McKIM&CREED

ENGINEERS

SURVEYORS

PLANNERS

January 8, 2021

Mr. JP Murphy
Town Manager
901 Ponce DeLeon Blvd
Belleair, FL 34616

Re: **Bridge and Seawall Evaluations**

Dear JP:

Please find enclosed, Moffat and Nichol's **Bridge and Seawall Evaluations** report dated **January 5, 2021**. The evaluations included assessments of the general structural condition of the bridges and wingwalls, as well as the adjacent seawalls. Cracks, spalls, scouring, and signs of settlement, movement, or wall failure were documented as well.

The bridges were found to have minimal damage and only preservation measures and continued basic maintenance, such as patching cracks/spalls noted in the routine inspection reports is recommended. Additionally, we see no indication of scour at any of the bridges, including the bridges currently noted as Scour Critical by the FDOT. The recommendations for the bridge repairs and associated budgetary costs are as follows:

- Winston Drive Bridge over Graff Canal: repair 3' x 5' void as soon as possible - $9,300
- North Pine Circle Bridge over Roth's Canal and wingwalls: general maintenance repairs - $39,250

The Thompson Park Seawall is in "Serious" condition and is recommended to be replaced on a moderate priority basis. The estimated cost is to replace the seawall is $210,680.

The Winston Park Seawall is in "Satisfactory" condition and it is recommended that a French drain be installed behind the seawall where loss of fill has occurred. The estimated cost is $5,000.

Please let me know if you have any questions or concerns.

Sincerely,

Phillip J. Locke

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Senior Project Manager

moffatt & nichol | 75 Years

BRIDGE AND SEAWALL EVALUATIONS

Town of Belleair, FL

REPORT

Produced For McKim & Creed

January 5, 2021

DOCUMENT VERIFICATION

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EXECUTIVE SUMMARY

Moffatt & Nichol (M&N) conducted an inspection of five (5) Bridges and two (2) seawalls for the Town of Belleair in Belleair, FL on October 21 and 22, 2020. The bridge and seawalls names and numbers are below:

- Bridge No. 155000 and wingwalls, Winston Drive over Graff Canal
- Bridge No. 155001 and wingwalls, North Pine Circle over Roths Canal
- Bridge No. 155003, Bayview Drive over Exotic Creek
- Bridge No. 155004, Overbrook Drive over Ikes Creek
- Bridge No. 150062, Indian Rocks Rd. (CR-233) over Ikes Creek
- Seawall at Thompson Park, adjacent to North Pine Circle
- Seawall at Winston Park, adjacent to Winston Drive

The scope of the inspection was to assess the general structural condition of the bridges and wingwalls, as well as the adjacent seawalls, and to document any cracks, spalls, and signs of settlement, movement, or wall failure. M&N measured the existing structural elements and visually evaluated the foundations.

The inspection utilized the 2019 FDOT Bridge Inspection Reports (Reports) to establish a rate of structural deterioration, channel degradation and scour. M&N confirmed the state of all deficiencies outlined in the FDOT reports and noted any changes or additional defects. The bridge inspections followed the procedures outlined in the "*Bridge Inspector's Reference Manual (BIRM)*" published by the Federal Highway Administration (FHWA). For the seawall inspections, M&N followed the procedures outlined in the "*Waterfront Facilities Inspection and Assessment*" published by the American Society of Civil Engineers (ASCE).

Bridges

Overall, the five (5) bridges inspected had minimal damages beyond those described in the Reports. Bridges 155000 and 155001 were noted by FDOT to be Scour Critical, and no scour was found at these two bridges or any other bridge on the list during this field assessment. There was a minimal amount of undermining on the northwest wingwall of Bridge No 150062 that poses no threat to the structural integrity of the bridge. It was noted that some bridge maintenance repairs have been completed since the 2019 routine FDOT inspection. Each of these bridges were designed for a service life of approximately 75 years.

Thompson Park Seawall

The Thompson Park Seawall has a condition assessment rating of SERIOUS. There are various areas of backfill loss with voiding behind the seawall along its entire length. These areas mostly occur at the concrete panel joints that have spalled and opened. Additionally, there is a 50-foot section of wall with up to six inches of lateral movement which has resulted in a large void and backfill loss. Additionally, there are a multitude of full-height cracks in the concrete cap and panels, along with spalls at every panel joint. The tie-rods here are all exposed and have coating failure with flaking corrosion, and one tie-rod 22 feet from the bridge has failed.

Winston Park Seawall

The Winston Park Seawall has a condition assessment rating of SATISFACTORY. There were minor to moderate defects and deterioration observed, but no evidence of overstressing. The concrete cap has been replaced since the installation of the seawall and is in good condition, along with the sidewalks on the upland side of the cap. However, the concrete wall panels are of original construction and have several spalls at the connection joints. One spall located 72 feet from Bridge 155000 has a two-foot-deep

void behind the wall due to backfill loss. None of the spalls were observed to have exposed steel reinforcing.

Repairs and Recommendations

Thompson Park Seawall

M&N recommends replacing the Thompson Park Seawall on a moderate-priority basis. Until the seawall is replaced, M&N recommends that vehicular live loading be restricted along the seawall, and that the wall be regularly monitored for additional lateral movement.

- Estimated Seawall Replacement Cost - $210,680

Winston Park Seawall

M&N recommends installing one French Drain behind the seawall where loss of fill was observed. In doing so, future voiding behind the seawall at those locations may be reduced. It is also recommended to fill any voiding with grout to prevent the settlement of the newly poured sidewalk on the upland side of the concrete cap. Per the ASCE Waterfront Inspection Manual, M&N recommends the seawall at Winston Park to be inspected again in 5 years.

- Estimated French Drain Cost - $5,000

Bridges

M&N recommends considering bridge preservation measures and to continue basic maintenance, such as patching cracks/spalls noted in the routine inspection reports.

Per the BIRM, M&N recommends inspection of the Bridges on a 24-month routine inspection cycle and a 60-month underwater inspection cycle, for bridge components in greater than four (4) feet of water.

- Bridge 155000 Estimated Repair Cost - $9,300
- Bridge 155001 Estimated Repair Cost - $39,250

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1.0 INTRODUCTION

The Town of Belleair is located directly south of Clearwater, FL along Clearwater Harbor. The company McKim & Creed is developing a Capitol Improvement Master Plan for the Town of Belleair which includes budgetary repair costs for several bridges and seawalls. The Town identified five short-span bridges and two parks with seawalls as areas of concern.

McKim & Creed requested M&N to perform a site visit to observe the general condition of the bridges and seawalls and to provide recommendations, including budgetary costs for repair or replacement, as necessary. The Town of Belleair provided the 2019 FDOT Bridge Inspection Reports generated from routine inspections.

The inspection team consisted of a Team Leader certified by both the National Bridge Inspection Standards (NIBS) and the Florida Department of Transportation (FDOT), and a qualified team member. Among the team's certifications are a Florida Registered Engineer with a vast amount of bridge and seawall inspection experience, a Certified Bridge Inspector (CBI), and a National Highway Institute (NHI)-certified Underwater Bridge Inspector. The wading inspections were performed by a certified commercial diver with experience in underwater bridge inspection and scour evaluations. Additionally, representatives from the Town of Belleair and McKim & Creed were on site periodically.

In this report you will find a section entirely for each Bridge and Seawall starting at Section 4. Within those sections, you will find a brief overview of the bridge / seawall history and construction type, and then a synopsis of the condition of the structure along with photos.

2.0 SCOPE OF WORK

The following structures have been requested for structural assessment. The location of the bridges and seawalls can be seen in Figure 2-1.

- Bridge No. 155000 and wingwalls, Winston Drive over Graff Canal
- Bridge No. 155001 and wingwalls, North Pine Circle over Roths Canal
- Bridge No. 155003, Bayview Drive over Exotic Creek
- Bridge No. 155004, Overbrook Drive over Ikes Creek
- Bridge No. 150062, Indian Rocks Rd. (CR-233) over Ikes Creek
- Seawall at Thompson Park, adjacent to North Pine Circle
- Seawall at Winston Park, adjacent to Winston Drive

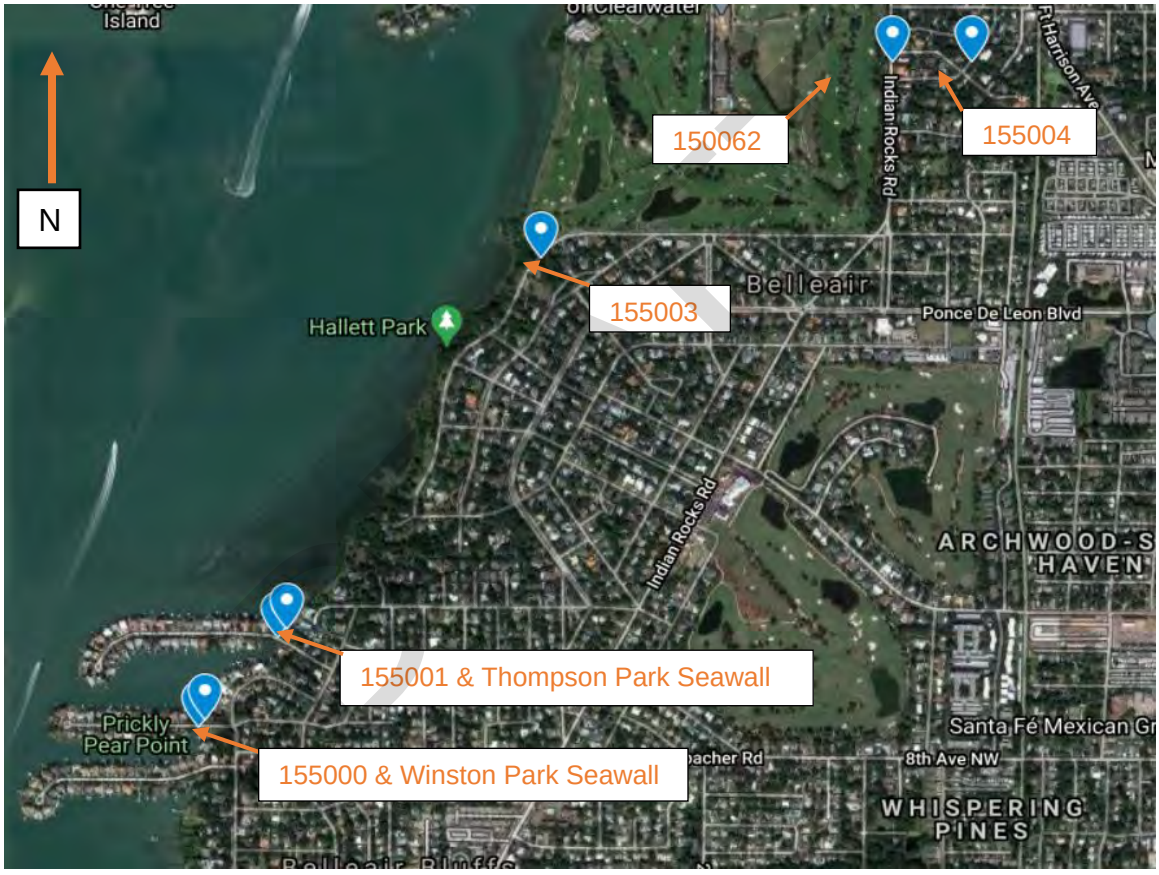


Figure 2-1: Town of Belleair, Bridge and Seawall Vicinity Map

2.1 Bridge and Wingwalls

The purpose of the bridge inspections is to observe the general structural condition of the bridges and wingwalls for cracks, spalls, and signs of settlement, movement, or wall failure. M&N measured the existing bridge and wingwall dimensions, including the bridge structural elements and visually evaluated the foundations.

The bridge inspection utilized the 2019 FDOT Bridge Inspection Reports to establish a rate of structural deterioration and channel degradation. M&N confirmed the state of deficiencies outlined in the reports and noted any changes.

The 2019 FDOT Inspection Reports indicated that Bridge No. 155000 and 155001 are scour critical and have unknown foundations, however M&N found no evidence of scour or undermining while inspecting the mudline around the bridge foundations.

2.2 Seawall Inspections

The purpose of the seawall inspections was to observe the general structural condition of the seawalls and areas behind the walls for cracks, spalls and signs of settlement, movement, or wall failure.

The existing concrete sheet pile walls are constructed with tongue and groove joints. A common cause of settlement behind concrete seawalls is damaged or worn construction joints, which allow fine soils to migrate through the joints. The site visit included observation of the sheet pile panel joints for damage and soil voids behind the wall.

Based on the results of the site visit, M&N has prepared a planning level Opinion of Probable Construction Cost (OPCC) for repair and/or replacement of the seawalls. The OPCC may be used to determine a budgetary unit cost for either repair/rehabilitation or replacement, as appropriate, to include in the Master Plan document. The cost estimate is based on FDOT guidelines and historical unit costs for seawall rehabilitation and repairs for similar projects in the local area.

3.0 CONDITION ASSESSMENT CRITERIA

Two inspection standards were used for assigning condition ratings to the bridges and seawalls.

3.1 Bridge Condition Assessment

The "*NBIS Bridge Inspection Reference Manual*" was utilized as a guide to perform the tasks outlined in the scope of work for the bridges. An overall condition rating system was used for the various bridge components as outlined in this manual. These rating systems provide a standard classification for all bridges and is produced by the Federal Highway Administration (FHWA). The rating system gives an overall condition rating for each structural system based on the observed and inspected conditions. Excerpts from this manual outlining the overall condition assessment ratings are as follows with additional information available in Appendix A:

Rating		Description
9	Excellent	
8	Very Good	No problems noted
7	Good	Some minor problems
6	Satisfactory	Structural elements show some minor deterioration
5	Fair	All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
4	Poor	Advanced section loss, deterioration, spalling or scour
3	Serious	Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	Critical	Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	Imminent Failure	Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic, but corrective action may put back in light service.
0	Failed	Out of service, beyond corrective action

3.2 Seawall Condition Assessment

The "*Waterfront Facilities Inspection and Assessment*" manual was utilized as a guide to perform the tasks outlined in the scope of work for the seawalls. An overall condition rating system, as well as individual element ratings for various structural and marine components, are outlined in this manual. These rating systems provide a standard classification for all waterfront facilities. The rating system gives an overall condition rating for each structural system based on the observed and inspected conditions.

The ratings are referred to as the 'Condition Assessment Rating' referenced from the ASCE No. 130 manual. These rating were used for the seawalls only. They indicate the condition of the entire structure and its ability to perform its intended function. Not every element making up the structure will meet the requirements of the overall rating; therefore, localized load restrictions may be recommended for areas where isolated deterioration has reduced the structural capacity of the structure.

Rating		Description
6	Good	No problems or only minor problems noted. Structural elements may show some very minor deterioration, but no overstressing observed. No repairs are required.
5	Satisfactory	Minor to moderate defects and deterioration observed, but no overstressing observed. No repairs are required
4	Fair	All primary structural elements are sound, but minor to moderate defects and deterioration observed. Localized areas of moderate to advanced deterioration may be present but do not significantly reduce the load bearing capacity of the structure. Repairs are recommended, but the priority of the recommended repairs is low.
3	Poor	Advanced deterioration or overstressing observed on widespread portions of the structure, but does not significantly reduce the load-bearing capacity of the structure. Repairs may need to be carried out with moderate urgency.
2	Serious	Advanced deterioration, overstressing, or breakage may have significantly affected the load bearing capacity of primary structural components. Local failures are possible, and loading restrictions may be necessary. Repairs may need to be carried out on a high-priority basis with urgency.
1	Critical	Very advanced deterioration, overstressing, or breakage has resulted in localized failure(s) of primary structural components. More widespread failures are possible or likely to occur, and load restrictions should be implemented as necessary. Repairs may need to be carried out on a very high-priority basis with strong urgency.

Element-level damage ratings are utilized to assess specific components of each structure based on the component's material type or function. Damage ratings are specified as no deterioration, minor, moderate, major, and severe. The specifics and reasoning for each of the ratings and material types are outlined in the "*Waterfront Facilities Inspection and Assessment*" manual. Excerpts from this manual outlining the overall condition assessment ratings as well as element-level damage ratings pertinent to the inspections performed are detailed in Appendix B.

4.0 BRIDGE 155000 – WINSTON DRIVE

Figure 4-1: Bridge 155000 at Winston Drive

4.1 Structure Description

Bridge 155000 at Winston Drive, shown in Figures 4-1 and 4-2, was built in 1950 and spans a non-navigable waterway on the east shore of Clearwater Harbor. The bridge is a simply supported, single span structure measuring 28.25 feet wide with a length of 25 feet. The superstructure consists of six (6) 48-inch wide, prestressed concrete slab beams with concrete deck and asphalt overlay. The bridge has 32-inch side barriers with single bullet rails along the full length of the main span. The shoreline adjacent to the bridge has 11-foot-long wingwalls at each corner of the abutments. This bridge is identical to Bridge 155001 at North Pine Circle.

A NBIS routine inspection was conducted in 2019 that identified areas of concerns which included but were not limited to concrete spalls, cracks, and delamination in various sections of the superstructure and substructure elements. Exposed steel reinforcing bars are present and rust spots with some corrosion were also listed. The structure was listed as scour critical. Minor maintenance repairs were completed since the 2019 FDOT inspection, including spall repairs at the abutments and bridge reflectors were added to the concrete barriers at the beginning and end of the concrete barriers.

4.2 Findings and Observations

The bridge and wingwalls inspection found minor to moderate defects on the underside of the bridge deck and wingwalls. The overall condition ratings for the structure are:

- 59-Superstructure = 7
- 60-Substructure = 7
- 61-Channel = 7
- 113-Scour = 8 (Field Observations Only)

The condition of the structure has not significantly changed since the 2019 FDOT inspection. The following field observations were noted during the inspection:

The southwest wingwall/seawall is cracked with an opening up to three (3) inches wide with four (4) inches of lateral movement at the top of the wall. A large void, approximately three (3) feet long and five (5) feet deep was observed behind the wall, as seen in Figure 4-3 and Figure 4-4.

- Cracks in the superstructure decks, underside of the slab units and substructure abutments are noted with some areas of exposed reinforcing, as seen in Figure 4-5 and Figure 4-6.
- The approach slabs are not visible because they are completely covered by the asphalt topping.
- There are transverse cracks along the expansion joints that are fully covered by asphalt topping, as seen in Figure 4-7.
- An under-water inspection of the abutments found no signs of scour or undermining of the foundations. There were no indications that the structure should be labeled as scour critical. A scour rating of 8 was given based on field observations only. A scour calculation/evaluation was not performed.
- Some concrete damage on the traffic railing barriers that was previously noted in the Reports has since been repaired.
- Joints in all wingwalls are offset up to one (1) inch.
- There is typical cracking in the wingwalls, as seen in Figure 4-8.
- A diagonal crack is present in the seawall where it transitions from the wingwall on the northeast side of the structure, as seen in Figure 4-9.
- The beam bearing pads were not visible at the time of inspection.
- The type and size of the bridge supports could not be identified because they were located behind the concrete abutment that extended to the mudline.

