February 16, 2024

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City of Stamford – Engineering Department
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Subject: Bridge No. 02212
Main Street over Rippowam River
Main Street Bridge Study

The City of Stamford (City) has retained BL Companies, Inc. (BL) to evaluate four rehabilitation/replacement options to address the deteriorated condition of Bridge No. 02212 while considering the potential historical and cultural impacts associated with each option. As part of the study, BL reviewed several documents outlining the existing condition, the prior structural evaluation, and the historical significance of the bridge, as well as performed a site visit to observe the current condition of the structure and to gather other relevant site information. This memorandum outlines the design, construction, and cost considerations associated with each option provided by the City, which will aid the City in determining a final scope of work for the subject bridge.

EXISTING BRIDGE BACKGROUND:

Bridge No. 02212, originally constructed in 1888, supports Main Street over the Rippowam River in Stamford, Connecticut. The existing bridge consists of a two-span wrought iron pin-connected lenticular pony-truss superstructure supported by stone masonry abutments, a stone masonry center pier, and eight intermediate concrete piers. The total superstructure length is approximately 125 feet and is comprised of two 61-foot 10-inch long, five-panel trusses in each span with independent end portals at the stone masonry abutments and center pier. The truss members in each span are transversely spaced approximately 36 feet 6 inches on center. Tapered floor beams, measuring 50 feet long and spaced 12 feet 2 inches on center, are hung from the lower chord pins of the truss with looped-rod hanger bars and are cantilevered transversely to support 6-foot wide timber sidewalk with decorative iron railing on either side of the trusses. Circa 1900, bridge modifications were performed to support two street railway tracks, which involved the construction of eight concrete piers beneath the floor beams to reduce the load-bearing spans between panel connections. In addition, a 13-inch-thick concrete deck was constructed around the stringers and two 9-inch-square concrete curbs were constructed alongside the trusses, narrowing the roadway width over the bridge to 33 feet. Due to the deteriorated condition of the structure, the bridge was closed to vehicular traffic in 2002, but remained open to pedestrian traffic, and was later closed to all traffic in 2023.

A well-preserved example of the Berlin Iron Bridge Company's patented lenticular pony-truss design, which was selected by many Connecticut municipalities in the late 19th-century, Bridge No. 02212 is considered historically significant and was placed on the National Register of Historic Places in 1987 under Criterion C with state-level significance and "engineering", "politics/government", and "transportation" also included as areas of significance. In 2001, the bridge was one of fourteen extant Berlin Iron Bridge Company structures of its kind in Connecticut, while the current number of remaining structures is unknown. The Main Street Bridge is distinctive as it is believed to be the widest of its type ever built, it is the only surviving two-span example in Connecticut, and it is the only surviving wrought-iron lenticular pony-truss supporting a major urban Connecticut street. The Main Street bridge is also locally significant as it was the second bridge rebuilt by the City in response to a demand for road and bridge improvements during an era of industrial, commercial, and residential growth. As such, all options discussed herein will aim to preserve the historical integrity of the bridge while restoring the structure to a state of good condition for pedestrian, bicycle, and/or vehicular use.

In 2023, a new prefabricated pedestrian bridge was constructed immediately north of Bridge No. 02212 to support pedestrian traffic at the site, since the condition of the existing truss required closure of the bridge including pedestrian traffic. The newly constructed pedestrian bridge is approximately 145 feet long, measured from centerline of bearing to centerline of bearing, and supports a 10-foot wide pedestrian travel way measured between handrails. The prefabricated pedestrian bridge supports a number of existing utilities formerly supported by Bridge No. 02212, including a 6" diameter gas main and a 2" diameter rigid metal conduit along the north side of the pedestrian bridge, four 4" diameter polyvinyl chloride conduits and six 5" diameter rigid metal conduits below the pedestrian travel way, and a 12" diameter insulated water main and a 2" diameter rigid metal conduit along the south side of the pedestrian bridge.

Figures 1-3 in Appendix A depict the general plan, typical section and south elevation of the existing bridge.

PROPOSED OPTIONS:

Option 1 – Superstructure Replacement

Option 1 involves replacing the existing superstructure to support vehicular and pedestrian traffic along the existing alignment. Figures 4-6 in Appendix A depict the proposed improvements for Option 1. The existing trusses will be temporarily supported in place to maximize the historical value retained while the existing concrete deck, stringers, floor beams, timber deck, and decorative iron railings are removed. In an attempt to maintain the historical integrity of the bridge, the existing trusses and decorative iron railings will be salvaged, cleaned, painted and reused as an ornamental treatment under the final condition. While the existing trusses are temporarily supported in place, the existing stone masonry abutments, wingwalls, and center pier will be repointed and repaired as required, and a section of the existing stone masonry abutments and center pier will need to be removed to accommodate the construction of new reinforced concrete bridge seats. The floor beams will be replaced in kind to replicate existing conditions. The existing intermediate concrete piers will be permanently removed and riprap scour countermeasures will be installed around the existing center pier and abutments to help minimize scour concerns of the shallow pier and abutment footings. A new continuous span multi-beam superstructure, comprised of 20-inch deep steel beams composite with an 8.5-inch thick reinforced concrete deck and a 3-inch thick bituminous concrete wearing surface, will be constructed while maintaining the existing 35-foot clear distance between trusses and will bear on the new bridge seats. The vertical profile of the roadway over the bridge will need to be raised by approximately 20 inches at the centerline to accommodate the proposed superstructure depth. The roadway width over the bridge will be reduced to a 30-foot curb-to-curb width, comprised of two 10-foot travel lanes and two 5-foot shoulders to accommodate vehicular traffic and cyclists. New MASH-compliant 3-tube curb-mounted bridge rail will be installed along both sides of the proposed bridge deck to protect the traveling public and the existing trusses. New 6-foot-wide concrete sidewalks with 42-inch tall pedestrian safety fences will be constructed outside the limits of the existing trusses in their approximate existing location and will be supported by the new superstructure. The existing decorative iron railings will be restored and used as a pedestrian railing along the sidewalks. The existing prefabricated pedestrian bridge will be removed as part of this option and the existing utilities will be permanently relocated to the new superstructure.

The proposed steel multi-beam superstructure will be designed to meet current design loading and safety standards. An added benefit of utilizing a steel multi-beam superstructure in this option is that the existing utilities can be accommodated between the steel beams, concealing the utilities from view, and the existing trusses, railings, and new replicated floor beams can be attached to the bridge as non-structural ornamental treatments. As part of this option, the existing trusses and the new floor beams will be used in an aesthetic capacity only and will support no loads other than their own self-weight. The removal of the existing intermediate concrete piers will increase the hydraulic opening beneath the bridge.

Option 2 – Full Replacement Along New Alignment

Option 2 involves removing the existing bridge in its entirety and constructing a new bridge to support vehicular and pedestrian traffic along a new alignment. Figures 7-9 in Appendix A depict the proposed improvements for Option 2. The proposed alignment will align the Main Street/West Main Street intersection with Greenwood Hill Street, Smith Street and Mill River Street at an intersection northwest of the existing bridge. A new continuous span multi-beam superstructure, comprised of 20-inch deep steel beams composite with an 8.5-inch thick reinforced concrete deck and a 3-inch thick bituminous concrete wearing surface, will be constructed at a skew. To minimize the adverse effect of removing the historic bridge, the existing trusses and decorative iron railing will be salvaged and restored for ornamental use on the proposed structure, while the other components of the existing structure will be removed and disposed. New pile founded reinforced concrete abutments and center pier will be installed along the new alignment. The proposed vertical profile of the bridge along the new alignment is anticipated to generally match the existing vertical profile of Main Street over the bridge, since the bridge will be reconstructed slightly north as part of this option. The proposed roadway width over the bridge will consist of a 30-foot curb-to-curb width, comprised of two 10-foot travel lanes and two 5-foot shoulders to accommodate vehicular traffic and cyclists. New MASH-compliant 3-tube curb-mounted bridge rail will be installed along both sides of the proposed bridge deck to protect the traveling public and the existing trusses. New 6-foot-wide concrete sidewalks with 42-inch tall pedestrian safety fences will be constructed outside the limits of the existing trusses and will be supported by the new superstructure. Note that due to the skewed alignment, the spans will be longer than those for Option 1. As a result, the trusses will be shorter than the spans, and unlike Option 1, the existing decorative iron railings will not be restored and used as a pedestrian railing. The utilities that exist on the prefabricated pedestrian bridge installed in 2023 will be temporarily relocated to a temporary bridge structure, the prefabricated pedestrian bridge will be removed, and the utilities will be permanently relocated to the permanent bridge structure.

The proposed steel multi-beam superstructure will be designed to meet current design loading and safety standards. An added benefit of utilizing a steel multi-beam superstructure in this option is that the existing utilities can be accommodated between the steel beams, concealing the utilities from view, and the existing trusses can be attached to the bridge as non-structural ornamental treatment. To match the appearance of the existing stone masonry substructure components, the proposed reinforced concrete abutments, wingwalls and center pier will be stone clad. The proposed substructure will be founded on piles to address scour concerns and the removal of the existing intermediate piers will improve the hydraulic performance of the bridge. Due to the skewed alignment, additional channel excavation will be required upstream to provide an adequate hydraulic opening below the new structure.

Option 3 – Relocation to Nearby Park as Artifact

Option 3 involves relocating the historic truss superstructure to a nearby park as an artifact, with the actual location to be determined by the City. Figures 10-11 in Appendix A depict the proposed improvements for Option 3. The existing concrete bridge deck, stringers, and abandoned utility conduits will be removed and disposed of, as they cannot be salvaged for transport due to their deteriorated condition. The existing decorative railing and timber sidewalk decking will be removed with the intent to reinstall in the final location of the truss. The trusses will be separated from the floor beams for transport by cutting the U-bolts connections. The floor beams will be repaired and carefully removed from the intermediate concrete piers and transported to the final location for the bridge to be reassembled. New precast concrete supports are anticipated to support the bridge superstructure at its new location. The existing stone masonry abutments and wingwalls will be repointed or repaired as retaining walls along the channel and/or removed as the site requires. The existing stone masonry center pier and the existing intermediate concrete piers will be permanently removed as part of this option to remove any obstructions from the waterway. New riprap will be installed along the channel to protect any new channel embankments from erosion. New fencing and guardrail will be installed as safety measures along the resulting Main Street dead end location. While the Main Street Bridge will be taken out of service as part of this option, the existing prefabricated pedestrian bridge will remain in its current location and will continue to accommodate both pedestrian traffic and the existing utilities.

Option 4A and 4B – Rehabilitation

The existing bridge was constructed in 1888, prior to the invention and proliferation of the automobile, and was therefore not originally designed to accommodate motorized vehicular loads. The structure was modified in circa 1900 to carry trolley loads. The existing trusses were not able to support these trolley loads; therefore, as part of that modification, eight intermediate concrete piers were constructed at the floor beam locations, at which point the trusses no longer served in their originally intended structural function. Removal of these concrete intermediate piers, therefore, would greatly inhibit the ability of the structure to carry modern vehicular loads. For this reason, Option 4 is a two-part rehabilitation option, comprised of Option 4A and Option 4B, which involve rehabilitating the existing structure with and without the intermediate piers.

It was not part of this scope to perform a structural analysis of the existing truss; however, for Option 4B, opinions were formed based on review of a letter entitled "Structural Evaluation of the Existing Trusses, West Main Street Pedestrian Bridge over the Mill River, Stamford, CT", WMC reference No. 09096.10, prepared by WMC Consulting Engineers, dated March 10, 2010, and addressed to Mr. Paul Ginotti P.E., City of Stamford.

Option 4A – Rehabilitation with Intermediate Piers

Option 4A involves rehabilitating the existing structure for both vehicular and pedestrian use. It is anticipated that the existing trusses and iron railing will be removed and transported to an offsite shop, where they can be cleaned, inspected, restored, and painted. Figures 12-13 in Appendix A depict the proposed improvements for Option 4A. The concrete deck, stringers, abandoned utility conduits, floor beams, and timber sidewalk decking will be removed and disposed of due to their deteriorated condition. The channel will be excavated and lined with riprap scour countermeasures to help minimize scour concerns of the shallow abutment and pier footings. The existing masonry abutments, wingwalls, and piers will be repointed or repaired as required. The restored trusses will be reinstalled, and the floor beams will be replaced with new steel floor beams that visually replicate the original floor beams. Similar to the existing condition, the floor beams will be independently supported by the intermediate piers and attached to the existing trusses at the lower chord pins utilizing similar looped-rod hanger bars. The upper portion of the existing intermediate concrete piers will be reconstructed to support the new floor beams. New steel stringers will be constructed composite with an 8.5-inch thick reinforced concrete deck and a 3-inch thick bituminous concrete wearing surface. The proposed concrete deck will be constructed between the existing 35-foot clear width between trusses. The roadway width over the bridge will be reduced to a 28-foot curb-to-curb width, comprised of two 10-foot travel lanes and two 4-foot shoulders to accommodate vehicular traffic. New MASH-compliant 3-tube curb-mounted bridge rail will be installed along both sides of the proposed bridge deck to protect the traveling public and the existing trusses. New 6-foot-wide timber sidewalks with 42-inch tall pedestrian safety fences will be constructed outside the limits of the existing trusses in their approximate existing location and the existing decorative iron railings will be restored. The existing prefabricated pedestrian bridge will be removed as part of this option and the existing utilities will be permanently relocated to the new superstructure.

Option 4B – Rehabilitation without Intermediate Piers

Option 4B involves removing the intermediate concrete piers and rehabilitating the existing structure for a single lane of vehicular traffic. Figures 12-13 in Appendix A depict the proposed improvements for Option 4B. Based on the document cited above and engineering judgment, we believe that it is likely that the bridge can accommodate such an arrangement with strengthening of the trusses and additional rehabilitation procedures described below, but this would need to be confirmed by a detailed structural analysis, which was not in the scope of this memorandum. Similar to Option 4A, it is anticipated that the existing trusses and iron railing will be removed, transported to an offsite shop where they can be cleaned, inspected, restored and strengthened with new steel components as required, and painted. The concrete deck, stringers, abandoned utility conduits, floor beams, and timber sidewalk decking will be removed and disposed of due to their deteriorated condition.

The existing stone masonry abutments, wingwalls, and center pier will be repointed or repaired as required. The intermediate concrete piers will be permanently removed, and riprap scour countermeasures will be installed around the existing center pier and abutments to help minimize scour concerns of the shallow pier and abutment footings. The restored trusses will be reinstalled and the floor beams will be replaced with new steel floor beams that visually replicate the original floor beams, which will be attached to the existing trusses at the lower chord pins utilizing similar looped-rod hanger bars. Due to the removal of the intermediate piers, the proposed curb-to-curb width will need to be restricted to 12 feet and will be centered transversely on the bridge to ensure load is distributed approximately equally between the trusses. New steel stringers will be installed composite with a lightweight fiber-reinforced polymer (FRP) deck to reduce dead loads compared to a conventional reinforced concrete bridge deck. Metal bridge rail will be mounted along each side. The new rail may not be able to conform to MASH standards due to the anchorage to the FRP deck; however, if analysis determines that the structure could support a more conventional concrete or lightweight concrete deck, MASH standards may be achievable. The existing prefabricated pedestrian bridge will remain as part of this option and the existing utilities will remain on the pedestrian bridge.

