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Basic Impact Analysis (BIA)

Realignment and reconstruction of Highway 430 near Rocky
Barachois Brook and Rocky Barachois Bridge replacement

And

Rehabilitation of decommissioned roadbed at Shoal Cove Brook

Gros Morne National Park
GMNP-2018-011

July 2018

1. PROJECT TITLE	Re-alignment and re-construction of Highway 430 near Rocky Barachois Brook and Rocky Barachois Bridge replacement and rehabilitation of decommissioned roadbed at Shoal Cove Brook	
2. PROJECT LOCATION (Park, Site, Canal, NMCA)	Gros Morne National Park	
3. PROJECT SITE(S)	Rocky Barachois / Route 430 approximately 22 km south of Rocky Harbour, Gros Morne National Park (49° 28.736' N x 57° 44.049' W) And Shoal Cove, Gros Morne National Park (49° 30.655' N x 57° 48.606' W)	
4. PROPONENT	Parks Canada	
5. PROPONENT CONTACT INFORMATION	Darren Fitzgerald, P.Eng. Highway Engineering Services (East) Parks Canada, Gros Morne National Park P.O. Box 130 3 DOT Drive Rocky Harbour, NL AOK 4N0 Telephone: (709) 458-3469 Cell: (709) 458-8672 Facsimile: (709) 458-3318 darren.fitzgerald@pc.gc.ca	
6. PROJECT DATES	Planned Commencement August 1, 2018	Planned Completion Dec. 31, 2019
7. INTERNAL PROJECT FILE #	GMNP-2018-011	
8. PROJECT DESCRIPTION		
<p>Parks Canada is replacing the Rocky Barachois Bridge on Route 430 in Gros Morne National Park and realigning the highway on either side to improve traffic flow and safety. The existing bridge was built in the mid 1960's and is at the end of its design life; it is deteriorating, does not meet current federal and provincial standards for a Category 2 road such as Route 430, and has limitations in terms of width, alignment, etc. that could affect the safety of road users. The new bridge and approaches will be located 10 to 15 meters upstream (east) from the existing bridge, will be built to standard for a Category 2 road with a design speed of 90 km/h, and will have a minimum 75 year design life. Two-way traffic will be maintained on the old bridge during bridge construction and highway realignment. Demolition of the old bridge and restoration of the old bridge site and highway approaches will then follow.</p> <p>In-water work is anticipated during this project, as fill will be added in the Rocky Barachois tidal zone to build up the road approaches, especially on the North side of the brook, and so appropriate mitigations will be implemented.</p> <p>Components of the work include:</p> <ol style="list-style-type: none"> <u>Construction of the replacement bridge</u>: The new bridge will be 58 m long x 11.4 m wide, will be a single span structure supported by tangent steel trapezoidal box girders, and is to be constructed approximately 15 m east of the existing bridge and above Rocky Barachois tidal zone. Abutments for the new bridge will be set back 7-8 m from the new toe of slope, the deck will be raised, and no streamside support piers will be required. All work should occur outside the wetted perimeter of the stream, though should this be required appropriate mitigations will be implemented. Components of bridge construction include: <ul style="list-style-type: none"> - Site preparation, including vegetation clearing and leveling, and stockpiling of any removed topsoil for use in site restoration. - Pile driving (steel H piles driven into bedrock). - Construction of concrete abutments and wingwalls as well as expansion joints. 		

- Installation of rip-rap along stream banks to prevent erosion.
- Installation of single span tangent steel trapezoidal box girders.
- Installation of curved composite concrete deck with asphalt surface and guard rails.
- Intermittent traffic control during construction.

2. Highway realignment: Road realignment earthworks measuring ~330 m on the northern approach and ~375 m to the southern approach will be constructed to connect the new bridge to the existing roadway and improve traffic flow and safety. The road footprint will include two 3.75 m wide lanes with 1.5 m shoulders, as well as ditching on either side for drainage purposes and embankments where needed. Part of the realignment includes putting some fill below the high tide mark in the estuary on the North side of the brook. Work will include removal of vegetation, grubbing, and excavation of the roadway to depth needed to ensure the roadway has a stable footing. The actual depths will depend on the nature of the soil and slope. Components the highway realignment include:

- Site preparation, including vegetation clearing, grubbing, and excavation.
- Blasting to widen rock cuts.
- Any topsoil removed for realignment will be stockpiled for use during site restoration.
- Installation of aggregate and rock fill where appropriate, then capping with fill.
- Embankment and ditch formation.
- Armour slopes along Rocky Barachois Brook with rip rap.
- Placing roadway granular material (using excavators, dump trucks, graders, compactors, and similar)
- Paving and line painting.
- Installation of guard rails.
- Installation of signage.
- Landscape finishing of construction slopes, including leveling, application of stockpiled topsoil (as needed) and seeding of disturbed areas beyond the road footprint.
- Traffic control during construction.

3. Removal and rehabilitation of the old roadway and bridge: Following completion of construction of the new bridge and approaches, the old bridge will be removed and decommissioned sections of roadbed will be removed and rehabilitated. Bridge demolition will follow a plan to be developed by the contractor in consultation with and approved by Parks Canada. This will include removal of the bridge deck, girders, and abutments. In-water work or disturbance of the stream bed should not be required, though should this be necessary then appropriate mitigations will be required. While the new alignments and approaches will require some removal of existing vegetation and creation of new infrastructure, restoration of the old roadbed and bridge site will substantially reduce the net increase in footprint resulting from the project. Components of bridge removal and site rehabilitation include:

- Removal of bridge railings, deck, girders, piers and abutments.
- Removal of asphalt from old decommissioned road approaches.
- Contouring of embankments to create more natural slopes and reduce erosion.
- Spreading of stockpiled topsoil from site to old roadbed and embankments, followed by seeding with an approved seed mix.
- Traffic control during construction.

4. Rehabilitation of decommissioned roadbed at Shoal Cove: In addition to Highway 430 realignment and bridge replacement, this project also include Shoal Cove Brook rehabilitation. In 2016, Shoal Cove Brook Bridge was replaced and Highway 430

approaches to the bridge were realigned. However, no rehabilitation and landscaping work has yet been done at this site. This project includes:

- Regrading of identified tree planting areas to create suitable planting surface
- Addition of new planting medium (soil and possibly manure or compost)
- Application of identified landscape treatment (either tree planting, shrub planting or hydroseeding)

The full planting schedule consists of 65 Balsam Fir (*Abies balsamae*), 107 Clump Red Maple (*Acer rubrum*), 135 Red Maple Whip, 240 Paper Birch (*Betula papyrifera*) and 115 White Spruce (*Picea glauca*).

