PETITCODIAC RIVER CAUSEWAY PROJECT
STAGE 2 FOLLOW-UP PROGRAM RESULTS

YEAR 10 EXECUTIVE SUMMARY

Submitted to:

New Brunswick Department of Transportation and Infrastructure
Fredericton, New Brunswick

Submitted by:

Wood Environment & Infrastructure Solutions,

a Division of Wood Canada Limited
Fredericton, New Brunswick

August 26, 2020

TABLE OF CONTENTS

PAGE

1.0 INTRODUCTION

1.1 Purpose

This document is a summary of the results of Year 10 (April 1, 2019 – March 31, 2020) of the Stage 2 Follow-up Program (S2FUP) for the Petitcodiac Causeway Project (the "Project"). Year 10 results are compared to baseline conditions established during the Stage 1 Follow-up Program with respect to predictions and conclusions contained in the Environmental Impact Assessment (EIA) and provide a measure of the effectiveness of mitigation measures undertaken in Stage 1. The predictions and conclusions contained in the EIA are generally focused on conditions that will be present following completion of Stage 3. Thus, it is not possible to verify these during Stage 2 of this three stage Project. This document focuses on how the environmental effects observed during Year 10 of Stage 2 are trending as compared to the EIA predictions and conclusions specific to Stage 3 and beyond. The document presents the findings and conclusions relevant to the six Valued Ecosystem Components (VECs, see Section 1.3).

For a comprehensive description of background, methodology, references, program modifications and a more detailed presentation of the results the reader is encouraged to refer to the main report, Stage 2 Follow-up Program Results for the Petitcodiac River Causeway Project Year 10 (April 1, 2019 – March 31, 2020) which is available from the New Brunswick Department of Transportation and Infrastructure (NBDTI) by contacting the Communications Director.

1.2 Follow-up Program Objectives

The S2FUP objectives are to:

- examine trends in environmental conditions for selected VECs to determine how environmental conditions are trending compared to the environmental effects predictions in the EIA;
- verify the effectiveness of mitigation measures to protect physical works installed during Stage 1;
- provide an early indication of any unexpected change in environmental conditions; and
- improve understanding of environmental cause and effect relationships.

1.3 Transitioning from Stage 2 to Stage 3 Follow-up Program

Stage 2 was originally planned for at least two full seasons before proceeding with Stage 3. Although the exact Stage 2 duration was never specified, it is implicit in the EIA that Stage 3 would be initiated after two years of Stage 2, assuming the above-mentioned objectives had been satisfied. The implementation of Stage 3 had been delayed for reasons that are not related to the environmental effects that have occurred since the opening of the gates on April 2010. Thus, the Stage 2 Follow-up program data collection continues to complement and support the results and conclusions of the first two years intended for the duration of Stage 2.

On December 16, 2016, the provincial government announced funding for Stage 3 of the Project, which includes the construction of a new bridge. Bridge construction began in May 2017 and is scheduled to be complete in 2021.

1.4 Scope

The S2FUP focuses on six VECs:

- Physical Characteristics of the Petitcodiac River and Estuary;
- Commercial Fisheries;
- Archaeology;
- Public Health and Safety – Surface Water;
- Fish Passage; and
- Engineered Environmental Protection Works.

1.5 Regulatory Context

The EIA required a Follow-up Program that would satisfy the objectives presented above. The S2FUP is a key component of the Environmental Management Plan (EMP) and is required as per Condition of EIA Approval #4 (CoA4). The S2FUP is divided into phases that correspond with the Implementation Plan, as per CoA5, and has been and will continue to be submitted to the New Brunswick Department of Environment and Local Government (NBDELG) for review and approval when required. The S2FUP is also required under the Canadian Environmental Assessment Act (CEAA) as a condition of the CEAA Screening undertaken by Fisheries and Oceans Canada (DFO). A Technical Review Committee (TRC), comprised of federal and provincial agency and department representatives, presided over the EIA process. The TRC was co-chaired by NBDELG, with DFO acting as the Federal Lead Responsible Authority. A similar TRC, chaired solely by NBDELG with input from DFO, was assembled to preside over the implementation of the Project.

1.6 Year 10 Activities Completed

A summary of activities completed in Year 10 is provided in Table 1.1.