4.3 Soundings

Soundings were taken at each bridge fascia and at offsets of 25 and 50 feet from the bridge. All fascia sounding measurements were taken from the top of rail and are in decimal feet. All offset sounding measurements were taken from the waterline and are in decimal feet. Refer to Table 4-1 through Table 4-2 and Graph 4-1 through Graph 4-2 for channel bottom comparisons. Sounding measurement differences over three (3) feet are in bold print and are positive (+) for aggradation and negative (-) for scour. The channel bottom profile comparison was made by comparing the latest FDOT topside sounding data from January 15, 2019.

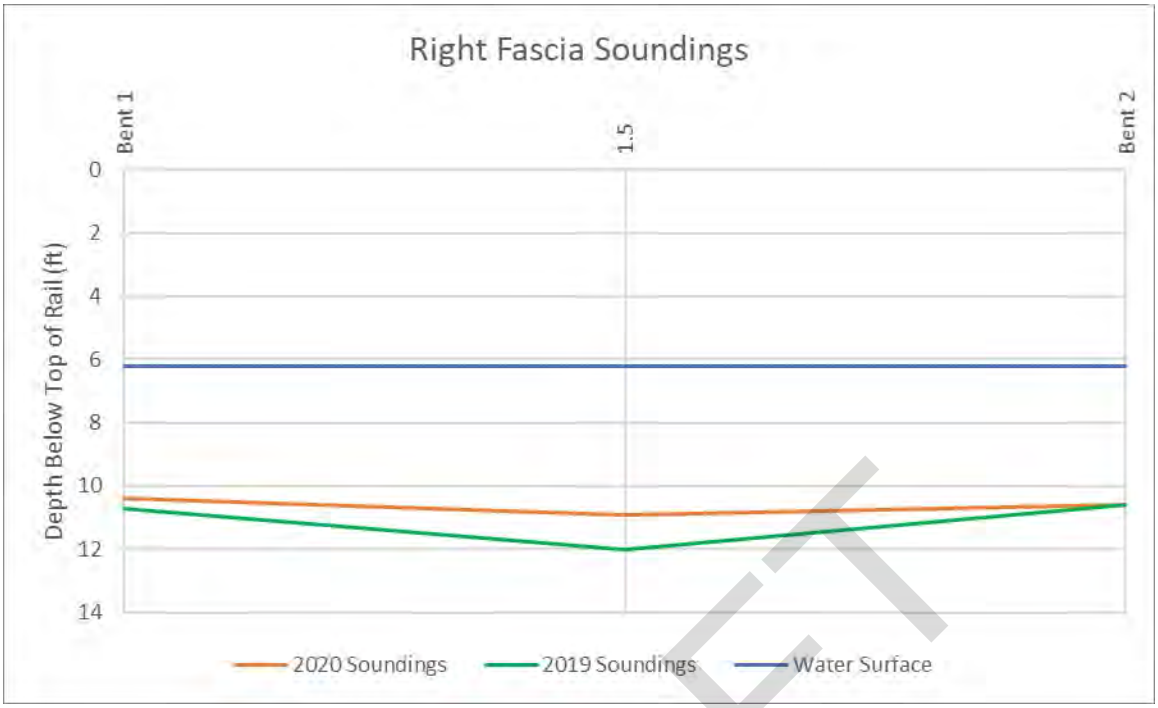
Table 4-1: Bridge 155000 Channel Soundings

50FT Right	25FT Right	Fascia Right	STATION	Fascia Left	25FT Left	50FT Left
5.4	4.7	10.4	Bent 1	10.3	4.8	5.0
5.1	4.8	10.9	1.5	10.8	4.7	5.1
4.8	4.2	10.6	Bent 2	10.3	3.8	3.9

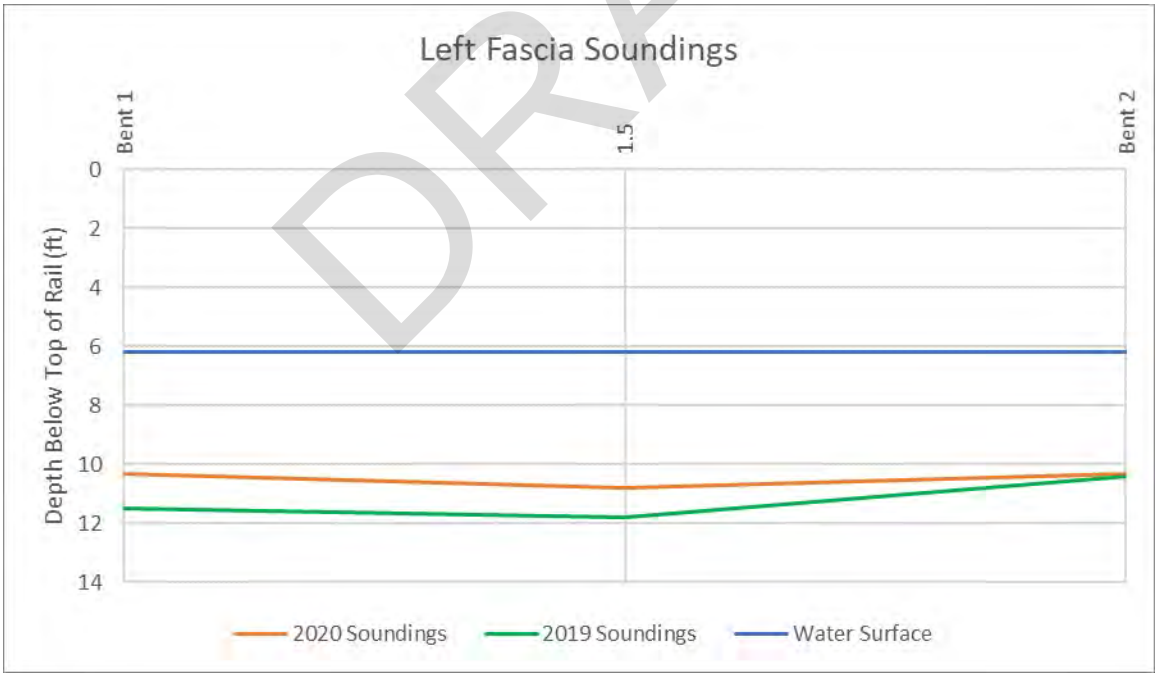
Table 4-2: Bridge 155000 Channel Soundings – Fascia Comparisons

STATION	Fascia Left 2020	Fascia Left 2019	Fascia Left Change	Fascia Right 2020	Fascia Right 2019	Fascia Right Change
Bent 1	10.3	11.5	+1.2	10.4	10.7	+0.3
1.5	10.8	11.8	+1.0	10.9	12.0	+1.1
Bent 2	10.3	10.4	+0.1	10.6	10.6	0.0

Graph 4-1 Bridge 155000 Right Fascia Cross Section



Graph 4-2 Bridge 155000 Left Fascia Cross Section



4.4 Repair Recommendations

Most of the findings observed in the field and noted in the FDOT report are normal issues that will not compromise the structural integrity of the bridge and wingwalls. The observations and findings for this bridge are of low priority repairs. It is recommended to routinely perform basic maintenance such as concrete spall or crack repairs, cleaning areas of debris and joint repairs at this bridge location.

One area of higher priority is the southwest wingwall. The crack opening in this wall caused leakage to occur which created a large void on the embankment. The 3-foot by 5-foot void is a hazard to pedestrians and should be repaired promptly.

- Bridge 155000 Estimated Repair Cost - $9,300

The structure should be monitored every 24 months per BIRM for additional irregularities that could further deteriorate the structural elements. Bridge 155000 was built in 1950 and is currently 70 years old. Based on the age, typical design life of bridges, its exposure to salt water, and its current condition, the bridge may show structural deterioration in the next five (5) to 10 years that requires maintenance repairs.

4.5 Site Photos

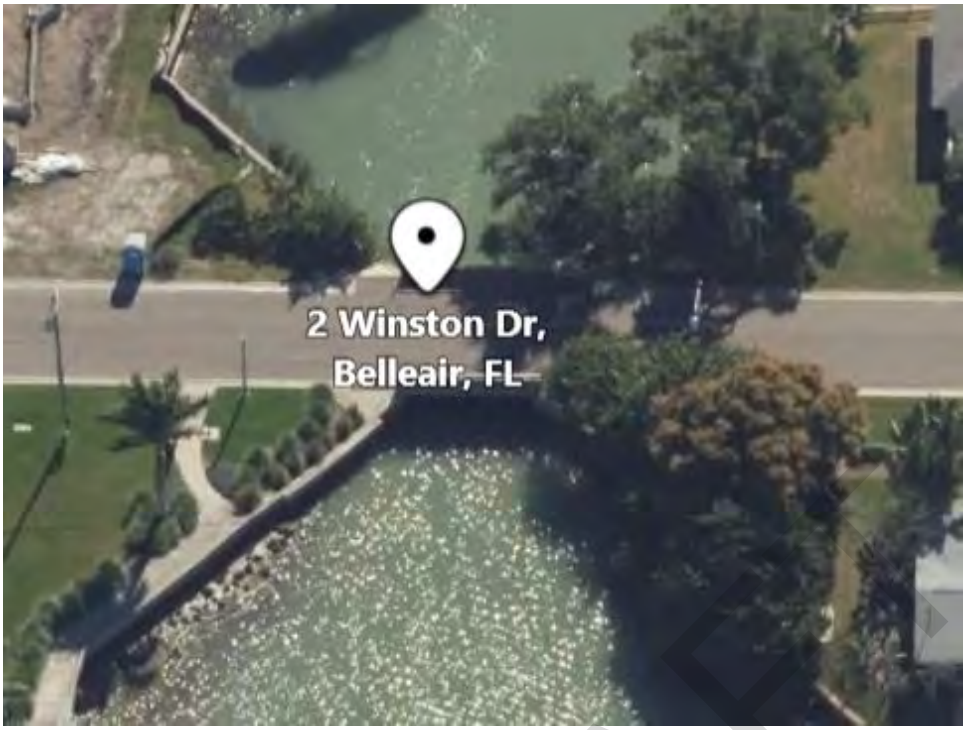


Figure 4-2: Aerial view of Bridge 155000 at Winston Drive

Figure 4-3: Southwest Wall – 4 inches of movement and 36 inch deep void

Figure 4-4: Southwest Wall – Opening in the panel and cap with void

Figure 4-5: Corrosion to steel at unpatched form tie holes in face of abutment

Figure 4-6: Typical spall at the underside of bridge slab beams

Figure 4-7: Cracks along expansion joint where the approach slab meets the bridge

Figure 4-8: Cracks in wingwalls

Figure 4-9: Diagonal crack with corrosion staining at the first joint from the bridge on the southeast corner where the wingwall meets the seawall.

5.0 SEAWALL AT WINSTON PARK – WINSTON DRIVE

Figure 5-1: Overall view of the Winston Park Seawall

5.1 Structure Description

The seawall structure in Figure 5-1 is an extension of the northeast wingwall at Bridge 155000 that borders Clearwater Harbor and Winston Park. It functions as a retaining system for the embankment that is Winston Park. This retaining system consists of cantilever steel sheet piles and anchored 4-foot wide concrete panels. The seawall measured approximately 162 feet long with a height from top of coping to mudline of five (5) feet. The wall has a 2-foot by 2-foot concrete cap at the top of the wall panels and a 5-foot wide concrete sidewalk immediately landward from the cap. Based on the condition observed, the concrete cap and steel sheet pile wall section were installed recently.

5.2 Findings and Observations

The seawall inspection found minor to moderate defects in the wall panels and minor defects to the cap. The overall condition ratings for the structure are:

- Seawall cap is in GOOD condition.
- Seawall panels are in FAIR condition.

The following field observations of the condition of the structure were noted during the inspection:

- The 25-foot section of steel sheet pile wall had no visible defects. The section seemed to have been repaired where the sheet piles were driven in front of damaged concrete panels.
- Voids seen from the water side of the concrete panels were mainly between the joints of the panels and measured up to two (2) feet deep. Spalls were observed as large as four (4) inches wide for the full joint height of the panel, as seen in Figure 5-2.
- Several horizontal and vertical hairline cracks are present. Some span the entire width of the seawall panels, as seen in Figure 5-3.

- There are hairline cracks throughout the entire cap with additional spalling in some areas of the underside.
- At the outfall 4-foot diameter pipe, there is an area of scour present. The scour was two to three (2-3) feet deep relative to the adjacent channel bottom with an overall water depth of five (5) feet. The scour cone encompasses approximately 36 linear feet of the seawall.

5.3 Repair Recommendations

The findings observed in the field are normal issues that will not compromise the structural integrity of the seawall. The observations and findings for this wall are of low priority repairs. It is recommended to routinely perform basic maintenance such as concrete spall or crack repairs, cleaning areas of debris and joint repairs. Filling void spaces behind the wall could also be treated as low priority routine maintenance.

To prevent the continued loss of fill at the seawall joints, the installation of a localized French drain is recommended at the one problem area noted. The drain will allow water to flow through the wall but will catch the soils and reduce future fill loss. The drain installation involves excavating out a 4-foot by 4-foot section centered at the problematic wall joint. The excavation should extend down below the waterline. A sheet of geocomposite drain is then placed against the inside of the seawall such that the wall joint is fully covered. Then, a layer of geotextile is placed before filling and compacting #57 stone inside the hole. The geotextile is then wrapped over the top of the stone before placing a final lift of soils and sod.

Additionally, a weep hole filter may be installed at the problematic seawall joint which allows water to flow out from behind the wall but not the soils. Installation of the weep hole filter includes a concrete patch at the seawall joint.

- Estimated cost of French drain and weep hole filter - $5,000

The structure should be monitored every five (5) years per ASCE Waterfront Inspection Manual for additional deterioration that could require maintenance repairs to the structural elements.

5.4 Site Photos

Figure 5-2: Void behind seawall at wall joint

Figure 5-3: Crack in concrete panel cap at wall joint

6.0 BRIDGE 155001 – NORTH PINE CIRCLE

Figure 6-1: Bridge 155001 at North Pine Circle

6.1 Structure Description

Bridge 155001 at North Pine Circle, shown in Figures 6-1 and 6-2, was built in 1950 and spans a non-navigable waterway on the east shore of Clearwater Harbor. The bridge is a simply supported, single span structure measuring 28.25 feet wide with a length of 25 feet. The superstructure consists of six (6) 48-inch wide precast prestressed concrete slab beams with concrete deck and asphalt overlay. The bridge has 32-inch side barriers with single bullet rails along the full length of the bridge main span. The shoreline adjacent to the bridge has 11-foot long wingwalls at each corner of the abutments. A utility penetrates the southeast wingwall adjacent to the abutment as seen in Figure 6-4. This bridge is identical to the Bridge 155000 at Winston Drive.

A NBIS routine inspection was conducted in 2019 that identified areas of concern which included but were not limited to concrete spalls, cracks, and delamination in various sections of the superstructure and substructure elements. Exposed steel reinforcing bars are present and rust spots with some corrosion were also listed. The structure was listed as scour critical. Minor maintenance repairs were completed since the 2019 FDOT inspection, including spall repairs at the abutments (Figure 6-5) and bridge reflectors were added to the concrete barriers at the beginning and end of the concrete barriers. An example of these repairs can be seen in Figure 6-3.

6.2 Findings and Observations

The bridge and wingwalls inspection found minor to moderate defects on the underside of the bridge deck and wingwalls. The overall condition ratings for the structure are:

- 59-Superstructure = 5
- 60-Substructure = 7
- 61-Channel = 7
- 113-Scour = 8 (Field Observations Only)

The condition of the structure has not significantly changed since the 2019 FDOT inspection. The following field observations were noted during the inspection:

- Failure of protective coating on the underside of the concrete slab unit, as seen in Figure 6-6.
- Cracks in the superstructure decks, underside of the slab units and substructure abutments are noted with some areas of corroded reinforcing as seen in Figure 6-7 and spalling as seen in Figure 6-8.
- The approach slabs are not visible because they are completely covered by the asphalt topping.
- There are transverse cracks along the expansion joints that are fully covered by asphalt topping.
- There is exposed rebar with corrosion on the underside of the cap at the southeast wingwall to private seawall transition, as seen in Figure 6-9.
- Multiple areas of delamination were found on the underside of the bridge deck corresponding to the delamination noted in the 2019 FDOT report, as seen in Figure 6-10.
- An under-water inspection of the abutments found no signs of scour or undermining of the foundations. There were no indications that the structure should be labeled as scour critical. A scour rating of 8 was given based on field observations only. A scour calculation/evaluation was not performed.
- Some concrete damage noted in the 2019 NBIS Inspection Report on the traffic railing barriers were repaired.
- The beam bearing pads were not visible
- The type and size of the bridge supports could not be identified because they were located behind the concrete abutment that extended to the mudline.
- Joints in all wingwalls are offset up to one (1) inch and one area on the southwest corner of the bridge has a diagonal crack and exposed reinforcing in the concrete cap, as seen in Figure 6-9.

6.3 Soundings

Soundings were taken at each bridge fascia and at offsets of 25 and 50 feet from the bridge. All fascia sounding measurements were taken from the top of rail and are in decimal feet. All offset sounding measurements were taken from the waterline and are in decimal feet. Refer to Table 6-1 through Table 6-2 and Graph 6-1 through Graph 6-2 for channel bottom comparisons. Sounding measurement differences over three (3) feet are in bold print and are positive (+) for aggradation and negative (-) for scour. The channel bottom profile comparison was made by comparing the latest FDOT topside sounding data from January 15, 2019.

