approach pavement and reduce the lateral earth pressure on the high wall abutment allowing the lateral earth pressure to be resisted by the pile batter and not depend on the stiffness of the soil below the footing.

Additional soil borings and the geotechnical report will confirm the backfill and foundation assumptions used to compute the preliminary cost of the structure.

The proposed abutments will likely be supported on piles due to large loads from the long span length and to resist the large overturning forces due the abutment height.

Under Clearance

The vertical profile for Ramps A and C were set at 23'-0" minimum over the Norfolk Southern Railroad.

Maintaining Traffic

Railroad traffic must be maintained at all times. Flaggers will be required when constructing Abutment A and when erecting the steel girders.

Structure Options

Based on the tight minimum vertical clearance and the span lengths, concrete beams were not considered. The adjacent Ramps B & D Bridge over the Norfolk Southern Railroad is a steel bridge due to complex geometries.

The proposed configuration consists of chorded fascias. An 8'-0" minimum wide shoulder along Ramp C (west side) and a 10'-0" minimum wide shoulder along Ramp A (east side) are maintained. The deck fascias are set parallel to each other and the fascia beams are set parallel with the deck fascia to maintain a constant overhang. Shoulder widths are greater than required but allow straight, parallel girders to be utilized. The out-to-out width of the bridge will remain constant.

The General Plan of Site for the proposed span arrangement and Cross Sections is included in Appendix A.

Standard expansion joints are proposed.

The width of the deck is less than 100' width required for longitudinal open joints. An expansion joint will be located in the substructure between this bridge and the R01-3 of 82194 (Ramps B & D Bridge over the Norfolk Southern Railroad).

Utilities

Several utilities are present near the proposed substructure locations. The utilities interfering with the proposed substructure shall be relocated. See Appendix A for existing utility locations.

Drainage

Due to the length and width of the bridge and the railroads requirements for overhead bridge deck drainage, it is assumed that closed drainage system will be required on the bridge. Downspouts located at each abutment and will empty into catch basins below that are tied into the local storm sewer system. Scupper locations and outlets will be determined during preliminary engineering design phase.
Aesthetics

Aesthetic treatments, including concrete texturing of the concrete parapet and concrete surface coating, are anticipated for the proposed structure. The limits of the texturing are unknown at this time. However, an aesthetic cost equaling 1% of the bridge cost was included in the Preliminary Cost Estimate for all bridges. Any specific aesthetic requirements are to be determined by MDOT through the Context Sensitive Solutions (CSS) process with the public and in consultation with the City of Detroit and will be incorporated into the Final Design plans.

Recommendations

Straight steel girders are proposed for the structure based on the tight vertical clearances and the span length. Also, straight steel girders are proposed for the adjacent structure, Ramps B and D over the Norfolk Southern Railroad. The bridge will be slightly wider than required by utilizing chorded fascias rather than curved girders. Shoulder widths will vary; however, a minimum shoulder width will be maintained.

The construction depth of the proposed section is 4'-6". The estimated cost for the proposed structure is $3,907,000. The cost per square foot is $462. A 15% design contingency has been added to costs above. Wing walls have been included in the cost estimate and in the cost per square foot. A Preliminary Cost Estimate is included in Appendix B.
General

Built in 1966, the existing structure is a two-span pedestrian bridge (90'-0", 90'-0") with a multi-span ramp at either end. The main bridge consists of three lines of WF33x130 rolled beams on concrete piers and spread footings. The deck thickness is 6" and the total width is 9'-6" (8'-0" clear). The minimum vertical clearance is 14'-6". Ramp A consists of five concrete slab spans (41'-9", 19'-0", 19'-0", 19'-0", 19'-0"). Ramp B consists of four concrete slab spans (68'-9" - 19'-0" - 19'-0" - 19'-0"). Both ramps have a deck thickness of 9" and the first spans are on fill.

The existing structure does not meet the current minimum vertical clearance requirements over I-75 and its ramps do not meet the current ADA requirements. The replacement structure of the Solvay Avenue Pedestrian Bridge is to be coordinated with improvements to the I-75 ramp alignments and the service drive work. The location of the proposed structure is to the east of the existing structure in order to accommodate the northbound and southbound service drive ramp drives.

The proposed structure has an out-to-out deck width of 15'-0". See the General Plan of Site sheets for details and geometry located in Appendix A. The structure design is to be completed based on current AASHTO standard specifications. The design live load is the AASHTO H-10 or AASHTO Pedestrian Loading (65 psf min.).

Currently, geotechnical information is not available for the bridge. From the soil information shown on the existing bridge record plans there is soft clay for approximately 80 feet below the existing footings. Additional soil borings and geotechnical information will be required for the preparation of preliminary design plans.

Under Clearance and Grade Raise

The existing structure currently has a minimum vertical under clearance of 14'-6" based on the existing record plans and the clearance posted on the bridge. I-75 at the project location is considered as a special route. In this case, a 17'-0" minimum under clearance is required for the proposed bridge. The proposed profile currently shown on the General Plan of Site accommodates the expected minimum vertical clearance along with a structural depth of 3'-6".

Maintaining Traffic

Solvay Avenue pedestrian traffic will be detoured to allow for removal of existing and construction of proposed bridge. Traffic control along I-75 for the structure replacement will require shoulder and temporary single lane closures to remove the existing piers and construct the new pier. Temporary right time freeway closures will be necessary during removal and erection of the beams.

Structure Design

Preliminary beam design was completed utilizing AASHTO Standard Specifications. The H-10 loading or AASHTO Pedestrian Loading (65 psf min.) was used for the design loading. This resulted in the use of a plate girder with a web depth of 28" for the 2 spans crossing I-75. This meets the required 3'-6" construction depth. The ramps will consist of 9" slab spans on monolithic piers and spread footings. Rest benches will be placed on the ramps per Context Sensitive Solutions (CSS) process with the community.

A wide flange rolled beams was investigated. Due to the excessive dead load deflection and the inability for rolled beams to hold the required camber this option was not carried further.

A concrete option was investigated. 48" PPC beams will be required for this option with the same span layout as for the steel. The 2 foot increase in the construction depth will require raising the profile which will in turn lengthen the ramps which is undesirable. Therefore, this option was not carried further.

A single span option was not investigated based on the significant increase in construction depth required and the limited increase available due to the vertical geometric constraints.

Cost

Detailed cost estimate is included in Appendix B.

The cost estimates assume two column piers on spread footings. Geotechnical investigation will need to confirm this recommendation.

The following is a cost summary:

<table>
<thead>
<tr>
<th>Beam Type</th>
<th>Superstructure Depth</th>
<th>Total Cost</th>
<th>Cost/SF Deck</th>
</tr>
</thead>
<tbody>
<tr>
<td>28&quot; Web Steel Plate Girder</td>
<td>42&quot;</td>
<td>$1,047,040</td>
<td>$108</td>
</tr>
</tbody>
</table>

The Total Cost includes the removal of the existing structure. The Cost/SF does not include removal of the existing structure. Also, a 20% design contingency has been added to costs above to account for the preliminary nature of the design and the fluctuation of prices.

Utilities

There are no utilities present under the main spans over I-75. There is a north-south 15" sanitary sewer under the ramps of the pedestrian bridge. The piers for the ramps are located to avoid interference with the sewer pipe.

Drainage

It is assumed that drainage will be collected at the expansion joints at Piers 1 and 3. Scuppers will not be required on the bridge based on the following:

1. The tributary width of bridge deck is relatively small.
2. The longitudinal grades are relatively steep.
3. Scuppers are not present on the existing bridge, which has a similar total span length and width as the proposed bridge.
Aesthetics

Aesthetic treatments, including concrete texturing of the concrete are anticipated for the proposed structure. The limits of the texturing are unknown at this time. However, an aesthetic cost equaling 1% of the bridge cost was included in the Preliminary Cost Estimate for all bridges. Any specific aesthetic requirements are to be determined by MDOT through the Context Sensitive Solutions (CSS) process with the public and in consultation with the City of Detroit and will be incorporated into the Final Design plans.
Structure Study

General

Built in 1966, the existing structure is a two-span pedestrian bridge (75'-6", 75'-6") with a multi-span ramp at either end. The main bridge consists of three lines of WF30x108 rolled beams on concrete piers and spread footings. The deck thickness is 6" and the total width is 9'-6" (8'-0" clear). The minimum vertical clearance is 14'-6". Ramp A consists of five concrete slab spans (31'-9", 24'-9", 19'-0", 19'-0", 25'-0"). Ramp B consists of four concrete slab spans (56'-6" - 19'-0" - 19'-0" - 19'-0"). Both ramps have a deck thickness of 9" and the first spans are on fill.

The existing structure does not meet the current minimum vertical clearance requirements over I-75 and its ramps do not meet the current ADA requirements. The replacement structure of the Beard Avenue Pedestrian Bridge is to be coordinated with improvements to the I-75 ramp alignments and the service drive work. The location of the proposed structure is to the west of the existing structure.

The proposed structure has an out-to-out deck width of 15'-0". See the General Plan of Site sheets for details and geometry located in Appendix A. The structure design is to be completed based on current AASHTO standard specifications. The design live load is the AASHTO H-10 or AASHTO Pedestrian Loading (65 psf min.).

Currently, geotechnical information is not available for the bridge. From the soil information shown on the existing bridge record plans there is soft clay for approximately 80 feet below the existing footings. Additional soil borings and geotechnical information will be required for the preparation of preliminary design plans.

Under Clearance and Grade Raise

The existing structure currently has a minimum vertical under clearance of 14'-6" based on the existing record plans and the clearance posted on the bridge. I-75 at the project location is considered a special route. In this case, a 17'-0" minimum under clearance is required for the proposed bridge. The proposed profile currently shown on the General Plan of Site accommodates the expected minimum vertical clearance along with a structural depth of 3'-6".

Maintaining Traffic

Beard Avenue pedestrian traffic will be detoured to allow for removal of existing and construction of proposed bridge. Traffic control along I-75 for the structure replacement will require shoulder and temporary single lane closures to remove the existing piers and construct the new pier. Temporary night time freeway closures will be necessary during removal and erection of the beams.

Structure Design

Preliminary beam design was completed utilizing AASHTO Standard Specifications. The H-10 loading or AASHTO Pedestrian Loading (65 psf min.) was used for the design loading. This resulted in the use of a plate girder with a web depth of 28" for the 2 spans crossing I-75. This meets the required 3'-6" construction depth. The ramps will consist of 9" slab spans on monolithic piers and spread footings. Rest benches will be placed on the ramps per Context Sensitive Solutions (CSS) process with the community.

A wide flange rolled beams was investigated. Due to the excessive dead load deflection and the inability for rolled beams to hold the required camber this option was not carried further.

A concrete option was investigated. 48" PPC beams will be required for this option with the same span layout as for the steel. The 2 foot increase in the construction depth will require raising the profile which will in turn lengthen the ramps which is undesirable. Therefore, this option was not carried further.

A single span option was not investigated based on the significant increase in construction depth required and the limited increase available due to the vertical geometric constraints.

Cost

Detailed cost estimate is included in Appendix B.

The cost estimates assume two column piers on spread footings. Geotechnical investigation will need to confirm this recommendation.

The following is a cost summary:

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<th>Beam Type</th>
<th>Superstructure Depth</th>
<th>Total Cost</th>
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<tr>
<td>28&quot; Web Steel Plate Girder</td>
<td>42&quot;</td>
<td>$1,147,200</td>
<td>$104</td>
</tr>
</tbody>
</table>

The Total Cost includes the removal of the existing structure. The Cost/SF does not include removal of the existing structure. Also, a 20% design contingency has been added to costs above to account for the preliminary nature of the design and the fluctuation of prices.

Utilities

An existing 54" water main is located under I-75 under the proposed structure. A 12" diameter water main is located under Ramp B. These utilities shall be relocated prior to construction of the bridge. An existing 15" sanitary sewer is located under Ramp B. There is also a 24" sanitary sewer as well as a 3" Michcon pipe that run parallel with an offset to the west of the main spans. These utilities pass under Ramp B. The piers for the ramps are located to avoid interference with these utilities.

Drainage

It is assumed that drainage will be collected at the expansion joints at Piers 1 and 3. Scuppers will not be required on the bridge based on the following:

1. The tributary width of bridge deck is relatively small.
2. The longitudinal grades are relatively steep.
3. Scuppers are not present on the existing bridge, which has a similar total span length and width as the proposed bridge.
Aesthetics

Aesthetic treatments, including concrete texturing of the concrete are anticipated for the proposed structure. The limits of the texturing are unknown at this time. However, an aesthetic cost equaling 1% of the bridge cost was included in the Preliminary Cost Estimate for all bridges. Any specific aesthetic requirements are to be determined by MDOT through the Context Sensitive Solutions (CSS) process with the public and in consultation with the City of Detroit and will be incorporated into the Final Design plans.
General
The existing structure is a highway bridge that was built in 1966. The existing bridge superstructure consists of a four span steel beam section with a composite reinforced concrete deck. The substructure consists of column piers and stub abutments.

The existing structure will be removed and replaced with a pedestrian bridge. The new structure is to be coordinated with improvements to the I-75 ramp alignments and the service drive work. The location of the proposed structure is at the east end existing structure.

The proposed structure has an out-to-out deck width of 15'-0". See the General Plan of Site sheets for details and geometry located in Appendix A. The structure design is to be completed based on current AASHTO standard specifications. The design live load is the AASHTO H-10 or AASHTO Pedestrian Loading (65 psf min.).