Table 1.1 Summary of Stage 2 Follow-up Program Activities Completed in Year 10

Program Component	Activities
Physical Characteristics of the Estuary Follow-up Program	• Vertical-stereo aerial photos. • Upstream LiDAR and downstream to Line 19, downstream cross-sections, no cross-sections in Shepody Bay. • Periodic fixed wing flyovers (ice monitoring, spring break-up, weather events). • 1 upstream scour monitoring event. • 1 downstream scour monitoring event. • Visual reconnaissance as required (max. ice accumulation, max. flows from land in spring and fall, max. sediment accumulation). • Monitoring of water level meters (3) and web cameras (3).
Engineered Land Protection Works Follow-up Program	• Regular inspections of traffic circle/starter dyke and related outfalls. • 1 aerial and 1 ground-based inspections of dykes and aboiteaux. • Inspection of shoreline protection.
Fish Passage and Fish Habitat Follow-up Program	• Fish trap operation. • Smolt wheel operation. • Electro-fishing. • Redd survey. • Smelt survey.

2.0 PHYSICAL CHARACTERISTICS

2.1 Objectives

The objective of this component is to monitor and measure changes to the Petitcodiac River (“the River”), the Petitcodiac Estuary (“the Estuary”), and the Upper Bay of Fundy (“the UBoF”) after gate opening to understand effects on width, depth, and other physical characteristics as compared to baseline conditions.

2.2 Results

2.2.1 Cross-sections

All references to “right” or “left” are taken as looking upstream.

2.2.1.1 Downstream of the Causeway to Hopewell Cape

No hydrographic surveys were carried out downstream of the causeway in 2019. The next scheduled hydrographic survey is in the fall of 2020 or spring of 2021 to accommodate the bridge construction schedule. LiDAR surveys down river to line 19 were not carried out in 2019 but are scheduled in the fall of 2020 or the spring of 2021.

As during Stage 1 and the preceding Stage 2 program, cross sections were surveyed approximately once a month in 2019 at the Gunningsville Bridge.

2.2.1.2 Upper Bay of Fundy (downstream of the causeway)

No surveys were carried out in 2019 and the next field work is scheduled for 2020-2021 prior to the opening of the new channel.

2.2.1.3 Development of the Scour Hole

Upstream of the control structure: Since there has been little change in the sections for several years, surveys were not carried out in 2019.

Downstream of the control structure: Data from the surveys indicate that this scour hole is becoming stabilized. The daily peak outflow at the site is related to the tidal volume upstream of the control structure. The repeated hydrographic surveys upstream of the control structure show that the tidal volume is decreasing over time because of the sediment deposition in the developing tidal flats upstream. Based on these observations, it is expected that the peak tidal outflows will decrease over time, and thus the depth of the scour hole downstream of the control structure should not increase to any significant degree over time.

2.2.1.4 Tidal Flats Upstream of the Causeway

The data indicate that the rate of increase in the surface elevation of the developing tidal flats is decreasing with time. The upstream tidal flats are still rising at a rate of approximately 100 mm/yr but the downstream rate of rise has slowed.

2.2.1.5 Channel Width Relationships

Upstream of the Control Structure: No hydrographic surveys were carried out in this section in 2019.

Downstream of the Control Structure: No hydrographic surveys were carried out in this section in 2019.

2.2.2 Ground-level Observations

Ground-level observations have been conducted on both banks of the River from Salisbury to Hopewell Cape seasonally from 2010 to 2019.

Winter conditions generally result in narrowing of the river along the City of Moncton and Town of Riverview shorelines, and even more prevalent upriver of the causeway. No problems with ice jamming were observed at the control structure, and the shorefast ice built up downriver of the control structure continued to protect the shoreline and any infrastructure adjacent to the river, such as trails and viewing platforms, during the winter months.

Erosion continues to expose the old wharf structure at Steadman Street, and continues to further deteriorate the wharf face of the city of Moncton's boardwalk near the Running Room. Also, widening of the river at the Gunningsville Bridge on the Moncton side of the river continues.

Upriver of the control structure change is less evident, as the mudflats have now established vegetation, and are now only flooded on the highest tides. No increased signs of erosion were observed upriver of the control structure and the exposed berm of the Salisbury sewage treatment facility appears unchanged.

2.2.3 Water Level Observations

2.2.3.1 Effect on Tide Levels

Measured high tides at Saint John and Gunningsville for the typical month of December over the period 2010-2019 indicates that for each year the tides at Moncton show an increase when compared to Saint John. This means that the total initial decrease in tide levels at Moncton, after opening the gates, is likely not permanent. However, the tide heights appear to be stabilizing about midway between the 2010 levels and those with the gates closed.

2.2.4 Sediment Deposition, Erosion and Net Accumulation

No data are available for 2019 due to the change-over in water level recorders.

3.0 COMMERCIAL FISHERIES

3.1 Objectives

The objective of this component is to determine how the Project affects commercial fisheries landings; lobster and scallop in the UBoF.

3.2 Results

In March 2015, due to the prolongation of Stage 2 and in recognition of the extensive information collected to date, a temporary suspension of the Lobster and Scallop monitoring program was approved in May 2015. This monitoring program will be resumed in Stage 3.