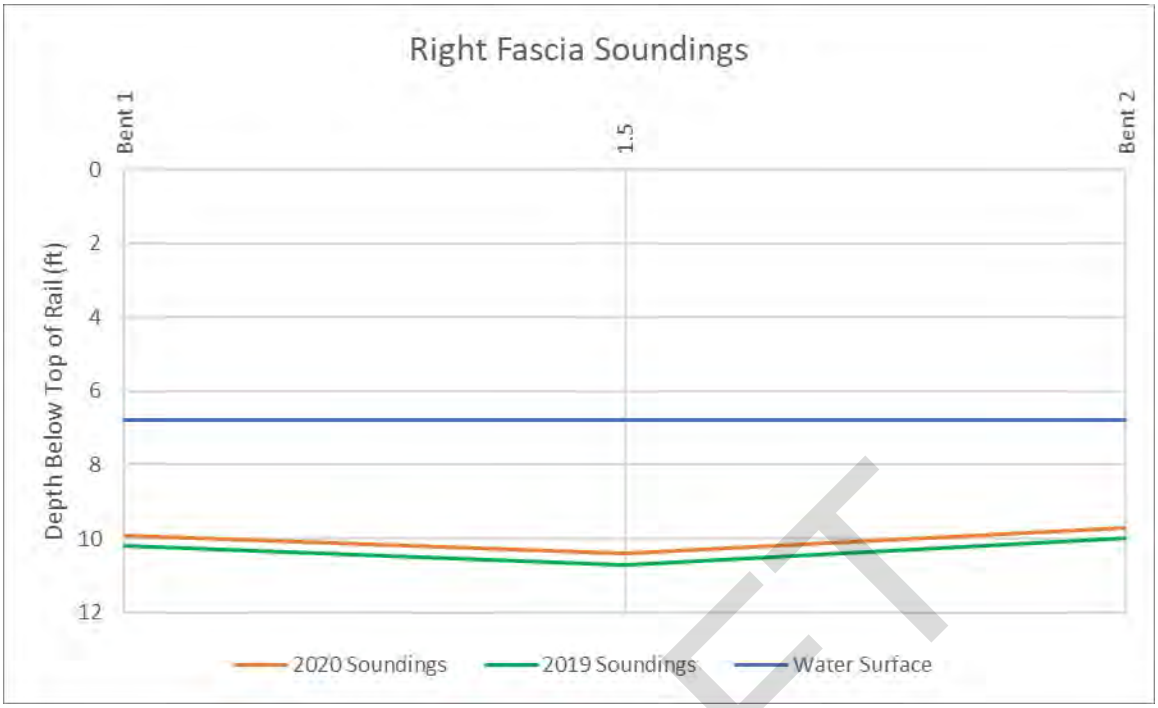
Table 6-1: Bridge 155001 Channel Soundings

50FT Right	25FT Right	Fascia Right	STATION	Fascia Left	25FT Left	50FT Left
3.7	3.3	9.9	Bent 1	10.3	4.8	4.5
3.6	3.3	10.4	1.5	10.6	5.0	5.2
2.9	2.7	9.7	Bent 2	10.2	4.4	4.7

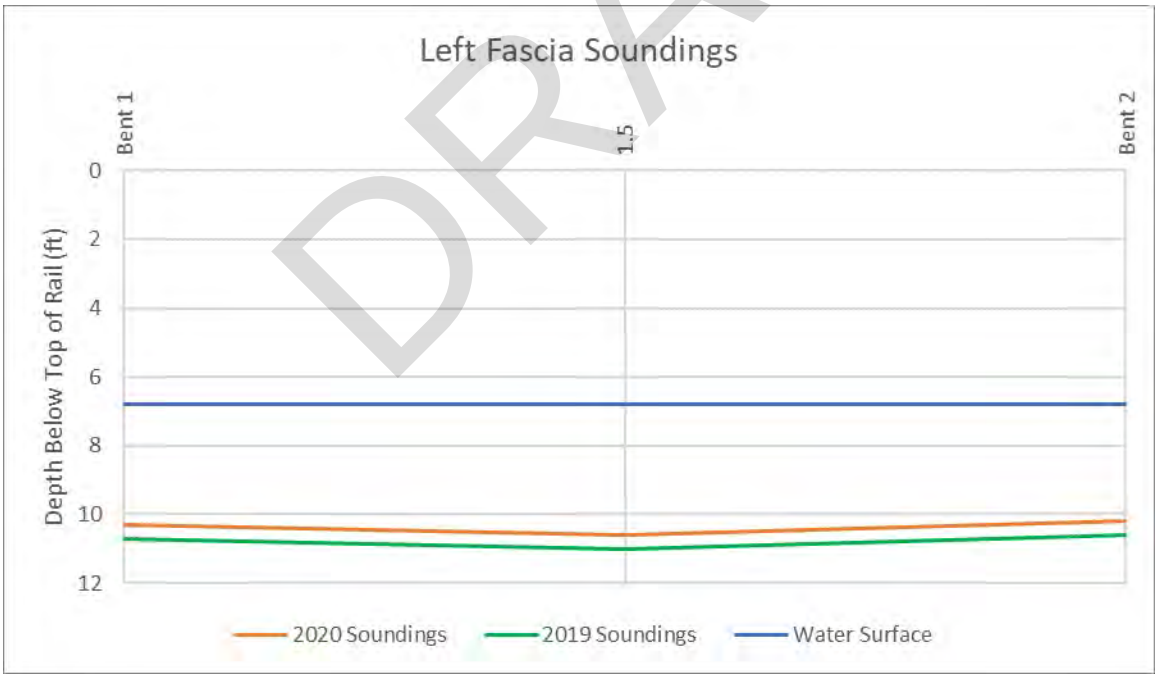
Table 6-2: Bridge 155001 Channel Soundings – Fascia Comparisons

STATION	Fascia Left 2020	Fascia Left 2019	Fascia Left Change	Fascia Right 2020	Fascia Right 2019	Fascia Right Change
Bent 1	10.3	10.7	+0.4	9.9	10.2	+0.3
1.5	10.6	11.0	+0.4	10.4	10.7	+0.3
Bent 2	10.2	10.6	+0.4	9.7	10.0	+0.3

Graph 6-1 Bridge 155001 Right Fascia Cross Section



Graph 6-2 Bridge 155001 Left Fascia Cross Section



6.4 Repair Recommendations

The findings observed in the field and noted in the 2019 FDOT inspection report are normal issues that will not compromise the structural integrity of the bridge and wingwalls. The observations and findings for this bridge are of low priority repairs. It is recommended to routinely perform basic maintenance such as concrete spall or crack repairs, cleaning areas of debris and joint repairs.

- Bridge 155001 Estimated Repair Cost - $39,250

The structure should be monitored every 24 months per BIRM for addition irregularities that could further deteriorate of the structural elements. Bridge 155001 was built in 1950 and is currently 70 years old. Based on the age, typical design life of bridges, its exposure to salt water, and its current condition, the bridge may show structural deterioration in the next five (5) to 10 years that requires maintenance repairs.

6.5 Site Photos

Figure 6-2: Aerial view of Bridge 155001 at North Pine Circle

Figure 6-3: Cracks in abutments with epoxy injection repair

Figure 6-4: Cracks in the southeast wingwall due corroded utility

Figure 6-5: Typical view of Abutment

Figure 6-6: Under side coating failure

Figure 6-7: Typical random area of corrosion on underside of Beam Slab panels

Figure 6-8: Typical spall in underside of Beam Slab panels

Figure 6-9: Cracks in wingwall / concrete panel wall connection on the southeast side of bridge. There is failure of the cap here with exposed steel reinforcing.

Figure 6-10: Area of delamination on underside of bridge deck.

7.0 SEAWALL AT THOMPSON PARK – NORTH PINE CIRCLE

Figure 7-1: Overall view of the Thompson Park Seawall

7.1 Structure Description

The seawall structure shown in Figure 7-1 is an extension of Bridge 155001 northeast wingwall that borders Clearwater Harbor and Thompson Park. It functions as a retaining system for the embankment that is Thompson Park. This retaining system consist of anchored four (4) foot wide concrete panels. The anchors are 2-inch diameter steel rods with a 6-inch by 6-inch steel washer plate. Behind the concrete panels is a mechanically stabilized earth (MSE) system constructed of geotextile material. The seawall measured approximately 162 feet long with a height of four (4) feet to the mudline. The wall has a 2-foot by 2- foot concrete cap at the top of the wall panels.

7.2 Findings and Observations

The seawall inspection found moderate to severe defects in the wall panels and moderate defects to the cap. The overall condition ratings for the structure are:

- Seawall cap is in FAIR condition.
- Seawall panels are in SERIOUS condition

The following field observations of the condition of the structure were noted during the inspection:

- The seawall has failed approximately 91 feet from the bridge abutment. The wall has up to six (6) inches of lateral movement at the cap and concrete panel joint. Behind this area there is a void with up to four (4) feet of penetration with geotextile fabric exposed, as seen in Figure 7-2 and Figure 7-3.
- One tie rod has failed, and all the remaining rods have signs of heavy corrosion with flaking and moderate section loss present on the washer plate, bolt, and tie rod hardware, as seen in Figure 7-4 and Figure 7-5.

- Several voids were observed from the topside behind the concrete panels. They range in size from two (2) feet in length along the seawall by six (6) inches deep, to as large as seven (7) feet in length by three (3) feet deep. An example of a void can be seen in Figure 7-6.
- Voids seen from the water side of the concrete panels were located at the panel joint connections. The largest void observed had up to four (4) feet of penetration with loss of backfill.
- All concrete panel connection joints have spalling and typical gaps of one (1) inch, as seen in Figure 7-7.
- Seawall at the adjacent property line partially covers a drainage outfall, as seen in Figure 7-8.
- There is full length edge spalling of the concrete cap.
- There is a 30-foot section of seawall with abrasion starting 60 feet from the Bridge abutment located two (2) feet above the mudline, measuring six (6) inches high by two (2) inches deep, as seen in Figure 7-9. This is in the splash zone / tidal zone.
- Hairline cracks throughout the entire cap with additional spalling in some areas of the underside with exposed steel reinforcement, as seen in Figure 7-10.

7.3 Repair and Recommendations

M&N recommends replacing the Thompson Park Seawall on a moderate-priority basis. Until the seawall is replaced, M&N recommends that vehicular live loading be restricted along the seawall, and that the wall be regularly monitored for additional lateral movement.

A full replacement of the seawall may be achieved by driving a new wall in front of the existing one and filling the space between the walls with #57 stone. Additionally, raising the grade at the park approximately two (2) feet to match the adjacent property elevation will ensure the resilience of the wall to meet future environmental demands. M&N recommends a sheet pile wall made of fiber reinforced polymers (FRP) with a concrete cap that is anchored by a buried deadman and connected with steel tie-rods. An itemized construction cost estimate is included in Appendix C.

- Estimated Seawall Replacement Cost - $210,680

Prior to the replacement of the wall, M&N recommends geotechnical investigation, sampling and testing near the seawall to identify the stratigraphy and strengths of the soils being retained. Additionally, a jet probe is recommended along the water side face of the existing wall to verify the tip elevation of the concrete walls and to identify the top of any firm layers that may affect the driving of the replacement wall.

The permitting agencies with jurisdiction regarding over-water construction are the Florida Department of Environmental Protection (FDEP) and the U.S. Army Corp of Engineers (USACE). If the replacement wall is installed no further than 18 inches from the face of the existing wall, the construction qualifies as a maintenance repair and is exempt from the full permitting process. It is recommended that the permitting agencies be contacted ahead of any scheduled construction to verify any additional requirements.

The structure should be monitored every two (2) years per ASCE Waterfront Inspection Manual for additional deterioration that could require maintenance repairs to the structural elements.

7.4 Site Photos

Figure 7-2 Wall failure resulting in large deflection between wall panels

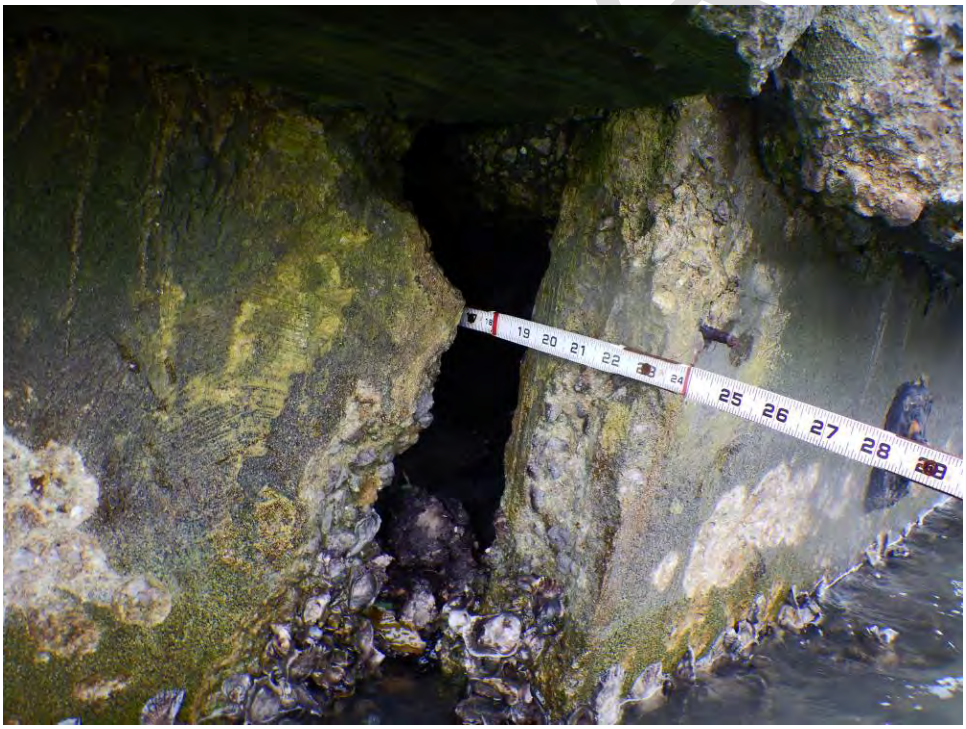


Figure 7-3 Deep void and loss of fill at wall failure

Figure 7-4: Missing tieback hardware

Figure 7-5: Typical tieback hardware, heavily corroded

Figure 7-6 Evidence of fill loss behind seawall cap and longitudinal cracks with corrosion staining in top of concrete cap.

Figure 7-7: Typical spalling at concrete seawall panel joints

Figure 7-8: Partially covered outfall at the private property line north of the park

Figure 7-9: Example area of abrasion along seawall in splash zone

Figure 7-10: Typical spalling and cracking of cap underside

8.0 BRIDGE 155003 – BAYVIEW DRIVE

Figure 8-1: Bridge 155003 at Bayview Drive

8.1 Structure Description

Bridge 155003 at Bayview Drive, shown in Figures 8-1 and 8-2, was built in 1992 and spans Exotic Creek, a non-navigable waterway that flows into Clearwater Harbor. The bridge is a simply supported, single span structure measuring 37 feet wide with a length of 50 feet. Approach slabs are 20 feet long at each abutment. The superstructure consists of five (5) prestressed precast concrete double tee beams with concrete deck overlay. The bridge has 6-foot wide sidewalks and 32-inch barriers with double bullet rails along the length of the bridge main span and approach slabs on each side. Wingwalls at each corner of the abutments protect the embankment slope.

A NBIS routine inspection was conducted in 2019 that identified areas of concern which included but were not limited to concrete spalls, cracks, and delamination in various sections of the superstructure and substructure elements. Exposed steel reinforcing bars are present and rust spots with some corrosion were also listed. Minor maintenance repairs were completed since the 2019 FDOT inspection, including grinding and leveling uneven sidewalks as seen in Figure 8-3 and object markers were added to the concrete barriers at the beginning and end of the concrete barriers.

8.2 Findings and Observations

The bridge and wingwalls inspection found only minor defects on the underside of the bridge deck and wingwalls. The overall condition ratings for the structure are:

- 59-Superstructure = 7
- 60-Substructure = 7
- 61-Channel = 8
- 113-Scour = 8 (Field Observations Only)

The condition of the structure has not significantly changed since the 2019 FDOT inspection. The following field observations were noted during the inspection:

- Cracks in the superstructure deck, sidewalks, barriers, and underside of tee beams are noted with some areas of exposed reinforcing. There is an additional area of delamination in the underside of the Double-T Beam, as seen in Figure 8-4.
- Deteriorated expansion joints at beginning and end of the bridge.
- Several minor construction spalls in the beam legs.
- The type of piles supporting the abutments are not able to be identified due to the rock rubble slope protection in the channel, see Figure 8-5.
- Heavy vegetation growth at wingwalls/abutments.

8.3 Soundings

Soundings were taken at each bridge fascia and at offsets of 25 and 50 feet from the bridge. All fascia sounding measurements were taken from the top of rail and are in decimal feet. All offset sounding measurements were taken from the waterline and are in decimal feet. Refer to Table 8-1 through Table 8-2 and Graph 8-1 through Graph 8-2 for channel bottom comparisons. Sounding measurement differences over three (3) feet are in bold print and are positive (+) for aggradation and negative (-) for scour. The channel bottom profile comparison was made by comparing the latest FDOT topside sounding data from January 16, 2019.

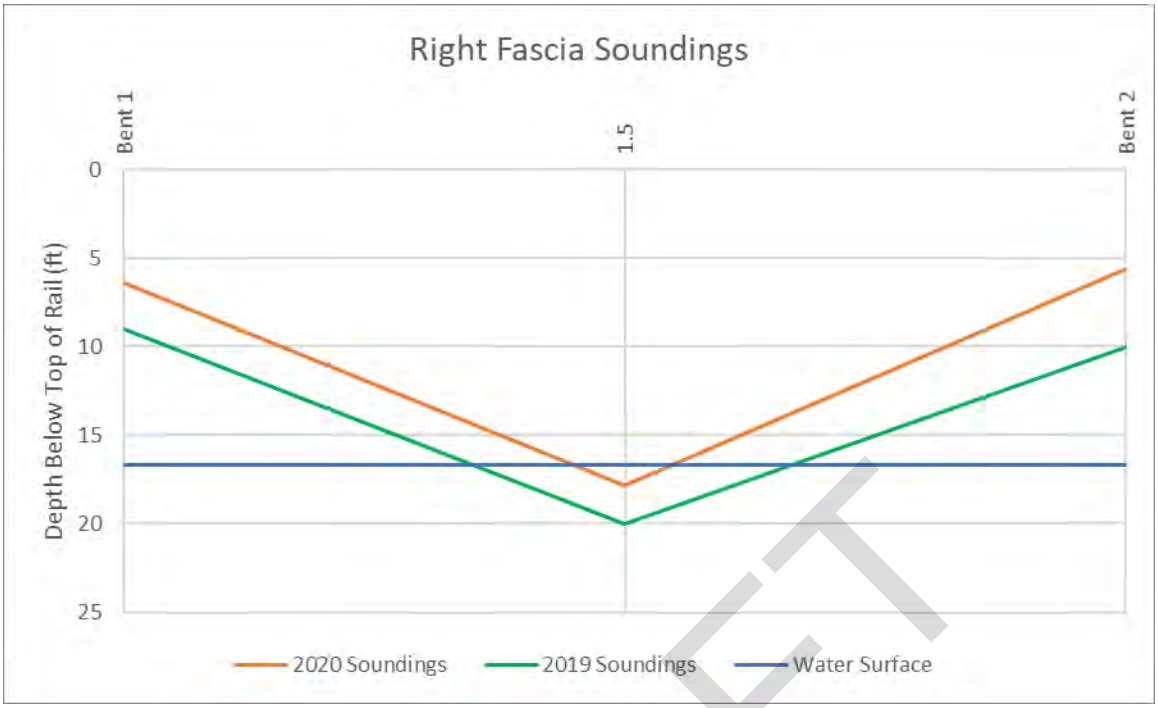
Table 8-1: Bridge 155003 Channel Soundings

50FT Right	25FT Right	Fascia Right	STATION	Fascia Left	25FT Left	50FT Left
--	--	6.4	Bent 1	6.5	--	--
1.0	1.0	17.8	1.5	16.8	--	--
--	--	5.6	Bent 2	6.0	--	--