PROPOSED RELATIVE IMPACTS:

Highway and Drainage

Options 3 will have minimal highway and drainage impacts since neither roadway reconstruction nor drainage work are anticipated at either approach to the bridge. This option will require the installation of fencing and guardrail as it applies to protect vehicles and pedestrians from the river at the termination of Main Street. Bollards or concrete planters may also be integrated at the east approach as part of Option 3 to serve as an aesthetic vehicular barricade.

Options 1, 2, 4A and 4B will require full depth roadway reconstruction to be performed at both approaches. The west approach will need to be reconstructed to accommodate the intersection with West Main Street and the east approach will need to be reconstructed to tie into the proposed roadway width over the bridge. Full depth driveway reconstruction will also be required for the property located at the southeast corner of the bridge. It is anticipated that the sidewalks along both sides of both approaches will need to be reconstructed as part of these options and any existing drainage structures within the project limits will need to be reset to finished grade. Option 4A and 4B will maintain both the existing alignment and the vertical profile of the roadway over the bridge, resulting in fewer impacts than Options 1 and 2. Option 1 will maintain the existing alignment but will require the vertical profile of the roadway over the bridge to be raised at the centerline to accommodate the proposed superstructure depth. Option 2 will generally maintain the existing vertical profile but will require the bridge to be constructed along a new alignment to the north of the existing structure, resulting in the largest impact of any of the options.

Traffic

Before the bridge was closed to vehicular traffic in 2002, the bridge was reported to have an ADT of 6,800 vehicles per day (Year of ADT 1998) and if the bridge were reopened to two-way traffic, it would be assumed to carry a similar volume of traffic; however, a more in-depth traffic study could be performed if desired. It is anticipated that a stop sign controlled intersection would be appropriate; however, a signal warrant analysis should be completed for the selected option to ensure that a signalized intersection is not required. Considering that the existing bridge has been closed to vehicular traffic since 2002 and has been closed to all traffic since 2023, minimal temporary impacts on the traveling public are anticipated for construction of the bridge. Minimal impacts to vehicular and pedestrian traffic along West Main Street are expected as a result of Options 2, 3, 4A and 4B while the intersection with Main Street is reconstructed. Driveway access for the property located at the southeast corner of the bridge will need to be maintained at all times during construction. It is anticipated that the existing prefabricated pedestrian bridge will be utilized to maintain pedestrian traffic during construction for Options 1, 3, 4A and 4B. Option 2 will require the prefabricated pedestrian bridge to be removed prior to construction of the new bridge, and therefore pedestrian traffic will not likely be maintained during construction for Option 2.

Environmental

All options will require work above and within the Rippowam River, which may pose environmental risks such as the inadvertent addition of debris into the river and/or the degradation of unique habitats for species. It is anticipated that an environmental review of the project site will need to be completed prior to construction and best management practices and mitigation measures will need to be implemented during construction to minimize adverse impacts. The existing structure will need to be tested for hazardous materials; however, due to the age of the structure, it is assumed that lead based paint and asbestos building materials are likely present and will need to be handled and disposed of accordingly for all options. Also, based on nearby past projects in the vicinity of the Rippowam River, it is likely that contaminated soils are present in the river. Therefore, soil samples will need to be obtained to identify any contaminated materials before proceeding to construction. Option 3 will have the lowest amount of channel excavation and Options 2 and 4A will have the most significant amounts of channel excavation.

Hydraulics

All options are expected to have non-adverse impacts to the Rippowam River. With the exception of Option 3, for which no hydraulic analysis would be required, all of the other options will require a full hydraulic analysis to demonstrate to regulatory agencies that there is no increase or adverse impact to the FEMA floodway for the 100-year storm event. The hydraulic model will also be used to design appropriate scour countermeasures to protect the final condition. Options 1, 2, 3 and 4B are expected to benefit the hydraulics as the intermediate piers of the existing bridge, obstructing a significant portion of the channel, will be removed. Scour countermeasures will be required for Options 1, 2, 4A and 4B, and riprap will be installed as part of Option 3 to protect any new channel embankments.

Permit Considerations

Since all options require some level of excavation for temporary and proposed impacts to a tidally influenced watercourse it is anticipated that all options will require:

- USACE Pre-Construction Notice (PCN)
- CT DEEP LWRD – Section 401 WQC
- Local Environmental Protection Board Approval
- P&Z Approval

The permit application and review times (totaling approximately one year) would contribute to the time required to bring the project to advertising for construction bids. Additionally, any adverse impact to the FEMA Floodway would require extensive coordination with FEMA, including approval of a Conditional Letter of Map Revision during design and a post-construction Letter of Map Revision at the project's end.

Historic Considerations

The integrity of the bridge's character-defining historical features were assessed using the seven aspects of integrity used by the National Park Service in the National Register of Historic Places program, including location, setting, design, materials, workmanship, feeling and association. The existing bridge has not been moved from its original location and continues to support Main Street over the Rippowam River in an urban neighborhood. While the built environment of the neighborhood has changed over time, the existing bridge has retained its integrity of location and a substantial degree of its integrity of setting. The original 1888 superstructure remains largely intact and is relatively well preserved, and the bridge remains the only two-span lenticular truss bridge in Connecticut, the last known lenticular truss bridge to support a major urban street in the state, and is believed to be the widest of its kind ever built. While the bridge was modified in circa 1900 to support two street railway tracks, the bridge's integrity of design and integrity of materials are substantial. Additionally, the bridge also possesses integrity of workmanship, integrity of feeling, and integrity of association.

Option 1: The bridge's integrity of location and setting would be maintained. Removing the pedestrian bridge would increase the integrity of setting. The integrity of design and materials would be diminished with the loss of the historic superstructure. The effect of additional modern railings would not be substantial and would protect the trusses. Aspects of workmanship, feeling, and association would be somewhat diminished.

Option 2: The bridge's integrity of location and setting would be somewhat diminished by the new alignment. Removing the pedestrian bridge would increase the integrity of setting. Integrity of design and materials would be diminished with the loss of the substructure and superstructure. The effect of additional modern railings would not be substantial and would protect the trusses. Overall aspects of workmanship, feeling and association would be somewhat diminished, more than Option 1.

Option 3: The bridge would lose its integrity of location, setting, and association. With the loss of the substructure, integrity of design, materials, and workmanship would be somewhat diminished. Integrity of feeling would also be somewhat diminished. However, as the 1991 Connecticut Historic Bridge Final Report: Preservation Plan notes, the intrinsic historic value of the double-span trusses makes them a good candidate for relocation.

Option 4A: The bridge's integrity of location and setting would be maintained. Integrity of design would likely be maintained or involve minimal diminishment. The integrity of materials would not be diminished if the new load-bearing system below the deck were replaced in-kind with steel. The effect of additional modern railings would not be substantial and would protect the trusses. Aspects of workmanship, feeling and association would be maintained.

Option 4B: The bridge's integrity of location and setting would be maintained. Integrity of design would likely be maintained or involve minimal diminishment. The integrity of materials would not be diminished if the new load-bearing system below the deck were replaced in-kind with steel. The effect of additional modern railings would not be substantial and would protect the trusses. Aspects of workmanship, feeling and association would be maintained. Removal of the intermediate piers is not desirable but would not significantly impact the historic integrity of the bridge. It would, however, diminish its ability to convey changes in transportation technology over time (i.e., the addition of the electric street railway and subsequent removal).

Utilities

Utility impacts are not anticipated for Options 3 and 4B. The prefabricated pedestrian bridge, which supports a number of the existing utilities formerly supported by Bridge No. 02212, will remain in place as part of these options. Utility impacts are anticipated, however, for Options 1, 2, and 4A, as the prefabricated pedestrian bridge will be removed as part of these options and the existing utilities will need to be permanently relocated to the Main Street Bridge. Options 1 and 4A will result in the least impacts since the existing utilities will only need to be relocated once during construction, from the prefabricated pedestrian bridge to the Main Street Bridge. Since the existing prefabricated pedestrian bridge needs to be removed prior to construction as part of Option 2, this option will require a temporary relocation and temporary utility bridge while the prefabricated pedestrian bridge is removed. Once the new bridge is constructed the utilities will be moved to the new bridge.

Right of Way

Due to limited available space surrounding the bridge it is anticipated that all options will require some level of temporary rights-of-way impacts for removal, staging, and/or reconstruction of the bridge. No permanent right-of-way impacts are anticipated for any of the options, provided that Option 3 is relocated within a city-owned property.

Schedule

Since permit and right-of-way impacts are similar for all the options, it is anticipated that design, permitting, and utility coordination will require approximately 18 months. The construction duration for Option 3 would be the shortest and would be completed in only a few months for removal and relocation of the existing structure. Assuming shop drawing approvals and material procurements are completed in advance of the construction with an early Spring start for commencing construction, Options 1, 4A, and 4B would likely take a full construction season and Option 2 would be expected to take two full construction seasons due to the added temporary relocations of existing utilities, removal of the existing utility bridge, and reconstruction of a new bridge.

Funding / Grant Identification

It is not anticipated that any grant funding would be available for Option 3 since most funding programs are for repairing and replacing transportation infrastructure and removal of the bridge would not apply. Since Main Street and West Main Street are classified as urban minor arterials it is expected that this project would not qualify for CTDOT Federal Local Bridge Program nor State Local Bridge Program funding, but would be a candidate for Local Transportation Capital Improvement Program (LOTCIP) funding, administered through the local Council of Governments (COG), with up to 100% reimbursement with state funds. As a result of grant funding, certain federal and state criteria would be required to be met, such as providing a bridge load rating and MASH-compliant bridge rail.

CONCLUSION:

Anticipated Costs

The total preliminary Opinion of Probable Cost (OPC) for each option is outlined below. Each OPC was prepared using the CTDOT 2023 Estimating Guidelines, the CTDOT estimator Weighted Unit Prices, pricing from recently completed projects of a similar nature, and additional available literature. Each OPC considers costs for Soft Costs (Design and Permitting), Construction Incidentals, Construction Contingencies, and Inflation as a function of the anticipated construction bid item costs. Of the overall construction bid items cost; minor item costs were estimated at 25%, Soft Costs were estimated at 8%, Construction Incidentals were estimated at 15%, and Construction Contingencies were estimated at 25%. Each OPC also includes a 6.5% inflation factor for 3 years through the year 2026.

Description	OPC
Option 1 – Superstructure Replacement	$ 6,500,000
Option 2 – Full Replacement Along New Alignment	$ 9,600,000
Option 3 – Relocation to Nearby Park as Artifact	$ 1,200,000
Option 4A – Rehabilitation With Intermediate Piers	$ 6,700,000
Option 4B – Rehabilitation Without Intermediate Piers	$ 5,200,000

Summary

BL Companies evaluated several design considerations while reviewing each option, including historical impacts, longevity and risk adversity, connectivity, hydraulics, cost, future maintenance and inspection, and utility impacts. Included below is an Alternative and Design Consideration Summary outlining these design considerations as they pertain to each option. Each option has been assigned a numerical value for each design consideration based on how well it performs compared to the other options, ranked in order from first to fifth, with first being the best and fifth being the worst. Future Maintenance and Inspection and Cost considerations were evaluated utilizing CTDOT Life-Cycle Cost Analysis Guidance for CTDOT Bridge Projects as a guide.

Alternative & Design Consideration Summary						
Design Consideration	**Option 1**	**Option 2**	**Option 3**	**Option 4A**	**Option 4B**	**Comments**
Historical Impacts	3rd	2nd	5th	1st	2nd	Historical impacts were ranked by significance of adverse impacts to the historic structure.
Longevity and Risk Adversity	3rd	2nd	1st	4th	5th	Option 3 was the best since there is no structure to maintain. Option 2 will provide an expected 75-year service life with no scour concerns. Option 1 still carries a risk of scour, while Options 4A and 4B carry the most risk due to a higher risk of scour and the brittle wrought-iron material used in a structural fracture critical capacity.
Connectivity	2nd/3rd	1st	5th	2nd/3rd	4th	Connectivity was ranked based on how well the community is connected across the river. Option 2 was ranked the best due to the realignment of the intersections. Options 1 and 4A were tied because they both accommodate vehicles and pedestrians, Option 4B only supports one-way vehicular traffic and pedestrians on the adjacent pedestrian bridge, and Option 3 was last since it only accommodates pedestrians.
Hydraulics	2nd/3rd	4th	1st	5th	2nd/3rd	Option 3 was rated highest since all substructure components will be removed from the river. Options 1 and 4B were tied for 2nd due to similar alignments and removal of intermediate piers. Option 2 was ranked 4th due to the alignment and the skewed pier. Option 4A was ranked the lowest with intermediate piers remaining.
Cost	3rd	5th	1st	4th	2nd	Costs were ranked by comparing the preliminary opinion of probable costs (OPCs) for each option.
Future Maintenance & Inspection	3rd	2nd	1st	4th	5th	This consideration was ranked by comparing anticipated maintenance and inspection needs for each structure. Option 3 is ranked best as there is no structure to inspect or maintain. Option 2 is ranked 2nd since it will provide a new 75-year structure with relatively low scheduled maintenance. Option 1 would follow Option 2 with an expected 45-year life cycle with a low maintenance superstructure. Options 4A and 4B will likely require more frequent inspections and will only be expected to provide up to a 20-year service life before requiring major preservation or rehabilitation.
Utility Impacts	3rd	5th	1st /2nd	4th	1st /2nd	The existing utilities will continue to be supported by the pedestrian bridge as part of Options 3 and 4B, and the existing utilities will be permanently relocated to the bridge as part of Options 1, 2, and 4A.

BL Companies is pleased to submit the Main Street Bridge Study and looks forward to meeting with the City to discuss further. If you have any questions, please contact me at (860) 760-1949 or at tpechillo@blcompanies.com.