9. VALUED COMPONENTS LIKELY TO BE AFFECTED

Natural Resources

- Air quality and noise: In addition to ambient air quality and natural noise levels (e.g. from wind, waves, and stream flow), the project area is subject to emissions and noise from highway traffic.
- Surface water (fresh and marine waters): Construction work will occur in Rocky Barachois, at the mouth of the stream, where rock infill will be used. Rocky Barachois is a coastal lagoon partially separated from Bonne Bay and influenced by tides. Rocky Barachois Brook is a medium-sized, relatively steep and fast flowing stream with a cobble and rock bottom and primarily riffle habitat.
- Soils and Landforms: The area is covered in a deep layer of till and clay, though bedrock slopes to the surface to the east. Project activity will require soil removal and reshaping, blasting / expansion of rock cuts, and also input of aggregate to create road embankments. The project could also affect shoreline stability, for example by altering slopes, drainage and runoff patterns, and by placing armour stone along banks. Paleontological research has indicated that rock cuts on the east side of Rocky Barachois Brook may contain trilobite fossils, though appearing to be of relatively low fossil potential (Knight 2013; see Appendix 2).
- Aquatic fauna: Small populations of adult and juvenile fish (primarily Brook Trout [*Salvelinus fontinalis*]), as well as other aquatic fauna such as molluscs and arthropods, are likely to be present in Rocky Barachois Brook during the course of this project. Potential for effects are primarily in freshwater and brackish water, but could also include downstream effects in the near shore marine environment of Bonne Bay. Brook Trout likely include juveniles and adults resident in the stream year round, and possibly anadromous adult trout that migrate upstream from the marine environment from late June to September each year. The estuary is also used by various other species of wildlife, including Common Merganser, River Otter, and Mink.
- Terrestrial fauna: Various species of terrestrial fauna use the area, including a wide variety of typical boreal birds such as woodpeckers, flycatchers, warblers and sparrows, as well as mammals including moose, bears, foxes, coyotes, and small mammals. The most obvious potential for effects on terrestrial fauna include disturbance of nesting birds (June to end of July) and interference with species that might travel along the stream to forage. The extended presence of construction crews can also lead to habituation of wildlife such as foxes, bears, and coyotes to humans.
- Vegetation: The area is typified by boreal forest vegetation, with balsam fir, black spruce, white spruce, trembling aspen, and paper birch comprising most of the forest canopy. Existing road embankments support grasses and alders. Areas where vegetation may be affected include upland forests and riparian zones.
- Species at risk: None known in area and no critical habitat in area.

Visitor Experience

- The project occurs along Route 430, the only highway linking the Northern Peninsula and southern Labrador to the rest of Newfoundland, and also a key travel route for park visitors. As such, it supports moderate to high volumes of traffic; in addition to cars and light trucks, this includes heavy trucks, motorhomes, and bicycles.

- Project activities have the potential to affect highway traffic safety (including both motorised road users and cyclists, and also traffic flow during and after construction).
- The nearest visitor facility is a road side pull off within the limits of the project. Its accessibility to the public is likely to be affected by construction activities. There are no campgrounds, day use areas etc. within 5 km of the project area.

Cultural Resources

- None known (see attached Archaeological Overview Assessment). There is an area of moderate archaeological potential between the hydro line access road on the southeast shore and the mouth of Rocky Barachois Brook.

10. EFFECTS ANALYSIS

Effects analysis considers possible interactions between the project infrastructure components and activities and the Valued Components, within the project area. Interactions may be direct or indirect and may cause a positive or negative effect. Potential effects of on the key indicators are identified by comparing the existing conditions to those which are expected to result from the introduction of the project. Note that these effects do not consider the adoption of planned mitigation measures identified in the next section, which aim to control/minimize the possible effects identified here.

Natural Resources

Air quality and noise:

- Construction activities will often lead to an increase in noise, dust and vehicle emissions above baseline (i.e., daily highway traffic volume), and a decrease in ambient air quality.
- Dust may come from disturbance of exposed soils by vehicles and wind, as well as construction activities such as excavation and also mixing of cement.
- Effects will generally be localised and transient, and should not require specific mitigation. However traffic on unpaved surfaces could cause excessive dust that requires dust control, and concrete dust could affect surface water.

Surface water (fresh and marine waters):

- Toxic spills or leaks from machinery, equipment and construction materials (e.g. concrete) could significantly impact water quality in Rocky Barachois estuary and the near shore marine environment.
- Fuels and materials stored at temporary staging areas have the potential to leak and leach into ground and surface water.
- Disturbance of the stream bed could lead to siltation and increased turbidity in Rocky Barachois Brook and the near shore marine environment.
- Debris from construction and bridge demolition may result in deleterious material entering the estuary thereby affecting water quality and aquatic organisms.
- Riparian and upland vegetation will be removed and soils and aggregate will be disturbed, exposed, and stockpiled due to construction activities and decommissioning of old road and bridge structures. This could create the risk of sediment runoff that could impact water quality in Rocky Barachois estuary and the near shore marine environment.

Soils and landform:

- Stripping of the existing topsoil during construction may negatively affect vegetation recovery and consequently impact soil stability after the project is complete.

- Removal of upland and riparian vegetation, soil disturbance due to construction activity, and decommissioning of old road and bridge structures could destabilise soils and shorelines, increasing the risk of erosion.
- Construction activities can lead to unnatural ground surfaces contours (e.g. rutting).
- Accidental spills and leaks can impact soils.
- Blasting of rock cuts could destroy fossils as well as expose hidden fossils. It is expected that this project will have limited potential to impact known, exposed fossils (see Appendix 2).

Aquatic fauna:

- Based on most DFO self-assessment criteria (<http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>) this project does not require a DFO review, including:
 - It is a clear span bridge
 - There will be no obstruction of fish passage during critical timing windows or otherwise
 - Bridge removal activities do not require review
 - There will be no impacts to SARA listed species
 However, as construction of the new approaches will require a limited amount of infilling below the high water mark, DFO has been contacted to ask if they have any concerns or input.
- Regardless of any requirement for DFO review, recommended measures to avoid causing harm to fish and fish habitat (see: <http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/measures-mesures-eng.html>) are being followed, as detailed in the mitigations below.
- Contamination of Rocky Barachois Brook from accidental spills or leaks from machinery or stored fluids, as well as construction materials (e.g. concrete) could impact the health and survival of fish and other aquatic organisms in the freshwater and marine ecosystems downstream from the construction site.
- Erosion and sedimentation could impact the health and survival of fish and other aquatic organisms in the freshwater and marine ecosystems downstream from the construction site.
- Stripping, handling, or storing of soils and aggregate may lead to increased sediment runoff, adversely affecting fish and fish habitat.