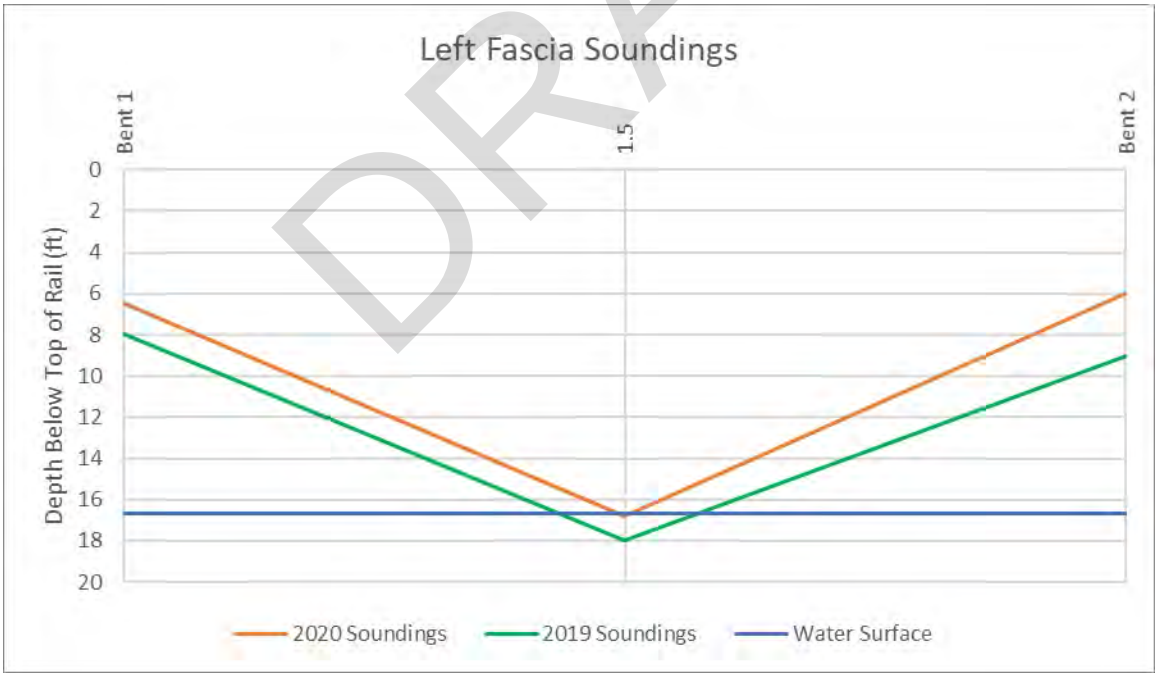
Table 8-2: Bridge 155003 Channel Soundings – Fascia Comparisons

STATION	Fascia Left 2020	Fascia Left 2019	Fascia Left Change	Fascia Right 2020	Fascia Right 2019	Fascia Right Change
Bent 1	6.5	8.0	+1.5	6.4	9.0	+2.6
1.5	16.8	18.0	+1.2	17.8	20.0	+2.2
Bent 2	6.0	9.0	+3.0	5.6	10.0	+4.4

Graph 8-1 Bridge 155003 Right Fascia Cross Section



Graph 8-2 Bridge 155003 Left Fascia Cross Section



8.4 Repair Recommendations

The findings observed in the field and noted in the 2019 FDOT inspection report are normal issues that will not compromise the structural integrity of the bridge and wingwalls. The observations and findings for this bridge are of low priority repairs. It is recommended to routinely perform basic maintenance such as concrete spall or crack repairs, cleaning areas of debris and joint repairs to name a few.

The structure should be monitored every 24 months per BIRM for addition irregularities that could further deteriorate of the structural elements. Bridge 155003 was built in 1992 and is currently 28 years old. Based on the age, typical design life of bridges, its exposure to salt water, and its current condition, it is not expected for this bridge to require major maintenance repairs in the next 20 years.

8.5 Site Photo

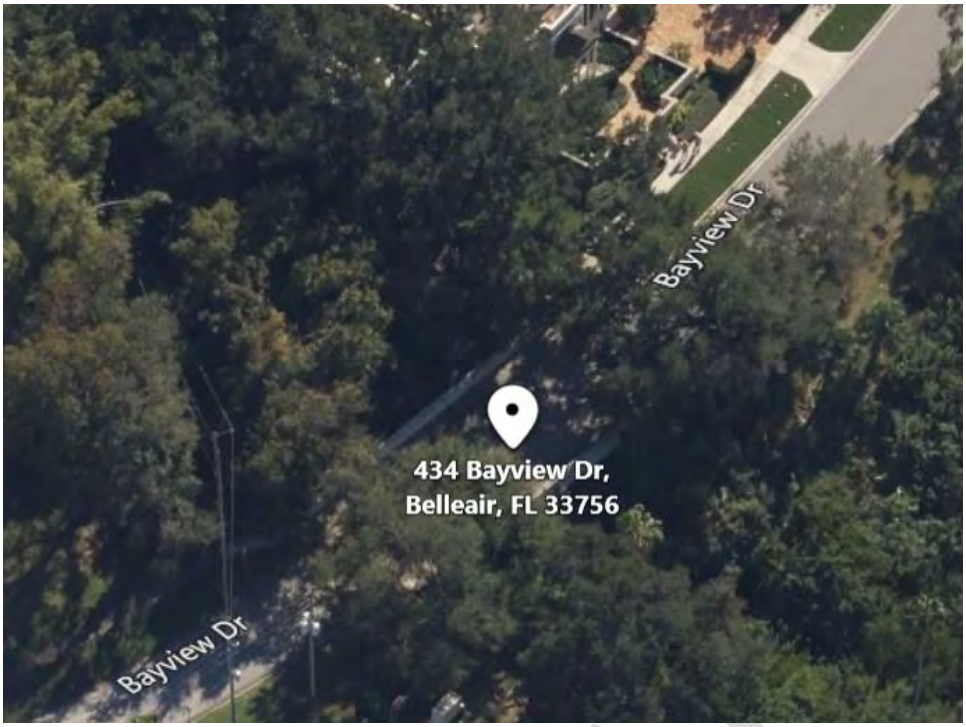


Figure 8-2: Aerial view of Bridge 155003 at Bayview Drive

Figure 8-3: Sidewalk repair

Figure 8-4: Area of delamination in beam

Figure 8-5: Channel and concrete rubble embankments

9.0 BRIDGE 155004 – OVERLOOK DRIVE

Figure 9-1: Bridge 155004 at Bayview Drive

9.1 Structure Description

Bridge 155004 at Overbrook Drive, shown in Figures 9-1 and 9-2 was built in 1994 and spans Ikes Creek, a non-navigable waterway in a residential neighborhood. The bridge is a single opening culvert that consists of five (5) precast concrete segments. The structure measures 28 feet wide with a length of 24 feet. Traffic guardrails are offset four (4) feet from the side headwalls where the edge of asphalt pavement begins. Wingwalls at each corner of the culvert headwalls protect the embankment slope.

A NBIS routine inspection was conducted in 2019 that identified areas of concern which included but were not limited to concrete spalls and hairline cracks in various sections of the precast segments. Openings and misalignments between precast segments and the wingwall joints were listed. Since the 2019 FDOT inspection, it appears that no preventative maintenance has been completed to the structure.

9.2 Findings and Observations

The bridge and wingwalls inspection found minor to moderate defects on the culvert ceiling and wingwalls. The overall condition ratings for the structure are:

- 61-Channel = 7
- 62-Culvert = 7
- 113-Scour = 8 (Field Observations Only)

The condition of the structure has not significantly changed since the 2019 FDOT inspection. The following field observations were noted during the inspection:

- Cracks in the culvert asphalt overlay.
- There are openings between precast segments up to one (1) inch, misalignment of up to 1.25 inches and approximately ten (10) inches of penetration. No evidence of falling debris is present, as seen in Figure 9-3 and Figure 9-4.
- Several minor construction spalls in the precast segments, as seen in Figure 9-5.
- Dense/heavy vegetation growth over wingwalls and headwalls parapet, as seen in Figure 9-6.
- There is aggradation of soil up to three (3) feet high in the channel along the south wall, as seen in Figure 9-7.
- Minor settlement of two (2) inches at the northwest wingwall with an open joint up to one (1) inch wide, as seen in Figure 9-8.
- The toe of the precast culvert section is exposed up to five (5) inches on the upstream and up to three (3) inches on the downstream sides of the structure, as seen in Figure 9-9.

9.3 Soundings

Soundings were taken at each bridge fascia and at offsets of 25 and 50 feet from the bridge. All fascia sounding measurements were taken from the top of headwall and are in decimal feet. All offset sounding measurements were taken from the waterline and are in decimal feet. Refer to Table 9-1 through Table 9-2 and Graph 9-1 through Graph 9-2 for channel bottom comparisons. Sounding measurement differences over three (3) feet are in bold print and are positive (+) for aggradation and negative (-) for scour. The channel bottom profile comparison was made by comparing the latest FDOT topside sounding data from January 16, 2019.

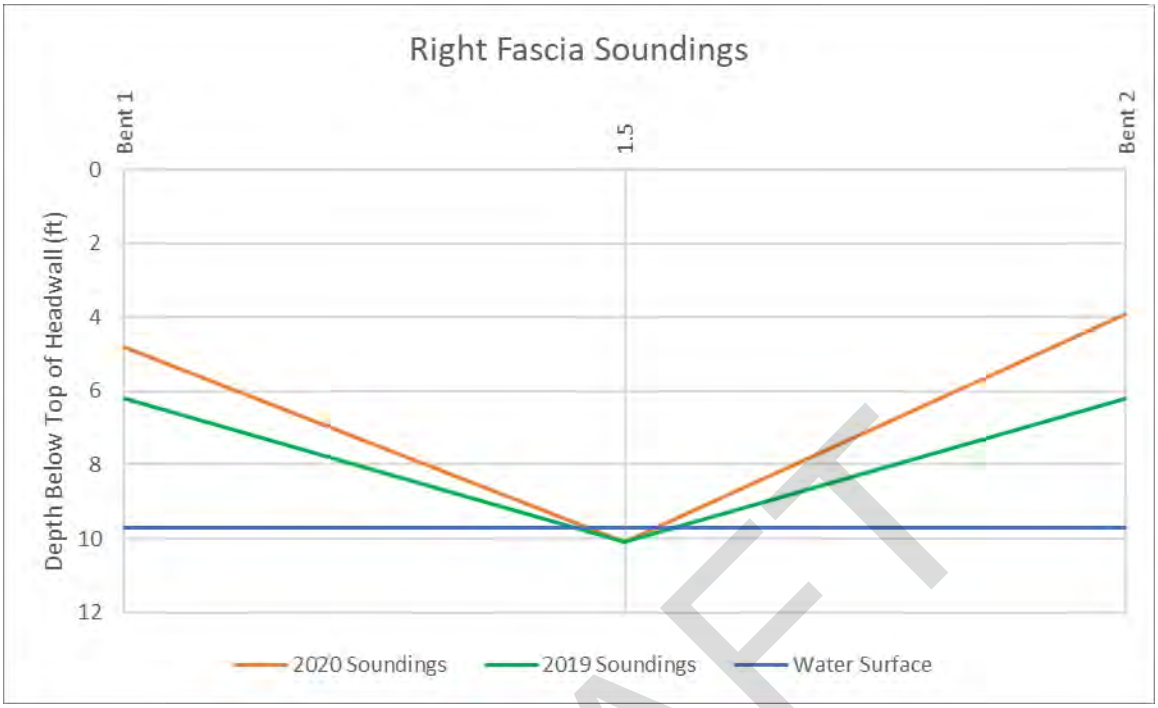
Table 9-1: Bridge 155004 Channel Soundings

50FT Right	25FT Right	Fascia Right	STATION	Fascia Left	25FT Left	50FT Left
--	--	4.8	Bent 1	8.4	--	--
0.5	0.5	10.1	1.5	9.8	0.5	0.5
--	--	3.9	Bent 2	8.0	--	--

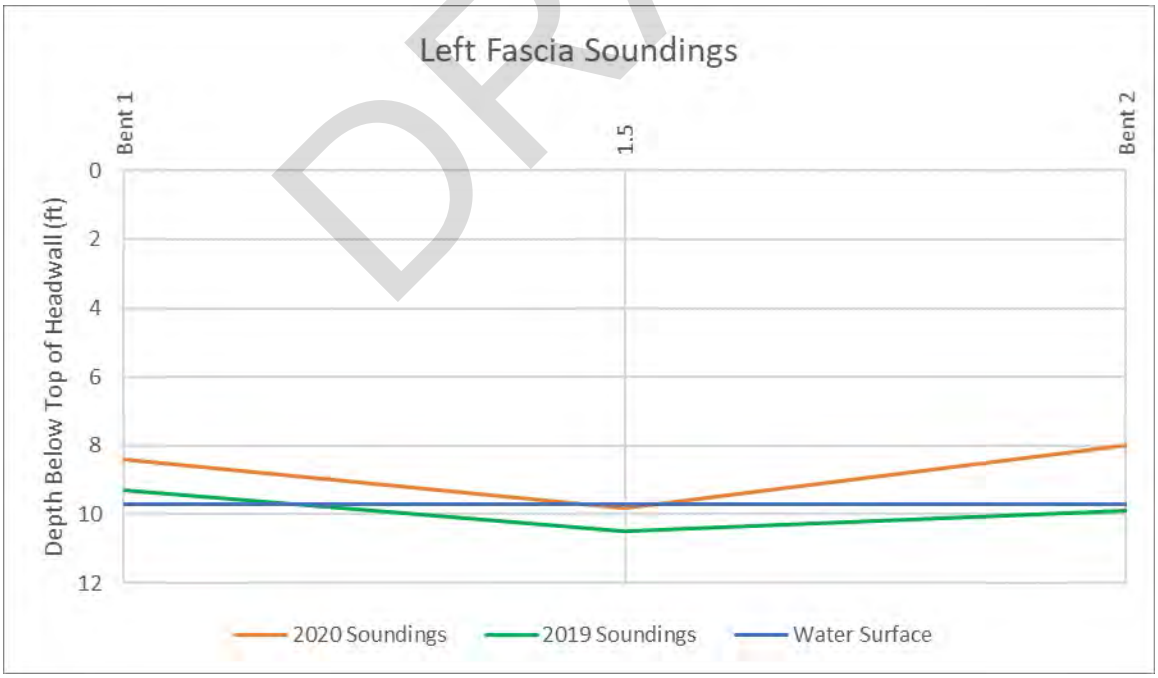
Table 9-2: Bridge 155004 Channel Soundings – Fascia Comparisons

STATION	Fascia Left 2020	Fascia Left 2019	Fascia Left Change	Fascia Right 2020	Fascia Right 2019	Fascia Right Change
Bent 1	8.4	9.3	+0.9	4.8	6.2	+1.4
1.5	9.8	10.5	+0.7	10.1	10.1	0.0
Bent 2	8.0	9.9	+1.9	3.9	6.2	+2.3

Graph 9-1 Bridge 155004 Right Fascia Cross Section



Graph 9-2 Bridge 155004 Left Fascia Cross Section



9.4 Repair Recommendations

The findings observed in the field and noted in the 2019 FDOT inspection report are normal issues that will not compromise the structural integrity of the precast culvert and wingwalls. The observations and findings for this bridge are of low priority repairs. It is recommended to routinely perform basic maintenance such as concrete spall or crack repairs, cleaning areas of debris and joint repairs to name a few.

The northwest wingwall has settled two (2) inches and there is minimal toe exposure at the upstream and downstream end of the culvert. While no immediate repair is required, M&N recommends the wall be monitored for additional settlement along with the depth of toe exposure during high flow events. Additionally, it is recommended to monitor the roadway for signs of sinkholes due to a small void found between the precast culvert sections.

The structure should be monitored every 24 months per BIRM for addition irregularities that could further deteriorate of the structural elements. Bridge 155004 was built in 1994 and is currently 26 years old. Based on the age, typical design life of bridges, its exposure to salt water, and its current condition, it is not expected for this bridge to require major maintenance repairs in the next 20 years.

9.5 Site Photo

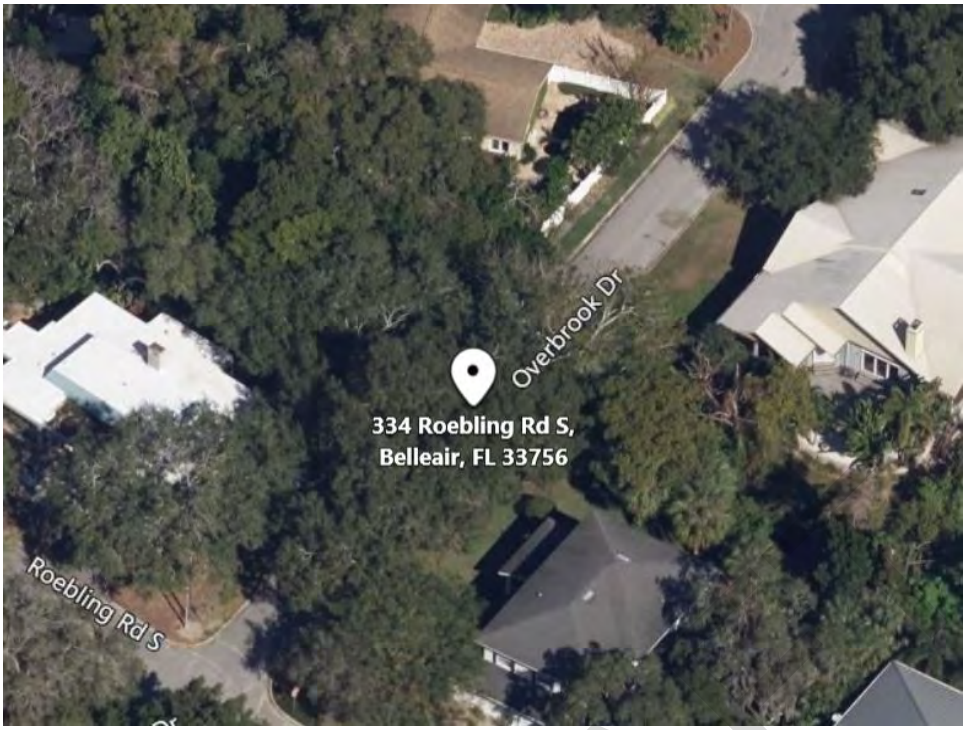


Figure 9-2: Aerial view of Bridge 155004 at Overbrook Drive

Figure 9-3: Misalignment between culvert segments with up to ten (10) inches of penetration

Figure 9-4: Opening between culvert segments

Figure 9-5: Construction spalling along ceiling edge of culvert opening

Figure 9-6: Bridge section & overgrown vegetation

Figure 9-7: Aggradation within culvert

Figure 9-8: Area of settlement and misalignment between headwall and wingwall

Figure 9-9: Example of exposed toe on the upstream side of the structure

10.0 BRIDGE 150062 – INDIAN ROCKS ROAD

Figure 10-1: Bridge 150062 at Bayview Drive

10.1 Structure Description

Bridge 150062 at Indian Rocks Road, shown in Figures 10-1 and 10-2 was built in 1927 and spans Ikes Creek, a non-navigable waterway in a residential neighborhood. The bridge is an arch structure with a 27-foot channel opening that supports the roadway deck. The span measures 31 feet wide with a length of 57.5 feet. The bridge includes an asphalt overlay roadway surface and a four (4) foot raised concrete sidewalk on the east end. Concrete barriers are along the main span of the traffic lanes and the sidewalk is protected by a galvanized pipe railing at the edge of the deck. Wingwalls at each corner of the abutments protect the embankment slope.