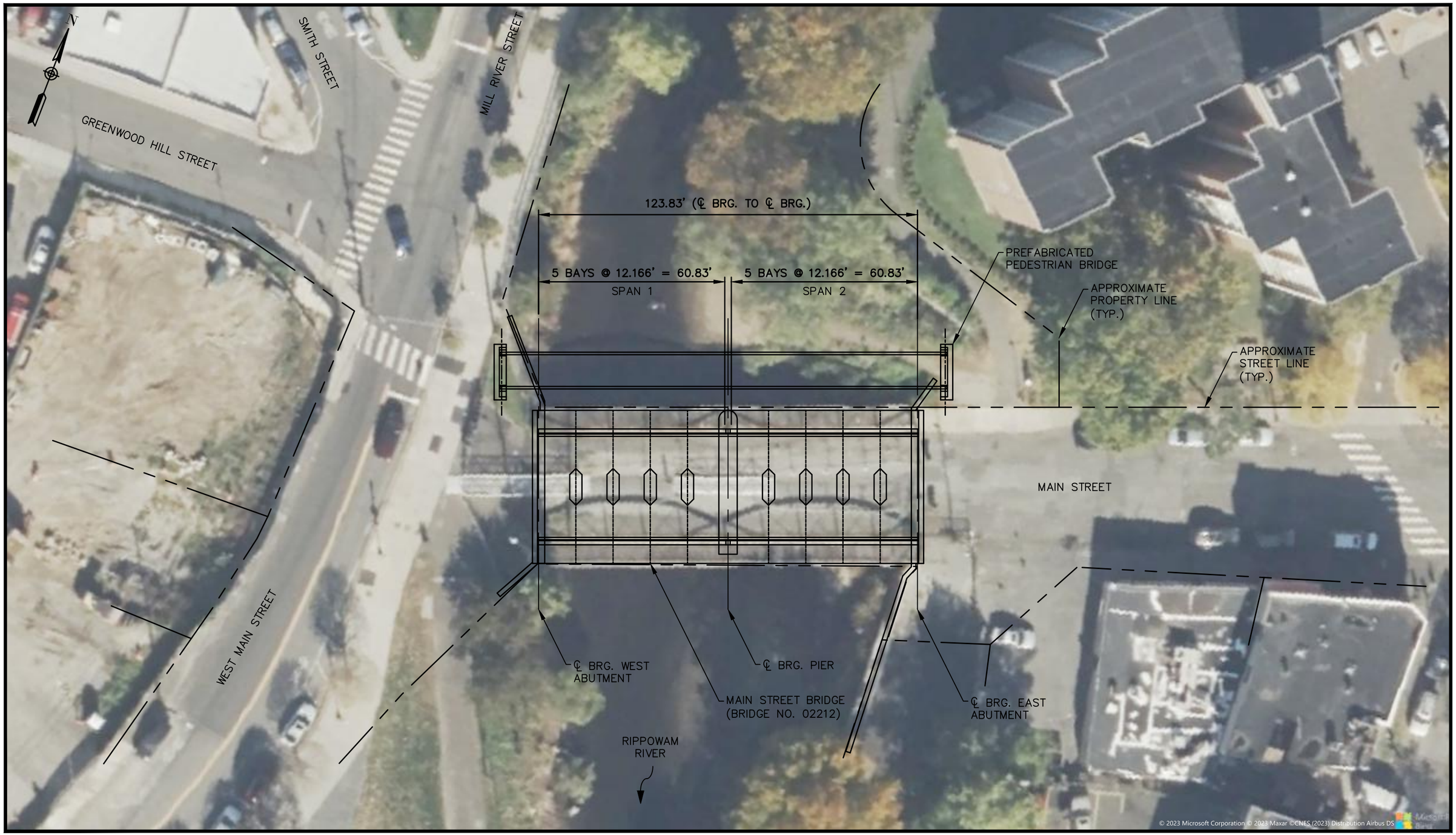
Respectfully Submitted,

BL Companies
Thomas Pechillo, PE
Project Manager

Encl.
Appendix A – Figures
Appendix B – Opinion of Probable Costs (OPCs)

APPENDIX A

FIGURES



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BL Companies

ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING

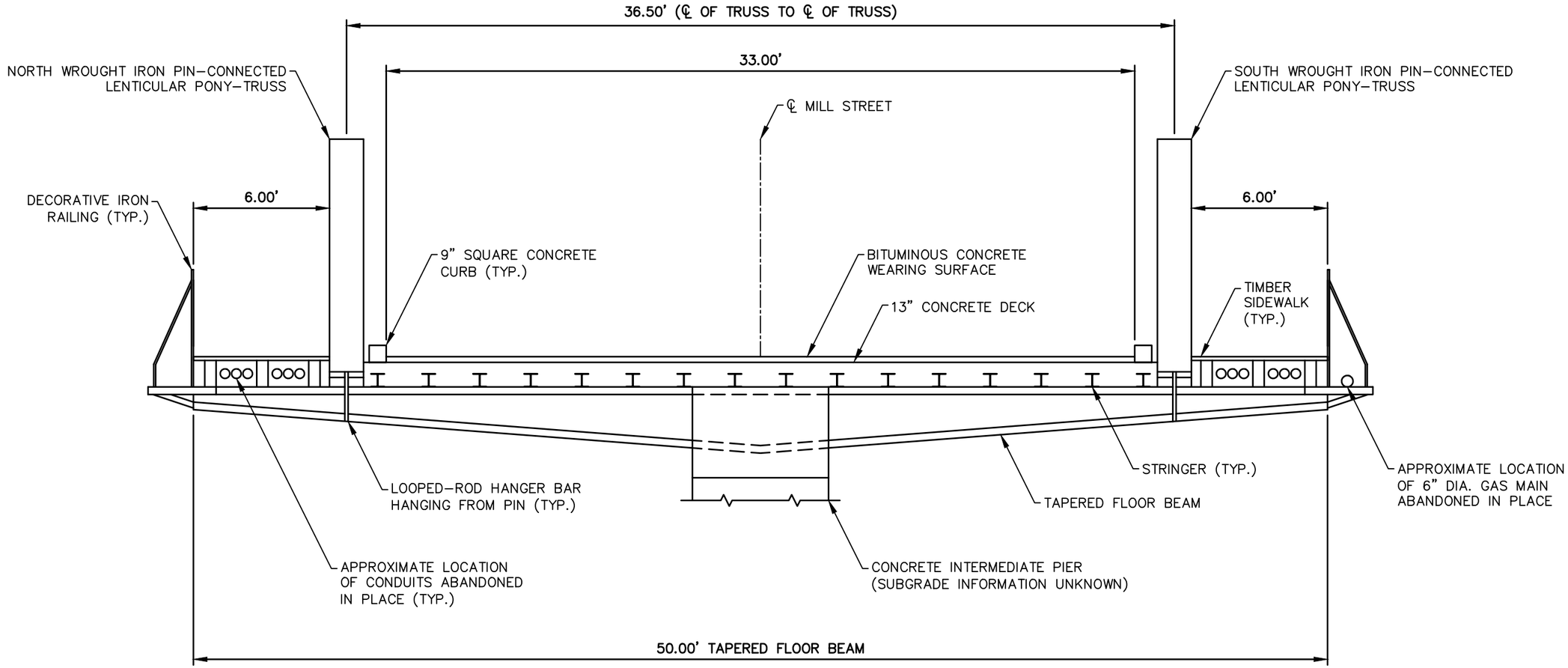
EXISTING CONDITION - GENERAL PLAN

MAIN STREET BRIDGE STUDY
MAIN STREET OVER RIPPOWAM RIVER
STAMFORD, CONNECTICUT

Designed	B.J.R.
Drawn	B.S.O.
Reviewed	
Scale	1"=30'
Project No.	2302505
Date	02/16/24
CAD File	

FIG-01

Xref (s): ; BD2302505 ; XBRG2302505-100



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ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING

BL Companies

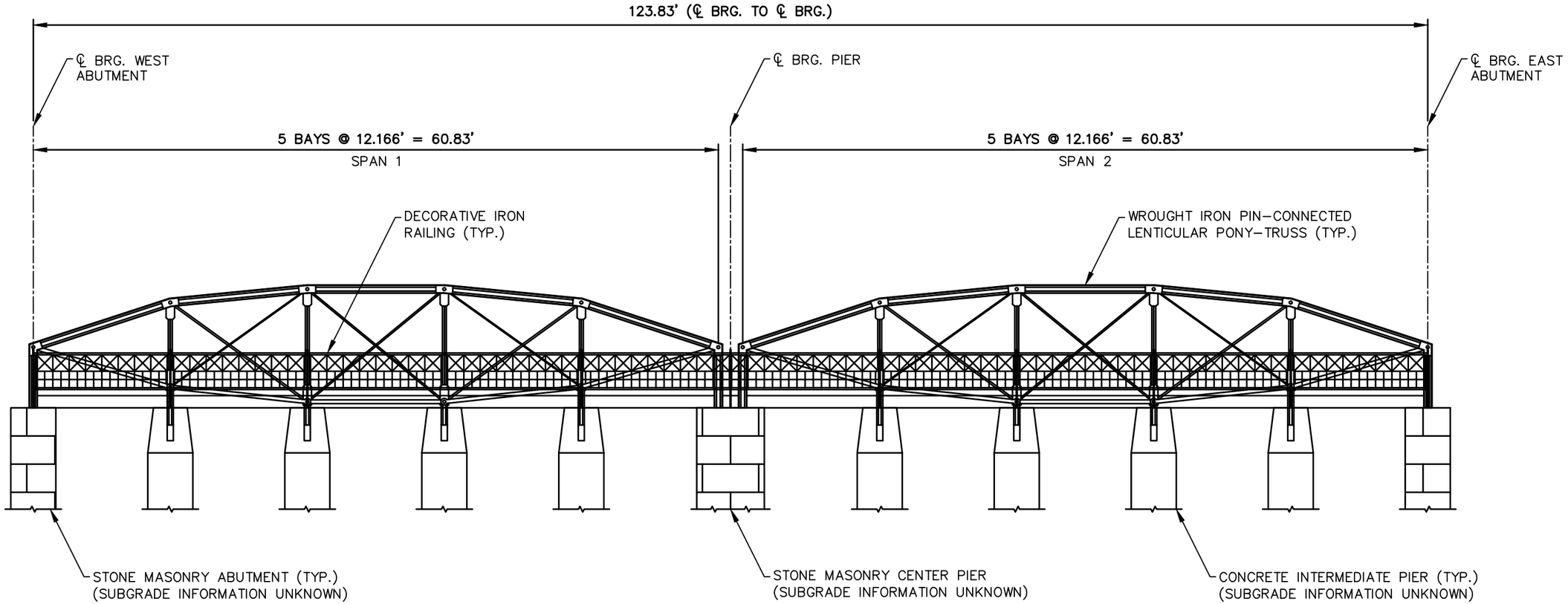
EXISTING CONDITION - TYPICAL SECTION

MAIN STREET BRIDGE STUDY
MAIN STREET OVER RIPPOWAM RIVER
STAMFORD, CONNECTICUT

Designed	B.J.R.
Drawn	B.S.O.
Reviewed	
Scale	1"=5'
Project No.	2302505
Date	02/16/24
CAD File	

FIG-02

Xref (s): ; BD2302505 ; XBRG2302505-100



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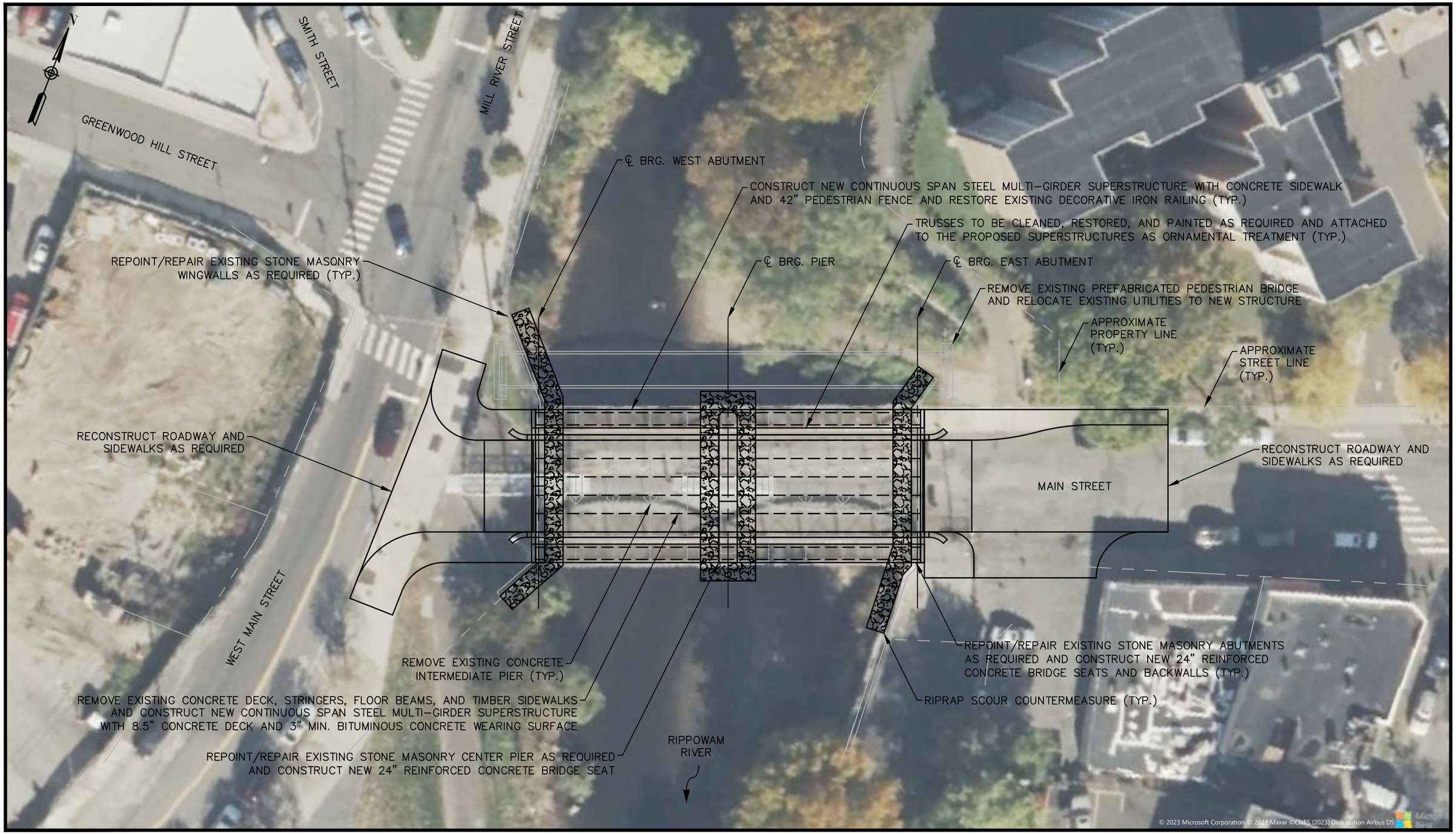
EXISTING CONDITION - SOUTH ELEVATION

MAIN STREET BRIDGE STUDY
MAIN STREET OVER RIPPOWAM RIVER
STAMFORD, CONNECTICUT

Designed	B.J.R.
Drawn	B.S.O.
Reviewed	
Scale	1"=10'
Project No.	2302505
Date	02/16/24
CAD File	