Currently, geotechnical information is not available for the bridge. Soil borings and geotechnical information will be required for the preparation of preliminary design plans.

Under Clearance and Grade Raise
I-75 at the project location is considered a special route. In this case, a 17'-0" minimum under clearance is required for the proposed bridge. The proposed profile currently shown on the General Plan of Site accommodates the expected minimum vertical clearance along with a structural depth of 3'-6".

Maintaining Traffic
Waterman Avenue traffic will be detoured to allow for removal of existing and construction of proposed bridge. Traffic control along I-75 for the structure replacement will require shoulder and temporary single lane closures to remove the existing piers and construct the new pier. Temporary night time freeway closures will be necessary during removal and erection of the beams.

Structure Design
Preliminary beam design was completed utilizing AASHTO Standard Specifications. The H-10 loading or AASHTO Pedestrian Loading (65 psf min.) was used for the design loading. This resulted in the use of a plate girder with a web depth of 28" for the 2 spans crossing I-75. This meets the required 3'-6" construction depth. The ramps will consist of 9\(^7\) slab spans on monolithic piers and spread footings. Rest benches will be placed on the ramps per Context Sensitive Solutions (CSS) process with the community.

A wide flange rolled beams was investigated. Due to the excessive dead load deflection and the inability for rolled beams to hold the required camber this option was not carried further.

A concrete option was investigated. 48\(^7\) PPC beams will be required for this option with the same span layout as for the steel. The 2 foot increase in the construction depth will require raising the profile which will in turn lengthen the ramps which is undesirable. Therefore, this option was not carried further.

A single span option was not investigated based on the significant increase in construction depth required and the limited increase available due to the vertical geometric constraints.

Cost
Detailed cost estimate is included in Appendix B.

The cost estimates assume two column piers on spread footings. Geotechnical investigation will need to confirm this recommendation.

The following is a cost summary:

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<tbody>
<tr>
<td>28(^7) Web Steel Plate Girder</td>
<td>42(^8)</td>
<td>$955,850</td>
<td>$118</td>
</tr>
</tbody>
</table>

The Total Cost and Cost/SF does not include the removal of the existing structure. Also, a 20% design contingency has been added to costs above to account for the preliminary nature of the design and the fluctuation of prices.

Utilities
An existing north-south 72\(^7\) diameter sanitary sewer is located under I-75 just east of the main span and passes under Ramp A. An existing 12\(^7\) water main is located under Ramp B. Existing Detroit Edison underground utilities are located east of the main span. The piers for the ramps are located to avoid interference with the pipes. However, these utilities should be field located during preliminary design to avoid potential interference with proposed piers or foundations.

Drainage
It is assumed that drainage will be collected at the expansion joints at Piers 1 and 3. Scuppers will not be required on the bridge based on the following:

1. The tributary width of bridge deck is relatively small.
2. The longitudinal grades are relatively steep.
3. Scuppers are not present on the existing bridge, which has a similar total span length and width as the proposed bridge.
Aesthetics

Aesthetic treatments, including concrete texturing of the concrete are anticipated for the proposed structure. The limits of the texturing are unknown at this time. However, an aesthetic cost equaling 1% of the bridge cost was included in the Preliminary Cost Estimate for all bridges. Any specific aesthetic requirements are to be determined by MDOT through the Context Sensitive Solutions (CSS) process with the public and in consultation with the City of Detroit and will be incorporated into the Final Design plans.
General

The structure of the Morrell Avenue Pedestrian Bridge is to be coordinated with improvements to the I-75 ramp alignments and the service drive work. Currently, there is no existing structure at the location of the proposed bridge.

The proposed structure has an out-to-out deck width of 9'-0". See the General Plan of Site sheets for details and geometry located in Appendix A. The structure design is to be completed based on current AASHTO standard specifications. The design live load is the AASHTO H-10 or AASHTO Pedestrian Loading (65 psf min.).

Currently, geotechnical information is not available for the bridge. Additional soil borings and geotechnical information will be required for the preparation of preliminary design plans.

Under Clearance and Grade Raise

I-75 at the project location is considered a special route. In this case, a 17'-0" minimum under clearance is required for the proposed bridge. The proposed profile currently shown on the General Plan of Site accommodates the expected minimum vertical clearance along with a structural depth of 4'-0".

Maintaining Traffic

Traffic control along I-75 for the structure replacement will require shoulder and temporary single lane closures to remove the existing piers and construct the new pier. Temporary right time freeway closures will be necessary during removal and erection of the beams.

Structure Design

Preliminary beam design was completed utilizing AASHTO Standard Specifications. The H-10 loading or AASHTO Pedestrian Loading (65 psf min.) was used for the design loading. This resulted in the use of a plate girder with a web depth of 30" for the 2 spans crossing I-75. This meets the required 4'-0" construction depth. The ramps will consist of 9" slab spans on monolithic piers and spread footings. Rest benches will be placed on the ramps per Context Sensitive Solutions (CSS) process with the community.

A wide flange rolled beams was investigated. Due to the excessive dead load deflection and the inability for rolled beams to hold the required camber this option was not carried further.

A concrete option was investigated. 48" PPC beams will be required for this option with the same span layout as for the steel. The 2 foot increase in the construction depth will require raising the profile which will in turn lengthen the ramps which is undesirable. Therefore, this option was not carried further.

A single span option was not investigated based on the significant increase in construction depth required and the limited increase available due to the vertical geometric constraints.

Cost

Detailed cost estimate is included in Appendix B.

The cost estimates assume two column piers on spread footings. Geotechnical investigation will need to confirm this recommendation.

The following is a cost summary:

<table>
<thead>
<tr>
<th>Beam Type</th>
<th>Superstructure Depth</th>
<th>Total Cost</th>
<th>Cost/SF Deck</th>
</tr>
</thead>
<tbody>
<tr>
<td>30&quot; Web Steel Plate Girder</td>
<td>44&quot;</td>
<td>$593,310</td>
<td>$148</td>
</tr>
</tbody>
</table>

A 20% design contingency has been added to costs above to account for the preliminary nature of the design and the fluctuation of prices.

Utilities

An existing 6x9' sanitary box sewer is located under I-75 just west of the main span. Existing conduits for MOL, SBC and ITC are located near Ramp B running east-west. Also, an existing DWSD 15" sanitary sewer and 8" water main and an 8" Michcon gas line are located under Ramp B. These utilities need to be field located during the Preliminary engineering phase to determine if they need to be relocated.

Drainage

It is assumed that drainage will be collected at the expansion joints at Piers 1 and 3. Scuppers will not be required on the bridge based on the following:

1. The tributary width of bridge deck is relatively small.
2. The longitudinal grades are relatively steep.
3. Scuppers are not present on the existing bridge, which has a similar total span length and width as the proposed bridge.

Aesthetics

Aesthetic treatments, including concrete texturing of the concrete are anticipated for the proposed structure. The limits of the texturing are unknown at this time. However, an aesthetic cost equaling 1% of the bridge cost was included in the Preliminary Cost Estimate for all bridges. Any specific aesthetic requirements are to be determined by MDOT through the Context Sensitive Solutions (CSS) process with the public and in consultation with the City of Detroit and will be incorporated into the Final Design plans.
General

The structure of the McKinstry Avenue Pedestrian Bridge is to be coordinated with improvements to the I-75 ramp alignments and the service drive work. Currently, there is no existing structure at the location of the proposed bridge.

The proposed structure has an out-to-out deck width of 15'-0". See the General Plan of Site sheets for details and geometry located in Appendix A. The structure design is to be completed based on current AASHTO standard specifications. The design live load is the AASHTO H-10 or AASHTO Pedestrian Loading (65 psf min.).

Currently, geotechnical information is not available for the bridge. Soil borings and geotechnical information will be required for the preparation of preliminary design plans.

Under Clearance and Grade Raise

I-75 at the project location is considered a special route. In this case, a 17'-0" minimum under clearance is required for the proposed bridge. The proposed profile currently shown on the General Plan of Site accommodates the expected minimum vertical clearance along with a structural depth of 3'-6".

Maintaining Traffic

Traffic control along I-75 for the structure replacement will require shoulder and temporary single lane closures to remove the existing piers and construct the new pier. Temporary right time freeway closures will be necessary during removal and erection of the beams.

Structure Design

Preliminary beam design was completed utilizing AASHTO Standard Specifications. The H-10 loading or AASHTO Pedestrian Loading (65 psf min.) was used for the design loading. This resulted in the use of a plate girder with a web depth of 28" for the 2 spans crossing I-75. This meets the required 3'-6" construction depth. The ramps will consist of 9" slab spans on monolithic piers and spread footings. Rest benches will be placed on the ramps per Context Sensitive Solutions (CSS) process with the community.

A wide flange rolled beams was investigated. Due to the excessive dead load deflection and the inability for rolled beams to hold the required camber this option was not carried further.

A concrete option was investigated. 48" PPC beams will be required for this option with the same span layout as for the steel. The 2 foot increase in the construction depth will require raising the profile which will in turn lengthen the ramps which is undesirable. Therefore, this option was not carried further.

A single span option was not investigated based on the significant increase in construction depth required and the limited increase available due to the vertical geometric constraints.

Cost

Detailed cost estimate is included in Appendix B.

The cost estimates assume two column piers on spread footings. Geotechnical investigation will need to confirm this recommendation.

The following is a cost summary:

<table>
<thead>
<tr>
<th>Beam Type</th>
<th>Superstructure Depth</th>
<th>Total Cost</th>
<th>Cost/SF Deck</th>
</tr>
</thead>
<tbody>
<tr>
<td>28&quot; Web Steel Plate Girder</td>
<td>42&quot;</td>
<td>$1,033,890</td>
<td>$106</td>
</tr>
</tbody>
</table>

A 20% design contingency has been added to costs above to account for the preliminary nature of the design and the fluctuation of prices.

Utilities

There is a north-south Comcast utility that runs parallel with an offset to the east of the main spans. These pipes go under the proposed ramps. The locations of the piers for the ramps are located to avoid interference with the pipes. At the north end of the proposed structure, there are Detroit Edison, Michcon and 6" Water main utilities that shall be avoided.

Drainage

It is assumed that drainage will be collected at the expansion joints at Piers 1 and 3. Scuppers will not be required on the bridge based on the following:

1. The tributary width of bridge deck is relatively small.
2. The longitudinal grades are relatively steep.
3. Scuppers are not present on the existing bridge, which has a similar total span length and width as the proposed bridge.

Aesthetics

Aesthetic treatments, including concrete texturing of the concrete are anticipated for the proposed structure. The limits of the texturing are unknown at this time. However, an aesthetic cost equaling 1% of the bridge cost was included in the Preliminary Cost Estimate for all bridges. Any specific aesthetic requirements are to be determined by MDOT through the Context Sensitive Solutions (CSS) process with the public and in consultation with the City of Detroit and will be incorporated into the Final Design plans.
Retaining Walls & Soundwalls

Various retaining wall systems have been evaluated for the proposed retaining walls. The wall systems were evaluated based on performance and risk, relative cost, aesthetics, and constructability. There are advantages and disadvantages for each retaining wall system. We have considered the following retaining wall systems:

- Mechanically Stabilized Earth Wall
- Cast-in-place Concrete Retaining Wall
- Precast Concrete Cantilever Retaining Wall
- Steel sheet piling with a concrete face
- Soldier Pile and Lagging with a concrete face

Mechanically stabilized earth (MSE) and concrete cantilever walls are typically easier to construct in areas that are to be filled rather than in areas to be cut. This is because in areas that are to be cut, an excavation would be required to be able to construct either a concrete or MSE retaining wall. This excavation would have to be either sloped to applicable local, state, and federal safety regulations, including current OSHA excavation and trench safety standards or a temporary earth retention system installed, which would increase the cost of either a concrete or MSE retaining wall in cut areas. Various aesthetic treatments can be performed with either a concrete or MSE retaining wall.

Precast concrete retaining walls cost less than MSE walls or cast-in-place concrete retaining walls. This type of wall system is installed vibration-free and can typically be placed safely over underlying impediments such as sanitary sewers. Since the precast walls and footings are fabricated at the casting yard, and therefore, removed from the critical path of the project, the precast concrete cantilever retaining wall system would expedite the construction of the interchange and minimize disruption to the I-75 traffic. It is anticipated that 250 feet long of the precast retaining walls may be erected in two days. In this case, the precast footings will be erected in one day followed directly by the erection of the precast walls. End connection method is used for the precast units. In this method, the precast walls are designed and detailed like cast-in-place. Full moment connections are provided between the precast walls and the precast footings through grout-filled mechanical splicers. At the precast plant, the splicers are embedded in the precast element on one end of the main reinforcing bars to be connected. The bars protrude from the other end of the precast member. At the construction site, the precast members are joined by inserting the protruding bars from the end of one precast member into the splicers of the adjacent member. The splicers are then grouted, in effect making the reinforcing bars continuous through the connection.

Steel sheet piling walls are typically installed in areas that are to be cut. They are relatively simple to install by either driving or vibrating steel sheets to a design tip elevation. The sheet piling can either be cantilevered, which requires the sheets to penetrate deep into the underlying soil, or, for taller walls, can be tied-back in order to control deflection and applied moment to within acceptable levels. Steel sheet pile walls are typically used where aesthetics are not an issue due to the rust that will develop. A concrete face, either plain or textured, may be installed in order to improve the aesthetics. A disadvantage is the sheets are continuously installed and vibrated, therefore, not conducive to working around impediments such as sanitary sewers.