A NBIS routine inspection was conducted in 2019 that identified areas of concerns which included but were not limited to concrete spalls and honeycombing including cracks in various sections of the superstructure and substructure elements. Rust staining with some corrosion and areas of undermining were also listed for the retaining walls. The structure was listed as functionally obsolete. Since the 2019 FDOT inspection, it appears that no preventative maintenance has been completed to the structure except for the added object marker to the west concrete barrier.

10.2 Findings and Observations

The bridge and wingwalls inspection found minor to moderate defects on the deck, underside of the arch and wingwalls. The channel rating was downgraded from a 9 to a 7 due to the area of undermining at the northwest wingwall. The overall condition ratings for the structure are:

- 59-Superstructure = 7
- 60-Substructure = 7
- 61-Channel = 7
- 113-Scour = 8 (Field Observation Only)

The condition of the structure has not significantly changed since the 2019 FDOT inspection. The following field observations were noted during the inspection:

- Transverse and longitudinal cracks are present on the superstructure asphalt overlay, as seen in Figure 10-3.
- There is an area of undermining at the northwest wingwall that measures up to three (3) inches high that has up to two (2) feet of penetration, as seen in Figure 10-4.
- Areas of honeycombing in the underside of the arch substructure are present near the mudline, as seen in Figure 10-5.
- Cracks in the barriers and underside of the concrete arch are noted with some minor areas of spalling, as seen in Figure 10-6.
- The surface corrosion of the pedestrian rail was repaired, but new areas of corrosion are present.
- Hairline cracks are noted at the connection where all four(4) wingwalls meet the arch structure.

10.3 Soundings

Soundings were taken at each bridge fascia and at offsets of 25 and 50 feet from the bridge. All fascia sounding measurements were taken from the top of rail and are in decimal feet. All offset sounding measurements were taken from the waterline and are in decimal feet. Refer to Table 10-1 through Table 10-2 and Graph 10-1 through Graph 10-2 for channel bottom comparisons. Sounding measurement differences over three (3) feet are in bold print and are positive (+) for aggradation and negative (-) for scour. The channel bottom profile comparison was made by comparing the latest FDOT topside sounding data from January 16, 2019.

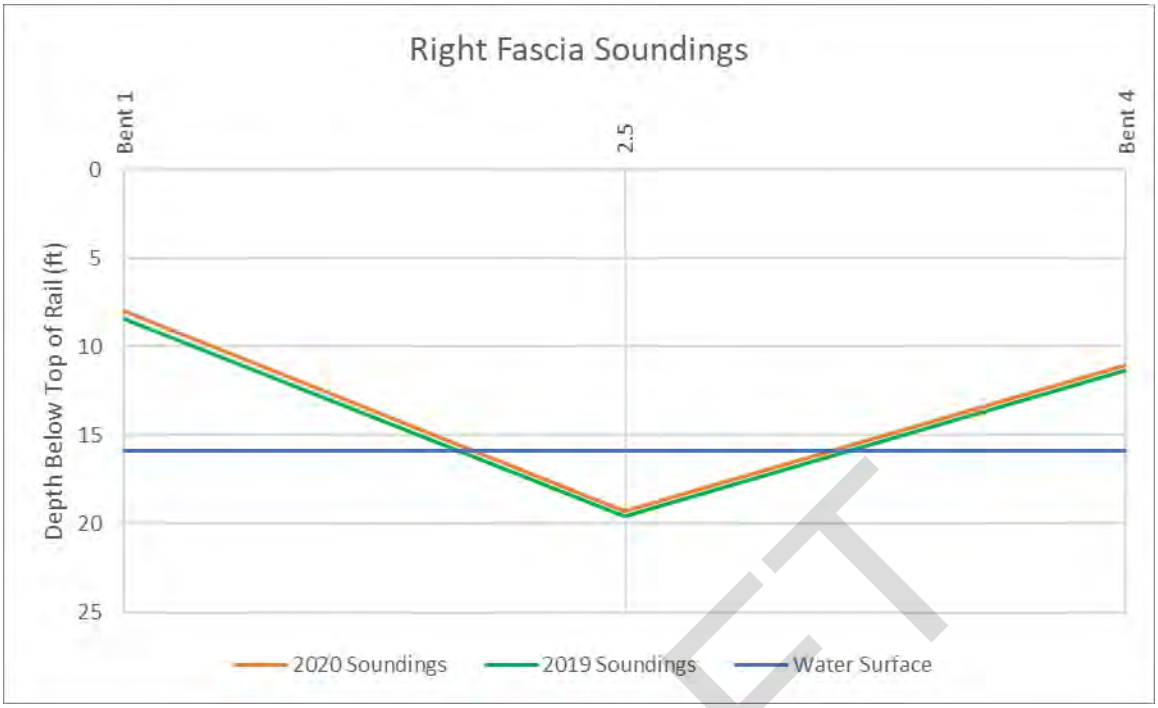
Table 10-1: Bridge 150062 Channel Soundings

50FT Right	25FT Right	Fascia Right	STATION	Fascia Left	25FT Left	50FT Left
		8.0	Bent 1	8.4		
0.5	0.5	19.3	2.5	19.6	0.5	0.5
		11.0	Bent 4	7.6		

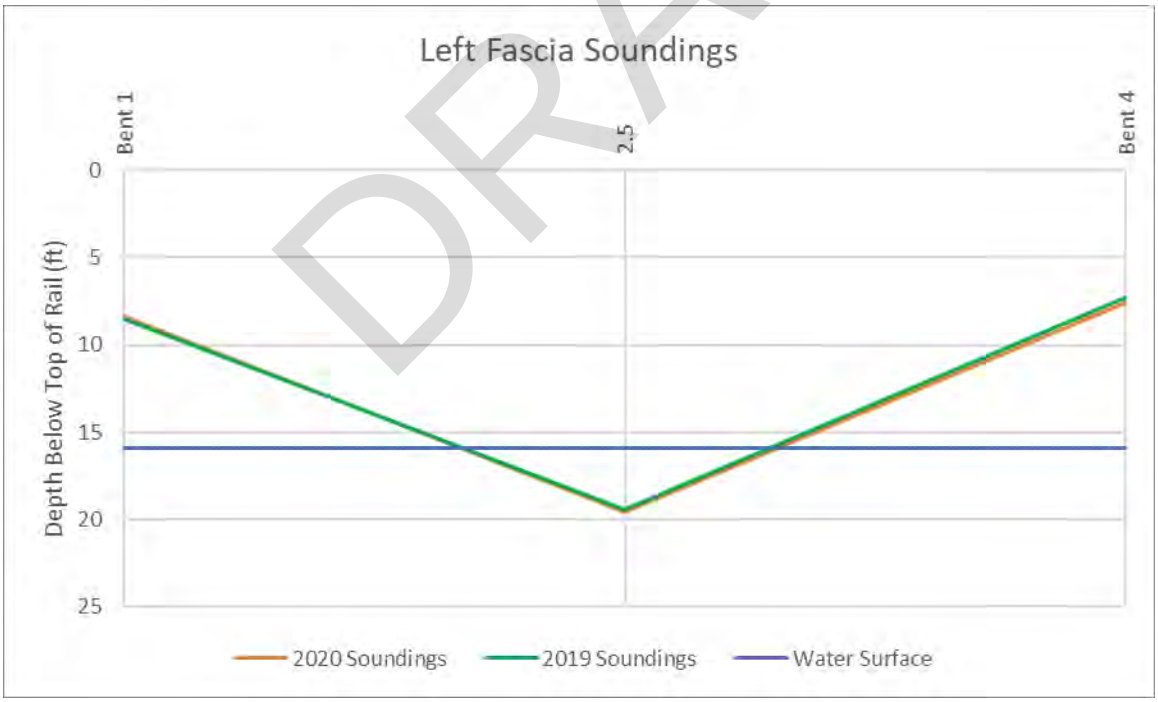
Table 10-2: Bridge 150062 Channel Soundings – Fascia Comparisons

STATION	Fascia Left 2020	Fascia Left 2019	Fascia Left Change	Fascia Right 2020	Fascia Right 2019	Fascia Right Change
Bent 1	8.4	8.5	+0.1	8.0	8.4	+0.4
2.5	19.6	19.4	-0.2	19.3	19.6	+0.3
Bent 4	7.6	7.3	-0.3	11.0	11.3	+0.3

Graph 10-1 Bridge 155062 Right Fascia Cross Section



Graph 10-2 Bridge 155062 Left Fascia Cross Section



10.4 Repair Recommendations

The findings observed in the field and noted in the 2019 FDOT inspection report are normal issues that will not compromise the structural integrity of the bridge and wingwalls. The observations and findings for this bridge are of low priority repairs. It is recommended to routinely perform basic maintenance such as concrete spall or crack repairs, cleaning areas of debris and joint sealant repairs.

The northwest wingwall has some minimal undermining. Currently no corrective action is necessary. The area should be monitored and if it increases, a repair to the wall foundation will be required by injecting grout into the undermined area to fill the void.

In the 2019 FDOT report, the structure was listed as functionally obsolete. No shoulders are present on the bridge and the concrete barriers are not adequate for the current crash rating. The pipe railing to the edge of the east sidewalk is not sufficient to protect pedestrians from slipping off the deck into the channel, as seen in Figure 10-7. A study should be conducted to consider if the structure will need to be replaced or routine maintenance will be sufficient to extend the useful service life of the bridge.

The structure should be monitored every 24 months per BIRM for addition deterioration that could require maintenance repairs to the structural elements.

10.5 Site Photo

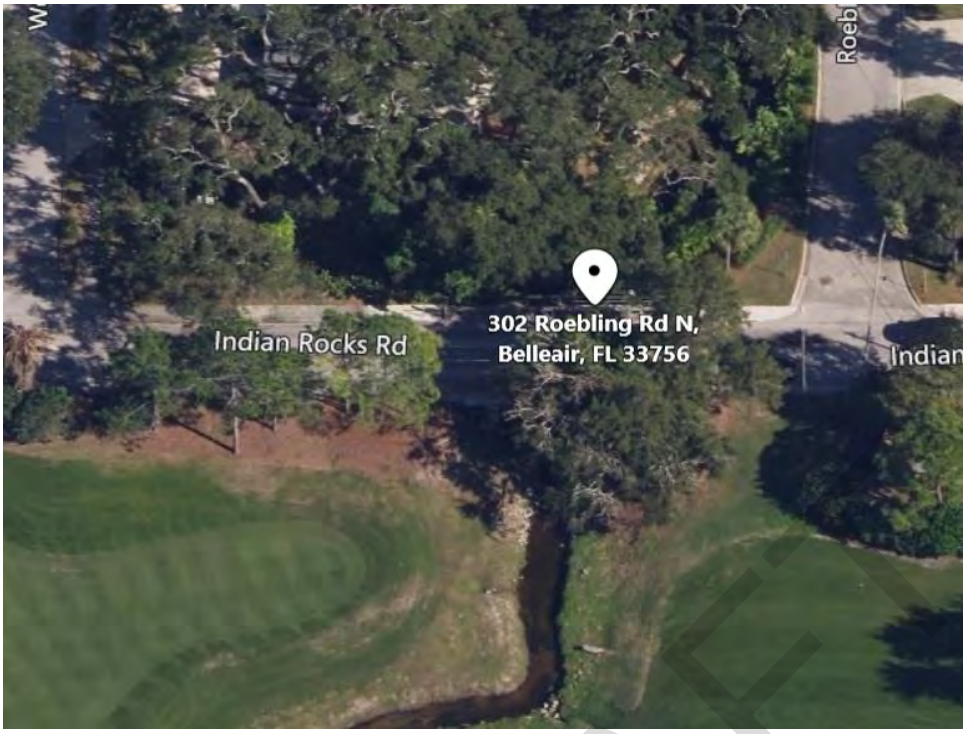


Figure 10-2: Aerial view of Bridge 155062 at Indian Rocks Road

Figure 10-3: Transverse cracks in bridge deck

Figure 10-4: Undermining at northwest wingwall three (3) inches in height with up to two (2) feet of penetration

Figure 10-5: Honeycombing under arch near the mudline

Figure 10-6: Concrete edge spall underside of arch

Figure 10-7: Bridge Section with obsolete crash barrier and sidewalk rail

11.0 CONCLUSIONS AND RECOMMENDATIONS

For the two walls inspected, the Thompson Park seawall has a condition rating of SERIOUS and the Winston Park seawall has a condition rating of SATISFACTORY. The Thompson Park seawall will need to be repaired on a moderate priority basis to prevent any additional movement or future failure to the structure. The Winston Park seawall has minor deficiencies that do not compromise its structural integrity and could be corrected on a non-priority basis.

- Estimated Thompson Park Seawall Replacement Cost - **$210,680**
- Estimated Winston Park French Drain Cost - **$5,000**

Overall, there were no major or significant structural deficiencies found during the inspection of the superstructure, substructures and wingwalls of any bridge. Minor defects and deterioration were observed, but do not compromise their structural integrity. Although not an immediate concern, on a non-priority basis, M&N recommends routine maintenance such as crack and spall repairs as a means of preservation. If repairs are done promptly, additional deterioration of exposed reinforcement can be drastically reduced in an aggressive environment.

- Bridge 155000 Estimated Repair Cost - **$9,300**
- Bridge 155001 Estimated Repair Cost - **$39,250**

APPENDIX A

NBIS CONDITION RATINGS

NBI & AASHTO Bridge Elements and Ratings

NBI Items 58 through 60 General Condition Ratings

- Item 58 – Deck
- Item 59 – Superstructure
- Item 60 – Substructure

Code	Description
N	NOT APPLICABLE
9	EXCELLENT CONDITION
8	VERY GOOD CONDITION – no problems noted.
7	GOOD CONDITION – some minor problems.
6	SATISFACTORY CONDITION – structural elements show some minor deterioration.
5	FAIR CONDITION – all primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
4	POOR CONDITION – advanced section loss, deterioration, spalling or scour.
3	SERIOUS CONDITION – loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	CRITICAL CONDITION – advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE CONDITION – major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put back in light service.
0	FAILED CONDITION – out of service – beyond corrective action.

BME (BRIDGE MANAGEMENT ELEMENTS)

Joints		
El. No.	Element Name	Units
300	Strip Seal Expansion Joint	LENGTH (ft.)
301	Pourable Joint Seal	LENGTH (ft.)
302	Compression Joint Seal	LENGTH (ft.)
303	Assembly Joint/Seal (Modular)	LENGTH (ft.)
304	Open Expansion Joint	LENGTH (ft.)
305	Assembly Joint without Seal	LENGTH (ft.)
306	Other Joint	LENGTH (ft.)

Wearing Surface and Protective Systems		
El. No.	Element Name	Units
510	Wearing Surface	AREA (sq. ft.)
515	Steel Protective Coating	AREA (sq. ft.)
520	Concrete Reinforcing Steel Protective System	AREA (sq. ft.)
521	Concrete Protective Coating	AREA (sq. ft.)

NBE (NATIONAL BRIDGE ELEMENTS)

Deck/Slabs		
El. No.	Element Name	Units
12	Reinforced Concrete Deck	AREA (sq. ft.)
13	Prestressed Concrete Deck	AREA (sq. ft.)
15	Prestressed Concrete Top Flange	AREA (sq. ft.)
16	Reinforced Concrete Top Flange	AREA (sq. ft.)
28	Steel Deck—Open Grid	AREA (sq. ft.)
29	Steel Deck—Concrete Filled	AREA (sq. ft.)
30	Steel Deck—Corrugated/Orthotropic/Etc.	AREA (sq. ft.)
31	Timber Deck	AREA (sq. ft.)
38	Reinforced Concrete Slab	AREA (sq. ft.)
54	Timber Slab	AREA (sq. ft.)
60	Other Material Deck	AREA (sq. ft.)
65	Other Material Slab	AREA (sq. ft.)

Superstructures		
El. No.	Element Name	Units
102	Closed Web/Box Girder, Steel	LENGTH (ft.)
104	Closed Web/Box Girder, Prestressed Concrete	LENGTH (ft.)
105	Closed Web/Box Girder, Reinforced Concrete	LENGTH (ft.)
106	Closed Web/Box Girder, Other	LENGTH (ft.)
107	Girder/Beam, Steel	LENGTH (ft.)
109	Girder/Beam, Prestressed Concrete	LENGTH (ft.)
110	Girder/Beam, Reinforced Concrete	LENGTH (ft.)
111	Girder/Beam, Timber	LENGTH (ft.)
112	Girder/Beam, Other	LENGTH (ft.)
113	Stringer, Steel	LENGTH (ft.)
115	Stringer, Prestressed Concrete	LENGTH (ft.)
116	Stringer, Reinforced Concrete	LENGTH (ft.)
117	Stringer, Timber	LENGTH (ft.)
118	Stringer, Other	LENGTH (ft.)
120	Truss, Steel	LENGTH (ft.)
135	Truss, Timber	LENGTH (ft.)
136	Truss, Other	LENGTH (ft.)
141	Arch, Steel	LENGTH (ft.)
142	Arch, Other	LENGTH (ft.)
143	Arch, Prestressed Concrete	LENGTH (ft.)
144	Arch, Reinforced Concrete	LENGTH (ft.)
145	Arch, Masonry	LENGTH (ft.)
146	Arch, Timber	LENGTH (ft.)
147	Cable – Main, Steel	LENGTH (ft.)
148	Cable – Secondary, Steel	EACH
149	Cable – Secondary, Other	EACH
152	Floor Beam, Steel	LENGTH (ft.)
154	Floor Beam, Prestressed Concrete	LENGTH (ft.)
155	Floor Beam, Reinforced Concrete	LENGTH (ft.)
156	Floor Beam, Timber	LENGTH (ft.)
157	Floor Beam, Other	LENGTH (ft.)
161	Pin, Pin and Hanger Assembly, or both	EACH
162	Gusset Plate	EACH

Substructures		
El. No.	Element Name	Units
202	Columns, Steel	EACH
203	Columns, Other	EACH
204	Columns, Prestressed Concrete	EACH
205	Columns, Reinforced Concrete	EACH
206	Columns, Timber	EACH
207	Column Tower (Trestle), Steel	LENGTH (ft.)
208	Column Tower (Trestle), Timber	LENGTH (ft.)
210	Pier Wall, Reinforced Concrete	LENGTH (ft.)
211	Pier Wall, Other	LENGTH (ft.)
212	Pier Wall, Timber	LENGTH (ft.)
213	Pier Wall, Masonry	LENGTH (ft.)
215	Abutment, Reinforced Concrete	LENGTH (ft.)
216	Abutment, Timber	LENGTH (ft.)
217	Abutment, Masonry	LENGTH (ft.)
218	Abutment, Other	LENGTH (ft.)
219	Abutment, Steel	LENGTH (ft.)
220	Pile Cap/Footing	LENGTH (ft.)
225	Pile, Steel	EACH
226	Pile, Prestressed Concrete	EACH
227	Pile, Reinforced Concrete	EACH
228	Pile, Timber	EACH
229	Pile, Other	EACH
231	Pier Cap, Steel	LENGTH (ft.)
233	Pier Cap, Prestressed Concrete	LENGTH (ft.)
234	Pier Cap, Reinforced Concrete	LENGTH (ft.)
235	Pier Cap, Timber	LENGTH (ft.)
236	Pier Cap, Other	LENGTH (ft.)

