



kwj KERR WOOD LEIDAL
consulting engineers



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Michichi Creek Aquatic Assessment

CCI Project No. 3694

Contact:
Adam Hope
587.434.4934
Adam.hope@ccisolutions.ca

Prepared: A. Hope
Revision: IFC-0
Date: 2022-12-07
Reviewed: T. Flotre
Approved: J. Boyle

Edmonton Area Office

17816 – 118 Ave NW
Edmonton, AB T5S 2W3
P: 780.784.1990

Calgary Area Office

2600, 520 – 5th Ave. SW
Calgary, AB T2P 3E7
P: 403.932.0560

Cochrane Area Office

9, 214 Grande Blvd W
Cochrane, AB T4C 2G4
P : 403.932.0560

Vancouver Area Office

Unit 601, 1525 Robson Street
Vancouver, BC V6C 1C3
P : 604.416.3617

Houston Area Office

20445 State Hwy 249 Suite 250
Houston, TX 77070
P: 832.210.1030

Revision Log

Revision	Issue Status	Prepared by	Reviewed by	Approved by	Date Approved
0	IFC	Adam Hope	Tristan Flotre	Jon Boyle	2022-12-07

TABLE OF CONTENTS

1.0	INTRODUCTION	1
2.0	METHODOLOGY	3
2.1	Desktop Review.....	3
2.2	Field Assessment	3
2.3	Habitat Assessment.....	3
2.4	Construction Risk Analysis	4
3.0	ASSESSMENT RESULTS	5
3.1	Desktop Assessment.....	5
3.2	Classification and Timing Window	6
3.3	Field Assessment	6
3.4	Fish Habitat Assessment	8
4.0	PROPOSED WORKS	8
4.1	Construction Methods and Timing	8
4.2	QAES Recommended Construction Methods.....	8
4.3	Potential Adverse Effects.....	9
5.0	QAES RECOMMENDED MITIGATION MEASURES	9
5.1	General Mitigation Measures	9
5.2	Erosion and Sediment Control (ESC)	10
5.3	Accidental Spill/Release Response	10
5.4	Bank Stabilization	11
5.5	Channel Re-alignment and Reclamation.....	11
5.6	Construction Risk Analysis	12
6.0	REGULATORY REQUIREMENTS	12
6.1	Water Act.....	12
6.2	Fisheries Act.....	12
6.3	Species at Risk Act (SARA).....	13
6.4	Public Lands Act.....	13
6.5	Canadian Navigable Waters Act (CNWA).....	13
7.0	CLOSURE	14
8.0	REFERENCES	15

LIST OF FIGURES

Figure 1.	Michichi Creek Aquatic Assessment Project Overview.....	2
Figure 2.	Aquatic Assessment Transects and Proposed Michichi Creek Re-alignment Area.....	7

LIST OF TABLES

Table 1.	Fish Habitat Rating Criteria	4
Table 2.	Fish Habitat Sensitivity Criteria.....	4
Table 3.	Predicted fish species assemblage of Michichi Creek and the adjacent Red Deer River within a 1km radius of the confluence	5

LIST OF APPENDICES

APPENDIX A	Species Summary Report.....	16
APPENDIX B	Construction Plans	19
APPENDIX C	Featured Images	21