Soldier pile and lagging walls are typically installed in areas that are to be cut. They are constructed by either driving or drilling and installing vertical steel beams (typically HP sections). As the excavation proceeds, wood lagging is installed between the steel beams. For a permanent wall system, a concrete face should be installed and designed to retain the soil in the event the wood lagging deteriorates and fails. The concrete face may either have a plain or textured finish.

When the retaining walls meet the bridge abutments, a 1 inch joint filler will be placed between the wingwall of the abutment and the retaining wall.

Cost

Detailed cost estimates are included in Appendix B. For each retaining wall, a summary of wall systems with an estimated cost for each is presented. The retaining walls are identified by letter (e.g., A, B, etc.) on the plans in Appendix A of this report. The total estimated construction cost for all retaining walls is approximately $16,250,000. The estimated construction costs include 30% design contingency. For the precast concrete cantilever walls and cast-in-place cantilever walls, light weight aggregate (slag) will be placed behind the walls when wall heights exceed 22 feet. Sheet piling without tie back is assumed feasible up to wall heights of 12 feet while soldier piles and lagging are assumed feasible up to wall heights of 18 feet.

Aesthetics

Aesthetic treatments are anticipated for all retaining walls. Any specific aesthetic requirements are to be determined by MDOT through the Context Sensitive Solutions (CSS) process with the public and in consultation with the City of Detroit and will be incorporated into the Final Design plans.

Recommendation

The following table summarizes the preferred option for each wall based on the lowest estimated construction cost. However, most of the steel sheet pile walls are interfering with existing utilities. Therefore, it is recommended that precast concrete retaining walls be used for all retaining walls. If precast concrete cantilever retaining wall system is selected for all the walls, the total estimated construction cost for retaining walls will be approximately $16,800,000.

<table>
<thead>
<tr>
<th>Wall</th>
<th>Preferred Option</th>
<th>Construction Cost</th>
<th>Wall</th>
<th>Preferred Option</th>
<th>Construction Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Steel Sheet Pile w/ Conc Face</td>
<td>$96,710</td>
<td>P</td>
<td>Precast Cantilever Wall</td>
<td>$2,588,906</td>
</tr>
<tr>
<td>B</td>
<td>Steel Sheet Pile w/ Conc Face</td>
<td>$31,698</td>
<td>Q</td>
<td>Precast Cantilever Wall</td>
<td>$226,739</td>
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<tr>
<td>C</td>
<td>Precast Cantilever Wall</td>
<td>$267,941</td>
<td>R</td>
<td>Steel Sheet Pile w/ Conc Face</td>
<td>$15,834</td>
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<tr>
<td>D</td>
<td>Steel Sheet Pile w/ Conc Face</td>
<td>$155,880</td>
<td>S</td>
<td>Steel Sheet Pile w/ Conc Face</td>
<td>$95,004</td>
</tr>
<tr>
<td>E</td>
<td>Precast Cantilever Wall</td>
<td>$1,784,009</td>
<td>T</td>
<td>Precast Cantilever Wall</td>
<td>$1,738,054</td>
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<tr>
<td>F</td>
<td>Precast Cantilever Wall</td>
<td>$1,145,309</td>
<td>U</td>
<td>Precast Cantilever Wall</td>
<td>$2,178,410</td>
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<td>$106,880</td>
<td>V</td>
<td>Precast Cantilever Wall</td>
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<tr>
<td>H</td>
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<td>$1,431,112</td>
<td>W</td>
<td>Precast Cantilever Wall</td>
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<td>J</td>
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<td>$240,661</td>
<td>X</td>
<td>Precast Cantilever Wall</td>
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<td>$589,272</td>
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<td>Precast Cantilever Wall</td>
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<tr>
<td>N</td>
<td>Precast Cantilever Wall</td>
<td>$899,102</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Total construction cost = $16,250,000
Appendix A
DECK SECTION
36"W x 39"H SPREAD PPC BOX BEAM
(LOOKING UPSTATION)
NOTES:
1. PLACEMENT OF CONC. BARRIER, TEMP, SHALL BE ACCORDING TO SPECIAL DETAIL R-126-E OR AS APPROVED BY THE ENGINEER. IN STAGE 1 THE TEMP BARRIER SHALL BE DOWELED INTO THE EXISTING DECK ACCORDING TO SPECIAL DETAIL R-126-E. INCLUDED IN THE PAY ITEM “Conc. Barrier, Temp, Furn”.
2. MEDIAN TO BE POURED AFTER COMPLETION OF STAGE 2 CONSTRUCTION.

EXIST 12"! GAS MAIN (TO BE RELOCATED BY OTHERS)
EXIST 1-3"! P.L.C. DUCT
EXIST 12-4"! D.E. CO. DUCTS (TO BE RELOCATED BY OTHERS)
EXIST 4-4"! P.L.D. DUCTS (TO BE RELOCATED BY OTHERS)

(LOOKING UPSTATION TOWARDS ABUTMENT A)
DECK SECTION
48" W x 42" H SPREAD PPC BOX BEAM

SECTION THRU ABUTMENT B
ABBREVIATIONS:
- LIMITS OF EXCAVATION AND BACKFILL
- ABUTMENT A SIMILAR

GENERAL PLAN OF SITE - DECK SECTIONS
LIVERNOIS AVE. OVER I-75

FILE NAME: Livernois-xs.dgn
CHECKED BY: KMP    DATE: 08/22/08
DRAWN BY: RMG     DATE: 08/22/08

Michigan Department of Transportation
1224.0x792.0
STAGE 1 REMOVAL

STAGE 1 CONSTRUCTION

STAGE 2 REMOVAL

STAGE 2 CONSTRUCTION

NOTES:

1. PLACEMENT OF CONCRETE BARRIER, TEMPORARY, SHALL BE ACCORDING TO SPECIAL DETAIL R-126-E OR AS APPROVED BY THE ENGINEER. IN STAGE 1 THE TEMP BARRIER SHALL BE DOWELED INTO THE EXISTING DECK ACCORDING TO SPECIAL DETAIL R-126-E. INCLUDED IN THE PAY ITEM "CONCRETE BARRIER, TEMP, FURN".

2. MEDIAN TO BE POURED AFTER COMPLETION OF STAGE 2 CONSTRUCTION.

CHECKED BY: KMP DATE: 08/22/08
DRAWN BY: RMG DATE: 08/22/08
FILE NAME: Clark STAGE.dgn

Michigan Department of Transportation

APPROVED CONSULTANT COORDINATING ENGINEER
802330

222 N. Washington Square, Suite 200 Lansing, Michigan 48933
NOTES:
1. MINIMUM VERTICAL CLEARANCE COMPUTED BY PARSONS ENGINEERING.
2. FOR ADDITIONAL NOTES, SEE SHEET 1 OF 4.

ELEVATION
VERT SCALE: 1" = 10'
HORIZ SCALE: 1" = 40'

Michigan Department of Transportation
11/14/08 S37 OF 82194 802330
222 N. Washington Square, Suite 200
Lansing, Michigan 48933
APPROVED
DESCRIPTION: SET MAG NAIL IN CENTER OF AN AERIAL TARGET ON FENCED-IN ASPHALT PARKING LOT EAST OF LIVERNOIS ST.

WITNESSES:
1. S70^W  80.00'  CL OF LIVERNOIS ST.
2. S20^E  9.00'   FENCE
3. N60^W  85.00'  FIRE HYDRANT
4. N90^W  60.00'  POWER POLE

DESCRIPTION: SET MAG NAIL IN CENTER OF CRAWFORD.

WITNESSES:
1. S75^W  15.00'  FENCE POST
2. N20^W  2.50'   EDGE CONCRETE

REFERENCE PT DATA
- PT = 3172+84.63
- PI = 3166+33.93
- PC = 3158+93.45
- E  =  159.33 FT
- L  = 1391.18 FT
- T  =  740.48 FT
- R  = 1641.00 FT

CIRCULAR CURVE DATA
PT = 3182+05.80
E  =   69.24 FT
L  =  650.60 FT
T  =  343.61 FT
R  =  818.00 FT

PROPOSED STRUCTURE
1. SPAN 1
   SCE 153'-0"
2. SPAN 2
   SCE 257'-8"
3. SPAN 3
   SCE 192'-6"
4. SPAN 4
   SCE 159'-6"
5. SPAN 5
   SCE 256'-6"
6. SPAN 6
   SCE 142'-0"
7. SPAN 7
   SCE 142'-0"
8. SPAN 8
   SCE 114'-8"
9. SPAN 9
   SCE 117'-6"

STATION EQUATIONS
- STA 3168+56.28 (RAMP C) = STA 12+52.06 (LIVERNOIS)
- STA 3166+23.32 (RAMP C) = STA 165+09.33 (I-75)

NOTES:
- The design of this structure is based on current Federal Specifications for bridges with a 250-year flood event. Live load and dead load values, and noise values, are based on Federal Specifications and the bridge is designed and specified in accordance with the latest edition of the American Association of State Highway and Transportation Officials (AASHTO) Design Specifications for Highways and Streets.
- The location and design of the bridge is consistent with the existing alignment and will not result in any adverse environmental impacts.
- The bridge is designed to accommodate future growth and development in the area.
- The bridge is designed to minimize the impact on local traffic and pedestrians.
- The bridge is designed to meet the needs of all users, including cyclists and pedestrians.

2035 ESTIMATED TRAFFIC DISTRIBUTION

NOTES:
- The design of this structure is based on Federal Specifications for bridges with a 250-year flood event. Live load and dead load values, and noise values, are based on Federal Specifications and the bridge is designed and specified in accordance with the latest edition of the American Association of State Highway and Transportation Officials (AASHTO) Design Specifications for Highways and Streets.
- The location and design of the bridge is consistent with the existing alignment and will not result in any adverse environmental impacts.
- The bridge is designed to accommodate future growth and development in the area.
- The bridge is designed to minimize the impact on local traffic and pedestrians.
- The bridge is designed to meet the needs of all users, including cyclists and pedestrians.
- The bridge is designed to meet the needs of all users, including cyclists and pedestrians.
CONTROL PT# 758
DESCRIPTION: SET MAG NAIL IN CENTER OF AN AERIAL TARGET ON FENCED-IN ASPHALT PARKING LOT EAST OF LIVERNOIS ST.

WITNESSES:
1. S70^W  80.00'  CL OF LIVERNOIS ST.
2. S20^E  9.00'   FENCE
3. N60^W  85.00'  FIRE HYDRANT
4. N90^W  60.00'  POWER POLE

CONTROL PT# 785
DESCRIPTION: SET MAG NAIL IN CENTER IN THE NORTHWEST QUADRANT OF CRAWFORD AND FISHER ST.

WITNESSES:
1. N75^E  7.00'  STOP SIGN
2. S60^W  4.00'  SIDEWALK INTERSECTION
3. S10^E  13.00' LIGHT POLE
4. S20^E  15.00' BACK OF CURB OF FISHER ST.

CONTROL PT# 907
DESCRIPTION: CHISELED 'X' ON THE NW BOLT OF LIGHT POLE ON THE SOUTH SIDE OF FORT STREET ACROSS FROM BUILDING #6142

ELEVATION: 585.33

CONTROL PT = 3158+93.45

2035 ESTIMATED TRAFFIC

DISTRIBUTION

SITUATION PLAN

REFERENCES STRUCTURE S41 OF 82194
PROPOSED STRUCTURE

SPAN 1

SPAN 2

SPAN 3

SPAN 4

SPAN 5

SPAN 6

SPAN 7

SPAN 8

NOTES:
- The design of this structure is based on current American Bridge Design Specifications for Highway Bridges. The geometry is defined as a super-elevation of 6% at the end of the super-elevation zone. The design of this structure is based on current AASHTO Standard LRFD Specifications for Highway Bridges HL-93 MOD LOADING.
- Live load plus impact deflection does not exceed the load and resistance factor method of design.
- For highway bridges, the design of this structure is based on current AASHTO Standard LRFD Specifications for Highway Bridges HL-93 MOD LOADING.
- The design of this structure is based on current AASHTO Standard LRFD Specifications for Highway Bridges HL-93 MOD LOADING.

REFERENCES STRUCTURE S41 OF 82194
PROPOSED STRUCTURE

SPAN 1

SPAN 2

SPAN 3

SPAN 4

SPAN 5

SPAN 6

SPAN 7

SPAN 8

NOTES:
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REFERENCES STRUCTURE S41 OF 82194
PROPOSED STRUCTURE

SPAN 1

SPAN 2

SPAN 3

SPAN 4

SPAN 5

SPAN 6

SPAN 7

SPAN 8

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- The design of this structure is based on current AASHTO Standard LRFD Specifications for Highway Bridges HL-93 MOD LOADING.