4.0 ARCHAEOLOGICAL AND HERITAGE RESOURCES

4.1 Objectives

The objectives of this component are to ensure all areas of potential archaeological interest are identified and, where necessary to mitigate risk to archaeological and heritage resources due to changes in flow patterns and erosion after the causeway gates were opened.

4.2 Results

It was recommended to the Archaeological Services Branch New Brunswick that field surveys be removed from the Stage 2 program. This recommendation was accepted. However, while there are no more scheduled Stage 2 archaeological field surveys, it is still recommended that should additional excavations be conducted on the historic marshlands associated with the Project, these activities should be monitored by a permitted archaeologist. These future activities might include dyke “shaping” or expansion where additional indigenous soils may be impacted. In addition, it is still recommended that if erosion has negatively affected an archaeological site or cultural feature, the provincial regulator be notified, and possible mitigation measures be considered.

5.0 PUBLIC HEALTH AND SAFETY: SURFACE WATER QUALITY

5.1 Objectives

The objective of sampling during Stage 2 is to continue to obtain interim surface water quality data following the opening of the causeway gates in order to provide an indication of how the environment is trending toward the predictions and conclusions contained in the EIA.

5.2 Conclusions

Given the general stability of surface water results, supplemental monitoring was suspended for the remainder of Stage 2 and no sampling events were conducted in 2019. Further data are not required to further understand how the surface water bacteria concentrations are trending in the Petitcodiac River. The Stage 3 Follow-up Monitoring Plan proposes that the next surface water sampling event be conducted in Stage 3, in the first year following channel opening.

6.0 FISH PASSAGE

6.1 Objectives

The objective of this component is to measure the passage of the nine fish species that require access to the Estuary for life cycle purposes. Fish passage monitoring that was originally proposed for Stage 3 was moved forward to Stage 2 due to the delay in implementing Stage 3.

6.2 Results

6.2.1 Presence of fish species

The S2Y10 results of the Fish Passage monitoring program may be summarized as follows:

- **Gaspereau:** 2019 gaspereau numbers were the lowest seen during any year of the monitoring program and were noticeably lower for both adults caught during the spawning run and Young-of-the-Year (YoY) caught after the spawning run. The low number of adult spawners in 2019 may be attributed to the small cohort of YoY that headed to sea in 2015. Tidal amplitude offers another possible explanation. Tides during the spawning run in 2019 were weaker tides than those noted in 2018.

- **American shad:** Occasional captures of adult shad such as occurred in 2018 are not enough to contradict the conclusion from the 2010 monitoring, that shad remain effectively extirpated from the Petitcodiac River system. Shad show a high fidelity (97%) to their natal streams, so it is to be expected that a river lacking a resident population would require an extended period to be recolonized by strays.

- **Striped bass:** Striped bass numbers in 2019 matched 2018 with 65 individuals. Aside from 2018, this was the lowest catch since 2011, when 158 were caught. Although numbers of striped bass caught have varied over the years, there has been an overall upward trend. The decline in 2018 and 2019 is probably attributable to relocation of the trap. Most striped bass seen every year tend to be YoY striped bass, however 2019 was an exception. The two-year age class dominated the total numbers of YoY. In 2018 YOY and 1-year old striped bass accounted for 68% of the total number caught but dropped to only 17% of the total catch in 2019.

- **American eel:** American eel numbers fell dramatically in 2019 to 15 individuals, the fewest eels detected at the head-of-tide since monitoring began after gate opening in 2010. This stands in stark contrast to the upward trend in numbers captured at the former site between 2010 and 2017.

- **White sucker:** The number of suckers captured in 2019 (327) was much more aligned with those of previous years at the former trap (except 2010), than was captured at the new trap in 2018. Theories on the lower numbers of white suckers caught in 2019 are varied but inconclusive.

- **White perch:** Capture numbers (8) were lower in 2019 than 2018 (32) as well as the period of 2015 – 2107, when numbers had increased from 167 to 231. Consistently low capture rates suggest that by 2017 a plateau in white perch population density had been established. The white perch tolerates estuarine level salinities and moved through the fishway prior to gate opening. Stage 2 monitoring results indicate that perch captures were strongly correlated with incoming tides; therefore, the low capture total may be attributable to the relocation of the trap upstream. These continuously low capture numbers may indicate that by 2017 a new plateau in white perch population density had been established that is somewhat lower than that indicated by the record high of 600 captures in 2013. The white perch tolerates estuarine-level salinities and moved through the fishway prior to the gates on the causeway being opened in 2010.