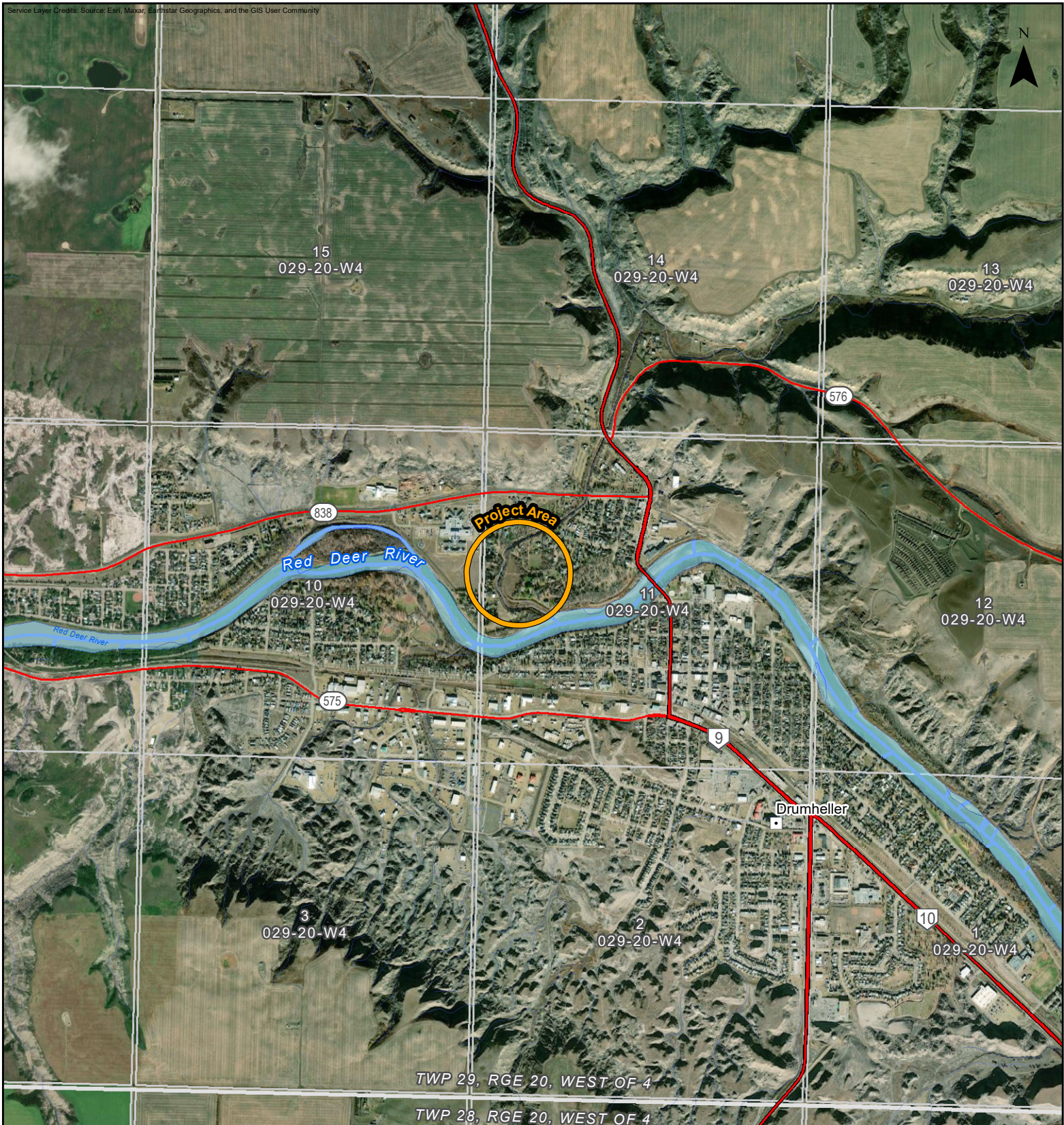
1.0 INTRODUCTION

Kerr Wood Ledial (KWL), the Consultant on behalf of the Town of Drumheller, will be designing flood resiliency mitigation measures along the banks of Michichi Creek (Waterbody ID: 1117) as part of the Drumheller Resiliency Flood Mitigation (DRFM) North Drumheller Michichi Creek West Berm and North Drumheller Michichi Creek East Berm projects (Figure 1). The Project involves the design and planning for the future installment of two (2) berms, which will include the re-alignment of portions of Michichi Creek (the Project). The Project will impact the riparian area of Michichi Creek, and works will entail the permanent installation of materials within the watercourse. Pending regulatory approval, watercourse re-alignment, bank stabilization and armoring construction is scheduled to commence Spring of 2023.

The Project will involve the partial re-alignment of Michichi Creek. Michichi Creek is a Mapped Class C waterbody with a Restricted Activity Period (RAP) from April 16 to July 15 (Government of Alberta [GoA] 2006). The proposed re-alignment is located immediately upstream of its confluence with the Red Deer River. Michichi Creek is located in the Red Deer River Basin and then enters the South Saskatchewan River (Fish and Wildlife Information Mapping Tool, [FWIMT]). The Project is located in the Foothills Fescue Subregion of the Grassland Natural Region (Natural Regions Committee 2006).

CCI Inc. (CCI) was retained by KWL to have a Qualified Aquatic Environment Specialist (QAES) conduct an aquatic assessment (analyzing fish populations and habitat) and to provide subsequent recommendations. This assessment serves to determine any potential adverse effects the Project may have to aquatic habitat and to provide QAES recommendations for the protection of aquatic resources. Recommendations are also provided for the design of fish habitat associated with the proposed creek re-alignment.

This report summarizes the existing watercourse characteristics and fish habitat potential observed at the Project location and downstream Zone-of-Influence (ZOI). This document also proposes construction mitigation recommendations to be implemented for the protection of aquatic resources and provides QAES recommendations for maintaining or improving fish habitat, in addition to outlining regulatory requirements.