Bridge Rails		
El. No.	Element Name	Units
330	Metal Bridge Railing	LENGTH (ft.)
331	Reinforced Concrete Bridge Railing	LENGTH (ft.)
332	Timber Bridge Railing	LENGTH (ft.)
333	Other Bridge Railing	LENGTH (ft.)
334	Masonry Bridge Railing	LENGTH (ft.)

Bearings		
El. No.	Element Name	Units
310	Elastomeric Bearing	EACH
311	Movable Bearing (roller, sliding, etc.)	EACH
312	Enclosed/Concealed Bearing	EACH
313	Fixed Bearing	EACH
314	Pot Bearing	EACH
315	Disk Bearing	EACH
316	Other Bearing	EACH

SIDE A

Decks and Slabs (NBE)		
El. No.	Element Name	Units
12	Reinforced Concrete Deck	AREA (sq. ft.)
13	Prestressed Concrete Deck	AREA (sq. ft.)
15	Prestressed Concrete Top Flange	AREA (sq. ft.)
16	Reinforced Concrete Top Flange	AREA (sq. ft.)
28	Steel Deck—Open Grid	AREA (sq. ft.)
29	Steel Deck—Concrete Filled Grid	AREA (sq. ft.)
30	Steel Deck—Corrugated/Orthotropic/Etc.	AREA (sq. ft.)
31	Timber Deck	AREA (sq. ft.)
38	Reinforced Concrete Slab	AREA (sq. ft.)
54	Timber Slab	AREA (sq. ft.)
60	Other Material Deck	AREA (sq. ft.)
65	Other Material Slab	AREA (sq. ft.)

Bridge Rails (NBE)		
El. No.	Element Name	Units
330	Metal Bridge Railing	LENGTH (ft.)
331	Reinforced Concrete Bridge Railing	LENGTH (ft.)
332	Timber Bridge Railing	LENGTH (ft.)
333	Other Bridge Railing	LENGTH (ft.)
334	Masonry Bridge Railing	LENGTH (ft.)

Joints (BME)		
El. No.	Element Name	Units
300	Strip Seal Expansion Joint	LENGTH (ft.)
301	Pourable Joint Seal	LENGTH (ft.)
302	Compression Joint Seal	LENGTH (ft.)
303	Assembly Joint/Seal (Modular)	LENGTH (ft.)
304	Open Expansion Joint	LENGTH (ft.)
305	Assembly Joint without Seal	LENGTH (ft.)
306	Other Joint	LENGTH (ft.)

Approach Slabs (BME)		
El. No.	Element Name	Units
320	Prestressed Concrete Approach Slab	AREA (sq. ft.)
321	Reinforced Concrete Approach Slab	AREA (sq. ft.)

Wearing Surface, Protective Systems, and Concrete Reinforcing Steel Protective Systems (BME)		
El. No.	Element Name	Units
510	Wearing Surfaces	AREA (sq. ft.)
515	Steel Protective Coating	AREA (sq. ft.)
520	Concrete Reinforcing Steel Protective System	AREA (sq. ft.)
521	Concrete Protective Coating	AREA (sq. ft.)

Superstructure (NBE)		
El. No.	Element Name	Units
102	Closed Web/Box Girder, Steel	LENGTH (ft.)
104	Closed Web/Box Girder, Prestressed Concrete	LENGTH (ft.)
105	Closed Web/Box Girder, Reinforced Concrete	LENGTH (ft.)
106	Closed Web/Box Girder, Other	LENGTH (ft.)
107	Open Girder/Beam, Steel	LENGTH (ft.)
109	Open Girder/Beam, Prestressed Concrete	LENGTH (ft.)
110	Open Girder/Beam, Reinforced Concrete	LENGTH (ft.)
111	Open Girder/Beam, Timber	LENGTH (ft.)
112	Open Girder/Beam, Other	LENGTH (ft.)
113	Stringer, Steel	LENGTH (ft.)
115	Stringer, Prestressed Concrete	LENGTH (ft.)
116	Stringer, Reinforced Concrete	LENGTH (ft.)
117	Stringer, Timber	LENGTH (ft.)
118	Stringer, Other	LENGTH (ft.)
120	Truss, Steel	LENGTH (ft.)
135	Truss, Timber	LENGTH (ft.)
136	Truss, Other	LENGTH (ft.)
141	Arch, Steel	LENGTH (ft.)
142	Arch, Other	LENGTH (ft.)
143	Arch, Prestressed Concrete	LENGTH (ft.)
144	Arch, Reinforced Concrete	LENGTH (ft.)
145	Arch, Masonry	LENGTH (ft.)
146	Arch, Timber	LENGTH (ft.)
147	Cable – Primary/Main, Steel	LENGTH (ft.)
148	Cable – Secondary, Steel	EACH
149	Cable – Secondary, Other	EACH
152	Floor Beam, Steel	LENGTH (ft.)
154	Floor Beam, Prestressed Concrete	LENGTH (ft.)
155	Floor Beam, Reinforced Concrete	LENGTH (ft.)
156	Floor Beam, Timber	LENGTH (ft.)
157	Floor Beam, Other	LENGTH (ft.)
161	Pin, Pin and Hanger Assembly, or both, Steel	EACH
162	Gusset Plate, Steel	EACH

Bearings (NBE)		
El. No.	Element Name	Units
310	Elastomeric Bearing	EACH
311	Movable Bearing (roller, sliding, etc.)	EACH
312	Enclosed/Concealed Bearing	EACH
313	Fixed Bearing	EACH
314	Pot Bearing	EACH
315	Disk Bearing	EACH
316	Other Bearing	EACH

Substructure (NBE)		
El. No.	Element Name	Units
202	Columns, Steel	EACH
203	Columns, Other	EACH
204	Columns, Prestressed Concrete	EACH
205	Columns, Reinforced Concrete	EACH
206	Columns, Timber	EACH
207	Column Tower (Trestle), Steel	LENGTH (ft.)
208	Column Tower (Trestle), Timber	LENGTH (ft.)
210	Pier Wall, Reinforced Concrete	LENGTH (ft.)
211	Pier Wall, Other	LENGTH (ft.)
212	Pier Wall, Timber	LENGTH (ft.)
213	Pier Wall, Masonry	LENGTH (ft.)
215	Abutment, Reinforced Concrete	LENGTH (ft.)
216	Abutment, Timber	LENGTH (ft.)
217	Abutment, Masonry	LENGTH (ft.)
218	Abutment, Other	LENGTH (ft.)
219	Abutment, Steel	LENGTH (ft.)
220	Pile Cap/Footing, Reinforced Concrete	LENGTH (ft.)
225	Pile, Steel	EACH
226	Pile, Prestressed Concrete	EACH
227	Pile, Reinforced Concrete	EACH
228	Pile, Timber	EACH
229	Pile, Other	EACH
231	Pier Cap, Steel	LENGTH (ft.)
233	Pier Cap, Prestressed Concrete	LENGTH (ft.)
234	Pier Cap, Reinforced Concrete	LENGTH (ft.)
235	Pier Cap, Timber	LENGTH (ft.)
236	Pier Cap, Other	LENGTH (ft.)

Culverts (NBE)		
El. No.	Element Name	Units
240	Culvert, Steel	LENGTH (ft.)
241	Culvert, Reinforced Concrete	LENGTH (ft.)
242	Culvert, Timber	LENGTH (ft.)
243	Culvert, Other	LENGTH (ft.)
244	Culvert, Masonry	LENGTH (ft.)
245	Culvert, Prestressed Concrete	LENGTH (ft.)

NBE - National Bridge Elements are used nationwide to determine the overall condition and safety of primary load carrying members.

BME - Bridge Management Elements are elements commonly included in an agency's systematic preventive maintenance program.

Reinforced Concrete - Condition State Definitions

Defect	CS 1 - Good	CS 2 - Fair	CS 3 - Poor	CS 4 - Severe
Delamination / Spall / Patched Area (1080)	None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None.	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence / Rust Staining (1120)	None.	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (1130)	Insignificant cracks or moderate width cracks that have been sealed. *See Element commentary below.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. *See Element commentary below.	Wide cracks or heavy pattern (map) cracking. *See Element commentary below.	
Abrasion / Wear (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Distortion (1900)	None.	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
Scour (6000)	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

*Element commentary: Reinforced concrete cracks less than 0.012 inches can be considered insignificant, cracks ranging 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

Prestressed Concrete - Condition State Definitions

Defect	CS 1 - Good	CS 2 - Fair	CS 3 - Poor	CS 4 - Severe
Delamination / Spall / Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Exposed Prestressing (1100)	None	Present without section loss	Present with section loss, but does not warrant structural review.	
Cracking (1110)	Insignificant cracks or moderate width cracks that have been sealed. **See Element commentary below.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. **See Element commentary below.	Wide cracks or heavy pattern (map) cracking. **See Element commentary below.	
Efflorescence / Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Abrasion / Wear (1190)	No abrasion or wearing	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

**Element commentary: Prestressed concrete cracks less than 0.004 inches can be considered insignificant, cracks ranging 0.004 to 0.009 inches can be considered moderate, and cracks greater than 0.009 inches can be considered wide.

Concrete Protective Coating - Condition State Definitions

Defect	CS 1 – Good	CS 2 – Fair	CS 3 – Poor	CS 4 – Severe
Wear (3510)	None.	Underlying concrete not exposed, coating showing wear from UV exposure, friction course missing.	Underlying concrete is not exposed, thickness of the coating is reduced.	Underlying concrete exposed, treated cracks are exposed.
Effectiveness (3540)	Fully effective.	Substantially effective.	Limited effectiveness.	The protective system has failed or is no longer effective.
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Masonry - Condition State Definitions

Delamination / Spall / Patched Area (1080)	None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Efflorescence / Rust Staining (1120)	None.	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Mortar Breakdown (1610)	None.	Cracking or voids in less than 10% of joints.	Cracking or voids in 10% or more of the of joints	
Split / Spall (1620)	None.	Block or stone has split or spalled with no shifting.	Block or stone has split or spalled with shifting but does not warrant a structural review.	
Patched Area (1630)	None.	Sound patch.	Unsound patch.	
Masonry Displacement (1640)	None.	Block or stone has shifted slightly out of alignment.	Block or stone has shifted significantly out of alignment or is missing but does not warrant structural review.	
Distortion (1900)	None.	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Concrete Reinforcing Steel Protective Systems

Defect	CS 1 – Good	CS 2 – Fair	CS 3 – Poor	CS 4 – Severe
Effectiveness (3600)	Fully effective.	Substantially effective.	Limited effectiveness.	The protective system has failed or is no longer effective.
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Joints - Condition State Definitions

Leakage (2310)	None.	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	Free flow of water through the joint.
Seal Adhesion (2320)	Fully Adhered.	Adhered for more than 50% of the joint height.	Adhered 50% or less of joint height but still some adhesion.	Complete loss of adhesion.
Seal Damage (2330)	None.	Seal abrasion without punctures.	Punctured or ripped or partially pulled out.	Punctured completely through, pulled out, or missing.
Seal Cracking (2340)	None.	Surface crack.	Crack that partially penetrates the seal.	Crack that fully penetrates the seal.
Debris Impaction (2350)	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material, but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
Adjacent Deck or Header (2360)	Sound. No spall, delamination or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched area that makes the joint loose.	Spall, delamination, unsound patched area or loose joint anchor that prevents the joint from functioning as intended.
Metal Deterioration or Damage (2370)	None.	Freckled rust, metal has no cracks, or impact damage. Connection may be loose but functioning as intended.	Section loss, missing or broken fasteners, cracking of the metal or impact damage but joint still functioning.	Metal cracking, section loss, damage or connection failure that prevents the joint from functioning as intended.
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Steel - Condition State Definitions

Defect	CS 1 - Good	CS 2 - Fair	CS 3 - Poor	CS 4 - Severe
Corrosion (1000)	None.	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Cracking (1010)	None.	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, fasteners, broken welds, or pack rust with distortion but does not warrant a structural review.	
Distortion (1900)	None.	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
Scour (6000)	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Steel Protective Coating - Condition State Definitions

Chalking (3410)	None.	Surface Dulling.	Loss of Pigment.	Not Applicable.
Peeling / Bubbling / Cracking (3420)	None.	Finish coats only.	Finish and primer coats.	Exposure of bare metal.
Oxide Film Degradation Color / Texture Adherence (weathering steel patina) (3430)	Yellow-orange or light brown for early development. Chocolate-brown to purple-brown for fully developed. Tightly adhered, capable of withstanding hammering or vigorous wire brushing.	Granular texture.	Small flakes, less than 1/2 in. diameter.	Dark black color. Large flakes, 1/2 in. diameter or greater, or laminar sheets or nodules.
Effectiveness (3440)	Fully effective.	Substantially effective.	Limited effectiveness.	Failed, no protection of the underlying metal
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Timber - Condition State Definitions

Defect	CS 1 - Good	CS 2 - Fair	CS 3 - Poor	CS 4 - Severe
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, fasteners, broken welds, or pack rust with distortion but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Decay / Section Loss (1140)	None.	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
Check / Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (1160)	None.	Crack that has been arrested through effective measures.	Identified crack exists that is not arrested, but does not require structural review.	
Split / Delamination (1170)	None.	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth, but does not require structural review.	
Abrasion / Wear (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness	Section loss 10% or more of the member thickness but does not warrant structural review.	
Distortion (1900)	None.	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
Scour (6000)	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Other Materials - Condition State Definitions

Defect	CS 1 - Good	CS 2 - Fair	CS 3 - Poor	CS 4 - Severe
Corrosion (1000)	None.	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Cracking (Steel) (1010)	None.	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion but does not warrant a structural review.	
Delamination / Spall / Patched Area (1080)	None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Efflorescence / Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (Reinforced Concrete and Other) (1130)	Insignificant cracks or moderate width cracks that have been sealed.*see Element commentary	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. *see Element commentary.	Wide cracks or heavy pattern (map) cracking. *see Element commentary.	
Deterioration (1220)	None.	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	
Distortion (1900)	None.	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
Movement (2210)	Free to move.	Minor restriction.	Restricted but not warranting structural review.	
Alignment (2220)	Lateral and vertical alignment is as expected for the temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the bearing but does not warrant a structural review.	
Bulging, Splitting, or Tearing (2230)	None.	Bulging less than 15% of the thickness.	Bulging 15% or more of the thickness. Splitting or tearing. Bearing's surfaces are not parallel. Does not warrant structural review.	
Loss of Bearing Area (2240)	None.	Less than 10%.	10% or more but does not warrant structural review.	

Other Materials - Condition State Definitions

Defect	CS 1 – Good	CS 2 – Fair	CS 3 – Poor	CS 4 – Severe
Leakage (2310)	None.	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	Free flow of water through the joint.
Seal Adhesion (2320)	Fully Adhered.	Adhered for more than 50% of the joint height.	Adhered 50% or less of joint height but still some adhesion.	Complete loss of adhesion.
Seal Damage (2330)	None.	Seal abrasion without punctures.	Punctured or ripped or partially pulled out.	Punctured completely through, pulled out, or missing.
Seal Cracking (2340)	None.	Surface crack.	Crack that partially penetrates the seal.	Crack that fully penetrates the seal.
Debris Impaction (2350)	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material, but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
Adjacent Deck or Header (2360)	Sound. No spall, delamination or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched area that makes the joint loose.	Spall, delamination, unsound patched area or loose joint anchor that prevents the joint from functioning as intended.
Metal Deterioration or Damage (2370)	None.	Freckled rust, metal has no cracks, or impact damage. Connection may be loose but functioning as intended.	Section loss, missing or broken fasteners, cracking of the metal or impact damage but joint still functioning.	Metal cracking, section loss, damage or connection failure that prevents the joint from functioning as intended.
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Wearing Surface - Condition State Definitions

Defect	CS 1 – Good	CS 2 - Fair	CS 3 - Poor	CS 4 - Severe
Delamination / Spall / Patched Area / Pothole (3210)	None.	Delaminated. Spall less than 1 in. deep or less than 6 in. diameter. Patched area that is sound. Partial depth pothole.	Spall 1 in. deep or greater or 6 in. diameter or greater. Patched area that is unsound or showing distress. Full depth pothole.	The wearing surface is no longer effective.
Crack (3220)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012–0.05 in. or spacing of 1.0–3.0 ft.	Width of more than 0.05 in. or spacing of less than 1.0 ft.	
Effectiveness (3230)	Fully effective. No evidence of leakage or further deterioration of the protected element.	Substantially effective. Deterioration of the protected element has slowed.	Limited effectiveness. Deterioration of the protected element has progressed.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Bearings - Condition State Definitions

Corrosion (1000)	None.	Freckled rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, fasteners, broken welds, or pack rust with distortion but does not warrant a structural review.	
Movement (2210)	Free to move.	Minor restriction.	Restricted but not warranting structural review.	
Alignment (2220)	Lateral and vertical alignment is as expected for the temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the bearing but does not warrant a structural review.	
Bulging, Splitting, or Tearing (2230)	None.	Bulging less than 15% of the thickness.	Bulging 15% or more of the thickness. Splitting or tearing. Bearing's surfaces are not parallel. Does not warrant structural review.	
Loss of Bearing Area (2240)	None.	Less than 10%.	10% or more but does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Agency Developed Elements (ADE)

El. No.	Element Name	Units

Agency Developed Element Defects - Condition State Definitions

Defect	CS 1 – Good	CS 2 – Fair	CS 3 – Poor	CS 4 – Severe

Item 56 - Minimum Lateral Underclearance on Left 3 digits
(XX.X meters) (code only for divided highways, 1-way streets, and ramps; not applicable to railroads)

Using a 3-digit number, record and code the minimum lateral under-clearance on the left (median side for divided highways) to the nearest tenth of a meter (with an assumed decimal point). The lateral clearance should be measured from the left edge of the roadway (excluding shoulders) to the nearest substructure unit, to a rigid barrier, or to the toe of slope steeper than 1 to 3. Refer to examples on page 34 under Item 55 - Minimum Lateral Underclearance on Right.

In the case of a dual highway, the median side clearances of both roadways should be measured and the smaller distance recorded and coded. If there is no obstruction in the median area, a notation of "open" should be recorded and 999 should be coded. For clearances greater than 30 meters, code 998. Coding of actual clearances greater than 30 meters to an exact measurement is optional. Code 000 to indicate not applicable.

Item 57

(Reserved)

Items 58 through 62 - Indicate the Condition Ratings

In order to promote uniformity between bridge inspectors, these guidelines will be used to rate and code Items 58, 59, 60, 61, and 62. The use of the AASHTO Guide for Commonly Recognized (CoRe) Structural Elements is an acceptable alternative to using these rating guidelines for Items 58, 59, 60, and 62, provided the FHWA translator computer program is used to convert the inspection data to NBI condition ratings for NBI data submittal.