Terrestrial fauna:

- Terrestrial fauna could suffer from loss of food sources and habitat due to removal of riparian and upland vegetation.
- Construction noise and activities may cause temporary avoidance behaviours, and also disrupt feeding and breeding activity of wildlife in the area.
- Improperly stored construction materials, garbage, and food may act as wildlife attractants, increasing risk of human-wildlife conflict and highway mortality.
- Accidental fuel or oil spills from construction equipment may negatively affect wildlife and habitat quality through contamination of vegetation or water sources used by wildlife.

Vegetation:

- Riparian and upland vegetation will be removed across much of the project area; some areas will revert or be restored but road embankments and the road footprint will be permanently cleared.
- Accidental fuel or oil spills from construction equipment could contaminate soils and groundwater, with adverse consequences for vegetation.
- Soil disturbance in highway construction and staging areas, as well as decommissioning of old road and bridge structures, may create habitat conducive to the establishment of invasive plant species that would displace or compete with native vegetation.

- Improper cleaning of machinery may transfer and spread invasive plant species.

Visitor Experience:

- Temporary traffic delays are likely to result from construction activities.
- Temporary, localized loss of natural aesthetic appeal and construction noise along the highway are likely to result from construction activities.
- The roadside pull off on the northwest side of Rocky Barachois Bridge may be closed to the public at various stages of the work.

Cultural Resources:

- The Archaeological Overview Assessment indicates one area (between access road and the mouth of Rocky Barachois Brook) of moderate archaeological potential for which archaeological survey and test pitting is required to determine whether there are archaeological resources in this immediate area. For the other areas with little to no archaeological potential, there is still always some chance that previously unknown cultural resources may be encountered during construction.

11. MITIGATION MEASURES

General Mitigations

1. The contractor will prepare an Environmental Protection Plan (EPP), certified by a Qualified Environmental Professional (QEP) and in accordance with Parks Canada Environmental Procedures, a minimum of 10 business days before construction begins. This EPP should address all mitigations listed here, and prior to work beginning the EPP must be approved by Parks Canada. The EPP will include, but not be limited to:
 - Names of persons responsible for ensuring adherence to Environmental Protection Plan; names and qualifications of persons responsible for manifesting hazardous waste to be removed from site; and names and qualifications of persons responsible for training site personnel.
 - A work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use; include details on how the work limits will be marked and procedures to keep operations within the clearing boundaries to minimize damage to peripheral vegetation and soil.
 - An overall site Erosion and Sedimentation Control (ESC) Management Plan which outlines areas where erosion and sedimentation are likely to occur and the means by which the Contractor proposes to control these issues, as well as monitoring and reporting requirements to assure that control measures are in compliance with the erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations. In addition, a localised ESC plan which directs specific mitigation for working in Rocky Barachois Brook is required. The ESC plan must also include methods and mitigations for the long term stability of slopes within the construction footprint at the interface of the bridge abutments and the river, and the area remaining after demolition and removal of the old bridge, footings and road.
 - A Spill Contingency Plan (SCP) that details the containment and storage, handling, use and disposal of empty containers, surplus fuels, or other hydrocarbon products to the satisfaction of the Parks Canada and in accordance with all applicable federal and provincial legislation. The SCP will include a list of products and materials to be used or brought on site that are considered or defined as hazardous or toxic to the environment. Such products may include, but are not limited to, fuels and lubricants. The Safety Data Sheets (SDS) for all chemicals used will be made available onsite. Appropriately sized and stocked spill kits will be on site capable of handling 125% of the largest potential spill. All contractor's staff will be made aware of their location(s) on site and will be trained on spill response procedures.
 - An Emergency Response Plan that outlines procedures to follow in the case of an emergency (e.g. equipment malfunction/failure, or fire).
 - Non-Hazardous Waste Disposal Plan identifying methods and locations for solid waste disposal including clearing debris and recycling of decommissioned bridge materials (including industrial waste, domestic waste, and human waste).

- Air Pollution Control Plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.
- Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
- Waste Water Management Plan identifying methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

Note that though this Basic Impact Analysis (BIA) specifies that the contractor must prepare an Environmental Protection Plan, if these two documents are not consistent the most rigorous with regard to environmental stewardship shall be followed.

2. All relevant mitigation measures outlined in the Parks Canada National Best Management Practices for Roadway, Highway, Parkway and Related Infrastructure (BMPs; PCA, 2015) will be followed. These allow an identified suite of well-understood project activities to proceed such that there will not be resulting significant adverse environmental effects. The BMPs are applicable when the project activities are routine and repetitive with well-understood and predictable effects. If the mitigations listed in this BIA or the Contractor's EPP conflict with the PCA Highways BMPs, the most rigorous with regard to environmental stewardship shall be followed.
3. Prior to starting work on site all contractor personnel working on site will be required to attend an on-site environmental briefing conducted by Parks Canada's Environmental Officer (EO) and project manager to review the mitigation measures required in this BIA. Contacts for Parks Canada's Resource Conservation include:
Gabrielle Robineau-Charette, Resource Management Officer and Environmental Officer, Parks Canada, Rocky Harbour. Email: gabrielle.robineau-charette@pc.gc.ca Office: 709-458-3581
Darroch Whitaker, Ecologist, Parks Canada, Rocky Harbour. Email: darroch.whitaker@pc.gc.ca Office: 709-458-3464
Trevor Rendell, Resource Conservation Manager, Parks Canada, Rocky Harbour. Email: trevor.rendell@pc.gc.ca Office: 709-458-3542, Cell: 709-636-4679

Equipment

4. Equipment must be washed prior to arrival such that it arrives on site in a clean condition and is maintained free of invasive species, noxious weeds, soils and other contaminants from off-site.
5. Prior to arrival on site equipment must be properly tuned, clean and free of contaminants, in good operating order, free of leaks (e.g., fuel, hydraulic fluid, coolant, oil or grease), and fitted with standard air emission control devices and spark arrestors.
6. Equipment will be inspected daily for fuel, hydraulic fluid, and other leaks, and for structural integrity, and inspections will be recorded. Detected leaks will be addressed immediately and reported to Parks Canada.
7. Equipment operators must be fully trained and experienced.
8. Fueling heavy equipment is prohibited within 100 m of the stream or open water, and must be carried out in a level area on either an impermeable roadside or at a staging area with spill catchment countermeasures in place. Fuelling sites should not drain towards water bodies or wetlands.
9. Fueling of small engines (e.g. generators, chainsaws) will not be permitted within 30 m of open water and portable containment pads must be used to prevent ground contact by accidental fuel spills.
10. Storage and movements of heavy equipment and workers' private vehicles shall be restricted to the 'footprint' of the construction and staging area only. Further, machinery (e.g., excavators, bobcats, chainsaws, and generators) must be stored and maintained on a flat surface at least 100 meters from the shoreline.
11. To prevent materials (e.g. soil, rock, demolition debris, etc.) from escaping from trucks, all loads must be covered or tarped during transport through the park.