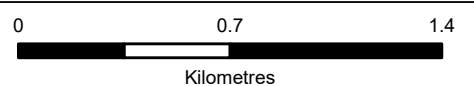
TWP 29, RGE 20, WEST OF 4
TWP 28, RGE 20, WEST OF 4



- Towns
- Project Area
- Rivers
- Major Highways
- Minor Highways
- Twp/Rge Grid

Town of Drumheller

Figure 1. Michichi Creek Aquatic Assessment Project Overview



Project #3694
Date: December 5, 2022
NAD 1983 UTM Zone 12N
File: ProjOView_3694_Nov23_2022

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2.0 METHODOLOGY

2.1 Desktop Review

A desktop assessment of background data on Michichi Creek and surrounding Red Deer River was completed using information provided by Alberta Environment and Parks' (AEP) *Fisheries and Wildlife Management Information System* (FWMIS) (Appendix 1). This database, in conjunction with the Fish and Wildlife Information Mapping Tool (FWIMT), is used to access data from surveys previously conducted on the waterbody. Reviewing previously conducted surveys gives insight into historical fish abundance and community assemblage, and aquatic habitat characteristics. Regulatory requirements under the *Fisheries Act*, *Water Act*, *Canadian Navigable Waters Act*, and the *Public Lands Act* were reviewed to determine what approvals are required for the Project.

2.2 Field Assessment

During field investigations conducted on October 20 and October 21, 2022, Michichi Creek was assessed for the quality and quantity of the existing aquatic habitat. Beginning at the confluence with the Red Deer River, seven (7) transects were established along 550 m of Michichi Creek, encompassing the expected ZOI for the Project. The ZOI was estimated based on channel grade, flow rate, and channel size. At each transect, water quality metrics (*i.e.*, pH, temperature, turbidity, dissolved oxygen, and conductivity) and channel characteristics (*i.e.*, wetted width, bankful width, water depth, cover, substrate, and bank condition) were recorded.

The presence and abundance of fish was determined through visual inspection and an electrofishing survey. These methods provided the most efficient sample of the fish numbers and assemblage, given the low flow and water depth, as well as the high turbidity.

2.3 Habitat Assessment

The aquatic habitat of Michichi Creek was assessed to obtain a set of baseline conditions within the future ZOI before any instream work takes place. The habitat information collected also provides context for the design of the re-aligned creek and allows identification of potential risks to fish habitat posed by the proposed work.

The fish species assemblage of the watercourse, as determined by desktop site review and electrofishing survey, is considered in the recommendations made to minimize loss of habitat within the footprint of the Project. As the work area of Michichi Creek is closely associated with the confluence with the Red Deer River, the habitat needs of species within the river at various life stages are also considered. The quality of habitat throughout the ZOI for fish spawning, rearing, migrating, and overwintering was evaluated and given appropriate rating. Habitat rating was determined based on several parameters, summarizing the watercourses' ability to support expected fish species at various life stages. The ratings used for this assessment are detailed in Table 1, below.

Table 1. Fish Habitat Rating Criteria

Rating	Description
Good	Habitat supports the needs of numerous fish species of various ages and may include high quality spawning or rearing habitat.
Moderate	Habitat supports at least one fish species needs. There are sections of the stream considered optimal, mixed with suboptimal quality habitat.
Poor	Considered to have limited productivity with few resources to provide for the needs of migrating, spawning, rearing or overwintering. Fragmented habitat which poses barriers to fish movement is also considered to be poor.
Unsuitable	Habitat present shows low potential for the productivity of fish populations. Inadequate habitat quality to support the life history of targeted fish species. Undefined and vegetated channels are considered to be unsuitable.

2.4 Construction Risk Analysis

The sensitivity of a waterbody to the potential stresses posed to fish and fish habitat by the Project can be categorized hierarchically as Nil, Low, Moderate, or High, as described in Table 2. These categories are used to make recommendations to minimize the negative impacts of construction on aquatic habitat.

Table 2. Fish Habitat Sensitivity Criteria

Category	Description
Nil	Dry and/or vegetated channel. Barriers to fish movement present such as beaver dams, hanging culverts or weirs. Low overwintering potential.
Low	Seasonal barriers to fish passage. There is little habitat for spawning or rearing. Banks are stable and vegetated. Pools present with sufficient depth, flow or groundwater inputs, allowing overwintering.
Moderate	The stream bank stability low in isolated areas of stream. There is sufficient flow, depth, or input in pools to provide overwintering habitat. There are no observed barriers to fish passage. The substrate is suitable in areas for spawning.
High	The stream banks are largely unstable with high potential for sediment inputs into the stream. Bed sediment shows high degree of scouring. Throughout the stream there are areas of overwintering habitat of sufficient depth and flow. Aquatic vegetation and sediment are conducive to spawning. Vegetative cover is present along the length of the observed section.