REFERENCES STRUCTURE S41 OF 82194
PROPOSED STRUCTURE

SPAN 1

SPAN 2

SPAN 3

SPAN 4

SPAN 5

SPAN 6

SPAN 7

SPAN 8

NOTES:
- The design of this structure is based on current American Bridge Design Specifications for Highway Bridges. The geometry is defined as a super-elevation of 6% at the end of the super-elevation zone. The design of this structure is based on current AASHTO Standard LRFD Specifications for Highway Bridges HL-93 MOD LOADING.
- Live load plus impact deflection does not exceed the load and resistance factor method of design.
- For highway bridges, the design of this structure is based on current AASHTO Standard LRFD Specifications for Highway Bridges HL-93 MOD LOADING.
- The design of this structure is based on current AASHTO Standard LRFD Specifications for Highway Bridges HL-93 MOD LOADING.
CROSS SECTION
48" W x 42" H SPREAD PPC BOX BEAM

OUT TO OUT DECK FASCIA
3'-4"

5 SPA @ 6'-5 5/8" (+) = 32'-4 3/8"

1'-7 1/2"

2'-9"

(LOOKING UPSTATION)

CROSS SECTION
48" W x 42" H SPREAD PPC BOX BEAM
(LOOKING UPSTATION)

LIMITS OF EXCAVATION, FDN
LIMITS OF BACKFILL
STRUCTURE, CIP
LIMITS OF LIGHTWEIGHT AGGREGATE SLAG, LM

ABUTMENT
SECTION THRU ABUTMENT B
(ABUTMENT B SHOWN, ABUTMENT A SIMILAR)

SECTION THRU ABUTMENT B
(ABUTMENT B SHOWN, ABUTMENT A SIMILAR)

CROSS SECTION
48" W x 42" H SPREAD PPC BOX BEAM

OUT TO OUT DECK FASCIA
3'-4"

5 SPA @ 6'-5 5/8" (+) = 32'-4 3/8"

1'-7 1/2"

2'-9"

(LOOKING UPSTATION)

CROSS SECTION
48" W x 42" H SPREAD PPC BOX BEAM

OUT TO OUT DECK FASCIA
3'-4"

5 SPA @ 6'-5 5/8" (+) = 32'-4 3/8"

1'-7 1/2"

2'-9"

(LOOKING UPSTATION)
GENERAL PLAN OF SITE - CROSS SECTION
RAMPS B AND D OVER NORFOLK SOUTHERN RR

MEASURED ALONG REF LINE A
MEASURED ALONG REF LINE B

CROSS SECTION

SECTION THRU ABUTMENT B
FRAMING PLAN

11/14/08 101-3 OF 82194 802330
NOTES

The design of this structure is based on current AASHTO Standard Specifications for Highway Bridges and United. Live load plus impact deflection does not exceed 1/500 of span length.

The work covered by these plans includes removal of the existing pedestrian bridge, construction of the proposed bridge, and placing slope paving to the limits shown. All other work is included in the plans that are a part of this contract.

The contractor shall locate all underground utilities prior to starting work and shall conduct his operations in such a manner as to ensure that these utilities are not disturbed.

Plan elevations refer to NAVD 88 datum.

This bridge is within MDOT Right-of-Way.

The contractor shall notify each utility company 48 hours in advance of work impacting that company's conduits or facilities.

The vertical minimum clearance computations were prepared by Parsons Engineers.

The design of this structure is based on current AASHTO Standard Specifications for Highway Bridges and United. Live load plus impact deflection does not exceed 1/500 of span length.

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The vertical minimum clearance computations were prepared by Parsons Engineers.

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Plan elevations refer to NAVD 88 datum.

This bridge is within MDOT Right-of-Way.

The contractor shall notify each utility company 48 hours in advance of work impacting that company's conduits or facilities.

The vertical minimum clearance computations were prepared by Parsons Engineers.

The design of this structure is based on current AASHTO Standard Specifications for Highway Bridges and United. Live load plus impact deflection does not exceed 1/500 of span length.

The work covered by these plans includes removal of the existing pedestrian bridge, construction of the proposed bridge, and placing slope paving to the limits shown. All other work is included in the plans that are a part of this contract.

The contractor shall locate all underground utilities prior to starting work and shall conduct his operations in such a manner as to ensure that these utilities are not disturbed.

Plan elevations refer to NAVD 88 datum.

This bridge is within MDOT Right-of-Way.

The contractor shall notify each utility company 48 hours in advance of work impacting that company's conduits or facilities.

The vertical minimum clearance computations were prepared by Parsons Engineers.
TO BE CONFIRMED

NOTES

The design of this structure is based on current American Society of Civil Engineers (ASCE) and American Association of State Highway and Transportation Officials (AASHTO) specifications and guidelines. The design also meets the requirements of the Michigan Department of Transportation (MDOT). The design is intended to provide a safe and functional structure for the intended use.

The work covered by these plans includes removal of the existing structure, construction of the proposed structure, and installation of new utilities. All work must be completed in accordance with the plans and specifications. This includes all underground utilities that are to be installed as part of the proposed structure.

The contractor shall locate all underground utilities prior to starting work, and shall coordinate with the utility companies to ensure that their operations do not interfere with the construction work. The contractor shall ensure that all underground utilities are marked and protected during construction. The contractor is responsible for the quality and durability of the work performed.

The proposed structure includes a pedestrian bridge over I-75, with a length of 43 feet (13.1 meters) and a width of 9 feet (2.7 meters). The bridge consists of five concrete slab spans, with a total length of 131 feet (39.9 meters) and a total width of 9 feet (2.7 meters). The bridge is designed to withstand live loads and impact deflection as specified in the AASHTO Standard Specifications for Highway Bridges.

The bridge is designed to provide a safe and functional crossing for pedestrians over I-75. The bridge is constructed of concrete with a maximum thickness of 9 inches (228.6 millimeters). The bridge includes a pedestrian railing and a concrete apron with a asphalt surface. The bridge is designed to meet the requirements of the Americans with Disabilities Act (ADA).

The bridge is located on Fort Street, west of Raderstrek Street. The bridge is designed to provide a safe and functional crossing for pedestrians over I-75. The bridge is constructed of concrete with a maximum thickness of 9 inches (228.6 millimeters). The bridge includes a pedestrian railing and a concrete apron with a asphalt surface. The bridge is designed to meet the requirements of the Americans with Disabilities Act (ADA).
GENERAL PLAN OF SITE
BEARD AVE PEDESTRIAN BRIDGE OVER I-75

PROFILE

VERT SCALE: 1" = 10'
HORIZ SCALE: 1" = 40'

CONCRETE DECK
PIER CAP
PIER COLUMN (TYP)
3'-0"
14'-0"
15'-0"

FOOTING

TYPICAL PEDESTRIAN BRIDGE SECTION AT BEARD AVE

CHECKED BY: MRB    DATE: 09/22/08
FILE NAME: Beard2-pos.dgn
DRAWN BY: VH     DATE: 09/18/08

TYPICAL PEDESTRIAN BRIDGE SECTION AT BEARD AVE

Michigan Department of Transportation
11/14/08
THE DESIGN OF THIS STRUCTURE IS BASED ON CURRENT AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES H-10 LOADING. LIVE LOAD PLUS IMPACT DEFLECTION DOES NOT EXCEED 1/500 OF SPAN LENGTH.

THE WORK COVERED BY THESE PLANS INCLUDES REMOVAL OF THE EXISTING BRIDGE, CONSTRUCTION OF THE PROPOSED BRIDGE, AND PLACING SLOPE PAVING TO THE LIMITS SHOWN. ALL OTHER WORK IS INCLUDED IN THE ROAD PLANS THAT ARE A PART OF THIS CONTRACT.

THE CONTRACTOR SHALL LOCATE ALL UNDERGROUND UTILITIES PRIOR TO STARTING WORK AND SHALL CONDUCT HIS OPERATIONS IN SUCH A MANNER AS TO ENSURE THAT THOSE UTILITIES NOT REQUIRING RELOCATION WILL NOT BE DISTURBED.

PLAN ELEVATIONS REFER TO NAVD 88 DATUM.

MEASURES SHALL BE TAKEN TO PREVENT DEBRIS FROM FALLING FROM THE STRUCTURE.

THIS BRIDGE IS WITHIN MDOT RIGHT-OF-WAY.

THE CONTRACTOR SHALL NOTIFY EACH UTILITY COMPANY 48 HOURS IN ADVANCE OF WORK IMPACTING THAT COMPANY'S CONDUITS OR FACILITIES.

THE VERTICAL MINIMUM CLEARANCE COMPUTATIONS WERE PREPARED BY PARSONS ENGINEERS.

TO BE ADDED WHEN INFORMATION IS AVAILABLE

TO BE CONFIRMED

NOTES

The design of this structure is based on current AASHTO standard specifications for highway bridges H-10 loading. Live load plus impact deflection does not exceed 1/500 of span length.

The work covered by these plans includes removal of the existing bridge, construction of the proposed bridge, and placing slope paving to the limits shown. All other work is included in the road plans that are a part of this contract.

The contractor shall locate all underground utilities prior to starting work and shall conduct his operations in such a manner as to ensure that those utilities not requiring relocation will not be disturbed.

Plan elevations refer to NAVD 88 datum.

Measures shall be taken to prevent debris from falling from the structure.

This bridge is within MDOT right-of-way.

The contractor shall notify each utility company 48 hours in advance of work impacting that company's conduits or facilities.

The vertical minimum clearance computations were prepared by Parsons engineers.
GENERAL PLAN OF SITE
WATERMAN AVE PEDESTRIAN BRIDGE OVER I-75

CONCRETE
DECK

PROTECTIVE FENCE
PIER CAP
PIER COLUMN (TYP)
3'-0"

FOOTING
TYPICAL PEDESTRIAN
BRIDGE SECTION AT WATERMAN AVE

PROFILE
VERT SCALE: 1" = 10'
HORIZ SCALE: 1" = 40'

CHECKED BY:  MRB    DATE:  09/22/08
DRAWN BY:   VH     DATE:   09/18/08

FILE NAME:  Waterman2-pos.dgn

Michigan Department of Transportation
222 N. Washington Square, Suite 200
Lansing, Michigan 48933

APPROVED CONSULTANT COORDINATING ENGINEER 802330

P02 OF 82194

TYPICAL PEDESTRIAN
BRIDGE SECTION AT WATERMAN AVE

L = 150'

APPROVED CONSULTANT COORDINATING ENGINEER 802330
The design of this structure is based on current AASHTO standard specifications for highway bridges H-10 loading. Live load plus impact deflection does not exceed 1/500 of span length.

The work covered by these plans includes removal of the existing bridge, construction of the proposed bridge, and placing slope paving to the limits shown. All other work is included in the road plans that are a part of this contract.

The contractor shall locate all underground utilities prior to starting work and shall conduct his operations in such a manner as to ensure that those utilities not requiring relocation will not be disturbed.

Plan elevations refer to NAVD 88 datum.

Measures shall be taken to prevent debris from falling from the structure.

This bridge is within MDOT right-of-way.

The contractor shall notify each utility company 48 hours in advance of work impacting that company's conduits or facilities.

The vertical minimum clearance computations were prepared by Parsons Engineers.

**NOTES**

**BENCHMARKS**

- BM 311
  - DESCRIPTION: CHISELED 'X' ON NW BOLT OF LIGHT POLE ON THE SOUTH SIDE OF FORT STREET ACROSS FROM BUILDING #6142 "FERGUSON FUNERAL HOME" 100 FEET EAST OF DRAGON STREET.
  - ELEVATION: 587.33

- BM 312
  - DESCRIPTION: CHISELED 'X' ON THE NW BOLT OF LIGHT POLE ON THE SOUTH SIDE OF FORT STREET 30 FEET EAST OF THE VISITOR AND EMPLOYEE ENTRANCE TO "BRIDGE WATER INTRIORS" BUILDING #4617.
  - ELEVATION: 585.33

**WITNESSES**

- N25^W  15.00'  CENTERLINE FISHER
- S70^W  12.00'  CENTERLINE MORRELL
- S50^E  12.00'  FIRE HYDRANT
- N70^E  14.00'  LIGHT POLE

**EXISTING STRUCTURE**

NONE

**UTILITIES**

- EX SAN 18" (DWSD)
- COMCAST COAXIAL (AG)
- MICHCON 4"
- DPL
- MICHCON 8" STEEL
- MICHCON 16" STEEL
- DETROIT EDISON
- WCG FIBER ROUTE
- MCI CONDUIT
- EX SAN 42" (DWSD)
- EX SAN 9'-0" x 8'-0" BOX (DWSD)
- EX WATER 8" (DWSD)
- EX WATER 6" (DWSD)
- EX SAN 15" PIPE (DWSD)

**SITUATION PLAN**

**REFERENCES**

- Ref Line 1
- Ref Line 2
- Ref Line 3
- Ref PT 1
- Ref PT 2
- Ref PT 3
- STA 194+79.21 (I-75)
- STA 2+38.64 (Bridge)
- STA 3+70.92 (Bridge)
- STA 4+45.15 (Bridge)
- STA 0+00.00 (Bridge)

**GENERAL PLAN OF SITE**

MORRELL AVE PEDESTRIAN BRIDGE OVER I-75

Michigan Department of Transportation
11/14/08
TYPICAL PEDESTRIAN BRIDGE SECTION AT MORRELL AVE

PROFILE

MORRELL AVE PEDESTRIAN BRIDGE OVER I-75

GENERAL PLAN OF SITE MORRELL AVE PEDESTRIAN BRIDGE OVER I-75

MICHIGAN DEPARTMENT OF TRANSPORTATION

222 N. Washington Square, Suite 200 Lansing, Michigan 48933

APPROVED CONSULTANT COORDINATING ENGINEER

802330

11/14/08 F11 OF 82194 802330

BENESCH MDOT

CHECKED BY: MRB DATE: 09/30/08

DRAWN BY: VH DATE: 09/30/08

PENICIPAL PEDESTRIAN BRIDGE SECTION AT MORRELL AVE

P11 OF 82194

0+23.00 EL 592.38

+8.34%

0+28.00 EL 592.38

+8.35%

0+51.00 EL 594.30

+8.35%

0+61.00 EL 594.30

+8.35%

0+84.00 EL 596.22

+8.35%

0+89.00 EL 596.22

+8.35%

1+12.00 EL 598.14

+8.35%

1+20.00 EL 598.14

-8.32%

2+44.80 EL 600.64

-2.00%

3+69.61 EL 598.14

-8.32%

3+77.61 EL 598.14

+0.00%

4+05.61 EL 598.14

-8.34%

593.39

4+15.61 EL 595.81

-8.32%

4+15.61 EL 595.81

+0.00%

4+15.61 EL 595.81

-8.34%

4+15.61 EL 595.81

-8.34%

593.39
GENERAL PLAN OF SITE

VERT SCALE: 1" = 10'
HORIZ SCALE: 1" = 40'

CONCRETE
DECK
PROTECTIVE FENCE
PIER CAP
PIER COLUMN (TYP)
3'-0"
8'-0"
9"
FOOTING
TYPICAL PEDESTRIAN
BRIDGE SECTION AT MORRELL AVE

MORRELL AVE PEDESTRIAN BRIDGE OVER I-75

PROFILE

0+23.00 EL 592.38 +8.34%
0+28.00 EL 592.38 +8.35%
0+51.00 EL 594.30 +8.35%
0+61.00 EL 594.30 +8.35%
0+84.00 EL 596.22 +8.35%
0+89.00 EL 596.22 +8.35%
1+12.00 EL 598.14 +8.35%
1+20.00 EL 598.14 +8.35%
2+44.80 EL 600.64 +2.00%
3+69.61 EL 598.14 +0.00%
3+77.61 EL 598.14 +0.00%
4+05.61 EL 595.81 -8.32%
4+15.61 EL 595.81 -8.32%
4+15.61 EL 595.81 +0.00%
593.39

TYPICAL PEDESTRIAN
BRIDGE SECTION AT MORRELL AVE
THE DESIGN OF THIS STRUCTURE IS BASED ON CURRENT AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES H-10 LOADING. LIVE LOAD PLUS IMPACT DEFLECTION DOES NOT EXCEED 1/500 OF SPAN LENGTH.