Hazardous materials and contaminants

12. Handle and store hazardous materials as per applicable federal legislation/regulations. The contractor must have all relevant and current Material Safety Data Sheets available onsite.
13. Hazardous or toxic products (fuels, lubricants, paint, sealants, etc.) must be (i) securely stored, (ii) shall not be stored within 200 m from any stream, wetland, or water body, and (iii) shall not be disposed of in the national park.
14. Fuels, gases, or other deleterious substances will be contained within the appropriate and approved containers, and tanks, hoses and connections will be inspected prior to use.
15. Storage of large amounts of fuel (more than 900 L) in the Park is not permitted. Refuelling of on-line equipment from storage facilities located outside Park boundaries is strongly preferred. Fuel can only be stored in pre-approved locations, and with Park consent.
16. Secondary containment and spill kits must be available on site during all periods of work. These must be able to handle 125% of the largest potential spill, and workers must be trained in their use and aware of their location.
17. Spills (e.g. hydraulic fluids) will be responded to immediately according to the Contractor's Spill Response Plan. In the event of any fluid spills or leaks, the Spill Response Plan will be followed, including immediate containment, cleanup/mitigation, and immediate reporting to Parks Canada. Any absorbent materials used in the clean-up or soils contaminated by the spill will be disposed of in the appropriate facilities and transported in accordance with the federal Transportation of Dangerous Goods Regulations. All spills will be reported to Parks Canada's EO.
18. Following the cleanup of any spill larger than 10 L the spill site will be inspected to ensure there is complete containment and disposal to the satisfaction of Parks Canada.

Waste

19. Burning of any vegetation, worksite materials, organic waste, or industrial waste is prohibited in the park.
20. Dumping leftover asphalt off the worksite is prohibited. A temporary onsite location may be permitted for clearing small amounts from trucks, but only with prior approval from the park's environmental officer.
21. Excess mixed cement should be disposed of outside the park and where there is no potential for contact with any wetlands or open water. However, small amounts of excess concrete may be temporarily dumped in designated structures such as onsite pits or berm areas, located a minimum of 30 m from watercourses, wetlands and any drainages. Straw bales, wood stakes, and sandbag materials can be used to construct temporary containment walls or "barriers", and these must be sufficient in size to contain all liquid and concrete waste with a minimum of 10 cm (4 inches) freeboard. Plastic lining material shall be a minimum of 10-mil polyethylene sheeting and shall be free of holes, tears or other defects that compromise the impermeability of the material. Collected wastewater must then be removed from the site and hardened concrete shall be broken up, removed, and disposed of outside the park at an approved landfill or equivalent facility.
22. Sanitary facilities, such as a portable container toilet, shall be provided at the work site, maintained in good working order, and emptied outside the park at an approved waste treatment facility.
23. To prevent habituation of wildlife, human wildlife conflict, and risk of wildlife being struck by vehicles, garbage that includes food waste or other wildlife attractants must be securely stored so that it is not accessible to wildlife, and should be disposed of daily.

Erosion and sediment control

24. As indicated above, the contractor must prepare an Erosion and Sedimentation Control (ESC) Management Plan as part of the EPP and submit this to Parks Canada's EO for approval prior to the start of earthworks activities.
25. Erosion and sedimentation controls must be installed prior to earthworks activities commencing. Inspect and maintain erosion and sediment control structures daily during all phases of the project and modify or enhance measures as necessary. Particular attention must be paid to activities in areas draining into Rocky Barachois Brook; erosion and runoff silts from exposed soils must be prevented from entering the stream.
26. Backfilled slopes shall be mechanically compacted and grades should be consistent with the project specifications or, where grades are not specified, prevailing down-slope grade. Exposed soils should be immediately stabilized against erosion by seeding, and / or by covering with mulch, straw, clean rock, gravel or other suitable materials. Hydro-seeding operations

with approved seed mix will be carried out, as directed by Departmental Representative, within 2 weeks of completion of work in an area.

27. Whenever possible use erosion and sediment control products made of 100% biodegradable materials (e.g., jute, sisal or coir fiber). Ensure backing materials are also biodegradable.
28. Stock piled aggregates and construction materials must be stored at an approved site far enough away from open water to prevent runoff of sediment or potential contaminants from entering the stream and nearby wetlands.
29. To reduce erosion and sediment runoff, grubbing and stripping of topsoil should be carried out under dry conditions (i.e. no surface runoff) whenever possible.
30. Construction and equipment travel will be minimized during periods of heavy precipitation, and excavation activities halted during heavy rainfall events (50 mm or more in 1 hour).
31. Erosion- and sediment-control materials will be readily available on-site. Materials may include but are not limited to rock, gravel, mulch, straw, straw bales, grass seed (seed mixture of 60% annual rye and 40% creeping red fescue), bio-degradable erosion control blankets, sediment fencing, staking, and polyethylene sheeting.

Blasting

32. Blasting must be pre-approved by the Parks Canada project manager and conform to the requirements in the project specification document.
33. The Parks Canada Representative will identify a magazine location for explosives should a factory site or "ready-to-use" explosives storage site be required.
34. The blasting supervisor will ensure no damage to infrastructure, people, surrounding vegetation, or wildlife by mitigating risk of fly rock.
35. Avoid using explosives in or near water. Use of explosives in or near water produces shock waves that can damage a fish swim bladder and rupture internal organs. Blasting vibrations may also kill or damage fish eggs or larvae.