3.0 ASSESSMENT RESULTS

3.1 Desktop Assessment

FWIMT was used to generate a report on the possible species assemblage of the creek as well as to reference past surveys of the area. Michichi Creek is classified as a HUC 8 watershed and drains into the HUC 2 Red Deer River. According to historical survey data submitted into FWMIS, Michichi Creek is known to have contained Brook Stickleback (BRST), Finescale Dace (FNDC), Fathead Minnow (FTMN), Lake Chub (LKCH), and Prussian Carp (PRCR). Additionally, there is the possibility of immigration into the creek of species present locally in the Red Deer River (see Table 3). Of the FWMIS generated list of fish species present in the area, no species are classified as At Risk under the *Species at Risk Act* (SARA) (Appendix A).

Table 3. Predicted fish species assemblage of Michichi Creek and the adjacent Red Deer River within a 1km radius of the confluence

Common Name	Scientific Name	Provincial Status	COSEWIC Listed Species	Species at Risk Act Status
Brook Stickleback	<i>Culaea inconstans</i>	Secure	Not listed	Secure
Finescale Dace	<i>Chrosomus neogaeus</i>	Secure	Not listed	Secure
Fathead Minnow	<i>Pimiphales promelas</i>	Secure	Not listed	Secure
Lake Chub	<i>Couesius plumbeus</i>	Secure	Not listed	Secure
Prussian Carp	<i>Carassius gibelio</i>	Exotic/alien	Not listed	Not listed
Burbot	<i>Lota lota</i>	Secure	Not listed	Secure
Emerald Shiner	<i>Notropis atherinoides</i>	Secure	Not listed	Secure
Flathead Chub	<i>Platygobio gracilis</i>	Secure	Not listed	Secure
Goldeye	<i>Hiodon alosoides</i>	Secure	Not listed	Secure
Longnose Dace	<i>Rhinichthys cataractae</i>	Secure	Not listed	Secure
Longnose Sucker	<i>Catostomus catostomus</i>	Secure	Not listed	Secure
Northern Pike	<i>Esox lucius</i>	Secure	Not listed	Secure
Quillback	<i>Carpionodes cyprinus</i>	Secure	Not listed	Not listed
River Shiner	<i>Notropis blennioides</i>	Secure	Not listed	Undetermined
Sauger	<i>Sander canadensis</i>	Secure	Not Listed	Sensitive
Shorthead Redhorse	<i>Moxostoma macrolepidotum</i>	Secure	Not listed	Secure
Troutperch	<i>Percopsis omiscomaycus</i>	Secure	Not Listed	Secure
Walleye	<i>Sander vitreus</i>	Secure	Not listed	Secure
White Sucker	<i>Catostomus comersoni</i>	Secure	Not listed	Secure

3.2 Classification and Timing Window

The preferred construction methods and timing are dependant on the Code of Practice (COP) waterbody classifications as well as the life history of the fishes present. Restricted Activity Periods (RAP) are in place to prevent disturbance to the aquatic ecosystem during times of sensitivity. According to the *Water Act Brooks Management Area Codes of Practice Map* (AEPc 2015), Michichi Creek is categorized as a mapped Class C waterbody and has an April 16 to July 15 RAP. Construction of the re-aligned watercourse should be scheduled so as not to occur during the RAP.

3.3 Field Assessment

Michichi Creek flows into the Red Deer River and is located within the town of Drumheller, Alberta. Seven (7) transects spanning five hundred fifty (550) meters were analyzed beginning at the confluence with the Red Deer River (0 m) (Figure 2). The proposed watercourse re-alignment occurs upstream of the one hundred (100) meter transect and continues until approximately the four hundred (400) meter transect. At five hundred (500) meters upstream, a beaver dam impoundment exists which holds a section of stream forty (40) centimeters deep and extended beyond six hundred (600) meters upstream at the time of the survey (See Appendix C, Plate 16). This pool section was not extensively electrofished due to the soft bed, broad channel width to be covered, and the increased depth. Downstream of the beaver dam the creek consists of a series of isolated pools. These pools varied between eight (8) to forty (40) centimeters in depth. No significant flow existed in the channel and the individual pools were disconnected with multiple sections of dry channel. Historical satellite imagery also shows the creek with little flow. The low water levels of the downstream sections exposed an additional concrete barrier (approximately 1.0 m in height) at three hundred (300) meters upstream of the confluence. This exists as sewage infrastructure for the town of Drumheller and may pose a barrier to fish passage under low water conditions (See Appendix C, Plate 12). Little aquatic vegetation or woody debris existed in the channel. The bed consists primarily of fine sediment with no coarser gravel and few boulders. The banks within the section of creek surveyed had moderate stability with steep slopes (20-90°) and the riparian area was generally vegetated with willows, grasses and sedges. Little aquatic vegetation existed in the creek.