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PLAN ELEVATIONS REFER TO NAVD 88 DATUM.

MEASURES SHALL BE TAKEN TO PREVENT DEBRIS FROM FALLING FROM THE STRUCTURE.

THIS BRIDGE IS WITHIN MDOT RIGHT-OF-WAY.

THE CONTRACTOR SHALL NOTIFY EACH UTILITY COMPANY 48 HOURS IN ADVANCE OF WORK IMPACTING THAT COMPANY'S CONDUITS OR FACILITIES.

THE VERTICAL MINIMUM CLEARANCE COMPUTATIONS WERE PREPARED BY PARSONS ENGINEERS.

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THE VERTICAL MINIMUM CLEARANCE COMPUTATIONS WERE PREPARED BY PARSONS ENGINEERS.
Appendix B

Cost Estimates (All Structures)
## Preliminary Estimate

**Springwells Street over I-75**

**JOB N° 802330**

**S07 of 82194**

**Bridge Replacement**

12 - 30’ Spread PPC Box Beam Alternative

(G2) Span - 85'-10", 7'-1" Full Height Abutment

Bridge Width - 95'-5" including (2-30’) lanes, 0'-6" lanes, 3'-10" sidewalks, 3'-10" median, two 8'-2" aesthetic railing

**Bridge Length** = 14885 ft²

---

**Prepared by:** MRB  **Date:** 8/22/2008

**Checked by:** KMP  **Date:** 9/5/2008

---

**SUBTOTAL** $25,000.00

---

**Prepared by:** MRB  **Date:** 8/22/2008

**Checked by:** KMP  **Date:** 9/5/2008

---

**SUBTOTAL** $25,000.00

---

**Summary**

**Substructure**

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<th>Unit</th>
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**Superstructure**

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**Misc.**

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**Percent of structure cost** 53%

---

**Percent of project cost** 12.0%

---

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**TOTAL (w/o Contingency and Mobilization)** $3,558,240.00

**Assumptions:**

1. General Design Contingency is included to account for the preliminary nature of the design and the fluctuation of prices.
2. The cost of reconstructing the new Springwells Avenue approach roadway is not included.
3. Every square foot of deck does not include the cost of removing the existing bridge.

---

**SUBTOTAL** $2,374,010.00

---

**Percent of structure cost** 47%

---

**Percent of project cost** 12.0%

---

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**TOTAL (w/o Contingency and Mobilization)** $4,012,700.00

---

**Cost per foot** $257
## Springwells Street over I-75
### Job # 802330
#### Preliminary Estimate
- Prepared by: MRB Date: 8/26/2008
- Checked by: KMP Date: 9/5/2008

**Bridge Replacement**
- Bridge Width=95'-5" including (1-20' U-turn lanes, 4-13' lanes, 1-10' sidewalk, 1-10' median, two 1'-8 1/2" aesthetic railing)
- Bridge Length=163'-11.5"

### Itemized Costs

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<td>Ft</td>
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### Total Costs:
- **Substructure**: $2,025,290.00
- **Superstructure**: $1,778,670.00
- **Miscellaneous**: $40,450.00
- **Maintenance of Traffic**: $16,250.00
- **Design Contingency**: $504,883.50
- **Mobilization**: $436,534.00
- **Total (w/o Contingency and Mobilization)**: $3,365,890.00

### Percent of Project Cost:
- Substructure: 44%
- Superstructure: 33%
- Miscellaneous: 1.0%
- Maintenance of Traffic: 0.4%
- Design Contingency: 1.5%
- Mobilization: 1.6%
- Aesthetics: 1.0%
- Total: 100%

### Design Contingency:
- 10% of project cost

### Notes:
1. Special Provision Required
2. Project Cleanup costs are included to cover preliminary nature of the design and the fluctuation of prices
3. Cost per square foot of deck does not include the cost of removing the existing bridge

---

**ASSUMPTIONS:**
1. A 15% design contingency is included to account for the preliminary nature of the design and the fluctuation of prices
2. The cost of reconstructing the new Green Avenue approach roadway is not included
3. Cost per square foot of deck does not include the cost of removing the existing bridge

---

**Design Contingency:**
- 10% of project cost

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**Mobilization:**
- 10% of project cost
**Michigan Department of Transportation**

**Preliminary Estimate**

**Prepared by:** MRB  
**Date:** 8/26/2008

**Checked by:** KMP  
**Date:** 9/5/2008

---

**Job # 802330**

- **Green Ave. over I-75 (in Detroit)**
- **Bridge Replacement**
- **23 - 39'' Side-by-Side PPC Box Beam Alternative**
- **Bridge Width=95'-5'' including (1-20' U-turn lanes, 4-13' lanes, 1-10' sidewalk, 1-10' median, two 1'-8 1/2'' aesthetic railing)**
- **Bridge Length=192'-0''**

**Item** | **Quantity** | **Unit** | **Unit Cost** | **Amount**
--- | --- | --- | --- | ---
**Substructure** | | | | **$481,520.83**
**2040020** | 2040020 | Structures, Rem 19,261 Sft | $25.00 | **$481,520.83**
| 7040002 | Steel Sheet Piling, Temp 1,313 Sft | $23.98 | **$31,485.74**
| 7040003 | Steel Sheet Piling, Temp, Left in Place | 0 Sft | $23.48 | **$0.00**
| 2060010 | Excavation, Fdn 3,717 Cyd | $8.24 | **$30,628.08**
| 4040033 | Underdrain, Fdn, 6 inch 191 Ft | $7.04 | **$1,343.47**
| 4040113 | Underdrain, Outlet Ending, 6 inch 4 Ea | $115.94 | **$463.76**
| 7050020 | Pile, CIP Conc, Furn and Driven, 12 inch | 19,745 Ft | $26.00 | **$513,366.43**
| 7060010 | Substructure Conc 1,442 Cyd | $402.00 | **$579,581.46**
| 2060002 | Backfill, Structure, CIP 4,858 Cyd | $9.70 | **$47,119.71**
| 2060008 | Conc Qua lity Assurance, Structure 2,327 Cyd | $11.00 | **$25,598.38**

---

**Superstructure** | | | | **$77,024.25**
**7060021** | 7060021 | Superstructure Conc, Night Casting 432 Cyd | $178.50 | **$77,024.25**
| 7060022 | Superstructure Conc, Form, Finish, and Cure 1 LS |  | **$60,106.67**
| 7060031 | Expansion Joint Device 191 Ft | $123.63 | **$23,592.73**
| 7060035 | Reinforcement, Steel, Epoxy Coated 173,784 Lb | $1.10 | **$191,162.58**
| 7060090 | Elec Grounding System 1 Ea |  | **$1,875.00**
| 7060100 | Bridge Ltg, Oper and Maintain 432 Cyd | $2.04 | **$880.28**
| 7060101 | Bridge Ltg, Furn and Rem 1 LS |  | **$8,000.00**
| 7070073 | Bearing, Elastomeric, 3 inch 45 Sft | $185.00 | **$8,325.00**
| 7110005 | Bridge Railing, Ae sthetic Parapet Tube 368 Ft | $155.84 | **$57,349.12**
| 8080110 | Post Tensioning 1 LS |  | **$30,000.00**
| 7160001 | Field Repr of Damaged Coating | 0 LS | $8,000.00 | **$0.00**
| 7070080 | Shear Developers 1 LS |  | **$28,335.64**
| 8190159 | Conduit, Schedule 80 PVC, 3 inch 368 Ft | $7.50 | **$2,760.00**

---

**Misc.** | | | | **$13,132.11**
**6050101** | 6050101 | Conc Quality Initiative 13,132 Dlr | $1.00 | **$13,132.11**
| 7060008 | Conc Qua lity Assurance, Structure 2,327 Cyd | $11.00 | **$25,598.38**

---

**Maintenance of Traffic** | | | | **$20,784.65**
**2090001** | 2090001 | Project Cleanup 0.5% 1 LS | **$20,784.65**
| 1040005 | Contractor Staking, Bridge 1 LS |  | **$70,256.20**

---

**Subtotal** | **$2,025,290.00** | **Percent of structure cost** | **45%**
**Percent of project cost** | **12.0%**

---

**Assumptions:**

1. 2% Design Contingency is included to account for the preliminary nature of the design and the fluctuation of prices
2. The cost of reconstructing the new Green Avenue approach roadway is not included
3. Cost per square foot of deck does not include the cost of removing the existing bridge

**Total (w/o Contingency and Mobilization):** **$3,618,900.00**

---

**Maintenance of Traffic** | | | | **$20,784.65**
**2090001** | 2090001 | Project Cleanup 0.5% 1 LS | **$20,784.65**
| 1040005 | Contractor Staking, Bridge 1 LS |  | **$70,256.20**

---

**Subtotal** | **$2,025,290.00** | **Percent of structure cost** | **45%**
**Percent of project cost** | **12.0%**

---

**Assumptions:**

1. 2% Design Contingency is included to account for the preliminary nature of the design and the fluctuation of prices
2. The cost of reconstructing the new Green Avenue approach roadway is not included
3. Cost per square foot of deck does not include the cost of removing the existing bridge

**Total (w/o Contingency and Mobilization):** **$4,303,870.00**

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**Design Contingency 1%**

| | | | **$645,580.50**

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**Total (w/o Contingency and Mobilization):** **$4,949,450.50**

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**Mobilization, Max, 10%**

| | | | **$430,387.00**

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**Total (w/o Contingency and Mobilization):** **$5,379,840.00**

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**Cost per Ft²** | **$226**

---

**Cost per Ft²** | **$275**

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**Aesthetics 1%**

| | | | **$35,830.00**

---

**Aesthetics 1%**

| | | | **$42,612.60**
## Preliminary Estimate

**Livernois Avenue over I-75**  
Job # 802330 (in Detroit)

**Bridge Replacement**

- **Preliminary Estimate**
- **Prepared by:** MRB Date: 8/22/2008
- **Checked by:** KMP Date: 9/5/2008

### Bridge Details

- **Bridge Width=103'-5" including (2-20' U-turn lanes, 3-13'-4" lanes, 2-10' medians, two 1'-8 1/2" aesthetic railing)**
- **Bridge Length=206'-5"**

### Cost Breakdown

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT COST</th>
<th>AMOUNT</th>
</tr>
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<tbody>
<tr>
<td><strong>Substructure</strong></td>
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<td></td>
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<td></td>
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<tr>
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**TOTAL (w/o Contingency and Mobilization) $3,560,790.00**

### Percentage Breakdown

- **Substructure: 54%**
- **Superstructure: 44%**
- **Misc.: 2%**
- **Maintenance of Traffic: 0%**