Demolition and decommissioning of infrastructure and site restoration

36. Before demolition of the old bridge at Rocky Barachois begins, the contractor will have to prepare a detailed demolition and removal plan that is reviewed and approved by Parks Canada. The proposed plan must be provided to Parks Canada for review at least two (2) weeks before the anticipated start date, and work cannot begin until Parks Canada has approved a final demolition plan. The demolition plan will include information on the timing of the work (season), the methods to be used to remove the bridge (including decking, abutments and highway approaches), mitigations that will be taken to prevent impacts on the aquatic environment, and steps that will be taken to remediate the area, stabilise exposed soils, and prevent sediment runoff.
37. All bridge demolition materials and excavated highway pavement must be removed from the site and disposed of at an approved facility/location outside the national park.
38. No part of the old bridge, construction equipment, or demolition debris may enter the stream. Where needed, measures must in place to prevent demolition materials from entering the stream (e.g. tarps, scaffolding, slurry from concrete cutting, etc.) and they must be inspected regularly and repaired as needed.
39. Demolition of footings for support pilings (and other shoreline work) should not be done during periods of high stream flow, and the forecast should be checked before key phases of demolition start to ensure that they will not span periods of flooding.
40. To stabilize exposed soils and prevent sediment runoff, site rehabilitation will be required to restore vegetation cover once the decommissioned highway approaches and bridge are removed. Areas having no vegetation cover should be hydro-seeded; these areas should first be cultivated to a depth of 100 mm, and salvaged topsoil should be spread in areas lacking sufficient soil; topsoil should be spread evenly and should not be compacted. A seed mixture of 60% annual rye and 40% creeping red fescue should be applied as soon as possible and, if work is completed during the growing season, should be applied not later than 2 weeks after completion of site preparation.
41. Effective sediment and erosion control measures will be established and maintained until re-vegetation of disturbed areas is achieved.

Additional environmental mitigations

Note that the mitigations listed above will address many potential impacts on valued components of the environment, visitor experiences, and cultural resources. The following additional mitigations are required to further protect specific elements of these resources.

Air quality and noise

42. Should dust control be required on the construction site or roadbed, only fresh water will be permitted.
43. All equipment, vehicles and stationary emission sources will be well maintained and used at optimal loads for minimal noise and air emissions.
44. Minimize idling of engines, contingent on operating instructions and temperature considerations.

Surface water (fresh and marine waters) *(Note that many mitigations listed elsewhere will also mitigate impacts on surface water, especially those for erosion and sediment control and hazardous materials and contaminants)*

45. Heavy machinery or equipment will not be permitted to work in water in the stream or estuary.
46. When in-water work is required cofferdams (or Aqua Dams) must be in place before any in-water work can take place. Cofferdams can be installed at low tide to limit de-watering needs. De-watering will be necessary to prevent suspended sediments, construction debris and other foreign materials from entering the stream. In water work, including mitigations, must be discussed with and approved by Parks Canada's EO.
47. Measures must be in place to prevent wastewater pumped from the worksite from directly or indirectly entering the stream. Excess water must be discharged well away from the stream and filtered either naturally over the forest floor or pumped onto filter fabric or straw spread on the forest floor.
48. Design and construct approaches to the waterbody such that they are perpendicular to the watercourse to minimize loss or disturbance to riparian vegetation.
49. All construction and demolition materials must be securely contained at the work site and kept from entering the stream. If necessary, a floating boom may be required to capture materials from being swept downstream and away from the work site.
50. Concrete mixing must take place at least 30 m from streams, wetlands or water bodies. Fresh, wet, uncured concrete, concrete dust, and wastewater is toxic to the aquatic environment and must not come into contact with any water body.
51. To protect stream water quality when cutting riparian vegetation (i.e. within 30 m of a watercourse), regular chainsaw bar lubricant oils must be replaced with BioLube or a similar non-toxic, vegetable-based chain oil.
52. Water extraction from within the Park boundaries is strictly forbidden. Water extraction may be permitted following detailed proposal submitted by the Contractor and subject to approval by the Departmental Representative.

Soils and Landforms *(Note that many mitigations listed elsewhere will also mitigate impacts on soils and landforms, especially those for erosion and sediment control and also for vegetation impacts)*

53. Any topsoil that is being stripped should be salvaged and stockpiled to be used for site landscaping and restoration throughout the course of the project, including following completion of construction and demolition of the decommissioned road and bridge structures. Do not mix topsoil that will be salvaged with subsoil, and remove stumps and roots where possible. Ideally topsoil will contain 20-40% organic humus ("peat").
54. When earthworks activities are complete in any area that will not form part of the finished bridge, embankments, or highway approaches, loosened soils should be shaped to match the local terrain and ensure noticeable construction impacts (e.g., ruts, holes, depressions, compacted areas) are appropriately re-graded, back-filled with topsoil, re-contoured and capped. Salvaged topsoil should be spread in areas lacking sufficient soil for plant growth; topsoil should be spread evenly and should not be compacted. Hydro-seeding, straw, dry mulch, or bio-degradable erosion control blankets may be required to stabilize exposed soils along some back slopes. If restoration occurs during the growing season a seed mixture of 70% annual rye and 30% creeping red fescue should be applied.
55. Hydraulic seeding shall be carried out as soon as possible after completion of the surface preparation in order to prevent erosion by wind and water. Fine grade areas to be seeded free of humps and hollows. Hydraulic seeding shall take place no

more than two (2) weeks after excavation and embankment construction is complete. Seed should comprise of a mixture of 70% annual rye and 30% creeping red fescue

56. Prior to work commencing Park staff, in consultation with subject area experts, will check existing rock cuts as well as loose rock at the base of rock cuts for exposed fossils and salvage any that have scientific or interpret value (see Appendix 2).
57. If it is possible to either stockpile blast rock in a safe location or allow on-site inspection of blast rock, Parks Canada will facilitate and assist with inspection of this rock by a knowledgeable expert in hopes of salvaging any exposed fossils that would otherwise be lost or destroyed.

Fish and fish habitat (*Note that many mitigations listed elsewhere will also mitigate impacts on fish and fish habitat, especially those for erosion and sediment control and also for surface water*)

58. In-water work should not be carried out between July 1 and September 15, as this is the period of migration for sea-run trout, and also because fish are more easily stressed during periods of low flow and warm water during summer. In water work, including mitigations, must be discussed with and approved by Parks Canada.
59. Minimize duration of in-water work.
60. Conduct in-stream work during periods of low flow, or at low tide, to further reduce the risk to fish and their habitat or to allow work in water to be isolated from flows.
61. Undertake all in-stream activities in isolation of open or flowing water to maintain the natural flow of water downstream and avoid introducing sediment into the watercourse.
62. Ensure that all in-water activities, or associated in-water structures, do not interfere with fish passage, constrict the channel width, or reduce flows, or result in the stranding or death of fish.
63. Screen any water intakes or outlet pipes to prevent entrainment or impingement of fish. Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself.
64. Shorelines and banks that are to be disturbed by the work will be stabilized immediately and if the original gradient of channel banks cannot be restored, a stable gradient will be restored.
65. If replacement rock reinforcement/armouring or rip-rap is required to stabilize eroding or exposed areas along stream banks, appropriately-sized, clean rock will be used. Such rock will be installed at a similar slope to maintain a uniform bank/shoreline and natural shoreline alignment.
66. If sedimentation of the stream is possible the work area must be isolated from the stream using coffer dams, silt curtains, or some other appropriate approach.