An electrofishing survey was conducted on two hundred fifty (250) meters of creek in the sections of channel which retained water. This assessment was conducted under an AEP issued Fish Research Licence (FRL# 22-3005.). Due to the fine sediment of the bed and the lack of flow, water clarity and fish observation were suboptimal. Three (3) Prussian Carp (*Carassius gibelio*; PRCP), two (2) Northern Crayfish (*Orconectes virilis*; CRAY), and one (1) Troutperch (*Percopsis omiscomaycus*; TRPR) were captured during the survey. Troutperch, while not identified in initial desktop review of the area, are native to the Red Deer River drainage and function in the ecosystem as a forage fish for larger species and as a predator of macroinvertebrates. Northern Crayfish are an introduced species in this watershed and are known to affect the local abundance and assemblage of aquatic insects, invertebrates, and aquatic vegetation. Prussian Carp are known to occur within the Red Deer River watershed and are an invasive species of particular concern to the aquatic environment. Prussian Carp have been shown to outcompete native species for resources and space, increase turbidity, and carry parasites transmissible to native species.



<p>Project Location</p>	<ul style="list-style-type: none"> Transects Proposed Creek Re-alignment Area Towns Twp/Rge Grid 	<div style="text-align: center;"> <h2>Town of Drumheller</h2> <h3>Figure 2. Aquatic Assessment Transects and Proposed Michichi Creek Re-alignment Area</h3> </div> <div style="display: flex; justify-content: space-between; align-items: center;"> <div data-bbox="779 1879 1071 1963"> </div> <div data-bbox="1079 1879 1583 1963"> </div> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 10px;"> <div data-bbox="779 1963 1071 2047"> </div> <div data-bbox="1079 1963 1583 2047"> <p>Project #3694 Date: December 5, 2022 NAD 1983 UTM Zone 12N File: WQMCrkReAlign_3694_Dec5_2022</p> </div> <div data-bbox="1477 2005 1583 2047" style="text-align: right;"> <p>1:2,100</p> </div> </div>
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3.4 Fish Habitat Assessment

Michichi Creek currently has several limiting factors to be addressed in order to improve the overall quality of fish habitat. The low diversity and abundance of fish in the creek at the time of the survey is indicative of a lack of suitable habitat and resources. Of the species identified from the creek, Prussian Carp and Northern Crayfish are known to be highly tolerant of a wide range of environmental conditions. As such, the presence of these species does not suggest a high habitat quality or resource availability in the watercourse. The pool in which the individual Troutperch was observed should not be considered overwintering habitat due to the lack of suitable depth or flow. The sections surveyed is composed exclusively of pools with no riffle or run sections. There was no observed habitat conducive to overwintering fish, with the possible exception of the beaver-dammed section upstream of the Project footprint.

Michichi Creek features multiple barriers to fish movement including the presence of dry sections of channel, concrete municipal sewage infrastructure (approximately 1.0 m in height), and a beaver dam (See Appendix C, Plates 5-11, 12 and 16). The bed of the channel is primarily composed of fine sediment with few embedded rocks, aquatic plants or woody debris. The fine sediment is easily suspended in the water, leading to the high turbidity readings observed (See Appendix C, Plates 1-4). The lack of available cover and gravel makes this stream suboptimal in terms of fish spawning and rearing. The channel lacks the habitat quality and heterogeneity to sustain the life history of fish species found in this watershed. At the time of the survey, the observed fish habitat was considered poor due to a lack of resources or space for spawning, rearing, feeding, or overwintering. As the condition of fish habitat within Michichi Creek is poor, construction of the re-aligned watercourse should do little to degrade the quality of the already suboptimal fish habitat. Provided all applicable regulations are adhered to and the recommendations in this report are considered, the re-aligned watercourse should have equivalent habitat quality to pre-construction conditions.

4.0 PROPOSED WORKS

4.1 Construction Methods and Timing

Avoidance of instream activity during periods of high sensitivity can reduce negative impacts to the aquatic environment. Pending regulatory approval, construction is to begin in Spring of 2023. Any instream work required for the re-alignment of the stream channel should be scheduled outside of the April 15 to July 16 RAP.

4.2 QAES Recommended Construction Methods

Construction methods chosen for the Project should consider the watercourse size, channel and flow characteristics, and fish habitat sensitivity. As such, the following measures should be implemented:

- All materials and equipment to be used in the Project are to be cleaned before arriving to site. Cleaned equipment is to be free of weeds, weed seeds, mud and debris.
- Construction equipment should be de-contaminated to prevent the potential spread of whirling disease, as per the Government of Alberta's decontamination protocol (AEPb, 2020).
- Excluding the section of stream to be re-aligned, all stream bed characteristics should be returned to pre-construction conditions at the end of instream construction.
- If flow is present at the time of instream construction, diversion of the water around the dewatered isolated construction area must maintain downstream flow at all stages of construction.