FIG-03

Xref (s): ; BD2302505 ; XBRG2302505-100



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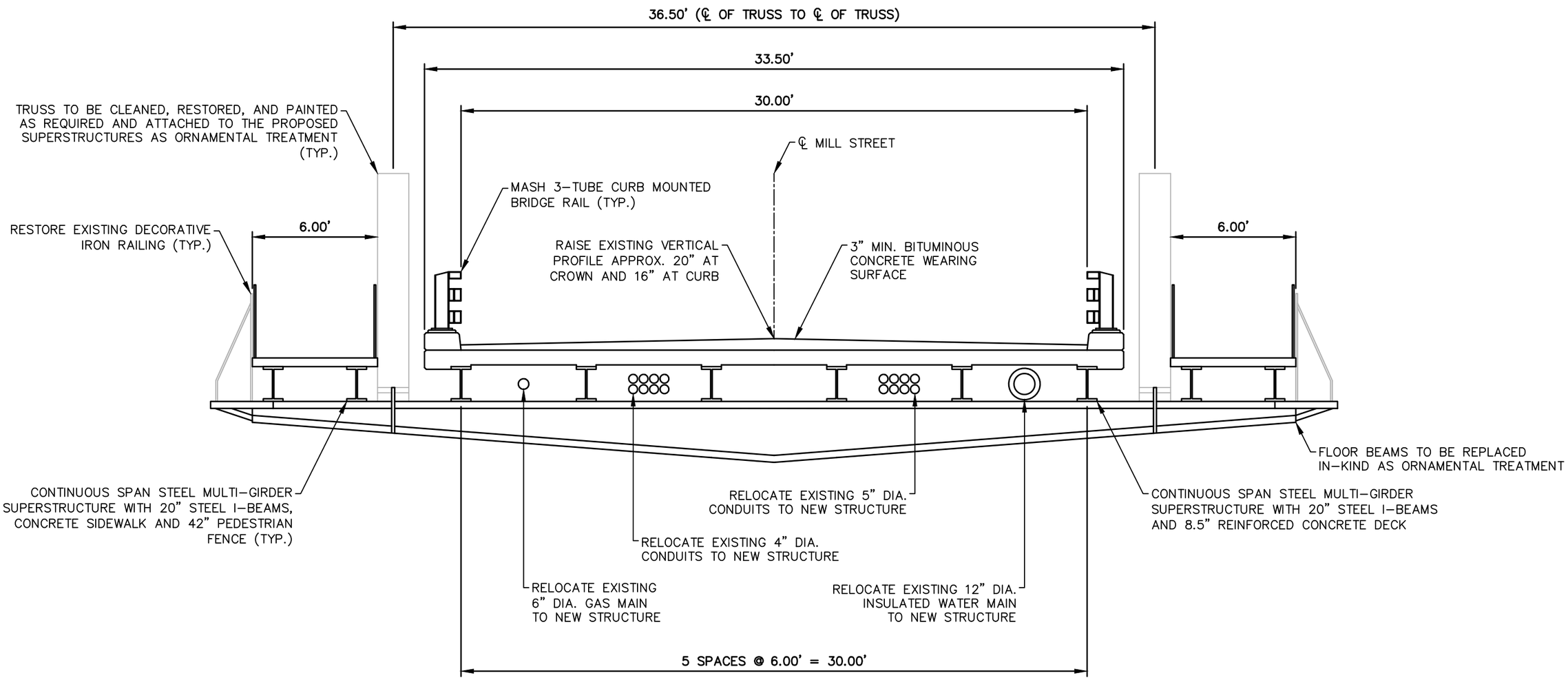
OPTION 1 (SUPERSTRUCTURE REPLACEMENT) - GENERAL PLAN

MAIN STREET BRIDGE STUDY
MAIN STREET OVER RIPPOWAM RIVER
STAMFORD, CONNECTICUT

Designed	B.J.R.
Drawn	B.S.O.
Reviewed	
Scale	1"=30'
Project No.	2302505
Date	02/16/24
CAD File	

FIG-04

Xref (s): ; XBRG2302505-101 ; BD2302505 ; XBRG2302505-100



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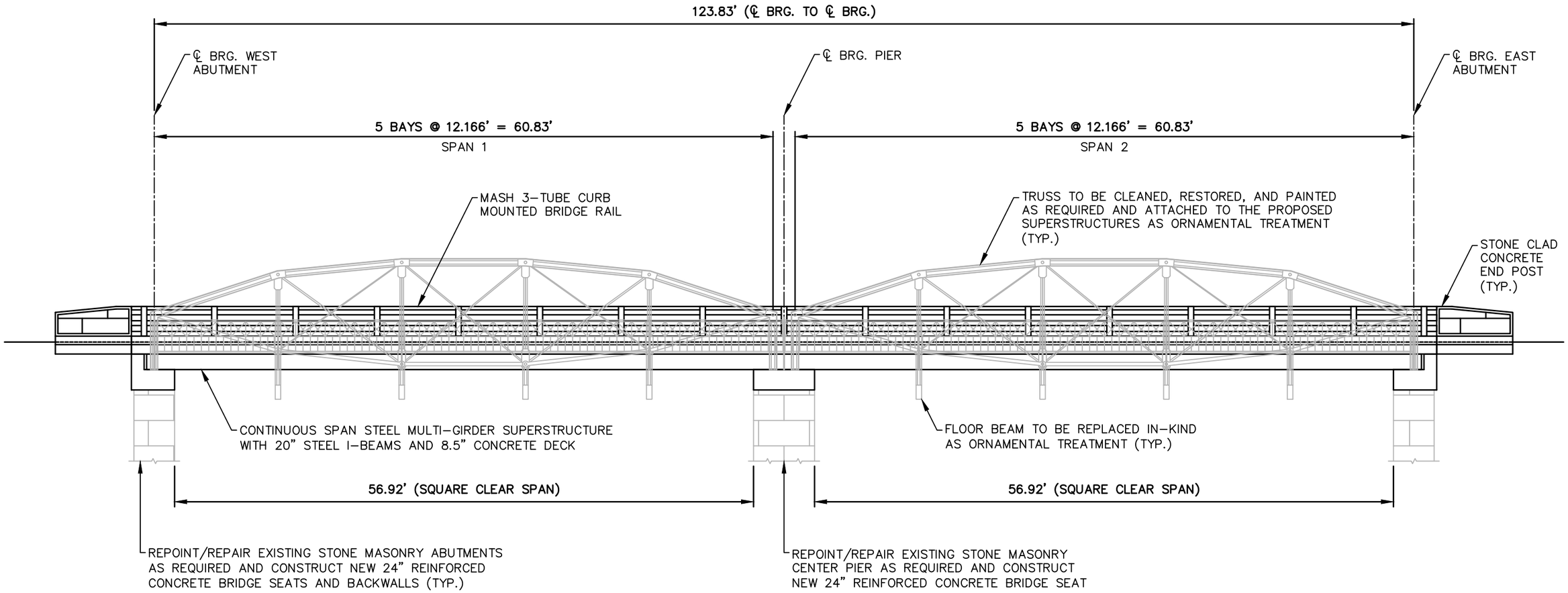
OPTION 1 (SUPERSTRUCTURE REPLACEMENT) - TYPICAL SECTION

MAIN STREET BRIDGE STUDY
MAIN STREET OVER RIPPOWAM RIVER
STAMFORD, CONNECTICUT

Designed	B.J.R.
Drawn	B.S.O.
Reviewed	
Scale	1"=5'
Project No.	2302505
Date	02/16/24
CAD File	

FIG-05

Xref (s): ; XBRG2302505-101 ; BD2302505 ; XBRG2302505-100



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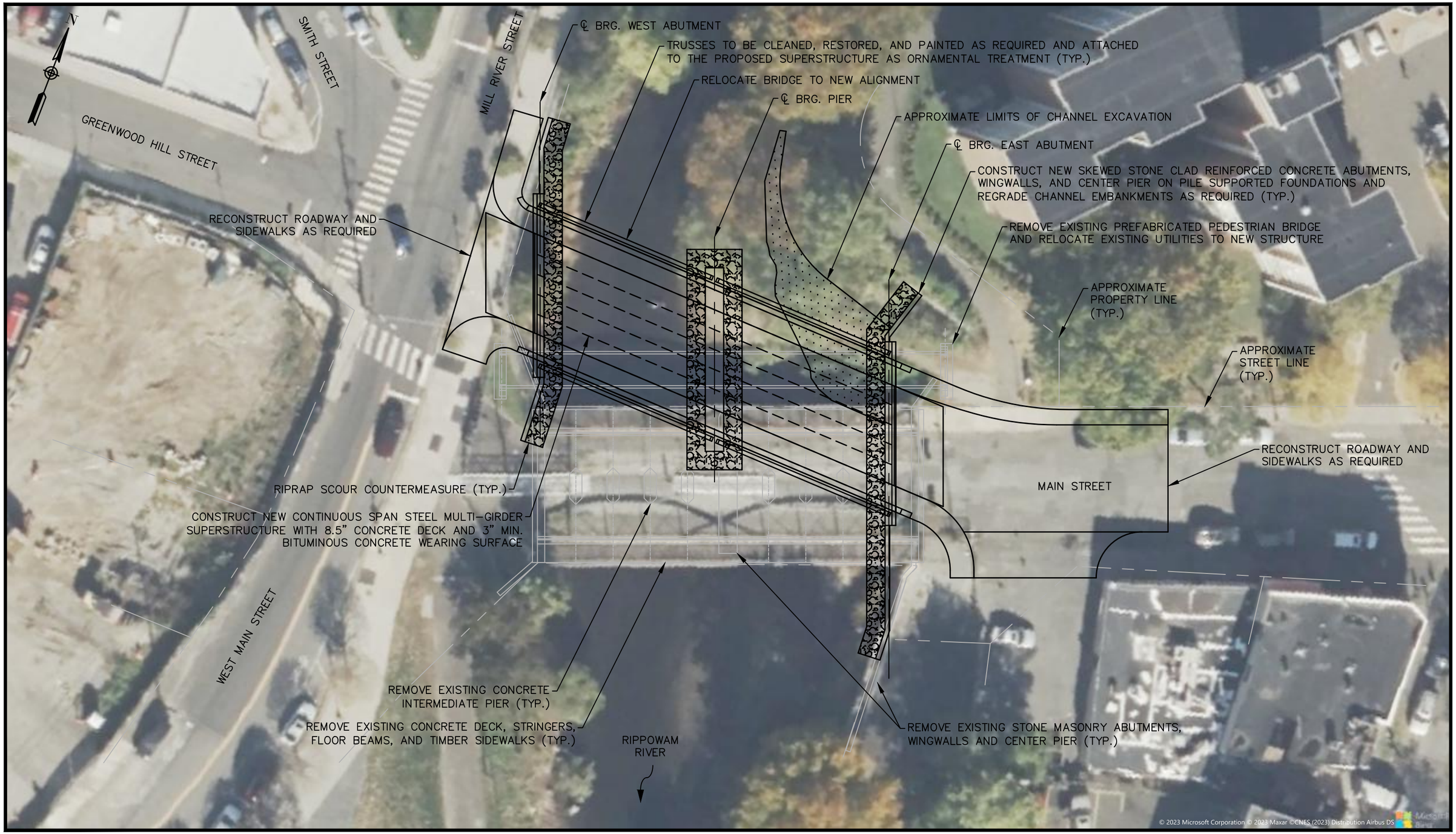
OPTION 1 (SUPERSTRUCTURE REPLACEMENT) - SOUTH ELEVATION

MAIN STREET BRIDGE STUDY
MAIN STREET OVER RIPPOWAM RIVER
STAMFORD, CONNECTICUT

Designed	B.J.R.
Drawn	B.S.O.
Reviewed	
Scale	1"=10'
Project No.	2302505
Date	02/16/24
CAD File	

FIG-06

Xref (s): ; XBRG2302505-101 ; BD2302505 ; XBRG2302505-100



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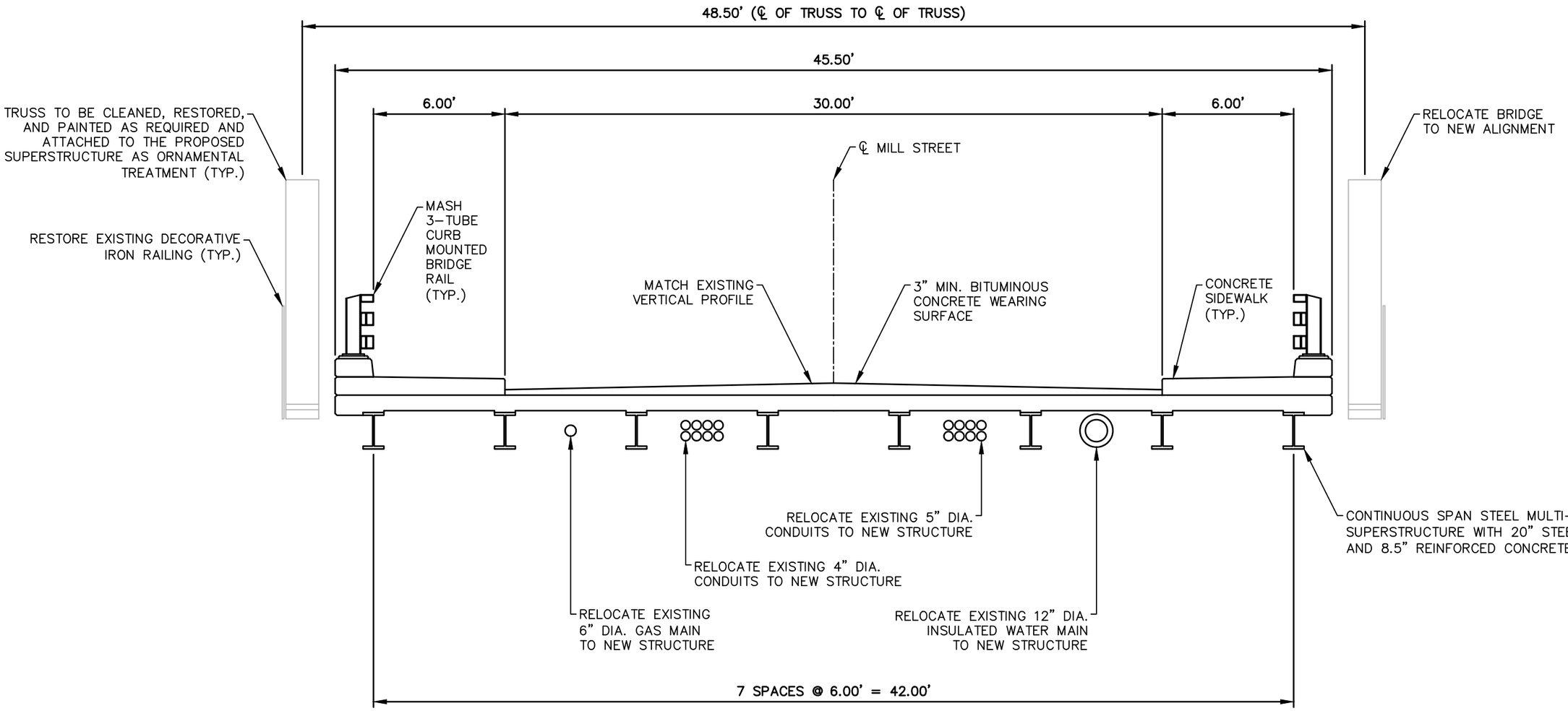
OPTION 2 (FULL REPLACEMENT ALONG NEW ALIGNMENT) - GENERAL PLAN

MAIN STREET BRIDGE STUDY
MAIN STREET OVER RIPPOWAM RIVER
STAMFORD, CONNECTICUT

Designed	B.J.R.
Drawn	B.S.O.
Reviewed	
Scale	1"=30'
Project No.	2302505
Date	02/16/24
CAD File	