Terrestrial fauna

67. Construction vehicles travelling on Park roads must respect posted speed limits and yield to wildlife.
68. To prevent incidental destruction of bird nests and nestlings, all vegetation cutting and grubbing must be completed either before or after the primary songbird nesting season. Therefore, this work must not occur between June 1 and July 15 and preferably would be completed before May 15 or after August 15. Should the Contractor wish to clear additional vegetation during June or July they must request permission to do so from Parks Canada's Environmental Officer, who will make a decision whether or not the clearing can proceed based on urgency, consultation with subject area experts, and inspection of the area to be cleared.
69. The contractor(s) must immediately report to Parks Canada any wildlife discovered nesting, roosting, or denning on or near the worksite. If an active wildlife nest, roost, or den is found, the vegetated area will be left intact and a suitable sized buffer of shrubs/trees around it will be clearly marked until the nest, roost, or den is no longer in use. The appropriate size of buffer is species dependent, and will be determined in consultation with Parks Canada's Environmental Officer.
70. To prevent habituation of wildlife, human wildlife conflict, and risk of wildlife being struck by vehicles, feeding of wildlife is strictly prohibited and all potential wildlife attractants, including gasoline, garbage, and food, must be securely stored so that they are not accessible to wildlife. Particular vigilance is required when workers are leaving at the end of the work day so that attractants are not accessible during the night.

71. The contractor(s) must immediately report to Parks Canada any instances of potential problem wildlife (e.g., foxes, coyotes, bears) becoming habituated to people in the vicinity of the worksite. A written record of any problem wildlife encounter must be submitted to the Parks Canada EO within 24 hours of the incident.
72. If wildlife is observed during work give animals the opportunity to escape the work area to the surrounding forest or elsewhere to seek new shelter.

Vegetation (Note that many mitigations listed elsewhere will also mitigate impacts on vegetation, especially those for erosion and sediment control)

73. Clearing of vegetation requires a Restricted Activity Permit from Gros Morne National Park. This can be obtained in communication with Park's Canada's EO.
74. Vegetation clearing and soil grubbing and removal should be limited to the minimum necessary for the completion of the project. Wherever possible vegetation cover should be maintained to prevent erosion. The area to be cleared must be clearly delineated with highly visible materials such as flagging tape to inform cutters and equipment operators of the area they are to work in to avoid unnecessary vegetation removal.
75. Equipment operators will take extra caution to avoid mechanical damage to trees and other vegetation outside the designated clearing area.
76. Cut vegetation must be either removed from the worksite to a location outside the park boundaries, mechanically chipped onsite, or dragged out of sight into forest edges. Any mechanically chipped woody vegetation must be dispersed evenly on site to a surface depth not greater than 5 cm.
77. Logs from newly cut trees may be stockpiled on already disturbed areas, and opportunities to make these available to local domestic wood cutters should be discussed with Parks Canada's EO.

Visitor Experience / Public Safety

78. Onsite stockpiling areas for construction materials must be barricaded from public access.
79. Traffic disruption during construction should be kept to the minimum required for safe and efficient operation.
80. Maintain the project area in as tidy a condition as is practical for the duration of work.
81. Appropriate signage warning road users that they are approaching / in a construction zone and regulating traffic flow must be in place and maintained whenever activity is being undertaken in the project area. Further, all such signage and associated materials (e.g. sandbags used to ballast signs) must be removed from the park after the completion of work.
82. Highway traffic must be controlled when work trucks, heavy machinery, and other potentially hazardous vehicles are turning onto or off of the public highway.
83. If/when blasting is needed, contractor is to coordinate with Parks Canada so it will notify park visitors of potential traffic delays on a regular basis.

Cultural Resources

84. An Archaeological Impact Assessment (AIA) is needed for the the area between the hydro line access road and the mouth of Rocky Barachois Brook). The work must be undertaken by a qualified archaeologist with an approved Research and Collections Permit issued by the park's research coordinator.
85. Any cultural resources found within the project limits as a result of the archaeological impact assessment will be documented and flagged before construction begins. This is to include a buffer of 5 m out from the resource, which will be deemed a no-go zone for vehicular traffic and machinery. Due to the nature of the project, it may not be possible to have a 5m buffer zone around cultural resource. If this is the case, a mitigation strategy could feasibly be developed to ensure that the resources are carefully documented and removed.
86. Project activities are restricted to areas presented in the design concept. If landscaping is required beyond these excavation limits, consult with Parks Canada's Terrestrial Archaeology section to determine if an additional AOA is required for these activities. Based on the AOA, an AIA and/or additional mitigation measures may be required prior to the continuation of excavation activities.

87. If cultural resources, features, or artifacts (e.g., stone tools, historic artifacts such as pipes, ceramics, iron stove parts, etc.) are encountered within the project area, work should cease and the Parks Canada project manager should be contacted immediately. The Parks Canada project manager will then pass information concerning the find to a Parks Canada archaeologist for advice and assessment of significance. This will in turn determine what will be required to mitigate the chance find.

12. CONSIDERATION OF THE NEED FOR PUBLIC PARTICIPATION & ABORIGINAL CONSULTATION

12 a) Need for public participation? NO X YES ____

12 b) Aboriginal consultations required? NO X YES ____

13. OTHER Considerations

Check all that apply

- Public/stakeholder engagement
- Aboriginal engagement or consultation
- Surveillance
- Follow-up monitoring, required to evaluate effectiveness of mitigation measures and/or assess restoration success
- Follow-up monitoring, required by legislation or policy (indicate basis of requirement e.g. required by the *Species at Risk Act*)
- SARA Notification

14. SIGNIFICANCE OF RESIDUAL ADVERSE EFFECTS

Natural Resources: Given the magnitude of effects, the phasing of project activities, and application of mitigation measures, the project is unlikely to result in significant residual adverse effects to natural resources.

Visitor Experience: Given the magnitude of effects, the fact that the existing roadway and bridge will be open to traffic throughout construction, and application of mitigation measures, the project is unlikely to result in significant residual adverse effects to visitor experience.

Cultural Resources: Given the magnitude of effects, the low potential for archaeological resources, and application of the mitigation measures the project is unlikely to result in significant residual adverse effects to cultural resources.