### Pretax Unit Costs

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<th>Unit Cost</th>
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<td>Excavation, Fdn</td>
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<td>Underdrain, Fdn, 6 inch</td>
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<td>Underdrain, Outlet Ending, 6 inch</td>
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<td>Pile, CIP Conc, Furn and Driven, 12 inch</td>
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<td>Substructure Conc</td>
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<tr>
<td>Reinforcement, Steel, Epoxy Coated</td>
<td>$1.10</td>
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<td>Wall Drain</td>
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<tr>
<td>Lightweight Aggregate, Mag, Cld</td>
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<tr>
<td>Sup. Structure Conc</td>
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<tr>
<td>Superstructure Conc, Night Casting</td>
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<td>False Decking</td>
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<td>Elec Grounding System</td>
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<tr>
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<tr>
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<tr>
<td>Bearing, Elastomeric, 3 inch</td>
<td>$185.00</td>
</tr>
<tr>
<td>Prest Conc Box Beam, Furn, 42 inch</td>
<td>$176.63</td>
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<tr>
<td>Prest Conc Box Beam, Erect, 42 inch</td>
<td>$12.00</td>
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<tr>
<td>Conduit, Schedule 80 PVC, 3 inch</td>
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<tr>
<td>Reinforcement, Mechanical Splice</td>
<td>$41.96</td>
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<tr>
<td>Fence, Structure</td>
<td>$10.01</td>
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<tr>
<td>Field Repr of Damaged Coating</td>
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<tr>
<td>Conc Quality Initiative</td>
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<td>Conc Quality Assurance, Structure</td>
<td>$11.00</td>
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<tr>
<td>Field Repr of Damaged Coating</td>
<td>$1.00</td>
</tr>
<tr>
<td>Conc Quality Assurance, Structure, Night casting</td>
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<tr>
<td>Field Repr of Damaged Coating</td>
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<tr>
<td>Field Repr of Damaged Coating</td>
<td>$1.00</td>
</tr>
</tbody>
</table>

**TOTAL (w/o Contingency and Mobilization) $3,560,790.00**

### Design Contingency

- **15%**
- **Percent of project cost: 12.0%**

### Design Staging

- **Max: 10%**
- **Percent of project cost: 8.0%**

### Aesthetics

- **1%**
- **Percent of project cost: 0.4%**

### TOTAL (w/o Contingency and Mobilization)

- **$3,745,850.00**

### Contingency

- **$561,880.00**
- **Percent of project cost: 12.0%**

### Mobilization

- **$356,080.00**
- **Percent of project cost: 9.0%**

### Aesthetics

- **$35,260.00**
- **Percent of project cost: 0.3%**

**TOTAL $4,450,990.00**

### ASSUMPTIONS:

1. **Special Provision Required**
2. **Cost per square ft of deck does not include the cost of removing the existing bridge**
3. **Cost per square ft of deck does not include the cost of removing the existing bridge**

---

**COST PER FT2: $192**

**COST PER FT2: $204**

**COST PER FT2: $238**
**Livernois Avenue over I-75**

**Bridge Replacement**

34" Web Steel Plate Girder Alternative

(2) Span - 106'-6" & 87'-6", Full Height Abutment

Subtotal $25,000.00

**Michigan Department of Transportation**

Preliminary Estimate

Prepared by: KMP Date: 8/12/2008

Checked by: MRB Date: 8/22/2008

Livernois Avenue over I-75

**Job # 802330**

(in Detroit)

**S10 of 82194**

Bridge Length=206'-5"

Bridge Width=103'-5" including (2-20' U-turn lanes, 3-13'-4" lanes, 2-10' medians, two 1'-8 1/2" aesthetic railing)

**ITEM QUANTITY UNIT UNIT COST AMOUNT**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Amount</th>
</tr>
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<tbody>
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<td>$16,161</td>
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**Superstructure**

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**Misc.**

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**Maintenance of Traffic**

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**ASSUMPTIONS:**

1) A 15% design contingency is included to account for the preliminary nature of the design and the fluctuation of prices
2) The cost of reconstructing the new Livernois Avenue approach roadway is not included
3) Cost per square foot of deck does not include the cost of removing the existing bridge

**SUBTOTAL (w/o Contingency and Mobilization)** $4,511,550.00

**TOTAL** $4,654,030.00

**Design Contingency** 15% 1 LS $676,730.00 $676,730.00

**Mobilization** 10% 1 LS $465,400.00 $465,400.00

**TOTAL** $5,817,530.00

**SUBTOTAL** $5,348,000.00

**COST PER FT^2** $258

**Area of Deck (ft^2)** 20,720

**COST PER FT^2** $130

**Area of Deck (ft^2)** 20,720
## Michigan Department of Transportation

**Preliminary Estimate**

**Job # 82194**

**Bridge Replacement**

### Bridge Replacement

**Clark Ave. over I-75 (in Detroit)**

**Job # 802330**

**Bridge Width:**

- **16 - 42" Spread PPC Box Beam Alternative**
- **39 - 42" Side-by-Side PPC Box Beam Alternative**

**Bridge Length:**

- **179'-2"**

### Substructure

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
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<th>AMOUNT</th>
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<td>Structures, Rem</td>
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<td>4 Ea</td>
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<td>7050020</td>
<td>Pile, CIP Conc, Furn and Driven, 12 inch</td>
<td>20,903 Ft</td>
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<td>Substructure Conc</td>
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**SUBTOTAL**

**$2,104,050.00**

**Percent of structure cost:** 39%

### Superstructure

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<td>7060022</td>
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<td>Conduit, Schedule 80 PVC, 3 inch</td>
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**SUBTOTAL**

**$1,368,240.00**

**Percent of structure cost:** 37%

### Miscellaneous

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**SUBTOTAL**

**$46,530.00**

**Percent of structure cost:** 1.0%

### Maintenance of Traffic

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**SUBTOTAL**

**$17,720.00**

**Percent of structure cost:** 0.5%

### Contractor Services

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**SUBTOTAL**

**$83,800.00**

**Percent of structure cost:** 1.6%

### Aesthetics

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**SUBTOTAL**

**$61,512.30**

**Percent of structure cost:** 1%
### Preliminary Estimate

**MICHIGAN DEPARTMENT OF TRANSPORTATION**

**Preliminary Estimate**

**Preliminary Estimate (Major Pay Items)**

Prepared by: KMP Date: 10/01/2008

Checked by: KMP Date: 9/5/2008

**Job # 802330**

(in Detroit)

**New Bridge**

84" Web Cored Steel Plate Girder Alternative (Radius = 1340 ft)

Spans 166'-0", 166'-0", 212'-0" and 166'-0", Full Bridge Alternatives

**Bridge Width=123'-5" including (2-20' U-turn lanes, 5-12' lanes, 2-10' median, two 1'-8 1/2" aesthetic railing)**

**Substructure**

- 34" Web Steel Plate Girder Alternative
- 2067021 Lightweight Aggregate, Slag, LM 3,172 Cyd $25 $79,289.22
- 2067021 Lightweight Aggregate, Slag, LM 705 Cyd $25 $17,632.55

**Superstructure**

- 7060010 Substructure Conc 1,145 Cyd $402.00 $460,285.95
- 7050020 Pile, CIP Conc, Furn and Driven, 12 inch 20,903 Ft $26.00 $543,470.92
- 7060035 Reinforcement, Steel, Epoxy Coated 125,229 Lb $1.10 $137,751.61
- 2067021 Lightweight Aggregate, Slag, LM 3,172 Cyd $25 $79,289.22
- 2067021 Lightweight Aggregate, Slag, LM 705 Cyd $25 $17,632.55

**Misc.**

- 1000001 Mobilization, Max, 10% 1 LS $703,508.00 $703,508.00
- 1000001 Mobilization, Max, 10% 1 LS $475,300.00 $475,300.00

**Total**

$9,146,000

**Percent of project cost**

1.6%
**MICHIGAN DEPARTMENT OF TRANSPORTATION**

Preliminary Estimate (Major Pay Items)

Prepared by: KMP  Date: 10/26/2008

**Ramp B over NB Service Drive, Livernois and Fort Street**

Job #  802330  (in Detroit)

S38 of 82194

New Bridge

Unit 1 - 54" Web Curved Steel Plate Girder Alternative (Radius = 1500 feet)  

Spans 127'-6" , 158'-9", 150'-3" and 110'-0" with High Wall and 95th Street Abutments

Unit 2 - 84" Web Curved Steel Plate Girder Alternative (Radius = 1500 feet)  

Spans 86'-8" and 114'-8", High Wall Abutments, Straddle Bent

Bridge Width=45'-3" including (2-12'-lanes, 8'inside and 10' outside shoulder, 1'-7 1/2" parapets)

Bridge Length=949'-6"

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**SUBTOTAL** | | | | $1,608,920 |

**SUPERSTRUCTURE**

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**SUBTOTAL** | | | | $8,279,910 |

**MICHIGAN DEPARTMENT OF TRANSPORTATION**

Preliminary Estimate (Major Pay Items)

Prepared by: KMP  Date: 9/26/2008

**Ramp C over I-75**

Job #  802330  S39 of 82194 and S40 of 82194  (in Detroit)

New Bridges

S39 of 82194 - 84" Web Curved Steel Plate Girder Alternative (Radius = 1641 feet)  

Spans 153'-0", 257'-8", 192'-6", 159'-6", and 142'-0", High Wall Abutments, Straddle Bent

S40 of 82194 - 54" Web Curved Steel Plate Girder Alternative (Radius = 818 feet)  

Spans 86'-8" and 114'-8", High Wall Abutments, Straddle Bent

Bridge Width=45'-3" including (2-12'-lanes, 8'inside and 16' outside shoulder, 1'-7 1/2" parapets)

Bridge Length=1103'-2" (Structure 1), 201'-4" (Structure 2)

<table>
<thead>
<tr>
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<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT COST</th>
<th>AMOUNT</th>
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<tr>
<td>Substructure</td>
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<tr>
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<td>$25.00</td>
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</table>

**SUBTOTAL** | | | | $1,608,920 |

**SUPERSTRUCTURE**

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<th>UNIT COST</th>
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<td>LS</td>
<td>$557,819</td>
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<td>4,302</td>
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**SUBTOTAL** | | | | $8,279,910 |

**ASSUMPTIONS:**

(1) A 20% design contingency is included to account for the preliminary nature of the design and the fluctuation of prices

(2) The cost of reconstructing the new approach roadway is not included

COST PER FT" = $217
### Preliminary Estimate (Major Pay Items)

**Prepared by:** KMP  
**Date:** 9/24/2008  
**Checked by:** KMP  
**Date:** 11/11/2008

**MICHIGAN DEPARTMENT OF TRANSPORTATION**

**Ramp D over I-75**  
**Job #: 802330**  
*(in Detroit)*  
**Cost Estimate**

**New Bridge**

**Bridge Width = 62'**

- 114" and 84" Web Curved Steel Plate Girder Alternative (Radius = 1574 feet)
- 6 - 42" Spread PPC Box Beam Alternative

#### Substructure

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
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<th>AMOUNT</th>
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<tbody>
<tr>
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#### Superstructure

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<td>7070008</td>
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#### Maintenance of Traffic

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#### Aesthetics

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### Preliminary Estimate

**Prepared by:** AIK  
**Date:** 10/30/2008  
**Checked by:** KMP  
**Date:** 11/11/2008

**MICHIGAN DEPARTMENT OF TRANSPORTATION**

**Ramp E over Ramp F**  
**Job #: 802330**  
*(in Detroit)*

**Cost Estimate**

**New Bridge**

**Bridge Width = 42'**

- Single Span - (112'-0"), Full Height Abutment

#### Substructure

<table>
<thead>
<tr>
<th>ITEM</th>
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<th>UNIT COST</th>
<th>AMOUNT</th>
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<tbody>
<tr>
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#### Superstructure

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<th>UNIT</th>
<th>UNIT COST</th>
<th>AMOUNT</th>
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<td>$25,883.75</td>
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<td>$1,875.00</td>
<td>$1,875.00</td>
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<tr>
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<tr>
<td>7070001</td>
<td>Floating Expansion Bearing</td>
<td>56</td>
<td>$1,984.50</td>
<td>$111,132.00</td>
</tr>
<tr>
<td>7070007</td>
<td>Bearing, Elastomeric, 3 inch</td>
<td>23</td>
<td>$185.00</td>
<td>$4,255.00</td>
</tr>
<tr>
<td>7070008</td>
<td>Structural Steel, Plate, Furn and Fab</td>
<td>6,824,765</td>
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<td>Shear Developers</td>
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### Miscellaneous

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### Aesthetics

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<th>AMOUNT</th>
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<tbody>
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### Maintenance of Traffic

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### Design Contingency

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<tr>
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<td>Mobilization, Max</td>
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### Total

**TOTAL (w/o Contingency and Mobilization)**

- **Subtotal:** $1,394,770.00
- **Design Contingency:** $2,563,444
- **Total:** $3,958,214.00

### Assumptions

1. A 20% design contingency is included to account for the preliminary nature of the design and the fluctuation of prices
2. The cost of reconstructing the new approach roadway is not included
3. Wing walls included in the Cost Estimate and the Square Foot Cost.
### Preliminary Estimate

**Ramp E over Ramp F**

**Job #: 802350**

(4) 123'-6" Max. Span, Flared Girders High Wall Abutments

**Three-Sided Concrete Structure**

- **Bridge Clear Width=42'-0'**

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<th>Quantity</th>
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<table>
<thead>
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<th>Quantity</th>
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<tr>
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**Total (w/o Contingency and Mobilization) $1,210,230.00**

### ASSUMPTIONS:

- 1) A 15% design contingency is included to account for the preliminary nature of the design and the fluctuation of prices
- 2) Area of Deck taken as Bridge Alternative.
- 3) Wing walls included in the cost.
- 4) Pavement not included in the cost.

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridge Width varies 81'-2 1/4&quot; to 125'-9 5/8&quot; including (6-12-lane, 8&quot; min. inside and 10&quot; min. outside shoulder, 1'-6&quot; parapets)</td>
<td>1</td>
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### TOTAL (w/o Contingency and Mobilization) $4,251,770.00

**ASSUMPTIONS:**

- 1) A 20% design contingency is included to account for the preliminary nature of the design and the fluctuation of prices
- 2) Area of Deck taken as Bridge Alternative.
- 3) Wing walls included in the cost.
- 4) Pavement not included in the cost.