FIG-07

Xref (s): ; XBRG2302505-100 ; BD2302505 ; XBRG2302505-102



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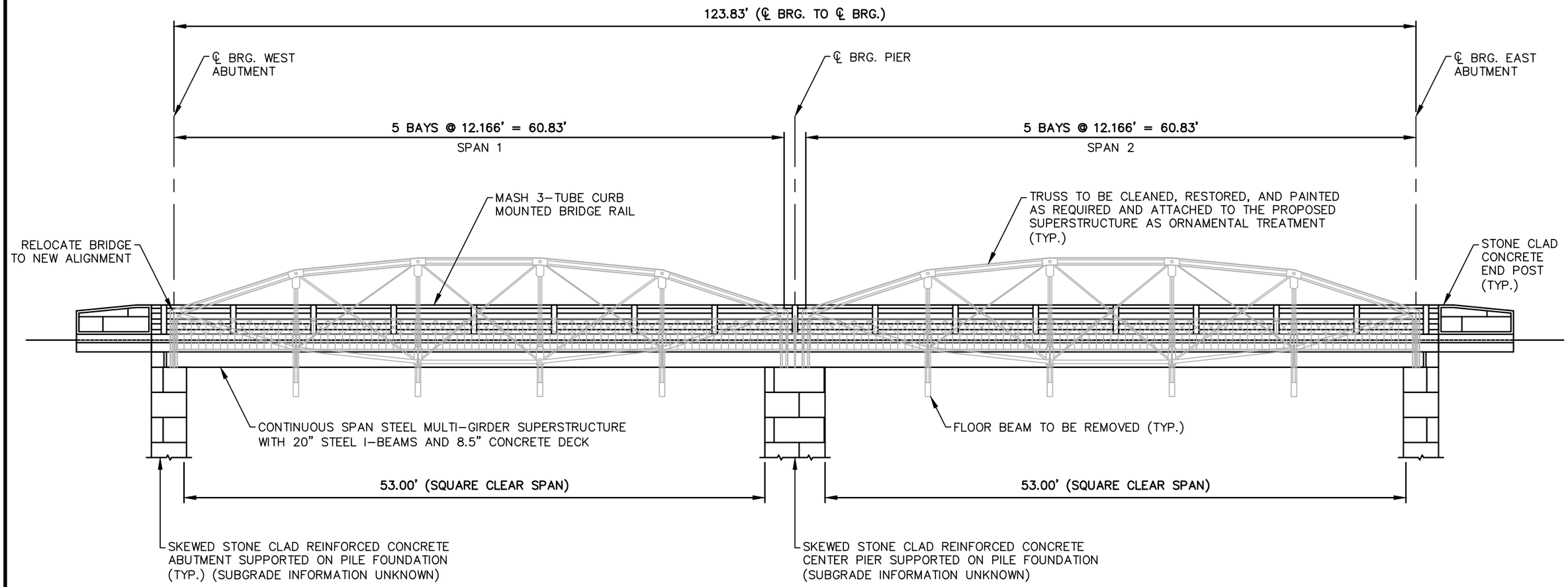
OPTION 2 (FULL REPLACEMENT ALONG NEW ALIGNMENT) - TYPICAL SECTION

MAIN STREET BRIDGE STUDY
MAIN STREET OVER RIPPOWAM RIVER
STAMFORD, CONNECTICUT

Designed	B.J.R.
Drawn	B.S.O.
Reviewed	
Scale	1"=5'
Project No.	2302505
Date	02/16/24
CAD File	

FIG-08

Xref (s): ; XBRG2302505-100 ; BD2302505 ; XBRG2302505-102



2/15/2024, BOBRIEN, G:\JOBS23\24\2302505\DWG\TBRG2302505-102-ELEVATION.DWG,ELEVATION.

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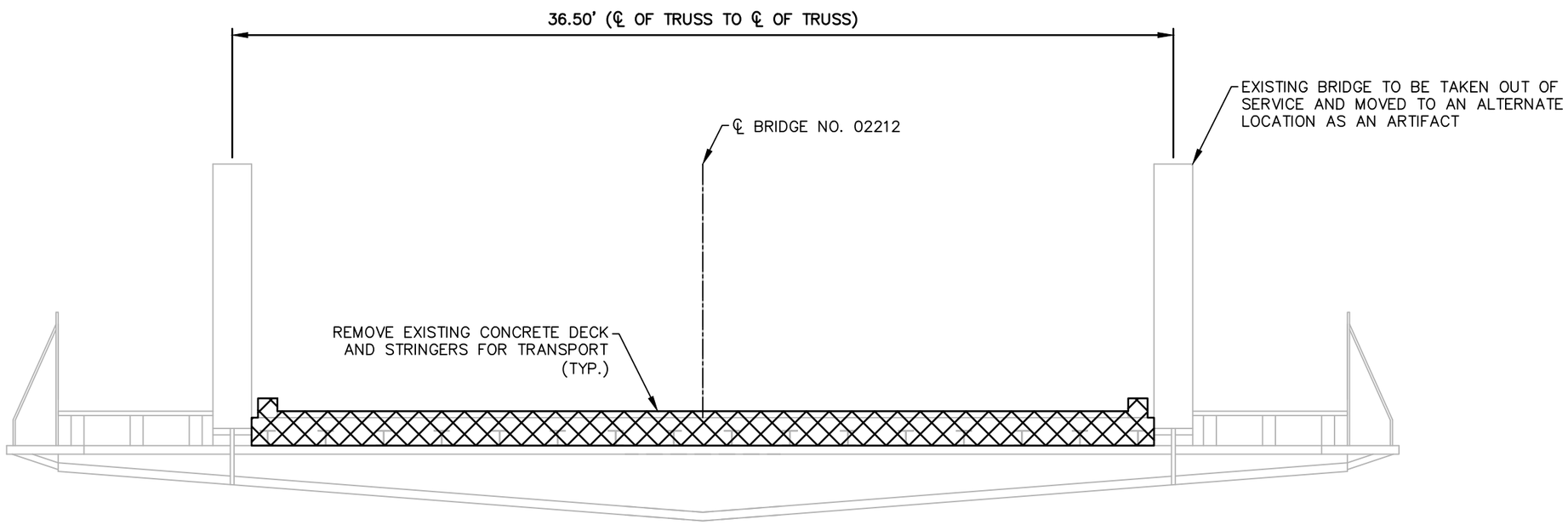
OPTION 2 (FULL REPLACEMENT ALONG NEW ALIGNMENT) - SOUTH ELEVATION

MAIN STREET BRIDGE STUDY
MAIN STREET OVER RIPPOWAM RIVER
STAMFORD, CONNECTICUT

Designed	B.J.R.
Drawn	B.S.O.
Reviewed	
Scale	1"=10'
Project No.	2302505
Date	02/16/24
CAD File	

FIG-09

Xref (s): ; XBRG2302505-100 ; BD2302505 ; XBRG2302505-102



2/15/2024, BOBRIEN, G:\JOBS23\24A2302505\DWG\TBRG2302505-103-SECTION.DWG-SECTION.

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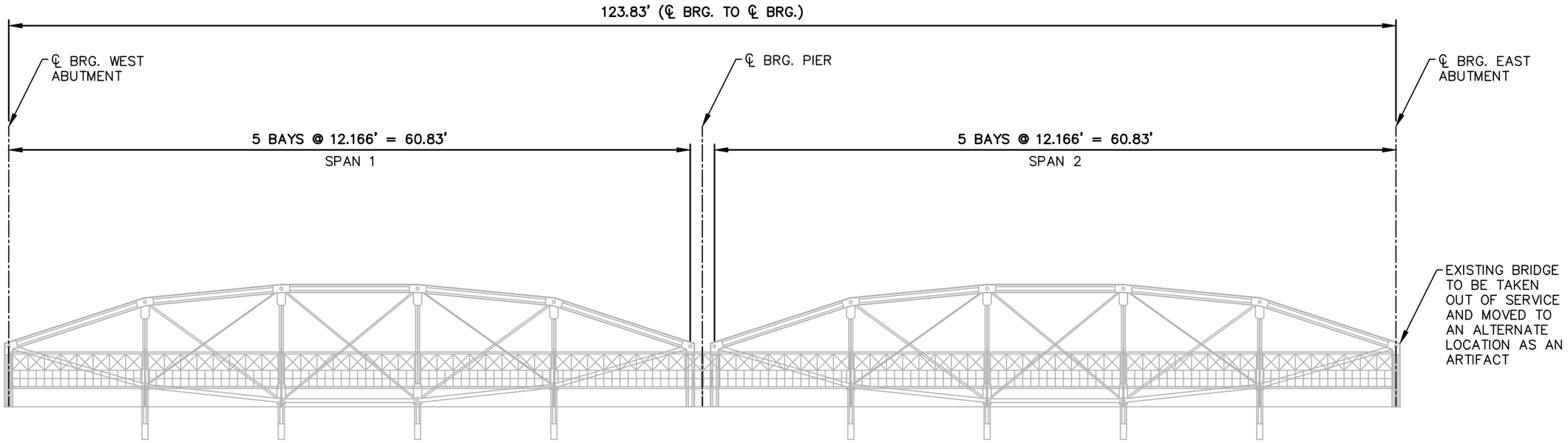
OPTION 3 (RELOCATION TO NEARBY PARK AS ARTIFACT) - TYPICAL SECTION

MAIN STREET BRIDGE STUDY
MAIN STREET OVER RIPPOWAM RIVER
STAMFORD, CONNECTICUT

Designed	B.J.R.
Drawn	B.S.O.
Reviewed	
Scale	1"=5'
Project No.	2302505
Date	02/16/24
CAD File	

FIG-10

Xref (s): ; XBRG2302505-100 ; BD2302505 ; XBRG2302505-103



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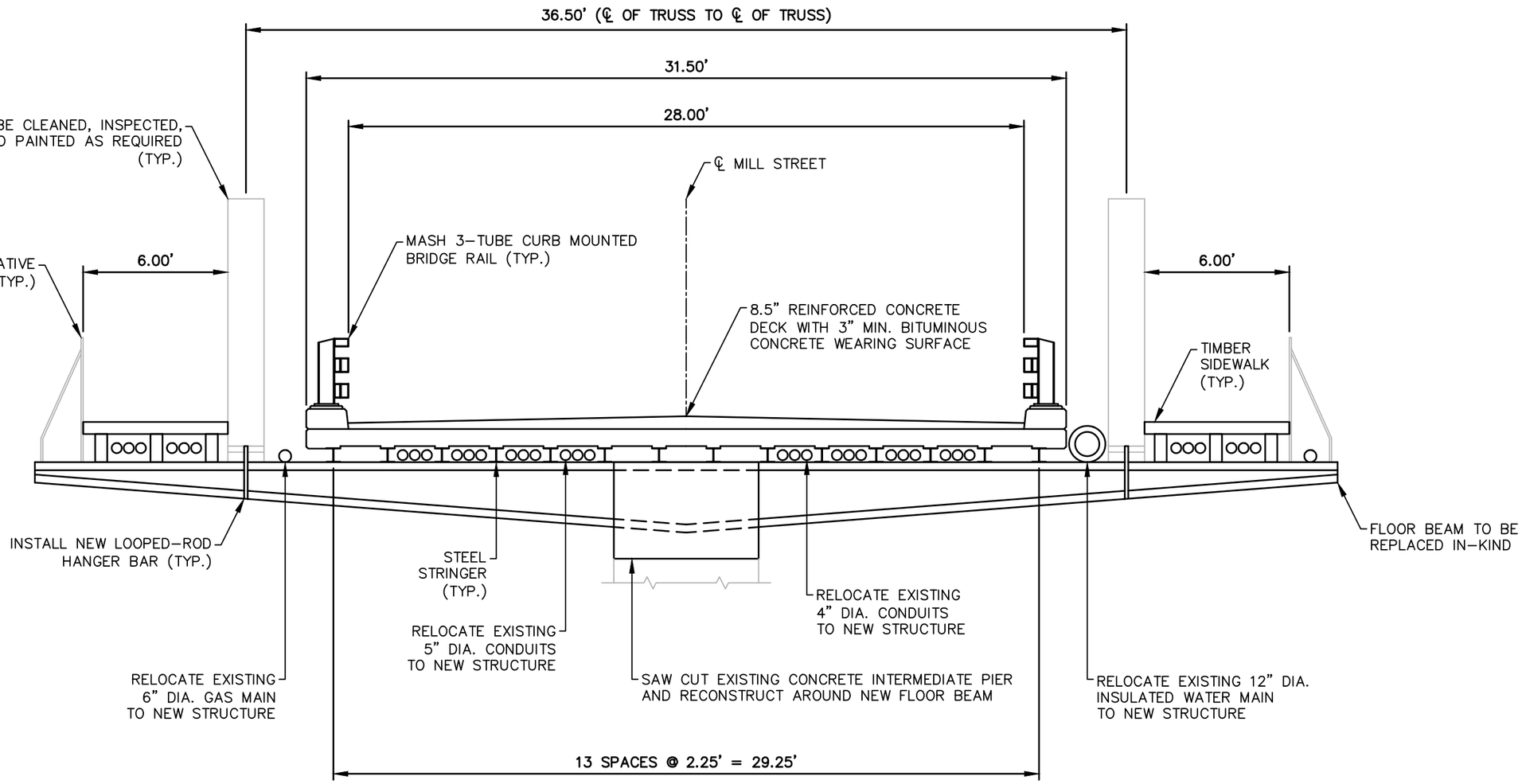
OPTION 3 (RELOCATION TO NEARBY PARK AS ARTIFACT) - SOUTH ELEVATION

MAIN STREET BRIDGE STUDY
MAIN STREET OVER RIPPOWAM RIVER
STAMFORD, CONNECTICUT

Designed	B.J.R.
Drawn	B.S.O.
Reviewed	
Scale	1"=10'
Project No.	2302505
Date	02/16/24
CAD File	

FIG-11

Xref (s): ; XBRG2302505-100 ; BD2302505 ; XBRG2302505-103



2/15/2024, BOBRIEN, G:\JOBS23\24\2302505\DWG\TBRG2302505-104A-SECTION.DWG,SECTION.