  Atlantic salmon: There were 12 Atlantic salmon captured during the 2019 season. All were adults, captured after the first adult release in 2019 on the Pollett on October 1st. In part, the numbers of salmon caught in 2019 reflect the large number of salmon (1,065) released in 2019. However, the salmon-capture success in 2019 is also attributable to continued use of the trap into the fall. There were almost double the number of days of monitoring in 2019 compared with 2018. The lack of smolts in 2019 was not surprising since 2018 documented the same result. Many of the individuals in the potential 2019

migratory smolt year class were captured the previous autumn and held at the Mactaquac Biodiversity Facility for subsequent distribution to the Recovery Sea Cage Site on Grand Manan. In addition, as noted previously, small downstream-migrating fish (including smolts) are caught by the trap when carried there by the incoming tide, whose amplitude is lower at the relocation area upstream. It has been conjectured that ever-increasing sizes of striped bass predators may be affecting smolt population, but gaspereau remains a plentiful food source and the largest striped bass was caught in late June (27th), after most smolt had already moved out to sea. Of note was the capture of an aquaculture escapee, the first such occurrence at the trap. Other than the lone escapee, all adult salmon caught so far (including 2019) had been recently released captively-reared fish with limited exposure to the wild.

- **Atlantic tomcod:** Captures fell to 5 in 2019, down from the 26 at the new trap site in 2018 and far less than the 1,609 captured in 2017, and the peak of 3,544 in 2016 at the former trap site. This is likely attributable to the trap relocation in 2018 and equipment change in 2019. Captures at the new site in 2019 were within a narrower window. Monitoring throughout the Follow Up Program has indicated that tomcod arrive in strong peaks, which may explain year-to-year variation due to the lack of constant trapping effort

- **Brook trout:** More than half the trout in 2019 were caught during October. Throughout Stage 2 monitoring there has been a consistent result of very few trout being caught, in contrast to numbers seen by anglers, during electrofishing, and during snorkel surveys. Brook trout may simply be skilled at evading the traps or are most active at the head-of-tide monitoring site outside of the trap season.

- **Smallmouth Bass:** The absence of smallmouth bass at the head of tide in 2019 may indicate that between the electrofishing in 2017, and operation of the trap in 2018 those that were present at the head of tide were fished out.

7.0 ENGINEERED ENVIRONMENTAL PROTECTION WORKS

7.1 Objectives

The objective of this component is to ensure that the physical works completed during Stage 1, prior to gate opening, are working as intended, and to identify potential maintenance requirements. These works include:

- Armoured areas for tidal surge and erosion protection at the former Moncton landfill, the TransAqua outfall, along the Riverview riverfront, along the Moncton riverfront near Westmorland Street, and along the Chateau Moncton shoreline.
- Agricultural dykes and aboiteaux upstream of the causeway.
- Drainage improvements at the traffic circle and starter dyke.
- Re-alignment of the underground 750 mm watermain crossing the Petitcodiac River.

7.2 Results

7.2.1 Armoured Areas

Generally, the erosion protection has been observed to function as was anticipated, providing adequate protection to areas of concern. In Year 10, no significant changes to existing erosion protection was required at any of the locations.

7.2.2 Traffic Circle Drainage Improvement and Starter Dyke

During Year 10 inspections, water within the drainage channel was found to continue to flow correctly, despite some silt build-up in the channel immediately downstream of the traffic circle flap gate. Visual inspections in past years indicated that the flap gate on the drainage outfall to the former headpond was intermittently not operational due to silt and mud deposits. No immediate action is required; however, monitoring will continue in this area and repairs will be recommended if required.

7.2.3 Watermain

No issues were noted during Year 10 inspections. Overall, the watermain and associated infrastructure is functioning as planned and no issues are anticipated.

7.2.4 Additional Observed Erosional Areas

The following areas of shoreline were inspected as part of the Year 10 inspections:

- downstream from existing riprap at the TransAqua outfall;
- southern shoreline immediately upstream of the causeway;
- between Chateau Moncton and Rogers Building; and
- upstream of Chateau Moncton adjacent to and underneath the boardwalk.

TransAqua outfall: Overall, no significant change was observed in Year 10. As such, no additional erosion protection has been installed and no additional erosion protection is necessary.

Southern shoreline: No significant changes to the shoreline were identified in this area during Year 10. At this time, there appears to be no risk to infrastructure from erosion in this area, and therefore no mitigation has been recommended.

Between Chateau Moncton and the Rogers building: In Year 10, as in previous years, it was revealed that an old wharf structure is becoming increasingly visible. Although no infrastructure has been identified as being at risk, the installation of additional erosion protection was recommended along this 310 m stretch of shoreline in Year 3 but has not been implemented at the request of the City of Moncton.

Upstream of Chateau Moncton: Monitoring undertaken in Year 10 indicates that the erosion protection in this location continues to function as expected.