15. SITE INSPECTION

Site inspection required

Site inspection not required

Parks Canada's project supervisor and Resource Conservation staff will regularly monitor the work site and areas downstream to ensure that the measures to mitigate environmental impacts and impacts on public safety and visitor experience are being adhered to and functioning.

<p>16. SARA REQUIREMENTS</p>	<p><input checked="" type="checkbox"/> There are no residual adverse effects to species at risk and therefore the SARA-Compliant Authorization Decision Tool was not required</p> <p>OR,</p> <p>the SARA-Compliant Authorization Decision Tool (<u>Appendix 2</u>) was used and determined:</p> <p><input type="checkbox"/> There is no contravention of SARA prohibitions</p> <p><input type="checkbox"/> Project activities contravene a SARA prohibition and CAN be authorized under SARA</p> <p><input type="checkbox"/> Project activities contravene a SARA prohibition and CANNOT be authorized</p>								
<p>17. EXPERTS CONSULTED</p> <p><i>Include Parks Canada experts. Add as many entries as necessary for the project.</i></p> <table border="1" data-bbox="90 663 1360 1037"> <tr> <td data-bbox="90 663 724 743">Department/Agency/Institution: NL-Dept Natural Resources, Geological Survey</td> <td data-bbox="724 663 1360 743">Date of Request: April 10, 2018</td> </tr> <tr> <td data-bbox="90 743 724 915">Expert's Name and Contact Information: Ian Knight Phone: (709) 729-4119 Email: ianknight@gov.nl.ca</td> <td data-bbox="724 743 1360 915">Title: Project Geologist</td> </tr> <tr> <td colspan="2" data-bbox="90 915 1360 957">Expertise Requested: Input on fossil potential of rock cuts</td> </tr> <tr> <td colspan="2" data-bbox="90 957 1360 1037">Response: Comments were received (see Appendix 2) and associated mitigations were incorporated into the final BIA</td> </tr> </table>		Department/Agency/Institution: NL-Dept Natural Resources, Geological Survey	Date of Request: April 10, 2018	Expert's Name and Contact Information: Ian Knight Phone: (709) 729-4119 Email: ianknight@gov.nl.ca	Title: Project Geologist	Expertise Requested: Input on fossil potential of rock cuts		Response: Comments were received (see Appendix 2) and associated mitigations were incorporated into the final BIA	
Department/Agency/Institution: NL-Dept Natural Resources, Geological Survey	Date of Request: April 10, 2018								
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Expertise Requested: Input on fossil potential of rock cuts									
Response: Comments were received (see Appendix 2) and associated mitigations were incorporated into the final BIA									
<p>18. DECISION</p> <p>NOTE: If the project is identified as likely to cause significant adverse effects, CEAA 2012 prohibits approval of the project unless the Governor in Council (Cabinet) determines that the effects are justified in the circumstances. A finding of significant effects therefore means that the project CANNOT go ahead.</p>									
<p>Taking into account implementation of mitigation measures outlined in the analysis, the project is:</p>									
<input checked="" type="checkbox"/>	Not likely to cause significant adverse environmental effects.								
<input type="checkbox"/>	Likely to cause significant adverse environmental effects.								
<p>19. REFERENCE LIST</p> <ul style="list-style-type: none"> • Civil Drawings, Re-alignment and re-construction of Highway 430 near Rocky Barachois Brook (Rocky Barachois 99 % Contract 1 Combined.pdf). Prepared by: Harbourside Engineering Consultants. 219 Waverley Road, Suite 200 Dartmouth, NS. B2X 2C3 • Higdon, J. 2018. Archaeological Overview Assessment for Rocky Barachois Bridge Replacement, Gros Morne National Park. • Knight, I. 2013. The Forteau formation, Labrador Group, in Gros Morne National Park: a preliminary assessment of its stratigraphy and lithofacies. Newfoundland and Labrador Department of Natural Resources Geological Survey, Report 13-1, pages 267-300. • Department of Fisheries and Oceans Canada 2016. Measures to avoid causing harm to fish and fish habitat including aquatic species at risk. <http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/measures-mesures-eng.html > 									

<ul style="list-style-type: none"> Gosse, M.M., A.S. Power, D.E. Hyslop, and S.L. Pierce. 1998. Guidelines for Protection of Freshwater Fish Habitat in Newfoundland and Labrador. Fisheries and Oceans, St. John's, NF. x + 105 pp., 2 appendices. 	
20. ATTACHMENT LIST (e.g., BMPs, project area diagrams, sensitive area maps, project execution plan, previous analysis, relevant permits)	
Parks Canada 2015. Parks Canada National Best Management Practices, Roadway, Highway, Parkway and Related Infrastructures.	
Higdon, J. 2018. Archaeological Overview Assessment for Rocky Barachois Bridge Replacement, Gros Morne National Park.	
21. NATIONAL IMPACT ASSESSMENT TRACKING SYSTEM (CEAA 2012 requires PCA submit a report to Parliament annually. EIAs must be entered in the tracking system by the end of April to enable reporting.)	
<input type="checkbox"/> Project registered in tracking system <input checked="" type="checkbox"/> Project not yet registered	
RECOMMENDATION AND APPROVAL (Add additional blocks as required.)	
Prepared by: Gabrielle Robineau-Charette Resource Management Officer	 Date: July 10, 2018
Recommended by: Trevor Rendell Resource Conservation Manager Western Newfoundland and Labrador Field Unit	 Date: July 10, 2018
Approval signature: Geoffrey Hancock Superintendent Gros Morne National Park and Western Newfoundland and Labrador Field Unit	 Date: July 11/18

Appendix 1 : Effects Identification Matrix

A. Direct Effects									
		Valued components potentially directly affected by the proposed project							
		Natural Resources					Visitor Experience	Cultural Resources	
		Air	Soil & landforms	Water (freshwater stream, coastal marine)	Flora (stream riparian vegetation, upland forest)	Fauna (fishes, nesting birds, mammals)	Visitor Safety		
Phase	Associated Activities								
Project Components	Preparation / Construction / Operation / Decommissioning	Supply and storage of materials	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Burning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Clearing	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Demolition	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Disposal of demolition materials	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Site remediation/ restoration	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Wastewater disposal	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Drainage	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Excavation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Backfilling	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Use of machinery	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Transport of materials/ equipment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Use/Removal of temporary facilities	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Use of Concrete	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Visitor Access	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Vehicle Traffic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		

Appendix 2: Correspondence received from Ian Knight, April 10, 2018, related to fossil potential of rock cuts at Dicks Brook and Rocky Barachois.

From: "Knight, Ian" <ianknight@gov.nl.ca>
 To: "darroch.whitaker@pc.gc.ca" <darroch.whitaker@pc.gc.ca>
 Date: 10/04/2018 12:59 PM
 Subject: RE: Highway projects involving rock cuts in Gros Morne.