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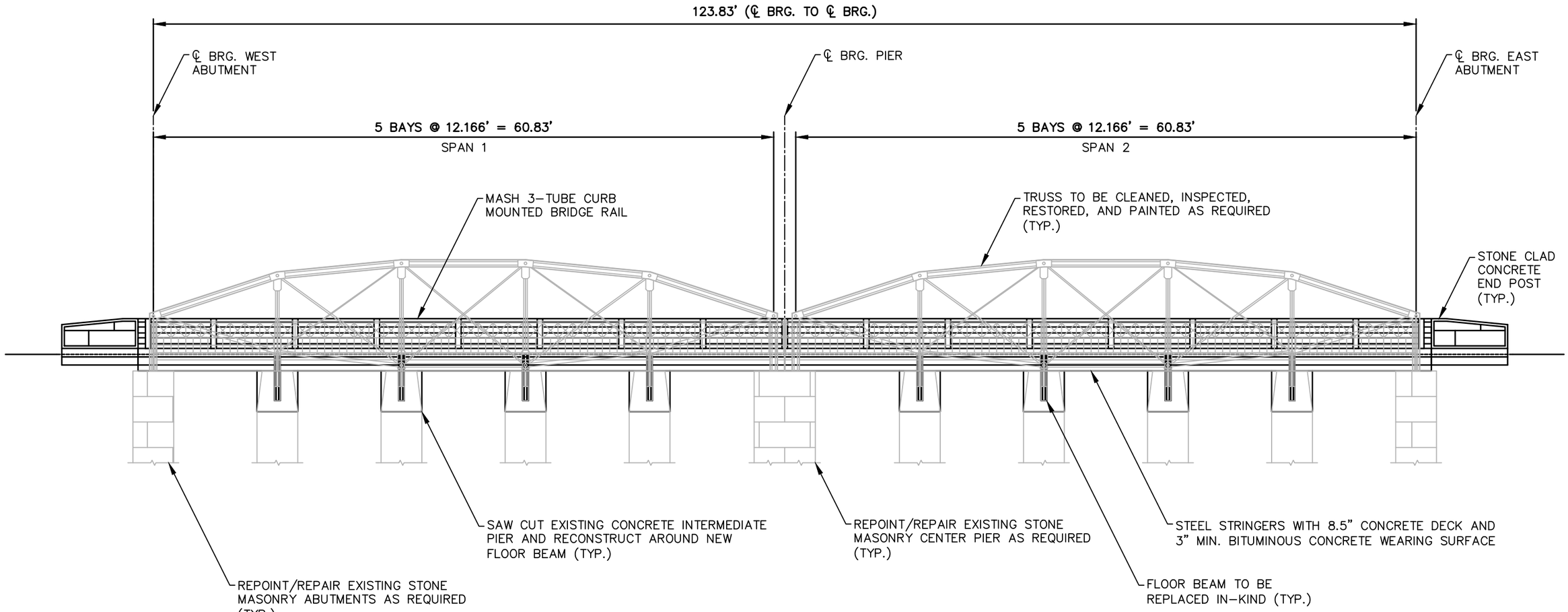
OPTION 4A (REHABILITATION WITH INTERMEDIATE PIERS) - TYPICAL SECTION

MAIN STREET BRIDGE STUDY
MAIN STREET OVER RIPPOWAM RIVER
STAMFORD, CONNECTICUT

Designed	B.J.R.
Drawn	B.S.O.
Reviewed	
Scale	1"=5'
Project No.	2302505
Date	02/16/24
CAD File	

FIG-12

Xref (s): ; XBRG2302505-100 ; BD2302505 ; XBRG2302505-104A



2/15/2024, BOBRIEN, G:\JOBS23\24\2302505\DWG\TBRG2302505-104A-ELEVATION.DWG,ELEVATION,

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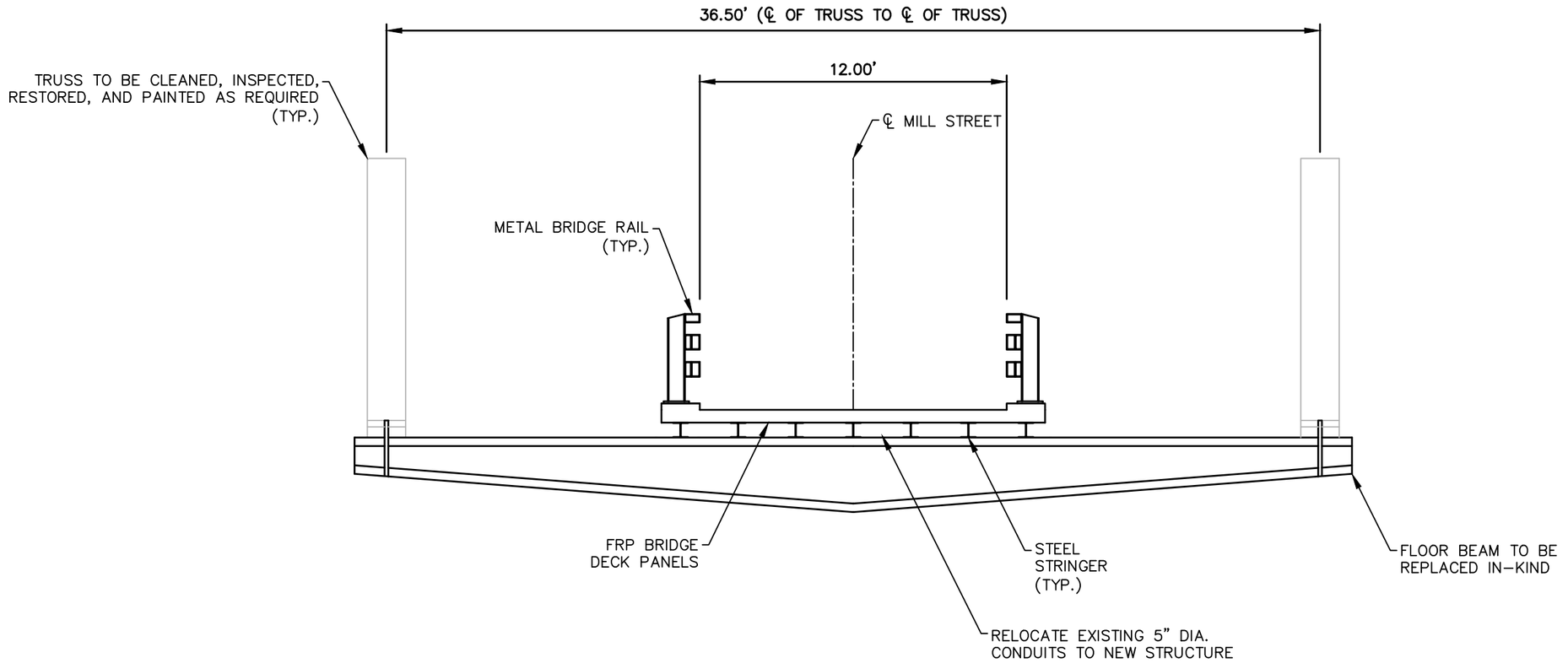
OPTION 4A (REHABILITATION WITH INTERMEDIATE PIERS) - SOUTH ELEVATION

MAIN STREET BRIDGE STUDY
MAIN STREET OVER RIPPOWAM RIVER
STAMFORD, CONNECTICUT

Designed	B.J.R.
Drawn	B.S.O.
Reviewed	
Scale	1"=10'
Project No.	2302505
Date	02/16/24
CAD File	

FIG-13

Xref (s): ; XBRG2302505-100 ; BD2302505 ; XBRG2302505-104A



2/15/2024, BOBRIEN, G:\JOBS23\24\2302505\DWG\TBRG2302505-104B-SECTION.DWG,SECTION.

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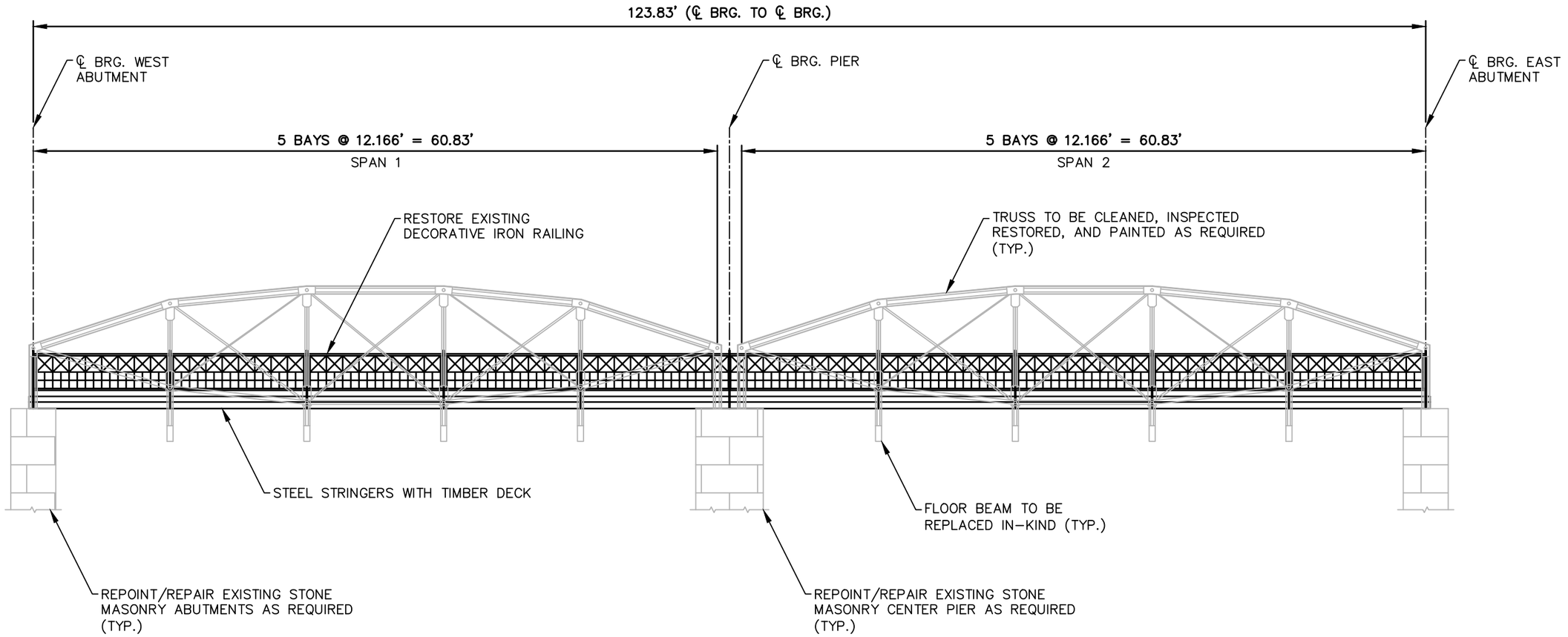
OPTION 4B (REHABILITATION WITHOUT INTERMEDIATE PIERS) - SOUTH ELEVATION

MAIN STREET BRIDGE STUDY
MAIN STREET OVER RIPPOWAM RIVER
STAMFORD, CONNECTICUT

Designed	B.J.R.
Drawn	B.S.O.
Reviewed	
Scale	1"=5'
Project No.	2302505
Date	02/16/24
CAD File	

FIG-14

Xref (s): ; XBRG2302505-100 ; BD2302505 ; XBRG2302505-104B



2/15/2024, BOBRIEN, G:\JOBS23\24\2302505\DWG\TBRG2302505-104B-ELEVATION.DWG, ELEVATION.

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OPTION 4B (REHABILITATION WITHOUT INTERMEDIATE PIERS) - SOUTH ELEVATION

MAIN STREET BRIDGE STUDY
MAIN STREET OVER RIPPOWAM RIVER
STAMFORD, CONNECTICUT

Designed	B.J.R.
Drawn	B.S.O.
Reviewed	
Scale	1"=10'
Project No.	2302505
Date	02/16/24
CAD File	

FIG-15

Xref (s): ; XBRG2302505-100 ; BD2302505 ; XBRG2302505-104B

APPENDIX B

OPINION OF PROBABLE COSTS (OPCs)

Option 1 - Superstructure Replacement

Item No.	Item	Unit	Quantity	Unit Cost	Cost
Highway Items					
0202000	EARTH EXCAVATION	CY	190	$ 62.20	$ 11,818.00
0202513	REMOVAL OF CONCRETE SIDEWALK	SY	2,095	$ 18.30	$ 38,338.50
0202529	CUT BITUMINOUS CONCRETE PAVEMENT	LF	165	$ 7.00	$ 1,155.00
0209001	FORMATION OF SUBGRADE	SY	355	$ 12.00	$ 4,260.00
0212000	SUBBASE	CY	120	$ 72.30	$ 8,676.00
0406170	HMA S1	TON	60	$ 273.80	$ 16,428.00
0406171	HMA S0.5	TON	80	$ 265.50	$ 21,240.00
0921001	CONCRETE SIDEWALK	SF	2,095	$ 22.70	$ 47,556.50
0922501	BITUMINOUS CONCRETE DRIVEWAY	SY	75	$ 91.50	$ 6,862.50
Total Highway Items					*$ 156,334.50*
Structure Items					
0020763A	DISPOSAL OF SEDIMENTS	TON	333	$ 100.00	$ 33,280.00
0101000A	ENVIRONMENTAL HEALTH & SAFETY	L.S.	1	$ 11,000.00	$ 11,000.00
0101117A	CONTROLLED MATERIALS HANDLING	C.Y.	250	$ 25.00	$ 6,250.00
0101130A	ENVIRONMENTAL WORK - SOLIDIFICATION	TON	160	$ 100.00	$ 16,000.00
0101176A	DISPOSAL OF PCB WASTE	TON	83	$ 200.00	$ 16,640.00
0020904	LEAD COMPLIANCE FOR ABRASIVE BLAST CLEANING	LS	1	$ 50,000.00	$ 50,000.00
0202000	EARTH EXCAVATION	CY	85	$ 78.30	$ 6,655.50
0202200	CHANNEL EXCAVATION - EARTH	CY	175	$ 80.00	$ 14,000.00
0202216A	EXCAVATION AND REUSE OF EXISTING CHANNEL BOTTOM MATERIAL	CY	70	$ 81.10	$ 5,677.00
0202217A	SUPPLEMENTAL STREAMBED CHANNEL MATERIAL	EST	1	$ 25,000.00	$ 25,000.00
0202250	CHANNEL EXCAVATION - ROCK	CY	10	$ 125.00	$ 1,250.00
0203202	STRUCTURE EXCAVATION - EARTH (EXCLUDING COFFERDAM AND DEWATERING)	CY	190	$ 27.00	$ 5,130.00
0203304	STRUCTURE EXCAVATION - ROCK (EXCLUDING COFFERDAM AND DEWATERING)	CY	10	$ 38.60	$ 386.00
0204001	COFFERDAM AND DEWATERING	LF	280	$ 500.00	$ 140,000.00
0216000	PERVIOUS STRUCTURE BACKFILL	CY	120	$ 87.40	$ 10,488.00
0406171	HMA S0.5	TON	110	$ 247.40	$ 27,214.00
0406173	HMA S0.25	TON	30	$ 241.00	$ 7,230.00
0503040	REMOVAL AND SALVAGE OF EXISTING PEDESTRIAN BRIDGE	LS	1	$ 105,000.00	$ 105,000.00
0503151	REMOVAL OF SUPERSTRUCTURE (SITE NO. 1)	LS	1	$ 150,000.00	$ 150,000.00
0503XXX	TEMPORARY SUPPORT OF HISTORIC TRUSS	LS	1	$ 10,000.00	$ 10,000.00
0520036	ASPHALTIC PLUG EXPANSION JOINT SYSTEM	LF	70	$ 497.30	$ 34,811.00
0521014	STEEL-LAMINATED ELASTOMERIC BEARINGS	EA	30	$ 2,200.00	$ 66,000.00
0601064	ABUTMENT AND WALL CONCRETE	CY	40	$ 1,633.90	$ 65,356.00
0601066	COLUMN AND CAP CONCRETE	CY	25	$ 2,943.90	$ 73,597.50
0605100	ASHLAR STONE MASONRY	SF	150	$ 120.00	$ 18,000.00
0601118	BRIDGE DECK CONCRETE	CY	145	$ 1,491.50	$ 216,267.50
0601121	PARAPET CONCRETE	LF	20	$ 638.80	$ 12,776.00
0601122	BRIDGE SIDEWALK CONCRETE	CY	25	$ 869.80	$ 21,745.00
0601123	APPROACH SLAB CONCRETE	CY	50	$ 688.40	$ 34,420.00
0602030	DERFORMED STEEL BARS - GALVANIZED	LB	41,200	$ 2.30	$ 94,760.00
0603061	STRUCTURAL STEEL (SITE NO. 1)	LS	1	$ 650,000.00	$ 650,000.00
06030XX	STRUCTURAL STEEL - FLOOR BEAMS (SITE NO. 1)	LS	1	$ 95,000.00	$ 95,000.00
0603081	STRUCTURAL STEEL REPAIRS (SITE NO. 1)	CWT	5	$ 4,186.30	$ 20,931.50
0603147	ABRASIVE BLAST CLEANING AND FIELD PAINTING OF STRUCTURE	LS	1	$ 210,000.00	$ 210,000.00
0603222	DISPOSAL OF LEAD DEBRIS FROM ABRASIVE BLAST CLEANING	TON	20	$ 606.90	$ 12,138.00
0606906	REBUILD MASONRY WALL	CY	50	$ 700.00	$ 35,000.00
0609001	REPOINTED MASONRY	SY	175	$ 232.50	$ 40,687.50
0703011	INTERMEDIATE RIPRAP	CY	175	$ 115.20	$ 20,160.00
0707009	MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)	SY	435	$ 103.80	$ 45,153.00
0708001	DAMPPROOFING	SY	40	$ 25.00	$ 1,000.00
0716000	TEMPORARY EARTH RETAINING SYSTEM	SF	85	$ 53.80	$ 4,573.00
0755010	GEOTEXTILE (SEPARATION - MEDIUM SURVIVABILITY)	SY	205	$ 5.90	$ 1,209.50
0819002A	PENETRATING SEALER PROTECTIVE COMPOUND	SY	480	$ 1.00	$ 480.00
0904051A	3-TUBE CURB MOUNTED BRIDGE RAIL	LF	260	$ 500.30	$ 130,078.00
0914XXX	42" PEDESTRIAN RAILING	LF	515	$ 120.00	$ 61,800.00
0974001	REMOVAL OF EXISTING MASONRY	CY	215	$ 214.00	$ 46,010.00
Total Structure Items					*$ 2,653,154.00*
Percentage Based Lump Sum Items					
0201001	CLEARING AND GRUBBING	LS	1	2.0%	$ 62,781.87
0971001	MAINTENANCE AND PROTECTION OF TRAFFIC	LS	1	1.0%	$ 31,390.93
0975004	MOBILIZATION AND PROJECT CLOSEOUT	LS	1	6.5%	$ 204,041.06
0980020	CONSTRUCTION SURVEYING	LS	1	1.0%	$ 31,390.93
Total Percentage Based Lump Sum Items					*$ 329,604.80*
Minor Items					
25% of Total Highway Items + Total Structure Items			*Minor Items*	25%	*$ 702,372.13*
Construction Cost					
Total Highway Items + Total Structure Items + Total Percentage Based Lump Sum Items + Minor Items					*$ 3,841,465.42*