- The stream must be regularly monitored for signs of sedimentation throughout the instream work of the Project.
- Monitoring of construction activities should be conducted by a QAES.
- Construction should be halted during storm conditions where the precipitation is likely to increase stream turbidity.

4.3 Potential Adverse Effects

The primary risks to the aquatic environment associated with construction activities include:

- Hazardous material spills;
- Loss of riparian vegetation;
- Introduction of exotic species; and
- Increased or prolonged levels of suspended sediment.

5.0 QAES RECOMMENDED MITIGATION MEASURES

5.1 General Mitigation Measures

General measures recommended for construction include the following items:

- Ensure that all necessary approvals, licenses, and permits are in place prior to commencement of any construction activities.
- Review and understand all mitigations and regulatory requirements.
- Schedule activity during low sensitivity periods outside of the RAP. Construction should halt during rain events that significantly increase erosion or sedimentation.
- Have controls in place to avoid the release of deleterious substances. Machines should be cleaned, fueled and maintained at least 100 m from the watercourse. Equipment may be fueled within the 100 m buffer upon the approval of an Environmental Inspector. Equipment to be fueled within the 100 m buffer must have secondary containment as approved by an Environmental Inspector.
- Use bio-friendly hydraulic fluids in equipment used adjacent to the watercourse.
- Prevent the spread of aquatic invasive species and diseases (e.g., Whirling Disease) by decontaminating all equipment which comes in contact with the watercourse. AEP places Michichi Creek in the White Zone for risk of the spread of Whirling disease (AEPa 2020). Equipment should at minimum be cleaned of all organic debris, drained of all water and dried thoroughly prior to the Project commencement and before the equipment leaves site.
- Runoff through or around the work area should be managed so that returning water leaving site meets or is lower than turbidity levels of the receiving watercourse.
- Noxious weeds on site should be identified and measures to control their spread via equipment should be in place.
- Any spoil or waste material removed from site should be stored above the high-water mark and stabilized to prevent sedimentation into the water body.
- Watercourse specific spill kit and safety equipment shall be placed on site during any construction work.

- In the event that Michichi Creek has flow at the time of construction, instream areas to be augmented will need to be isolated and dewatered. This requires a fish salvage to be conducted to relocate any fish in the isolation to a safe location downstream. The water diverted around the isolation should maintain flow conditions downstream of the work area at all times during instream work. Pump outlets should be placed so that the water returning to the creek does not scour out the discharge area or suspend sediment.

5.2 Erosion and Sediment Control (ESC)

Disturbance in the channel and riparian area is likely to affect the movement of sediment within the work area. Measures should be taken to limit the amount of sediment such as clay, sand or silt that reaches the watercourse; such measures include the following:

- ESC shall be in place to protect any access points or temporary storage locations as well as the specific work site
- Ensure no ditch drains directly into a watercourse without proper sediment control devices.
- Inspect and clean silt fences on a regular basis, especially after heavy rainfalls.
- Install temporary ESC measures (*e.g.*, straw wattles, geotextile fabric, silt fence, *etc.*) where the potential exists for soil erosion and sediment mobilization (*i.e.*, unvegetated areas near the watercourse).
- Any water pumped from the stream should be discharged to a vegetated area where it can re-enter the channel after filtering through the riparian area.

5.3 Accidental Spill/Release Response

If any deleterious substance (fuel, lubricant, antifreeze, *etc.*) are accidentally released into the waterbody or surrounding riparian area, immediate actions must be taken by the contractor to limit further release and spread of the substance. All releases are to be reported immediately to Alberta Environment and Parks (AEP) (Spill Reporting Line: 1-800-222-6514) as well as the Department of Fisheries and Oceans (Emergency Response Line :1-800-889-8852). Additional measures to be taken include the following items:

- A Spill Response Plan (SRP) should be designed by the contractor to be implemented in the event of a release.
- All equipment should be in working order and free of leaks.
- Contractor staff should be trained in the safe fueling and maintenance of equipment used, as well as having an understanding of the SRP.
- An area outside of a 100 m buffer surrounding the watercourse should be identified for equipment refueling, maintenance and storage.
- All fueled generators, pumps, and light units to be used in the work area are to have secondary containment measures.
- Onsite there should be spill kits, drip trays, and appropriate containers for the disposal of contaminated materials.

5.4 Bank Stabilization

The re-aligned creek channel must have its banks stabilized to prevent excessive erosion and sedimentation. Bank stabilization recommendations include the following:

- Armoring of the banks should be done using rock that is clean, primarily angular, and of sufficient size to resist being washed out.
- Biodegradable geotextiles are to be used to hold bank soil in place until it is established with vegetation.
- Materials used to stabilize the bank must be free of asphalt or other deleterious substances.