**Cost Per SqFt = $365**

---

_MICHIGAN DEPARTMENT OF TRANSPORTATION_
# Preliminary Estimate (Major Pay Items)

| Job: # 802330 | Phase: R01-4 of 82194 | Location: (in Detroit) | New Bridges 38" Steel Plate Girder Alternative | Small Spans, Steel Girder, High Approach Parapet |

**MICHIGAN DEPARTMENT OF TRANSPORTATION**

**Preliminary Estimate**

Prepared by: KMP Date: 10/14/2008

Prepared by: MRB Date: 9/16/2008

Checked by: Date:

Checked by: Date:

Ramps A & C over the Norfolk Southern RR and Plaza Drive

**Job # 802330**

(in Detroit)

R01-4 of 82194

Cost per square foot of deck does not include the cost of removing the existing bridge

- **P01 of 82194**
  - Bridge Clear Width=14'-0"

## Substructure

<table>
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**Total Substructure** $236,390.00

## Superstructure

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**Total Superstructure** $2,002,300.00

## Maintenance of Traffic

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>702020</td>
<td>1,124</td>
<td>ft²</td>
<td>$10.01</td>
<td>$11,480.00</td>
</tr>
</tbody>
</table>

**Total Maintenance of Traffic** $15,100.00

**Total** (w/o Contingency and Mobilization) $805,420.00

## Aesthetics

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>706000</td>
<td>1</td>
<td>LS</td>
<td>$30,949.50</td>
<td>$30,949.50</td>
</tr>
</tbody>
</table>

**Total Aesthetics** $30,950.00

**Total (w/o Contingency and Mobilization) $805,420.00**

### ASSUMPTIONS:

- **Special Provision Required**: 1) A 2% design contingency is included to account for the preliminary nature of the design and the fluctuation of prices
  
2) The cost of reconstructing the new approach roadway is not included
  
3) Wing walls are included in the estimated cost and the cost per square foot.

**TOTAL** $3,907,000.00

**Area of Deck (ft²)**: $1,017,360.00

**Cost per ft²**: $302

---

**Ramps A & C over the Norfolk Southern RR and Plaza Drive**

**Job: # 802330**

(in Detroit)

**P01 of 82194**

**Bridge Clear Width=14'-0"

## Substructure

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>702030</td>
<td>20,840</td>
<td>ft²</td>
<td>$25.00</td>
<td>$521,000.00</td>
</tr>
<tr>
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<td>17,571</td>
<td>yd³</td>
<td>$26.00</td>
<td>$467,000.00</td>
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<tr>
<td>706000</td>
<td>1,751</td>
<td>yd³</td>
<td>$402.00</td>
<td>$703,861.80</td>
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<tr>
<td>706000</td>
<td>29,008</td>
<td>lb</td>
<td>$1.10</td>
<td>$31,908.38</td>
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<tr>
<td>706000</td>
<td>175,090</td>
<td>lb</td>
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<td>$192,599.00</td>
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<td>706000</td>
<td>4,000</td>
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**Total Substructure** $236,390.00

## Superstructure

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<td>706000</td>
<td>258</td>
<td>cyd</td>
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<td>$34,669.87</td>
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**Total Superstructure** $2,002,300.00

## Maintenance of Traffic

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Cost</th>
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</thead>
<tbody>
<tr>
<td>702020</td>
<td>1,124</td>
<td>ft²</td>
<td>$10.01</td>
<td>$11,480.00</td>
</tr>
</tbody>
</table>

**Total Maintenance of Traffic** $15,100.00

**Total** (w/o Contingency and Mobilization) $805,420.00

## Aesthetics

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>706000</td>
<td>1</td>
<td>LS</td>
<td>$30,949.50</td>
<td>$30,949.50</td>
</tr>
</tbody>
</table>

**Total Aesthetics** $30,950.00

**Total (w/o Contingency and Mobilization) $805,420.00**

### ASSUMPTIONS:

- **Special Provision Required**: 1) A 2% design contingency is included to account for the preliminary nature of the design and the fluctuation of prices
  
2) The cost of reconstructing the new approach roadway is not included
  
3) Wing walls are included in the estimated cost and the cost per square foot.

**TOTAL** $3,907,000.00

**Area of Deck (ft²)**: $1,017,360.00

**Cost per ft²**: $302
Beard Ave. Pedestrian Bridge over I-75
Job # 802330
(in Detroit)
Prepared by: MRB Date: 9/16/2008

**MICHIGAN DEPARTMENT OF TRANSPORTATION**

**Preliminary Estimate**

**Prepared by:** MRB  **Date:** 9/16/2008

**Job # 802330**

**(2 Spans - 89'-0" & 101'-0" plus Ramps)**

**Bridge Clear Width-0'-0"**

**Substructure**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT COST</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>700005</td>
<td>3,640</td>
<td>Sq Ft</td>
<td>0.25</td>
<td>$912,000.00</td>
</tr>
<tr>
<td>700010</td>
<td>398</td>
<td>Cyl</td>
<td>$822.80</td>
<td>$329,374.75</td>
</tr>
<tr>
<td>700034</td>
<td>11,367</td>
<td>Lb</td>
<td>$1.10</td>
<td>$12,704.82</td>
</tr>
</tbody>
</table>

**Superstructure**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT COST</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>700005</td>
<td>204,002</td>
<td>Structures, Rem</td>
<td>3,648 Sq Ft</td>
<td>$25</td>
</tr>
<tr>
<td>700010</td>
<td>70,600</td>
<td>Substructure Conc</td>
<td>309 Cyd</td>
<td>$402.00</td>
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<tr>
<td>700034</td>
<td>70,600</td>
<td>Reinforcement, Steel, Epoxy Coated</td>
<td>33,797 Lb</td>
<td>$1.10</td>
</tr>
</tbody>
</table>

**SUBTOTAL** $252,710.00

| Percent of structure cost | 22% |

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT COST</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>700010</td>
<td>70,600</td>
<td>Substructure Conc</td>
<td>242 Cyd</td>
<td>$134.50</td>
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<tr>
<td>700034</td>
<td>70,600</td>
<td>Superstructure Conc, Form, Finish, and Cure</td>
<td>1 LS</td>
<td>$101,813.40</td>
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<tr>
<td>700031</td>
<td>70,600</td>
<td>Expansion Joint Device</td>
<td>30 Ft</td>
<td>$123.63</td>
</tr>
<tr>
<td>700032</td>
<td>70,600</td>
<td>False Decking</td>
<td>13,593 Sq Ft</td>
<td>$0.56</td>
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<tr>
<td>700034</td>
<td>70,600</td>
<td>Reinforcement, Steel, Epoxy Coated</td>
<td>110,224 Lb</td>
<td>$1.10</td>
</tr>
<tr>
<td>700072</td>
<td>70,600</td>
<td>Structural Steel, Plate, Furn and Fab</td>
<td>76,414 Lb</td>
<td>$1.87</td>
</tr>
<tr>
<td>700078</td>
<td>70,600</td>
<td>Structural Steel, Plate, Erect</td>
<td>76,414 Lb</td>
<td>$0.18</td>
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<tr>
<td>700080</td>
<td>70,600</td>
<td>Shear Developers</td>
<td>1 LS</td>
<td>$2,304.00</td>
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<tr>
<td>8080110</td>
<td>70,600</td>
<td>Fence, Structure</td>
<td>13,260 Sq Ft</td>
<td>$10.01</td>
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</table>

**SUBTOTAL** $590,460.00

| Percent of structure cost | 51% |

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT COST</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>6050101</td>
<td>6050101 Conc Quality Initiative</td>
<td>2,487 Dlr</td>
<td>$1.00</td>
<td>$2,486.73</td>
</tr>
<tr>
<td>7060008</td>
<td>7060008 Conc Quality Assurance, Structure</td>
<td>607 Cyd</td>
<td>$11.00</td>
<td>$6,677.35</td>
</tr>
</tbody>
</table>

**SUBTOTAL** $9,160.00

| Percent of structure cost | 0.8% |

**Subtotal (w/o Contingency and Mobilization)** $882,460.00

**Design Contingency 20%**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT COST</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1040005</td>
<td>1040005 Contractor Staking, Bridge</td>
<td>1 LS</td>
<td>$17,131.80</td>
<td>$17,131.80</td>
</tr>
</tbody>
</table>

**SUBTOTAL** $176,490.00

| Percent of project cost | 15.4% |

**Subtotal (w/o Contingency and Mobilization)** $882,460.00

**Mobilization, Max, 10%**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT COST</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000001</td>
<td>1000001 Mobilization, Max</td>
<td>1 LS</td>
<td>$88,246.00</td>
<td>$88,246.00</td>
</tr>
</tbody>
</table>

**SUBTOTAL** $88,250.00

| Percent of project cost | 7.7% |

**Total ($w/o Contingency and Mobilization)** $1,147,200.00

**ASSUMPTIONS:**

1. **Area of Deck (ft2) = 9945**
2. **Cost per square foot of deck does not include the cost of removing the existing bridge**
3. **COST PER FT² = $104**

**Waterman Ave. Pedestrian Bridge over I-75**

**Job # 802330**

**(2 Spans - 116'-0" & 112'-0" plus Ramps)**

**Bridge Clear Width-14'-0"**

**Substructure**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT COST</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>700005</td>
<td>3,640</td>
<td>Sq Ft</td>
<td>0.25</td>
<td>$912,000.00</td>
</tr>
<tr>
<td>700010</td>
<td>398</td>
<td>Cyl</td>
<td>$822.80</td>
<td>$329,374.75</td>
</tr>
<tr>
<td>700034</td>
<td>11,367</td>
<td>Lb</td>
<td>$1.10</td>
<td>$12,704.82</td>
</tr>
</tbody>
</table>

**SUBTOTAL** $252,710.00

| Percent of structure cost | 22% |

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT COST</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>700010</td>
<td>298</td>
<td>Cyl</td>
<td>$134.50</td>
<td>$40,045.53</td>
</tr>
<tr>
<td>700034</td>
<td>7070073</td>
<td>Expansion Joint Device</td>
<td>30 Ft</td>
<td>$123.63</td>
</tr>
<tr>
<td>7070078</td>
<td>7070078</td>
<td>Structural Steel, Plate, Furn and Fab</td>
<td>189,201 Lb</td>
<td>$1.87</td>
</tr>
</tbody>
</table>

**SUBTOTAL** $325,760.00

| Percent of structure cost | 36% |

**Superstructure**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT COST</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>700010</td>
<td>298</td>
<td>Cyl</td>
<td>$134.50</td>
<td>$40,045.53</td>
</tr>
<tr>
<td>700034</td>
<td>7070073</td>
<td>Expansion Joint Device</td>
<td>30 Ft</td>
<td>$123.63</td>
</tr>
<tr>
<td>7070078</td>
<td>7070078</td>
<td>Structural Steel, Plate, Furn and Fab</td>
<td>189,201 Lb</td>
<td>$1.87</td>
</tr>
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</table>

**SUBTOTAL** $325,760.00

| Percent of structure cost | 36% |

**Miscellaneous**

<table>
<thead>
<tr>
<th>ITEM</th>
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<th>UNIT COST</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>6050101</td>
<td>6050101 Conc Quality Initiative</td>
<td>1,946 Dlr</td>
<td>$1.00</td>
<td>$1,945.51</td>
</tr>
<tr>
<td>7060008</td>
<td>7060008 Conc Quality Assurance, Structure</td>
<td>484 Cyd</td>
<td>$11.00</td>
<td>$5,328.31</td>
</tr>
</tbody>
</table>

**SUBTOTAL** $7,270.00

| Percent of structure cost | 0.8% |

**Maintenance of Traffic**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT COST</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2090001</td>
<td>2090001 Project Cleanup</td>
<td>0.5%</td>
<td>1 LS</td>
<td>$3,550.85</td>
</tr>
</tbody>
</table>

**SUBTOTAL** $3,550.00

| Percent of structure cost | 0.4% |

**Subtotal (w/o Contingency and Mobilization)** $373,270.00

**Design Contingency 20%**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT COST</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1040005</td>
<td>1040005 Contractor Staking, Bridge</td>
<td>1 LS</td>
<td>$14,734.00</td>
<td>$14,734.00</td>
</tr>
</tbody>
</table>

**SUBTOTAL** $29,468.00

| Percent of project cost | 15.4% |

**Subtotal (w/o Contingency and Mobilization)** $373,270.00

**Mobilization, Max, 10%**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT COST</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000001</td>
<td>1000001 Mobilization, Max</td>
<td>1 LS</td>
<td>$88,246.00</td>
<td>$88,246.00</td>
</tr>
</tbody>
</table>

**SUBTOTAL** $88,250.00

| Percent of project cost | 7.7% |

**Total ($w/o Contingency and Mobilization)** $575,580.00

**ASSUMPTIONS:**

1. **Area of Deck (ft2) = 9945**
2. **Cost per square foot of deck does not include the cost of removing the existing bridge**
3. **COST PER FT² = $104**

**CONTRACTOR PROVISIONS**

1. A 20% design contingency is included to account for the preliminary nature of the design and the fluctuation of prices
2. Cost of removing existing bridge is not included in this estimate
### Preliminary Estimate

#### Substructure

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superstructure</td>
<td>122 Cyd</td>
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<tr>
<td>Reinforcement, Steel, Epoxy Coated</td>
<td>12,516 Lb</td>
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<td><strong>SUBTOTAL</strong></td>
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<tr>
<td>Percent of structure cost</td>
<td></td>
<td></td>
<td><strong>11%</strong></td>
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</table>