Condition ratings are used to describe the existing, in-place bridge as compared to the as-built condition. Evaluation is for the materials related, physical condition of the deck, superstructure, and substructure components of a bridge. The condition evaluation of channels and channel protection and culverts is also included. Condition codes are properly used when they provide an overall characterization of the general condition of the entire component being rated. Conversely, they are improperly used if they attempt to describe localized or nominally occurring instances of deterioration or disrepair. Correct assignment of a condition code must, therefore, consider both the severity of the deterioration or disrepair and the extent to which it is widespread throughout the component being rated.

The load-carrying capacity will not be used in evaluating condition items. The fact that a bridge was designed for less than current legal loads and may be posted shall have no influence upon condition ratings.

Portions of bridges that are being supported or strengthened by temporary members will be rated based on their actual condition; that is, the temporary members are not considered in the rating of the item. (See Item 103 - Temporary Structure Designation for the definition of a temporary bridge.)

Completed bridges not yet opened to traffic, if rated, shall be coded as if open to traffic

Condition Ratings (cont'd)

The following general condition ratings shall be used as a guide in evaluating Items 58, 59, and 60:

Code	Description
N	NOT APPLICABLE
9	EXCELLENT CONDITION
8	VERY GOOD CONDITION - no problems noted.
7	GOOD CONDITION - some minor problems.
6	SATISFACTORY CONDITION - structural elements show some minor deterioration.
5	FAIR CONDITION - all primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
4	POOR CONDITION - advanced section loss, deterioration, spalling or scour.
3	SERIOUS CONDITION - loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	CRITICAL CONDITION - advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE CONDITION - major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put back in light service.
0	FAILED CONDITION - out of service - beyond corrective action.

Item 58 - Deck 1 digit

This item describes the overall condition rating of the deck. Rate and code the condition in accordance with the above general condition ratings. Code N for culverts and other structures without decks e.g., filled arch bridge.

Concrete decks should be inspected for cracking, scaling, spalling, leaching, chloride contamination, potholing, delamination, and full or partial depth failures. Steel grid decks should be inspected for broken welds, broken grids, section loss, and growth of filled grids from corrosion. Timber decks should be inspected for splitting, crushing, fastener failure, and deterioration from rot.

The condition of the wearing surface/protective system, joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, and scuppers shall not be considered in the overall deck evaluation. However, their condition should be noted on the inspection form.

Item 58 - Deck (cont'd)

Decks integral with the superstructure will be rated as a deck only and not how they may influence the superstructure rating (for example, rigid frame, slab, deckgirder or T-beam, voided slab, box girder, etc.). Similarly, the superstructure of an integral deck-type bridge will not influence the deck rating.

Item 59 - Superstructure 1 digit

This item describes the physical condition of all structural members. Rate and code the condition in accordance with the previously described general condition ratings. Code N for all culverts.

The structural members should be inspected for signs of distress which may include cracking, deterioration, section loss, and malfunction and misalignment of bearings.

The condition of bearings, joints, paint system, etc. shall not be included in this rating, except in extreme situations, but should be noted on the inspection form.

On bridges where the deck is integral with the superstructure, the superstructure condition rating may be affected by the deck condition. The resultant superstructure condition rating may be lower than the deck condition rating where the girders have deteriorated or been damaged.

Fracture critical components should receive careful attention because failure could lead to collapse of a span or the bridge.

Item 60 - Substructure 1 digit

This item describes the physical condition of piers, abutments, piles, fenders, footings, or other components. Rate and code the condition in accordance with the previously described general condition ratings. Code N for all culverts.

All substructure elements should be inspected for visible signs of distress including evidence of cracking, section loss, settlement, misalignment, scour, collision damage, and corrosion. The rating given by Item 113 - Scour Critical Bridges, may have a significant effect on Item 60 if scour has substantially affected the overall condition of the substructure.

The substructure condition rating shall be made independent of the deck and superstructure.

Integral-abutment wingwalls to the first construction or expansion joint shall be included in the evaluation. For non-integral superstructure and substructure units, the substructure shall be considered as the portion below the bearings. For structures where the substructure and superstructure are integral, the substructure shall be considered as the portion below the superstructure.

Item 61 - Channel and Channel Protection 1 digit

This item describes the physical conditions associated with the flow of water through the bridge such as stream stability and the condition of the channel, riprap, slope protection, or stream control devices including spur dikes. The inspector should be particularly concerned with visible signs of excessive water velocity which may affect undermining of slope protection, erosion of banks, and realignment of the stream which may result in immediate or potential problems. Accumulation of drift and debris on the superstructure and substructure should be noted on the inspection form but not included in the condition rating.

Rate and code the condition in accordance with the previously described general condition ratings and the following descriptive codes:

Code	Description
N	Not applicable. Use when bridge is not over a waterway (channel).
9	There are no noticeable or noteworthy deficiencies which affect the condition of the channel.
8	Banks are protected or well vegetated. River control devices such as spur dikes and embankment protection are not required or are in a stable condition.
7	Bank protection is in need of minor repairs. River control devices and embankment protection have a little minor damage. Banks and/or channel have minor amounts of drift.
6	Bank is beginning to slump. River control devices and embankment protection have widespread minor damage. There is minor stream bed movement evident. Debris is restricting the channel slightly.
5	Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.
4	Bank and embankment protection is severely undermined. River control devices have severe damage. Large deposits of debris are in the channel.
3	Bank protection has failed. River control devices have been destroyed. Stream bed aggradation, degradation or lateral movement has changed the channel to now threaten the bridge and/or approach roadway.
2	The channel has changed to the extent the bridge is near a state of collapse.
1	Bridge closed because of channel failure. Corrective action may put back in light service.
0	Bridge closed because of channel failure. Replacement necessary.

Item 62 - Culverts 1 digit

This item evaluates the alignment, settlement, joints, structural condition, scour, and other items associated with culverts. The rating code is intended to be an overall condition evaluation of the culvert. Integral wingwalls to the first construction or expansion joint shall be included in the evaluation. For a detailed discussion regarding the inspection and rating of culverts, consult Report No. FHWA-IP-86-2, Culvert Inspection Manual, July 1986.

Item 58 - Deck, Item 59 - Superstructure, and Item 60 - Substructure shall be coded N for all culverts.

Rate and code the condition in accordance with the previously described general condition ratings and the following descriptive codes:

Code	Description
N	Not applicable. Use if structure is not a culvert.
9	No deficiencies.
8	No noticeable or noteworthy deficiencies which affect the condition of the culvert. Insignificant scrape marks caused by drift.
7	Shrinkage cracks, light scaling, and insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift with no misalignment and not requiring corrective action. Some minor scouring has occurred near curtain walls, wingwalls, or pipes. Metal culverts have a smooth symmetrical curvature with superficial corrosion and no pitting.
6	Deterioration or initial disintegration, minor chloride contamination, cracking with some leaching, or spalls on concrete or masonry walls and slabs. Local minor scouring at curtain walls, wingwalls, or pipes. Metal culverts have a smooth curvature, non-symmetrical shape, significant corrosion or moderate pitting.
5	Moderate to major deterioration or disintegration, extensive cracking and leaching, or spalls on concrete or masonry walls and slabs. Minor settlement or misalignment. Noticeable scouring or erosion at curtain walls, wingwalls, or pipes. Metal culverts have significant distortion and deflection in one section, significant corrosion or deep pitting.
4	Large spalls, heavy scaling, wide cracks, considerable efflorescence, or opened construction joint permitting loss of backfill. Considerable settlement or misalignment. Considerable scouring or erosion at curtain walls, wingwalls or pipes. Metal culverts have significant distortion and deflection throughout, extensive corrosion or deep pitting.

(codes continued on the next page)

Item 62 - Culverts (cont'd)

3 Any condition described in Code 4 but which is excessive in scope. Severe movement or differential settlement of the segments, or loss of fill. Holes may exist in walls or slabs. Integral wingwalls nearly severed from culvert. Severe scour or erosion at curtain walls, wingwalls or pipes. Metal culverts have extreme distortion and deflection in one section, extensive corrosion, or deep pitting with scattered perforations.

2 Integral wingwalls collapsed, severe settlement of roadway due to loss of fill. Section of culvert may have failed and can no longer support embankment. Complete undermining at curtain walls and pipes. Corrective action required to maintain traffic. Metal culverts have extreme distortion and deflection throughout with extensive perforations due to corrosion.

1 Bridge closed. Corrective action may put back in light service.

0 Bridge closed. Replacement necessary.

Item 63 - Method Used to Determine Operating Rating 1 digit

Use one of the codes below to indicate which load rating method was used to determine the Operating Rating coded in Item 64 for this structure.

Code	Description
1	Load Factor (LF)
2	Allowable Stress (AS)
3	Load and Resistance Factor (LRFR)
4	Load Testing
5	No rating analysis performed

Item 113 - Scour Critical Bridges 1 digit

Use a single-digit code as indicated below to identify the current status of the bridge regarding its vulnerability to scour. Scour analyses shall be made by hydraulic/geotechnical/structural engineers. Details on conducting a scour analysis are included in the FHWA Technical Advisory 5140.23 titled, "Evaluating Scour at Bridges." Whenever a rating factor of 4 or below is determined for this item, the rating factor for Item 60 - Substructure may need to be revised to reflect the severity of actual scour and resultant damage to the bridge. A scour critical bridge is one with abutment or pier foundations which are rated as unstable due to (1) observed scour at the bridge site or (2) a scour potential as determined from a scour evaluation study.

Code	Description
N	Bridge not over waterway.
U	Bridge with "unknown" foundation that has not been evaluated for scour. Since risk cannot be determined, flag for monitoring during flood events and, if appropriate, closure.
T	Bridge over "tidal" waters that has not been evaluated for scour, but considered low risk. Bridge will be monitored with regular inspection cycle and with appropriate underwater inspections. ("Unknown" foundations in "tidal" waters should be coded U.)
9	Bridge foundations (including piles) on dry land well above flood water elevations.
8	Bridge foundations determined to be stable for assessed or calculated scour conditions; calculated scour is above top of footing. (Example A)
7	Countermeasures have been installed to correct a previously existing problem with scour. Bridge is no longer scour critical.
6	Scour calculation/evaluation has not been made. (Use only to describe case where bridge has not yet been evaluated for scour potential.)
5	Bridge foundations determined to be stable for calculated scour conditions; scour within limits of footing or piles. (Example B)
4	Bridge foundations determined to be stable for calculated scour conditions; field review indicates action is required to protect exposed foundations from effects of additional erosion and corrosion.
3	Bridge is scour critical; bridge foundations determined to be unstable for calculated scour conditions: - Scour within limits of footing or piles. (Example B) - Scour below spread-footing base or pile tips. (Example C)

(codes continued on the next page)

Item 113 - Scour Critical Bridges (cont'd)

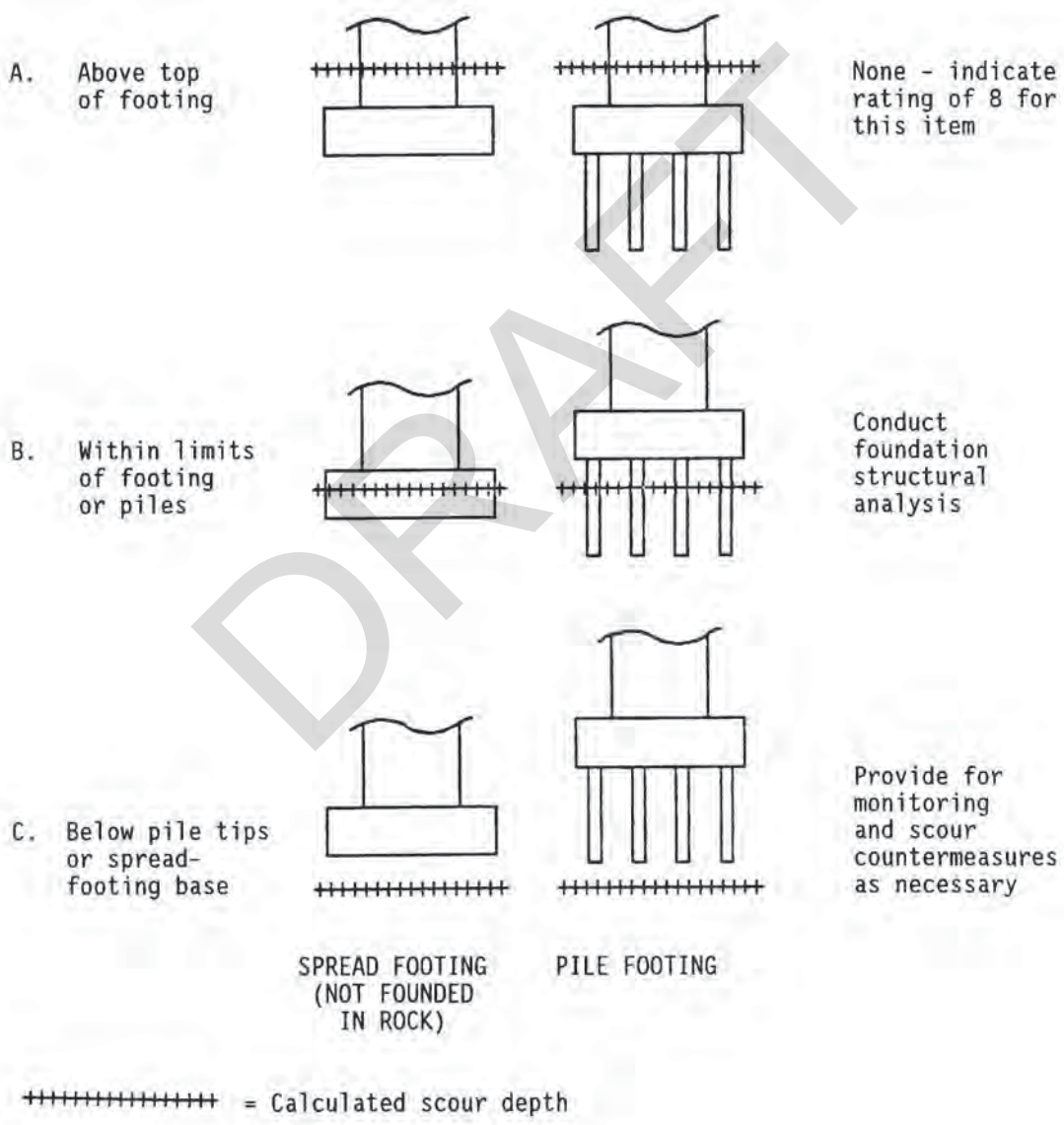
Code Description

2 Bridge is scour critical; field review indicates that extensive scour has occurred at bridge foundations. Immediate action is required to provide scour countermeasures.

1 Bridge is scour critical; field review indicates that failure of piers/abutments is imminent. Bridge is closed to traffic.

0 Bridge is scour critical. Bridge has failed and is closed to traffic.

EXAMPLES: CALCULATED SCOUR DEPTH ACTION NEEDED



APPENDIX B

ASCE CONDITION STATE RATINGS

Table 2-14. Condition Assessment Ratings

Rating		Description
6	Good	No visible damage or only minor damage noted. Structural elements may show very minor deterioration, but no overstressing observed. No repairs are required.
5	Satisfactory	Limited minor to moderate defects or deterioration observed but no overstressing observed. No repairs are required.
4	Fair	All primary structural elements are sound but minor to moderate defects or deterioration observed. Localized areas of moderate to advanced deterioration may be present but do not significantly reduce the load-bearing capacity of the structure. Repairs are recommended, but the priority of the recommended repairs is low.
3	Poor	Advanced deterioration or overstressing observed on widespread portions of the structure but does not significantly reduce the load-bearing capacity of the structure. Repairs may need to be carried out with moderate urgency.
2	Serious	Advanced deterioration, overstressing, or breakage may have significantly affected the load-bearing capacity of primary structural components. Local failures are possible, and loading restrictions may be necessary. Repairs may need to be carried out on a high-priority basis with urgency.
1	Critical	Very advanced deterioration, overstressing, or breakage has resulted in localized failure(s) of primary structural components. More widespread failures are possible or likely to occur, and load restrictions should be implemented as necessary. Repairs may need to be carried out on a very high-priority basis with strong urgency.

Table 2-5. Damage Ratings for Steel Elements

Damage Rating		Existing Damage[a]	Exclusions [Defects Requiring Elevation to the Next Higher Damage Rating(s)]
NI	Not Inspected	• Not inspected, inaccessible, or passed by[b]	
ND	No Defects	• Protective coating or wrap intact • Light surface rust • No apparent loss of material	
MN	Minor	• Protective coating or wrap damaged and loss of thickness up to 15% of nominal at any location • Less than 50% of perimeter or circumference affected by corrosion at any elevation or cross section • Loss of thickness up to 15% of nominal at any location	Minor damage not appropriate if • Changes in straight line configuration or local buckling • Corrosion loss exceeding fabrication tolerances (at any location)
MD	Moderate	• Protective coating or wrap damaged and loss of thickness 15 to 30% of nominal at any location • More than 50% of perimeter or circumference affected by corrosion at any elevation or cross section • Loss of thickness 15 to 30% of nominal at any location	Moderate damage not appropriate if • Changes in straight line configuration or local buckling • Loss of thickness exceeding 30% of nominal at any location

(Continued)

Table 2-5. Damage Ratings for Steel Elements *(Continued)*

Damage Rating		Existing Damage[a]	Exclusions [Defects Requiring Elevation to the Next Higher Damage Rating(s)]
MJ	Major	• Protective coating or wrap damaged and loss of nominal thickness 30 to 50% at any location • Partial loss of flange edges or visible reduction of wall thickness on pipe piles • Loss of nominal thickness 30 to 50% at any location	Major damage not appropriate if • Changes in straight line configuration or local buckling • Perforations or loss of wall thickness exceeding 50% of nominal
SV	Severe	• Protective coating or wrap damaged and loss of wall thickness exceeding 50% of nominal at any location • Structural bends or buckling, breakage and displacement at supports, loose or lost connections • Loss of wall thickness exceeding 50% of nominal at any location	

[a] Any defect listed is sufficient to identify relevant damage grade.
[b] If not inspected due to inaccessibility or passed by, note as such.