5.5 Channel Re-alignment and Reclamation

The construction plan includes the re-alignment of a section of Michichi Creek. The bank will be structured according to engineering specifications in the Project design plan (Appendix B). This presents opportunity to design the new channel with features that are more conducive to aquatic life and create opportunity for fish species that could inhabit Michichi Creek. The habitat assessment showed the creek characteristics and fish habitat to be of poor quality for a number of reasons. These deficiencies can be improved upon in several ways to benefit fish which may include:

- The new channel's eccentricity can be augmented. This re-establishment adds curves and character to the stream to increase its effective length within the work area and to provide variable hydrologic conditions.
- The materials chosen to construct the bed of the re-aligned channel should be of a wide size range from gravel to boulder. The variation in substrate creates a heterogeneous environment of interstitial space suitable for multiple species.
- Boulders, cobbles and coarse woody debris can be introduced to the channel to provide cover, variation in flow conditions, and microhabitats for fish and invertebrates.
- A variety of gravel sizes and small woody debris can be added to the bed to increase the quality of habitat for spawning and rearing fish as well as invertebrates.
- The grade and hydrography of the re-aligned channel can be changed to allow the formation of riffles and runs as well as overwintering pools. The grade and hydrography should be evaluated, and recommendations acquired from a Professional Engineer as a part of a detailed Care of Water Plan for the proposed project.
- Riparian vegetation along the banks of the channel can be planted to increase bank stability and provide solar protection for the creek.
- The concrete municipal sewage structure identified as a barrier to fish passage can be replaced with a below ground or alternative out-of-stream options that do not interfere with the stream.

5.6 Construction Risk Analysis

The risk to the aquatic environment is based upon the sensitivity of the habitat and the proposed construction activities. Based upon observations of multiple barriers to fish passage and lack of overwintering habitat within the proposed work area in Michichi Creek, the habitat quality is considered poor. The instream work of the proposed Project poses the most risk to the aquatic environment. As such, instream construction below the high-water mark should be reserved for a time outside of the RAP. While the presence of fish at the time of survey in Michichi Creek was limited due to the presence of fish barriers and low water, high water events during freshet and times of high precipitation may increase connectivity of the creek and re-establish its connection to the Red Deer River.

Due to the lack of flow and overwintering pools in the channel, presence of barriers to fish passage, and low aquatic habitat quality, it is the opinion of CCI that the risk posed to aquatic habitat in Michichi Creek resulting from construction activities is classified as low to Nil. If instream construction occurs outside of the RAP and suitable precautions are taken to prevent the release of deleterious substances and sediment into the watercourse, the risk to the aquatic habitat and fish is minimal. If the re-aligned channel is constructed with the recommendations of this report, the fish habitat quality may be increased allowing an increase in the potential productivity of Michichi Creek.

6.0 REGULATORY REQUIREMENTS

6.1 Water Act

Pursuant to Section 36 of the *Water Act*, activities that may impact waterbodies, regardless of ownership, and the aquatic environment, require an approval unless otherwise authorized by the *Water Act*. Activities requiring a water act approval include placing construction works within a waterbody; erosion protection; draining a waterbody; removing or disturbing ground and/or vegetation within the bed and shore that results in altering the flow, level, direction and/or location of a water; and channel re-alignment. A Water Act approval is required for the Project due to the permanently altered state of the channel.

6.2 Fisheries Act

Pursuant to fish and fish habitat protection provisions of the Fisheries Act, the death of fish (Section 34.4 [1]) and the Harmful Alteration, Disruption and Destruction (HADD) of fish habitat (Section 35[1]) is prohibited. The fish and fish habitat protection provisions of the Fisheries Act applies to all waters that are frequented by fish (whether part of a fishery or not), and required to maintain their life cycles (*i.e.*, spawning, feeding, rearing, overwintering). DFO has released standards and guidelines, including interim codes of practices for certain activities which do not require review. The code of practice for end-of-pipe fish protection screens for small water intakes in freshwater will apply to Project activities involving the pumping of water from the watercourse (DFOb 2020). As the permanent re-alignment of a watercourse is not specifically covered by the codes of practice, a DFO review of the Project is required. The submission to DFO should clearly indicate what mitigation and preventative measures will be in place to prevent the death of fish and the Harmful Alteration, Disruption, or Destruction of fish habitat.

6.3 Species at Risk Act (SARA)

SARA is in place to protect species and critical habitat sensitive to human impact. Species included under Schedule 1 are established by the Federal Cabinet and are based on recommendations by COSEWIC and consultation with government, Aboriginal peoples, stakeholders, and the Canadian public. SARA applies to federal lands; however, it also applies to other lands when provincial protection is deemed inadequate by the Federal Minister of the Environment. Of the species known to exist in the area (see Table 3, p. 5), no fish are listed as at risk under Schedule 1 of the SARA. Furthermore, this section of the watercourse is not identified as critical habitat for any species at risk.