Option 1 - Superstructure Replacement

Item No.	Item	Unit	Quantity	Unit Cost		Cost
Design, Construction Incidentals & Contingency						
8% of Construction Cost		*Soft Costs (Design & Permitting)*		8%	*$*	*307,317.23*
15% of Construction Cost			*Incidentals*	15%	*$*	*576,219.81*
25% of Construction Cost			*Contingency*	25%	*$*	*960,366.36*
Inflation						
6.5% of Total Highway Items + Total Structure Items + Total Percentage Based Lump Sum Items, per Year for 3 Years			*Inflation*	6.5%	*$*	*749,085.76*
		Total Cost *			***$***	***6,500,000.00***

** Rounded Up to the Nearest $100,000 for Estimating*

Note: It shall be noted that in providing an Opinion of Probable Construction Cost (OPCC), the Consultant has no control over the cost or price of labor, equipment or materials, or over the contractor's method of pricing. Accordingly, the OPCC provided by the Consultant is made on the basis of professional judgement and experience, but the Consultant makes no warranty or guaranty, express or implied, that the bids or the negotiated cost of the Work will not vary from the Consultant's OPCC.
Note: No costs were associated with the moves of the existing utilities since it is assumed that cost associated with the relocation of privatley owned utilites on town rights of way will be borne by the respective utility owner.

Option 2 - Full Replacement Along New Alignment

Item No.	Item	Unit	Quantity	Unit Cost	Cost
Highway Items					
0202000	EARTH EXCAVATION	CY	200	$ 62.30	$ 12,460.00
0202513	REMOVAL OF CONCRETE SIDEWALK	SY	1,485	$ 18.30	$ 27,175.50
0202529	CUT BITUMINOUS CONCRETE PAVEMENT	LF	160	$ 7.10	$ 1,136.00
0209001	FORMATION OF SUBGRADE	SY	380	$ 11.70	$ 4,446.00
0212000	SUBBASE	CY	130	$ 71.60	$ 9,308.00
0406170	HMA S1	TON	65	$ 268.60	$ 17,459.00
0406171	HMA S0.5	TON	85	$ 261.90	$ 22,261.50
0921001	CONCRETE SIDEWALK	SF	1,485	$ 24.50	$ 36,382.50
0922501	BITUMINOUS CONCRETE DRIVEWAY	SY	75	$ 91.50	$ 6,862.50
Total Highway Items					*$ 137,491.00*
Structure Items					
0020763A	DISPOSAL OF SEDIMENTS	TON	333	$ 100.00	$ 33,280.00
0101000A	ENVIRONMENTAL HEALTH & SAFETY	L.S.	1	$ 11,000.00	$ 11,000.00
0101117A	CONTROLLED MATERIALS HANDLING	C.Y.	227	$ 25.00	$ 5,662.50
0101130A	ENVIRONMENTAL WORK - SOLIDIFICATION	TON	160	$ 100.00	$ 16,000.00
0101176A	DISPOSAL OF PCB WASTE	TON	83	$ 200.00	$ 16,640.00
0020904	LEAD COMPLIANCE FOR ABRASIVE BLAST CLEANING	LS	1	$ 50,000.00	$ 50,000.00
0202000	EARTH EXCAVATION	CY	350	$ 53.70	$ 18,795.00
0202200	CHANNEL EXCAVATION - EARTH	CY	390	$ 80.00	$ 31,200.00
0202216A	EXCAVATION AND REUSE OF EXISTING CHANNEL BOTTOM MATERIAL	CY	125	$ 70.40	$ 8,800.00
0202217A	SUPPLEMENTAL STREAMBED CHANNEL MATERIAL	EST	1	$ 25,000.00	$ 25,000.00
0202250	CHANNEL EXCAVATION - ROCK	CY	20	$ 125.00	$ 2,500.00
0203202	STRUCTURE EXCAVATION - EARTH (EXCLUDING COFFERDAM AND DEWATERING)	CY	480	$ 28.50	$ 13,680.00
0203304	STRUCTURE EXCAVATION - ROCK (EXCLUDING COFFERDAM AND DEWATERING)	CY	25	$ 38.60	$ 965.00
0204001	COFFERDAM AND DEWATERING	LF	350	$ 500.00	$ 175,000.00
0204151A	HANDLING WATER	LS	1	$ 150,000.00	$ 150,000.00
0213100	GRANULAR FILL	CY	90	$ 80.00	$ 7,200.00
0216000	PERVIOUS STRUCTURE BACKFILL	CY	805	$ 64.90	$ 52,244.50
0406171	HMA S0.5	TON	115	$ 245.00	$ 28,175.00
0406173	HMA S0.25	TON	30	$ 241.00	$ 7,230.00
0503040	REMOVAL AND SALVAGE OF EXISTING PEDESTRIAN BRIDGE	LS	1	$ 105,000.00	$ 105,000.00
0503151	REMOVAL OF SUPERSTRUCTURE (SITE NO. 1)	LS	1	$ 150,000.00	$ 150,000.00
0503XXX	REMOVAL AND SALVAGE OF HISTORIC TRUSS	LS	1	$ 100,000.00	$ 100,000.00
0520036	ASPHALTIC PLUG EXPANSION JOINT SYSTEM	LF	100	$ 481.10	$ 48,110.00
0521014	STEEL-LAMINATED ELASTOMERIC BEARINGS	EA	24	$ 2,200.00	$ 52,800.00
0601062	FOOTING CONCRETE	CY	235	$ 643.90	$ 151,316.50
0601064	ABUTMENT AND WALL CONCRETE	CY	165	$ 1,406.10	$ 232,006.50
0601066	COLUMN AND CAP CONCRETE	CY	40	$ 2,943.90	$ 117,756.00
0605100	ASHLAR STONE MASONRY	SF	1,400	$ 100.00	$ 140,000.00
0601118	BRIDGE DECK CONCRETE	CY	175	$ 1,452.00	$ 254,100.00
0601121	PARAPET CONCRETE	LF	20	$ 638.80	$ 12,776.00
0601122	BRIDGE SIDEWALK CONCRETE	CY	50	$ 790.20	$ 39,510.00
0601123	APPROACH SLAB CONCRETE	CY	55	$ 688.40	$ 37,862.00
0602030	DERFORMED STEEL BARS - GALVANIZED	LB	80,800	$ 2.50	$ 202,000.00
0603061	STRUCTURAL STEEL (SITE NO. 1)	LS	1	$ 550,000.00	$ 550,000.00
0603081	STRUCTURAL STEEL REPAIRS (SITE NO. 1)	CWT	5	$ 4,186.30	$ 20,931.50
0603147	ABRASIVE BLAST CLEANING AND FIELD PAINTING OF STRUCTURE	LS	1	$ 210,000.00	$ 210,000.00
0603222	DISPOSAL OF LEAD DEBRIS FROM ABRASIVE BLAST CLEANING	TON	20	$ 606.90	$ 12,138.00
0703011	INTERMEDIATE RIPRAP	CY	180	$ 115.20	$ 20,736.00
0706001	MICROPILES	EA	52	$ 8,145.60	$ 423,571.20
0706002	VERIFICATION TEST FOR MICROPILES	EA	7	$ 24,913.20	$ 174,392.40
0706003	PROOF TEST FOR MICROPILES	EA	7	$ 6,471.25	$ 45,298.75
0707009	MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)	SY	435	$ 103.80	$ 45,153.00
0708001	DAMPPROOFING	SY	210	$ 21.40	$ 4,494.00
0716000	TEMPORARY EARTH RETAINING SYSTEM	SF	1,100	$ 45.70	$ 50,270.00
0755010	GEOTEXTILE (SEPARATION - MEDIUM SURVIVABILITY)	SY	220	$ 5.90	$ 1,298.00
0904051A	3-TUBE CURB MOUNTED BRIDGE RAIL	LF	260	$ 500.30	$ 130,078.00
0974001	REMOVAL OF EXISTING MASONRY	CY	375	$ 173.40	$ 65,025.00
Total Structure Items					*$ 4,049,994.85*
Percentage Based Lump Sum Items					
0201001	CLEARING AND GRUBBING	LS	1	2.0%	$ 93,575.10
0971001	MAINTENANCE AND PROTECTION OF TRAFFIC	LS	1	1.0%	$ 46,787.55
0975004	MOBILIZATION AND PROJECT CLOSEOUT	LS	1	6.5%	$ 304,119.08
0980020	CONSTRUCTION SURVEYING	LS	1	1.0%	$ 46,787.55
Total Percentage Based Lump Sum Items					*$ 491,269.29*
Minor Items					
25% of Total Highway Items + Total Structure Items			*Minor Items*	25%	*$ 1,046,871.46*
Construction Cost					
Total Highway Items + Total Structure Items + Total Percentage Based Lump Sum Items + Minor Items					*$ 5,725,626.60*

Option 2 - Full Replacement Along New Alignment

Item No.	Item	Unit	Quantity	Unit Cost		Cost
Design, Construction Incidentals & Contingency						
8% of Construction Cost		*Soft Costs (Design & Permitting)*		8%	*$*	*458,050.13*
15% of Construction Cost			*Incidentals*	15%	*$*	*858,843.99*
25% of Construction Cost			*Contingency*	25%	*$*	*1,431,406.65*
Inflation						
6.5% of Total Highway Items + Total Structure Items + Total Percentage Based Lump Sum Items, per Year for 3 Years			*Inflation*	6.5%	*$*	*1,116,497.19*
		Total Cost *			***$***	***9,600,000.00***

** Rounded Up to the Nearest $100,000 for Estimating*

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Note: No costs were associated with the moves of the existing utilities since it is assumed that cost associated with the relocation of privatley owned utilites on town rights of way will be borne by the respective utility owner.

Option 3 - Relocation to Nearby Park as Artifact

Item No.	Item	Unit	Quantity	Unit Cost	Cost
0202000	EARTH EXCAVATION	CY	20	$ 62.20	$ 1,244.00
0913001	4' POLYVINYL CHLORIDE CHAIN LINK FENCE	LF	150	$ 75.00	$ 11,250.00
0910300	METAL BEAM RAIL (R-B MASH)	LF	80	$ 40.00	$ 3,200.00
0918011	END ANCHORAGE-TYPE I	EA	2	$ 5,000.00	$ 10,000.00
0944000	FURNISHING AND PLACING TOPSOIL	SY	400	$ 7.00	$ 2,800.00
0950005	TURF ESTABLISHMENT	SY	400	$ 2.50	$ 1,000.00
Total Highway Items					*$ 29,494.00*
Structure Items					
0203202	STRUCTURE EXCAVATION - EARTH (EXCLUDING COFFERDAM AND DEWATERING)	CY	75	$ 27.00	$ 2,025.00
0203304	STRUCTURE EXCAVATION - ROCK (EXCLUDING COFFERDAM AND DEWATERING)	CY	5	$ 38.60	$ 193.00
0204151A	HANDLING WATER	LS	1	$ 100,000.00	$ 100,000.00
0216000	PERVIOUS STRUCTURE BACKFILL	CY	80	$ 93.10	$ 7,448.00
0503151	REMOVAL OF SUPERSTRUCTURE (SITE NO. 1)	LS	1	$ 150,000.00	$ 150,000.00
0503XXX	REMOVAL AND RELOCATE HISTORIC TRUSS	LS	1	$ 120,000.00	$ 120,000.00
0606906	REBUILD MASONRY WALL	CY	30	$ 700.00	$ 21,000.00
0609001	REPOINTED MASONRY	SY	80	$ 232.50	$ 18,600.00
0703011	INTERMEDIATE RIPRAP	CY	110	$ 122.30	$ 13,453.00
0755010	GEOTEXTILE (SEPARATION - MEDIUM SURVIVABILITY)	SY	130	$ 5.90	$ 767.00
Total Structure Items					*$ 433,486.00*
Percentage Based Lump Sum Items					
0201001	CLEARING AND GRUBBING	LS	1	2.0%	$ 10,958.11
0971001	MAINTENANCE AND PROTECTION OF TRAFFIC	LS	1	6.0%	$ 32,874.32
0975004	MOBILIZATION AND PROJECT CLOSEOUT	LS	1	6.5%	$ 35,613.85
0980020	CONSTRUCTION SURVEYING	LS	1	1.0%	$ 5,479.05
Total Percentage Based Lump Sum Items					*$ 84,925.33*
Minor Items					
25% of Total Highway Items + Total Structure Items		*Minor Items*		25%	*$ 115,745.00*
Construction Cost					
Total Highway Items + Total Structure Items + Total Percentage Based Lump Sum Items + Minor Items					*$ 663,650.33*
Design, Construction Incidentals & Contingency					
8% of Construction Cost		*Soft Costs (Design & Permitting)*		8%	*$ 53,092.03*
15% of Construction Cost		*Incidentals*		15%	*$ 99,547.55*
25% of Construction Cost		*Contingency*		25%	*$ 165,912.58*
Inflation					
6.5% of Total Highway Items + Total Structure Items + Total Percentage Based Lump Sum Items, per Year for 3 Years		*Inflation*		6.5%	*$ 129,411.81*
		Total Cost *			***$ 1,200,000.00***