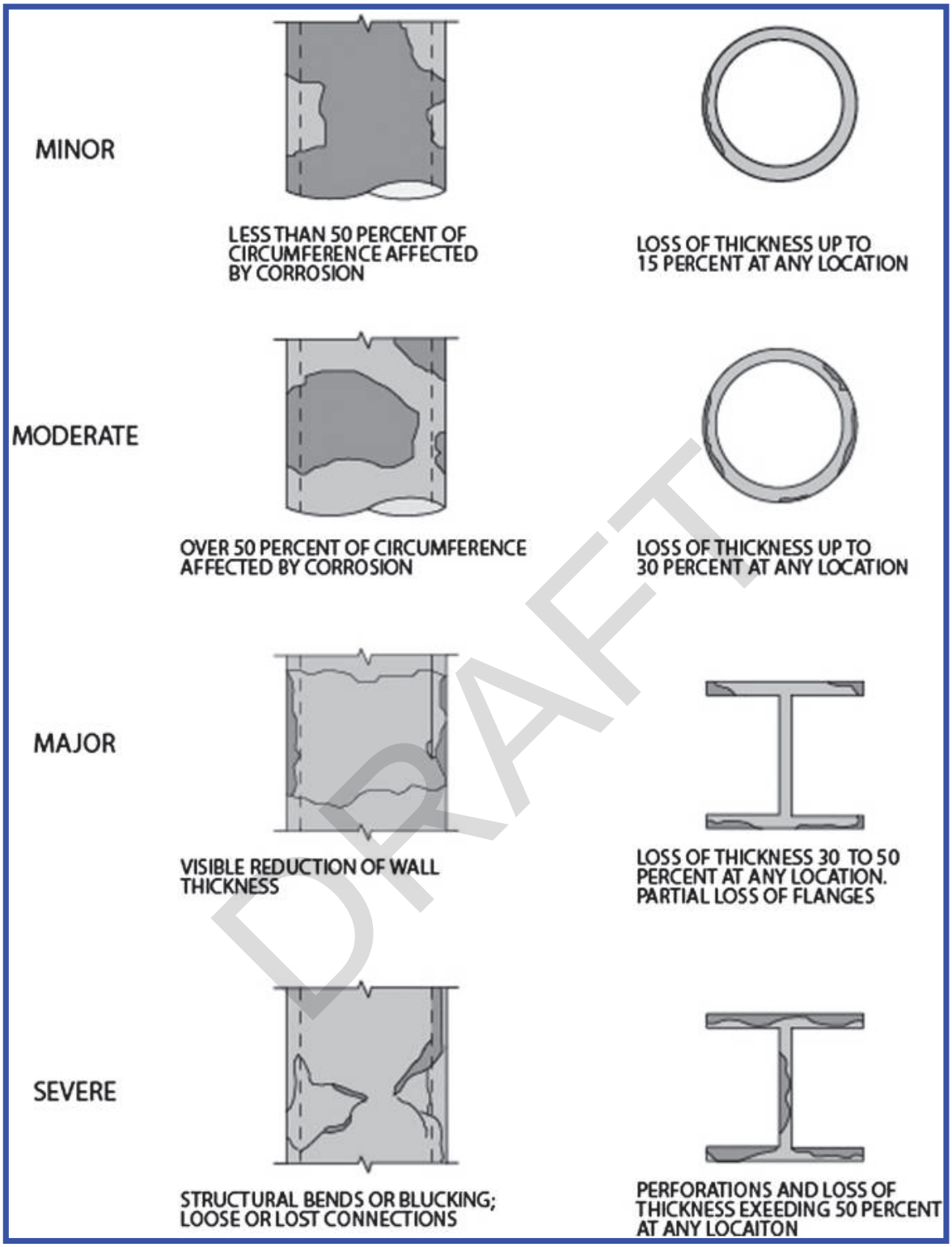


Fig. 2-3. Damage ratings for steel elements
Source: Courtesy of CH2M HILL, Inc. and COWI, Inc., reproduced with permission.

Table 2-6. Damage Ratings for Reinforced Concrete Elements

Damage Rating		Existing Damage[a]	Exclusions [Defects Requiring Elevation to the Next Higher Damage Rating(s)]
NI	Not Inspected	• Not inspected, inaccessible, or passed by[b]	
ND	No Defects	• Good original hard surface, hard material, sound	
MN	Minor	• Mechanical abrasion or impact spalls up to 1 in. in depth • Occasional corrosion stains or small pop-out corrosion spalls • General cracks up to 1/16 in. in width	Minor damage not appropriate if • Structural damage • Corrosion cracks • Chemical deterioration[c]
MD	Moderate	• Structural cracks up to 1/16 in. in width • Corrosion cracks up to 1/4 in. in width • Chemical deterioration: Random cracks up to 1/16 in. in width; "Soft" concrete and/or rounding of corners up to 1 in. deep • Mechanical abrasion or impact spalls greater than 1 in. in depth	Moderate damage not appropriate if • Structural breakage and/or spalls • Exposed reinforcement • Loss of cross section due to chemical deterioration beyond rounding of corner edges

MJ	Major	• Structural cracks 1/16 in. to 1/4 in. in width and partial breakage (through section cracking with structural spalls) • Corrosion cracks wider than 1/4 in. and open or closed corrosion spalls (excluding pop-outs) • Multiple cracks and disintegration of surface layer due to chemical deterioration • Mechanical abrasion or impact spalls exposing the reinforcing	Major damage not appropriate if • Loss of cross section exceeding 30% due to any cause
SV	Severe	• Structural cracks wider than 1/4 in. or complete breakage • Complete loss of concrete cover due to corrosion of reinforcing steel with more than 30% of diameter loss for any main reinforcing bar • Loss of bearing and displacement at connections • Loss of concrete cover (exposed steel) due to chemical deterioration • Loss of more 30% of cross section due to any cause	

[a] Any defect listed is sufficient to identify relevant damage grade.
[b] If not inspected due to inaccessibility or passed by, note as such.
[c] Chemical deterioration: Sulfate attack, alkali-silica reaction, alkali-aggregate reaction, alkali-carbonate reaction ettringite distress, or other chemical/concrete deterioration.

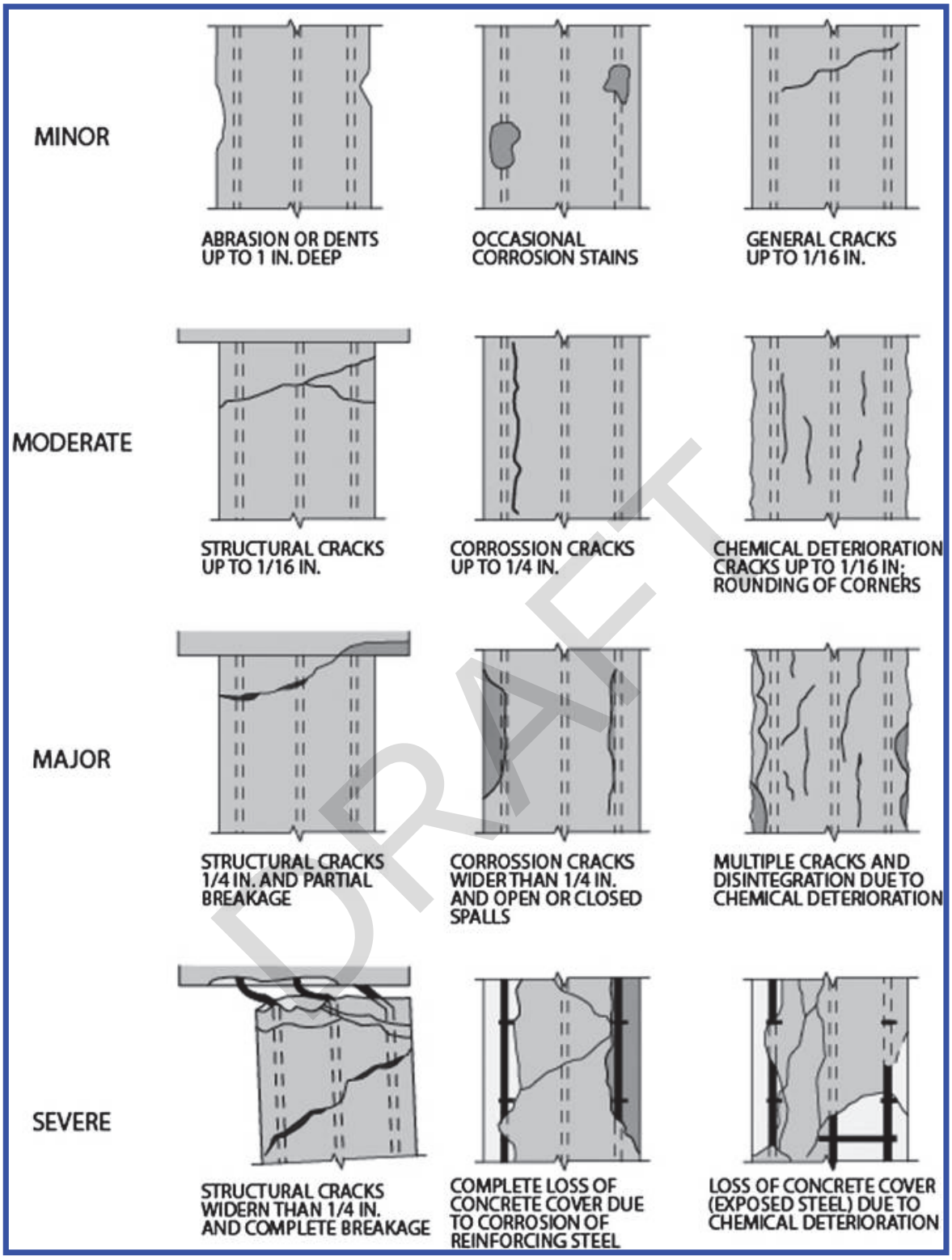


Fig. 2-4. Damage ratings for reinforced concrete elements
Source: Courtesy of CH2M HILL, Inc. and COWI, Inc., reproduced with permission.

Table 2-7. Damage Ratings for Prestressed Concrete Elements

Damage Rating		Existing Damage[a]	Exclusions [Defects Requiring Elevation to the Next Higher Damage Rating(s)]
NI	Not Inspected	• Not inspected, inaccessible, or passed by[b]	
ND	No Defects	• Good original hard surface, hard material, sound	
MN	Minor	• Minor mechanical or impact spalls up to 0.5 in. deep	Minor damage not appropriate if • Structural damage • Corrosion damage • Chemical deterioration[c] • Cracks of any type or size
MD	Moderate	• Structural cracks up to 1/32 in. in width • Chemical deterioration: Random cracks up to 1/32 in. in width	Moderate damage not appropriate if • Structural breakage and/or spalls • Corrosion cracks • Loss of cross section in any form • "Softening" of concrete

(Continued)

Table 2-7. Damage Ratings for Prestressed Concrete Elements *(Continued)*

Damage Rating		Existing Damage[a]	Exclusions [Defects Requiring Elevation to the Next Higher Damage Rating(s)]
MJ	Major	• Structural cracks 1/32 in. to 1/8 in. in width • Any corrosion cracks generated by strands or cables • Chemical deterioration: cracks wider than 1/8 in. • "Softening" of concrete up to 1 in. deep	Major damage not appropriate if • Exposed prestressing steel
SV	Severe	• Structural cracks wider than 1/8 in. and at least partial breakage or loss of bearing • Corrosion spalls over any prestressing steel • Partial spalling and loss of cross section due to chemical deterioration	

[a] Any defect listed is sufficient to identify relevant damage grade.
[b] If not inspected due to inaccessibility or passed by, note as such.
[c] Chemical deterioration: Sulfate attack, alkali-silica reaction, alkali-aggregate reaction, alkali-carbonate reaction ettringite distress, or other chemical/concrete deterioration.

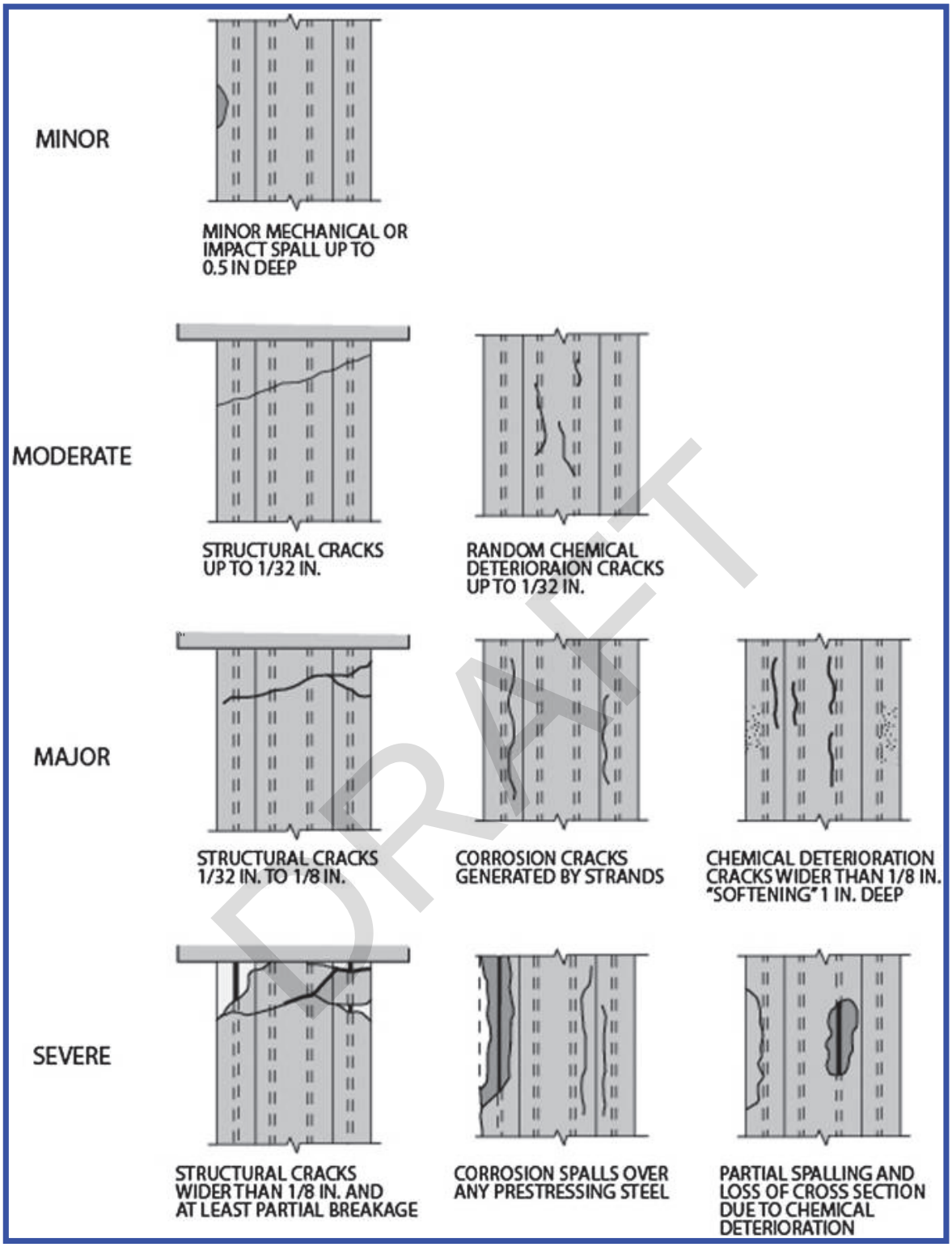


Fig. 2-5. Damage ratings for prestressed concrete elements
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APPENDIX C

OPINION OF PROBABLE CONSTRUCTION COST

moffatt & nichol

Seawall at Thompson Park - North Pine Circle

Date prepared: November 17, 2020
M&N Job Number: 201263

Item	Description	Quantity	Unit	Unit Price	Extension
	Thompson Park Seawall Construction	**163**	**LF**	**$1,300**	
1	**Marine Construction**				
	Mobilization/Demobilization	1	LS	$25,000.00	$25,000
	Furnish UC-30 FRP Composite Sheetpile	3,260	SF	$15.00	$48,900
	Install UC-30 FRP Composite Sheetpile	10	DAY	$5,000.00	$50,000
	Grout Sock	2	EA	$2,500.00	$5,000
	Selective Demolition of Existing Cap	1	LS	$4,500.00	$4,500
	Excavation	40	CY	$50.00	$2,000
	Furnish & Install Steel Tie Rods	14	EA	$150.00	$2,100
	Furnish & Install Precast Deadman	14	EA	$250.00	$3,500
	Concrete Cap	163	LF	$150.00	$24,450
	#57 Stone Fill	54	CY	$120.00	$6,480
	Structural Fill	150	CY	$80.00	$12,000
	Sod	4,500	SF	$1.50	$6,750
	Subtotal				**$190,680**
2	**Design Contingency**	10.0%			**$20,000**
	Total				**$210,680**
	Estimate Range	30.0%			$273,884
		-20.0%			$168,544

When reviewing the above estimated costs it is important to note the following:

- The costs have been developed based on historical and current data using in-house sources, information from previous studies as well as budget price quotations solicited from local suppliers and contractors.
- Indirect costs (engineering, project management, owners overhead, third party QA/QC) are not included
- This cost estimate is an 'Opinion of Probable construction Cost' made by a consultant. In providing opinions of construction cost, it is recognized that neither the client nor the consultant has control over the cost of labor, equipment, materials, or the contractor's means and methods of determining constructibility, pricing, or schedule. This opinion of construction cost is based on the consultant's reasonable professional judgement and experience and does not constitute a warranty, expressed or implied, that contractor's bids or negotiated prices for the work will not vary from the client's.

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Bridge 155000 - Winston Drive

Date prepared: November 18, 2020
M&N Job Number: 201263

Item	Description	Quantity	Unit	Unit Price	Extension
1	**Marine Construction**				
	Mobilization/Demobilization	1	LS	$5,000.00	$5,000
	Repair Existing Seawall (10 LF)	10	LF	$55.50	$555
	Geotextile Fabric (Heavy weight)	1	Roll	$450.00	$450
	Stone	2	CY	$120.00	$240
	Concrete Cap	10	LF	$150.00	$1,500
	#57 Stone Fill	2	CY	$120.00	$240
	Structural Fill	2	CY	$80.00	$160
	Sod	50	SF	$1.50	$75
	Subtotal				**$8,300**
2	**Design Contingency**	10.0%			**$1,000**
	Total				**$9,300**
	Estimate Range	30.0%			$12,090
		-20.0%			$7,440

When reviewing the above estimated costs it is important to note the following:

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moffatt & nichol

Bridge 155001 - North Pine Circle

Date prepared: November 18, 2020
M&N Job Number: 201263

Item	Description	Quantity	Unit	Unit Price	Extension
1	**Marine Construction**				
	Mobilization/Demobilization	1	LS	$5,000.00	$5,000
	Blast Clean and paint underside of deck	700	SF	$25.00	$17,500
	Spall / Delam repair underside of deck (assume 6" deep)	26	CF	$500.00	$12,750
	Subtotal				**$35,250**
2	**Design Contingency**	10.0%			**$4,000**
	Total				**$39,250**
	Estimate Range	30.0%			$51,025
		-20.0%			$31,400

When reviewing the above estimated costs it is important to note the following:

- The costs have been developed based on historical and current data using in-house sources, information from previous studies as well as budget price quotations solicited from local suppliers and contractors.
- Indirect costs (engineering, project management, owners overhead, third party QA/QC) are not included
- This cost estimate is an 'Opinion of Probable construction Cost' made by a consultant. In providing opinions of construction cost, it is recognized that neither the client nor the consultant has control over the cost of labor, equipment, materials, or the contractor's means and methods of determining constructibility, pricing, or schedule. This opinion of construction cost is based on the consultant's reasonable professional judgement and experience and does not constitute a warranty, expressed or implied, that contractor's bids or negotiated prices for the work will not vary from the client's.