#### Superstructure

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>Superstructure Conc</td>
<td>123 Cyd</td>
<td>$134.50</td>
<td>$16,580.74</td>
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<td>Superstructure Conc, Form, Finish, and Cure</td>
<td>1 LS</td>
<td>$51,776.30</td>
<td>$51,776.30</td>
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</tr>
<tr>
<td>Expansion Joint Device</td>
<td>18 Ft</td>
<td>$123.63</td>
<td>$2,225.34</td>
<td></td>
</tr>
<tr>
<td>False Decking</td>
<td>4,005 Sft</td>
<td>$0.56</td>
<td>$2,242.80</td>
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</tr>
<tr>
<td>Reinforcement, Steel, Epoxy Coated</td>
<td>53,289 Lb</td>
<td>$1.10</td>
<td>$58,617.63</td>
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<td>Bearing, Elastomeric, 3 inch</td>
<td>5 Sft</td>
<td>$185.00</td>
<td>$925.00</td>
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</tr>
<tr>
<td>Structural Steel, Plate, Furn and Fab</td>
<td>73,756 Lb</td>
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<td>$137,923.67</td>
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<tr>
<td>Structural Steel, Plate, Erect</td>
<td>73,756 Lb</td>
<td>$0.18</td>
<td>$13,276.08</td>
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<tr>
<td>Shear Developers</td>
<td>1 LS</td>
<td>$1,840.00</td>
<td>$1,840.00</td>
<td></td>
</tr>
<tr>
<td>Fence, Structure</td>
<td>8,900 Sft</td>
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<td>$89,089.00</td>
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<td><strong>SUBTOTAL</strong></td>
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</tr>
<tr>
<td>Percent of structure cost</td>
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<td><strong>63%</strong></td>
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</table>

#### Misc.

<table>
<thead>
<tr>
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<th>Quantity</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conc Quality Initiative</td>
<td>978 Dlr</td>
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<td>$977.51</td>
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<tr>
<td>Conc Quality Assurance, Structure</td>
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<td><strong>SUBTOTAL</strong></td>
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<td><strong>$3,670.00</strong></td>
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<tr>
<td>Percent of structure cost</td>
<td></td>
<td></td>
<td><strong>0.6%</strong></td>
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</tr>
</tbody>
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#### Maintenance of Traffic

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SUBTOTAL</strong></td>
<td></td>
<td></td>
<td><strong>$0.00</strong></td>
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#### Miscellaneous

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Cleanup</td>
<td>0.5%</td>
<td>1 LS</td>
<td>$3,840.75</td>
<td>$3,840.75</td>
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<tr>
<td>Contractor Staking, Bridge</td>
<td>1 LS</td>
<td>$15,439.80</td>
<td>$15,439.80</td>
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</tr>
<tr>
<td>Shear Developers</td>
<td>1 LS</td>
<td>$7,874.30</td>
<td>$7,874.30</td>
<td></td>
</tr>
<tr>
<td><strong>SUBTOTAL</strong></td>
<td></td>
<td></td>
<td><strong>$27,072.85</strong></td>
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</tr>
</tbody>
</table>

### TOTAL (w/o Contingency and Mobilization)

- **$456,390.00**
- **$91,278.00**
- **$45,639.00**
- **$593,310.00**

**Assumptions:**

- Area of Deck (ft²): 4005
- **Cost per ft² = $148**

---

### Preliminary Estimate

#### Substructure

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>Structural, Rein</td>
<td>0 Sq</td>
<td>$25</td>
<td>$0.00</td>
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<tr>
<td>Reinforcement, Steel, Epoxy Coated</td>
<td>31,166 Lb</td>
<td>$1.10</td>
<td>$34,293.26</td>
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<tr>
<td><strong>SUBTOTAL</strong></td>
<td></td>
<td></td>
<td><strong>$64,640.00</strong></td>
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</tr>
<tr>
<td>Percent of structure cost</td>
<td></td>
<td></td>
<td><strong>11%</strong></td>
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</tr>
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#### Superstructure

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Superstructure Conc</td>
<td>287 Cyd</td>
<td>$822.80</td>
<td>$115,361.30</td>
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<tr>
<td>Reinforcement, Steel, Epoxy Coated</td>
<td>107,896 Lb</td>
<td>$1.10</td>
<td>$118,685.88</td>
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<tr>
<td>Bearing, Elastomeric, 3 inch</td>
<td>7 Sft</td>
<td>$185.00</td>
<td>$1,295.00</td>
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<tr>
<td>Structural Steel, Plate, Furn and Fab</td>
<td>91,057 Lb</td>
<td>$1.87</td>
<td>$170,277.17</td>
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<tr>
<td>Structural Steel, Plate, Erect</td>
<td>91,057 Lb</td>
<td>$0.18</td>
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<tr>
<td>Shear Developers</td>
<td>1 LS</td>
<td>$2,544.00</td>
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<tr>
<td>Fence, Structure</td>
<td>12,980 Sft</td>
<td>$10.01</td>
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<td><strong>SUBTOTAL</strong></td>
<td></td>
<td></td>
<td><strong>$609,890.00</strong></td>
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</tr>
<tr>
<td>Percent of structure cost</td>
<td></td>
<td></td>
<td><strong>59%</strong></td>
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#### Misc.

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<th>Unit Cost</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conc Quality Initiative</td>
<td>2,307 Dlr</td>
<td>$1.00</td>
<td>$2,307.23</td>
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<tr>
<td>Conc Quality Assurance, Structure</td>
<td>578 Cyd</td>
<td>$11.00</td>
<td>$6,362.59</td>
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<tr>
<td><strong>SUBTOTAL</strong></td>
<td></td>
<td></td>
<td><strong>$8,670.00</strong></td>
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</tr>
<tr>
<td>Percent of structure cost</td>
<td></td>
<td></td>
<td><strong>0.8%</strong></td>
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#### Maintenance of Traffic

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<tr>
<th>Item</th>
<th>Quantity</th>
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<th>Amount</th>
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<tbody>
<tr>
<td><strong>SUBTOTAL</strong></td>
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<td></td>
<td><strong>$0.00</strong></td>
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</table>

#### Miscellaneous

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<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>Project Cleanup</td>
<td>0.5%</td>
<td>1 LS</td>
<td>$3,840.75</td>
<td>$3,840.75</td>
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<tr>
<td>Contractor Staking, Bridge</td>
<td>1 LS</td>
<td>$15,439.80</td>
<td>$15,439.80</td>
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<tr>
<td><strong>SUBTOTAL</strong></td>
<td></td>
<td></td>
<td><strong>$19,280.55</strong></td>
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</tr>
</tbody>
</table>

### TOTAL (w/o Contingency and Mobilization)

- **$795,300.00**
- **$159,060.00**
- **$79,530.00**
- **$1,033,890.00**

**Assumptions:**

- Area of Deck (ft²): 9735
- **Cost per ft² = $106**

---
### Michigan Department of Transportation

**Retaining Walls**

**Preliminary Estimate**

**Job # 802330**

**Retaining Walls**

**Summary of Options**

(in Detroit)

<table>
<thead>
<tr>
<th>WALL OPTIONS</th>
<th>CONSTRUCTION COST</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>Option1: Steel Sheet Pile w/ Conc Face</td>
</tr>
<tr>
<td></td>
<td>Option2: Precast Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option3: Cast-in-Place Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option4: Soldier Pile &amp; Lagging w/ Conc Face</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Option1: Steel Sheet Pile w/ Conc Face</td>
</tr>
<tr>
<td></td>
<td>Option2: Precast Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option3: Cast-in-Place Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option4: Soldier Pile &amp; Lagging w/ Conc Face</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>Option1: Steel Sheet Pile w/ Conc Face</td>
</tr>
<tr>
<td></td>
<td>Option2: Precast Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option3: Cast-in-Place Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option4: Soldier Pile &amp; Lagging w/ Conc Face</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Option1: Steel Sheet Pile w/ Conc Face</td>
</tr>
<tr>
<td></td>
<td>Option2: Precast Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option3: Cast-in-Place Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option4: Soldier Pile &amp; Lagging w/ Conc Face</td>
</tr>
<tr>
<td><strong>E</strong></td>
<td>Option1: Precast Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option2: Cast-in-Place Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option3: MSE Wall</td>
</tr>
<tr>
<td></td>
<td>Option4: Soldier Pile &amp; Lagging w/ Conc Face</td>
</tr>
<tr>
<td><strong>F</strong></td>
<td>Option1: Precast Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option2: Cast-in-Place Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option3: MSE Wall</td>
</tr>
<tr>
<td></td>
<td>Option4: Soldier Pile &amp; Lagging w/ Conc Face</td>
</tr>
<tr>
<td><strong>G</strong></td>
<td>Option1: Precast Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option2: Cast-in-Place Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option3: MSE Wall</td>
</tr>
<tr>
<td></td>
<td>Option4: Soldier Pile &amp; Lagging w/ Conc Face</td>
</tr>
<tr>
<td><strong>H</strong></td>
<td>Option1: Precast Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option2: Cast-in-Place Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option3: MSE Wall</td>
</tr>
<tr>
<td></td>
<td>Option4: Soldier Pile &amp; Lagging w/ Conc Face</td>
</tr>
<tr>
<td><strong>I</strong></td>
<td>Option1: Precast Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option2: Cast-in-Place Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option3: MSE Wall</td>
</tr>
<tr>
<td></td>
<td>Option4: Soldier Pile &amp; Lagging w/ Conc Face</td>
</tr>
<tr>
<td><strong>J</strong></td>
<td>Option1: Precast Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option2: Cast-in-Place Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option3: MSE Wall</td>
</tr>
<tr>
<td></td>
<td>Option4: Soldier Pile &amp; Lagging w/ Conc Face</td>
</tr>
<tr>
<td><strong>K</strong></td>
<td>Option1: Prefab Wall</td>
</tr>
<tr>
<td></td>
<td>Option2: Cast-in-Place Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option3: MSE Wall</td>
</tr>
<tr>
<td></td>
<td>Option4: Soldier Pile &amp; Lagging w/ Conc Face</td>
</tr>
<tr>
<td><strong>L</strong></td>
<td>Option1: Prefab Wall</td>
</tr>
<tr>
<td></td>
<td>Option2: Cast-in-Place Cantilever Wall</td>
</tr>
<tr>
<td></td>
<td>Option3: MSE Wall</td>
</tr>
<tr>
<td></td>
<td>Option4: Soldier Pile &amp; Lagging w/ Conc Face</td>
</tr>
</tbody>
</table>

Note: Preferred option in bold.

* MSE wall option is not applicable since EPS blocks should be used for this wall because of settlement issues.
## Demolition Cost Estimate

(for structures not being replaced)

<table>
<thead>
<tr>
<th>Structure</th>
<th>Area (Sq.ft)</th>
<th>Unit Cost</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casgrain Street Pedestrian Bridge</td>
<td>3885.5</td>
<td>$25</td>
<td>$97,138</td>
</tr>
<tr>
<td>Dragoon St. Bridge</td>
<td>16179.75</td>
<td>$25</td>
<td>$404,494</td>
</tr>
<tr>
<td>Cavalry Street Pedestrian Bridge</td>
<td>5323.5</td>
<td>$25</td>
<td>$133,088</td>
</tr>
<tr>
<td>Junction Street Bridge</td>
<td>10579</td>
<td>$25</td>
<td>$264,475</td>
</tr>
<tr>
<td>Ferdinand Street Pedestrian Bridge</td>
<td>3638.5</td>
<td>$25</td>
<td>$90,963</td>
</tr>
<tr>
<td>Waterman Street</td>
<td>21249</td>
<td>$25</td>
<td>$531,225</td>
</tr>
</tbody>
</table>

Sub Total = $1,521,381

20% Contingency = $304,276

Total = $1,825,658
Appendix C

Comparative Cost Estimate – Steel Girder vs. Tub Girder (Ramp D)
**Ramp D over I-75**  
Job # 8022330  
(in Detroit)  
SXX of 82194  
New Bridge  

Unit 2 Spans 241'-6", 357'-6" and 241'-6". Pile Bent Abutment  

Unit Length=840'-6"  

Bridge Width=45'-3" including (2-12'-lanes, 8' inside and 10' outside shoulder, 1'-7 1/2" parapets)  

### Curved Steel Plate Girder Alternative

<table>
<thead>
<tr>
<th>Girder</th>
<th>Weight (lbs)</th>
<th>Total Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>558,920</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>561,080</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>563,640</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>566,200</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>658,930</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>656,260</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>666,640</td>
<td></td>
</tr>
<tr>
<td>Cross Frames</td>
<td>127,940</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,359,610</strong></td>
<td><strong>6,539,415</strong></td>
</tr>
</tbody>
</table>

*Units Costs are from Industrial Steel Corp. from a recent Michigan Bridge Project*

### Steel Curved Tub Girder Alternative

<table>
<thead>
<tr>
<th>Tub Girder</th>
<th>Weight (lbs)</th>
<th>Total Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1,493,800</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1,912,000</td>
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</tr>
<tr>
<td>Cross Frames</td>
<td>274,690</td>
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</tr>
<tr>
<td>Longitudinal Bracing</td>
<td>132,980</td>
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</tr>
<tr>
<td>Longitudinal Flange Splice</td>
<td>128,800</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,942,270</strong></td>
<td><strong>8,278,767</strong></td>
</tr>
</tbody>
</table>

*Units Costs are from Industrial Steel Corp. from a recent Michigan Bridge Project*
Appendix D - Geotechnical Report
(To come Nov. 30, 2008)