** Rounded Up to the Nearest $100,000 for Estimating*

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Option 4A - Rehabilitation With Intermediate Piers

Item No.	Item	Unit	Quantity	Unit Cost	Cost
Highway Items					
0202000	EARTH EXCAVATION	CY	190	$ 62.20	$ 11,818.00
0202513	REMOVAL OF CONCRETE SIDEWALK	SY	2,095	$ 18.30	$ 38,338.50
0202529	CUT BITUMINOUS CONCRETE PAVEMENT	LF	165	$ 7.00	$ 1,155.00
0209001	FORMATION OF SUBGRADE	SY	355	$ 12.00	$ 4,260.00
0212000	SUBBASE	CY	120	$ 72.30	$ 8,676.00
0406170	HMA S1	TON	60	$ 273.80	$ 16,428.00
0406171	HMA S0.5	TON	76	$ 265.50	$ 20,294.82
0921001	CONCRETE SIDEWALK	SF	2,095	$ 22.70	$ 47,556.50
0922501	BITUMINOUS CONCRETE DRIVEWAY	SY	75	$ 91.50	$ 6,862.50
Total Highway Items					*$ 155,389.32*
Structure Items					
0020763A	DISPOSAL OF SEDIMENTS	TON	666	$ 100.00	$ 66,560.00
0101000A	ENVIRONMENTAL HEALTH & SAFETY	L.S.	1	$ 11,000.00	$ 11,000.00
0101117A	CONTROLLED MATERIALS HANDLING	C.Y.	500	$ 25.00	$ 12,500.00
0101130A	ENVIRONMENTAL WORK - SOLIDIFICATION	TON	160	$ 100.00	$ 16,000.00
0101176A	DISPOSAL OF PCB WASTE	TON	166	$ 200.00	$ 33,280.00
0020904	LEAD COMPLIANCE FOR ABRASIVE BLAST CLEANING	LS	1	$ 50,000.00	$ 50,000.00
0202000	EARTH EXCAVATION	CY	65	$ 84.10	$ 5,466.50
0202200	CHANNEL EXCAVATION - EARTH	CY	430	$ 80.00	$ 34,400.00
0202216A	EXCAVATION AND REUSE OF EXISTING CHANNEL BOTTOM MATERIAL	CY	175	$ 70.40	$ 12,320.00
0202217A	SUPPLEMENTAL STREAMBED CHANNEL MATERIAL	EST	1	$ 25,000.00	$ 25,000.00
0202250	CHANNEL EXCAVATION - ROCK	CY	25	$ 125.00	$ 3,125.00
0203202	STRUCTURE EXCAVATION - EARTH (EXCLUDING COFFERDAM AND DEWATERING)	CY	135	$ 27.00	$ 3,645.00
0203304	STRUCTURE EXCAVATION - ROCK (EXCLUDING COFFERDAM AND DEWATERING)	CY	10	$ 38.60	$ 386.00
0204001	COFFERDAM AND DEWATERING	LF	280	$ 500.00	$ 140,000.00
0216000	PERVIOUS STRUCTURE BACKFILL	CY	80	$ 93.10	$ 7,448.00
0406171	HMA S0.5	TON	100	$ 252.70	$ 25,270.00
0406173	HMA S0.25	TON	30	$ 241.00	$ 7,230.00
0503XXX	INSPECT & RESTORE EXISTING HISTORICAL BRIDGE	LS	1	$ 250,000.00	$ 250,000.00
0503151	REMOVAL OF SUPERSTRUCTURE (SITE NO. 1)	LS	1	$ 150,000.00	$ 150,000.00
0520036	ASPHALTIC PLUG EXPANSION JOINT SYSTEM	LF	65	$ 500.70	$ 32,545.50
0521014	STEEL-LAMINATED ELASTOMERIC BEARINGS	EA	42	$ 5,647.00	$ 237,174.00
0601066	COLUMN AND CAP CONCRETE	CY	55	$ 2,943.90	$ 161,914.50
0605100	ASHLAR STONE MASONRY	SF	150	$ 120.00	$ 18,000.00
0601118	BRIDGE DECK CONCRETE	CY	120	$ 1,532.30	$ 183,876.00
0601121	PARAPET CONCRETE	LF	20	$ 638.80	$ 12,776.00
0601123	APPROACH SLAB CONCRETE	CY	45	$ 698.00	$ 31,410.00
0602030	DERFORMED STEEL BARS - GALVANIZED	LB	31,600	$ 3.00	$ 94,800.00
0603061	STRUCTURAL STEEL (SITE NO. 1)	LS	1	$ 150,000.00	$ 150,000.00
06030XX	STRUCTURAL STEEL - FLOOR BEAMS (SITE NO. 1)	LS	1	$ 100,000.00	$ 100,000.00
0603081	STRUCTURAL STEEL REPAIRS (SITE NO. 1)	CWT	60	$ 4,186.30	$ 251,178.00
0603147	ABRASIVE BLAST CLEANING AND PAINTING OF STRUCTURE	LS	1	$ 210,000.00	$ 210,000.00
0603222	DISPOSAL OF LEAD DEBRIS FROM ABRASIVE BLAST CLEANING	TON	20	$ 606.90	$ 12,138.00
0609001	REPOINTED MASONRY	SY	200	$ 232.50	$ 46,500.00
0606906	REBUILD MASONRY WALL	CY	70	$ 700.00	$ 49,000.00
0701XXX	TIMBER SIDEWALK	SF	1,500	$ 4.20	$ 6,300.00
0703011	INTERMEDIATE RIPRAP	CY	215	$ 115.60	$ 24,854.00
0707009	MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)	SY	390	$ 105.20	$ 41,028.00
0716000	TEMPORARY EARTH RETAINING SYSTEM	SF	85	$ 53.80	$ 4,573.00
0755010	GEOTEXTILE (SEPARATION - MEDIUM SURVIVABILITY)	SY	515	$ 5.90	$ 3,038.50
0819002A	PENETRATING SEALER PROTECTIVE COMPOUND	SY	120	$ 1.00	$ 120.00
0904051A	3-TUBE CURB MOUNTED BRIDGE RAIL	LF	250	$ 503.50	$ 125,875.00
0914XXX	42" PEDESTRIAN RAILING	LF	500	$ 120.00	$ 60,000.00
0974001	REMOVAL OF EXISTING MASONRY	CY	140	$ 251.60	$ 35,224.00
Total Structure Items					*$ 2,745,955.00*
Percentage Based Lump Sum Items					
0201001	CLEARING AND GRUBBING	LS	1	2.0%	$ 64,834.51
0971001	MAINTENANCE AND PROTECTION OF TRAFFIC	LS	1	1.0%	$ 32,417.25
0975004	MOBILIZATION AND PROJECT CLOSEOUT	LS	1	6.5%	$ 210,712.16
0980020	CONSTRUCTION SURVEYING	LS	1	1.0%	$ 32,417.25
Total Percentage Based Lump Sum Items					*$ 340,381.18*
Minor Items					
25% of Total Highway Items + Total Structure Items			*Minor Items*	25%	*$ 725,336.08*
Construction Cost					
Total Highway Items + Total Structure Items + Total Percentage Based Lump Sum Items + Minor Items					*$ 3,967,061.58*

Option 4A - Rehabilitation With Intermediate Piers

Item No.	Item	Unit	Quantity	Unit Cost		Cost
Incidentals & Contingency						
8% of Construction Cost		*Soft Costs (Design & Permitting)*		8%	*$*	*317,364.93*
15% of Construction Cost			*Incidentals*	15%	*$*	*595,059.24*
25% of Construction Cost			*Contingency*	25%	*$*	*991,765.39*
Inflation						
6.5% of Total Highway Items + Total Structure Items + Total Percentage Based Lump Sum Items, per Year for 3 Years			*Inflation*	6.5%	*$*	*773,577.01*
		Total Cost *			***$***	***6,700,000.00***

** Rounded Up to the Nearest $100,000 for Estimating*

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Note: No costs were associated with the moves of the existing utilities since it is assumed that cost associated with the relocation of privatley owned utilites on town rights of way will be borne by the respective utility owner.

Option 4B - Rehabilitation Without Intermediate Piers

Item No.	Item	Unit	Quantity	Unit Cost	Cost
Highway Items					
0202000	EARTH EXCAVATION	CY	95	$ 62.20	$ 5,909.00
0202513	REMOVAL OF CONCRETE SIDEWALK	SY	2,095	$ 18.30	$ 38,338.50
0202529	CUT BITUMINOUS CONCRETE PAVEMENT	LF	165	$ 7.00	$ 1,155.00
0209001	FORMATION OF SUBGRADE	SY	178	$ 12.00	$ 2,130.00
0212000	SUBBASE	CY	60	$ 72.30	$ 4,338.00
0406170	HMA S1	TON	30	$ 273.80	$ 8,214.00
0406171	HMA S0.5	TON	40	$ 265.50	$ 10,620.00
0921001	CONCRETE SIDEWALK	SF	2,095	$ 22.70	$ 47,556.50
0922501	BITUMINOUS CONCRETE DRIVEWAY	SY	75	$ 91.50	$ 6,862.50
Total Highway Items					*$ 125,123.50*
Structure Items					
0020763A	DISPOSAL OF SEDIMENTS	TON	333	$ 100.00	$ 33,280.00
0101000A	ENVIRONMENTAL HEALTH & SAFETY	L.S.	1	$ 11,000.00	$ 11,000.00
0101117A	CONTROLLED MATERIALS HANDLING	C.Y.	250	$ 25.00	$ 6,250.00
0101130A	ENVIRONMENTAL WORK - SOLIDIFICATION	TON	160	$ 100.00	$ 16,000.00
0101176A	DISPOSAL OF PCB WASTE	TON	83	$ 200.00	$ 16,640.00
0020904	LEAD COMPLIANCE FOR ABRASIVE BLAST CLEANING	LS	1	$ 50,000.00	$ 50,000.00
0202000	EARTH EXCAVATION	CY	65	$ 84.10	$ 5,466.50
0202200	CHANNEL EXCAVATION - EARTH	CY	170	$ 80.00	$ 13,600.00
0202216A	EXCAVATION AND REUSE OF EXISTING CHANNEL BOTTOM MATERIAL	CY	70	$ 81.10	$ 5,677.00
0202217A	SUPPLEMENTAL STREAMBED CHANNEL MATERIAL	EST	1	$ 25,000.00	$ 25,000.00
0202250	CHANNEL EXCAVATION - ROCK	CY	10	$ 125.00	$ 1,250.00
0203202	STRUCTURE EXCAVATION - EARTH (EXCLUDING COFFERDAM AND DEWATERING)	CY	50	$ 27.00	$ 1,350.00
0203304	STRUCTURE EXCAVATION - ROCK (EXCLUDING COFFERDAM AND DEWATERING)	CY	5	$ 38.60	$ 193.00
0204001	COFFERDAM AND DEWATERING	LF	280	$ 500.00	$ 140,000.00
0216000	PERVIOUS STRUCTURE BACKFILL	CY	80	$ 93.10	$ 7,448.00
0503151	REMOVAL OF SUPERSTRUCTURE (SITE NO. 1)	LS	1	$ 150,000.00	$ 150,000.00
0503XXX	INSPECT & RESTORE EXISTING HISTORICAL BRIDGE	LS	1	$ 250,000.00	$ 250,000.00
0520036	ASPHALTIC PLUG EXPANSION JOINT SYSTEM	LF	35	$ 497.30	$ 17,405.50
0521014	STEEL-LAMINATED ELASTOMERIC BEARINGS	EA	15	$ 5,647.00	$ 84,705.00
0601121	PARAPET CONCRETE	LF	20	$ 638.80	$ 12,776.00
0605100	ASHLAR STONE MASONRY	SF	150	$ 120.00	$ 18,000.00
0603061	STRUCTURAL STEEL (SITE NO. 1)	LS	1	$ 100,000.00	$ 100,000.00
06030XX	STRUCTURAL STEEL - FLOOR BEAMS (SITE NO. 1)	LS	1	$ 100,000.00	$ 100,000.00
0603081	STRUCTURAL STEEL REPAIRS (SITE NO. 1)	CWT	75	$ 4,186.30	$ 313,972.50
0603147	ABRASIVE BLAST CLEANING AND PAINTING OF STRUCTURE	LS	1	$ 210,000.00	$ 210,000.00
0603222	DISPOSAL OF LEAD DEBRIS FROM ABRASIVE BLAST CLEANING	TON	20	$ 606.90	$ 12,138.00
0609001	REPOINTED MASONRY	SY	200	$ 232.50	$ 46,500.00
0606906	REBUILD MASONRY WALL	CY	70	$ 700.00	$ 49,000.00
07010XX	FRP BRIDGE DECKING	SF	1,900	$ 110.00	$ 209,000.00
0703011	INTERMEDIATE RIPRAP	CY	170	$ 115.60	$ 19,652.00
0716000	TEMPORARY EARTH RETAINING SYSTEM	SF	85	$ 53.80	$ 4,573.00
0755010	GEOTEXTILE (SEPARATION - MEDIUM SURVIVABILITY)	SY	205	$ 5.90	$ 1,209.50
0904051A	3-TUBE CURB MOUNTED BRIDGE RAIL	LF	250	$ 503.50	$ 125,875.00
0974001	REMOVAL OF EXISTING MASONRY	CY	195	$ 222.00	$ 43,290.00
Total Structure Items					*$ 2,101,251.00*
Percentage Based Lump Sum Items					
0201001	CLEARING AND GRUBBING	LS	1	2.0%	$ 50,030.89
0971001	MAINTENANCE AND PROTECTION OF TRAFFIC	LS	1	1.5%	$ 37,523.17
0975004	MOBILIZATION AND PROJECT CLOSEOUT	LS	1	6.5%	$ 162,600.38
0980020	CONSTRUCTION SURVEYING	LS	1	1.0%	$ 25,015.44
Total Percentage Based Lump Sum Items					*$ 275,169.88*
Minor Items					
25% of Total Highway Items + Total Structure Items			*Minor Items*	25%	*$ 556,593.63*
Construction Cost					
Total Highway Items + Total Structure Items + Total Percentage Based Lump Sum Items + Minor Items					*$ 3,058,138.01*

Option 4B - Rehabilitation Without Intermediate Piers

Item No.	Item	Unit	Quantity	Unit Cost		Cost
Incidentals & Contingency						
8% of Construction Cost		*Soft Costs (Design & Permitting)*		8%	*$*	*244,651.04*
15% of Construction Cost			*Incidentals*	15%	*$*	*458,720.70*
25% of Construction Cost			*Contingency*	25%	*$*	*764,534.50*
Inflation						
6.5% of Total Highway Items + Total Structure Items + Total Percentage Based Lump Sum Items, per Year for 3 Years			*Inflation*	6.5%	*$*	*596,336.91*
		Total Cost *			***$***	***5,200,000.00***

** Rounded Up to the Nearest $100,000 for Estimating*

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