Hi Darroch,

Here are a few thoughts about the road work. I have already measured sections at GM-17 and GM-18. Both had interesting details regards the stratigraphy in the park.

GM-17 begins in the Forteau and ends close to the base of the Hawkes Bay. It has some fossil horizons but did not yield anything that could be readily identified so new road cuts would only provide new surfaces and rubble to perhaps see good trilobites.

GM-18 is the first of a series of outcrops (GM-18 to 18D) along the road west and east of Dicks Brook found in the basal part of the Hawkes Bay Fm. I found some very good trilobite heads and I believe a complete animal at GM-18C-D when I measured the section through a number of road cuts (Doug Boyce has Ided them as Mesonacis fremonti and M. bonnensis, essentially the youngest part of the Bonnia-Olenellus zone). The UTM for first outcrop was 447652E 5480173N (NAD 27; GM-18). Fossils were found at GM-18C-D at 449200E 5478861N which is east of the brook I believe. The fossils were found north of the road in loose rubble in the roadside ditch below a low rock cliff where I located the source bed.

So it seems that the new roadcut approaching Dicks Brook from the west will likely not threaten any fossil site and could easily excavate new rock from which fossils can be found. Gm-18C may be an issue but I think that even then a new roadcut or cuts will also be useful.

Regards the 4 questions you posed. No. 1 is answered here; No 2 is probably unnecessary; No 3 would be a good idea if there is time and it suits the construction schedule. I am out in western Nfld frequently so an e. mail when it is a suitable time; I could also follow up after the construction is over. No 4 - I don't have any other concerns - I tend to welcome road works where there are new exposures created as they provide new geological opportunities for discovery.

I trust this is helpful. Let me know if I have been confusing.

Ian

From: darroch.whitaker@pc.gc.ca [darroch.whitaker@pc.gc.ca]
Sent: Tuesday, April 10, 2018 10:13 AM
To: Knight, Ian
Cc: Randy.Thompson@pc.gc.ca; gabrielle.robineau-charette@pc.gc.ca
Subject: Highway projects involving rock cuts in Gros Morne.

Hello Dr. Knight,

We're in the process of conducting impact assessments for two highway projects in Gros Morne National Park, both of which will involve replacing bridges and associated realignment of the highway approaches to the bridges during the summer of 2018. In each case the realignment will likely require expansion (blasting) of the existing rock cuts along the road side. The two bridges are at Rocky Barachois and Dick's Brook, towards the south end of the Eastern Arm of Bonne Bay, and I believe the rock cuts correspond to sites GM-17 and GM-18, respectively, in your

2013 paper on the Forteau formation in Gros Morne (Geological Survey, Report 13-1, pages 267-300). My sense is that the expansion of the rock cut at Dick's Brook will be relatively limited, but that the realignment at Rocky Barachois will involve quite a bit more blasting to move the road over (see dashed purple lines in the attached screen capture; note that the airphoto has been rotated, see north arrow in upper left). As you have looked at these sites in your research we were wondering if you could share any thoughts on potential impacts and mitigations for this aspect of the road realignments. For example:

- Are there important, exposed fossils at the existing rock cuts that should be salvaged prior to construction?
- Would you (or perhaps someone else) like an opportunity to complete additional surveys at these sites before construction occurs?
- Would you like an opportunity to inspect blast rock removed from the site?
- Do you have any more general concerns with the work? If so, please offer some detail.

Thanks and please feel free to call with any questions or to discuss.

Regards

Darroch

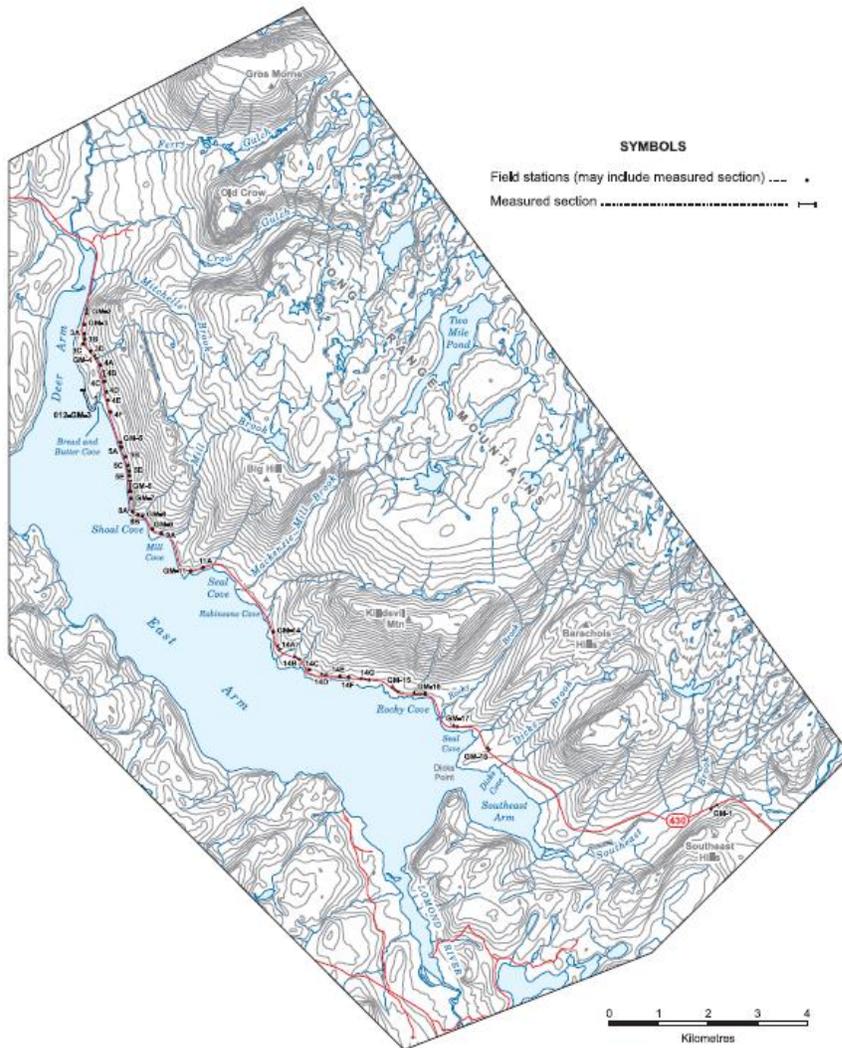


Figure 2. Map showing location of field stations and sections of Forteau Formation in GMNP.