6.4 Public Lands Act

The *Public Lands Act* regulates various public land uses (e.g., land dispositions), sale and purchase of and, declaration of waterbodies as being owned by the Crown (GOA 2022). The Crown can claim the bed and shore of permanent waterbodies (e.g., wetlands, creeks, and drainage channels) found on a given property. Approvals under this Act are required for shoreline modifications and encroachments on bed and shore. A disposition may be required for the re-alignment of Michichi Creek.

6.5 Canadian Navigable Waters Act (CNWA)

The CNWA provides for the protection of navigation on all public navigable waterways in Canada through the *Navigation Protection Program* (GOC 2019). Regulatory approval is required in scheduled navigable waters where the works risk a substantial interference with navigability. Scheduled navigable waters are included in the List of Scheduled Waters under the CNWA. For works in non-scheduled waterways, owners of the works may opt-in for a review under the CNWA. Non-scheduled waterways are still protected under the CNWA and could be subject to court proceedings if the works interfere with navigation. At the time of survey, Michichi Creek was not considered navigable and was a non-scheduled waterway; therefore, regulatory approval under the CNWA will not be required (AEPa 2020).

7.0 CLOSURE

CCI has prepared this report for the exclusive use of Kerr Wood Ledial, using accepted aquatic assessment techniques at the time of this report. The material contained in this report reflects CCI's professional judgment considering all available information at the time of preparation. Any use which a third party makes of this report or any reliance on, or decisions to be based on this report, are the responsibility of such third parties. CCI accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Prepared by:

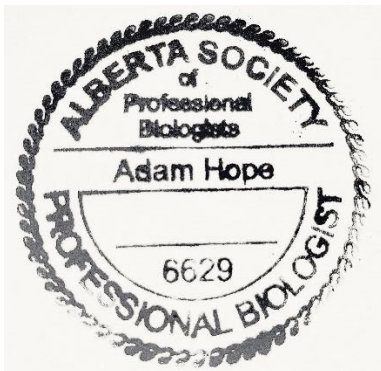


Adam Hope, P. Biol
Environmental Planner, Fisheries Biologist

Approved by:



Jon Boyle, P. Ag.
Planning and Permitting Manager



8.0 REFERENCES

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- [AEPb] Alberta Environment and Parks. 2020. *Decontamination Protocol for Work in or Near Water* [Online]. Accessed October 19, 2022 from: <https://open.alberta.ca/dataset/9b126cfd-b637-4dd2-838e-b43d12c8993a/resource/d89b106e-af61-4858-a991-12caadd0869d/download/aep-decontamination-protocol-for-work-in-or-near-water.pdf>.
- [AEPc] Alberta Environment and Parks. 2006. *Water Act Brooks Management Area Codes of Practice Map* [Online]. Accessed October 19, 2022 from: <https://open.alberta.ca/dataset/1bdbc003-75a0-41dc-b33d-099c5bc536ad/resource/8e470b78-8eb9-496d-bbfc-8a359c821cec/download/2478000-2006-brooks-code-practice.pdf>
- [DFOa] Department of Fisheries and Oceans. 2019. *Measures to protect fish and fish habitat*. [Online]. Accessed October 30, 2022 from: <https://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures-eng.html>.
- [DFOb] Department of Fisheries and Oceans. 2020. *Interim code of practice: End-of-pipe fish protection screens for small water intakes in freshwater* [Online]. Accessed October 30, 2022 from: <https://www.dfo-mpo.gc.ca/pnw-ppe/codes/screen-ecran-eng.html>
- [GOA] Government of Alberta. 2022. *Public Lands Act*. Accessed October 30, 2022 from: https://www.kings-printer.alberta.ca/570.cfm?frm_isbn=9780779832330&search_by=link
- [GOC] Government of Canada. 2019. *Navigation Protection Program* from Transport Canada. [Online] Accessed October 30, 2022 from: <https://tc.canada.ca/en/programs/navigation-protection-program/navigation-protection-program>

APPENDIX A Species Summary Report

Fish and Wildlife Internet Mapping Tool (FWIMT)

(source database: Fish and Wildlife Management Information System (FWMIS))

Species Summary Report

Report Date: 20-Oct-2022 09:05

Species present within the current extent

Fish Inventory

BURBOT
 EMERALD SHINER
 FLATHEAD CHUB
 GOLDEYE
 LONGNOSE DACE
 LONGNOSE SUCKER
 MINNOW FAMILY
 NORTHERN PIKE
 QUILLBACK
 RIVER SHINER
 SAUGER
 SHORthead REDHORSE
 SUCKER FAMILY
 WALLEYE
 WHITE SUCKER

Wildlife Inventory

LONG-TAILED WEASEL
 PRAIRIE RATTLESNAKE

Stocked Inventory

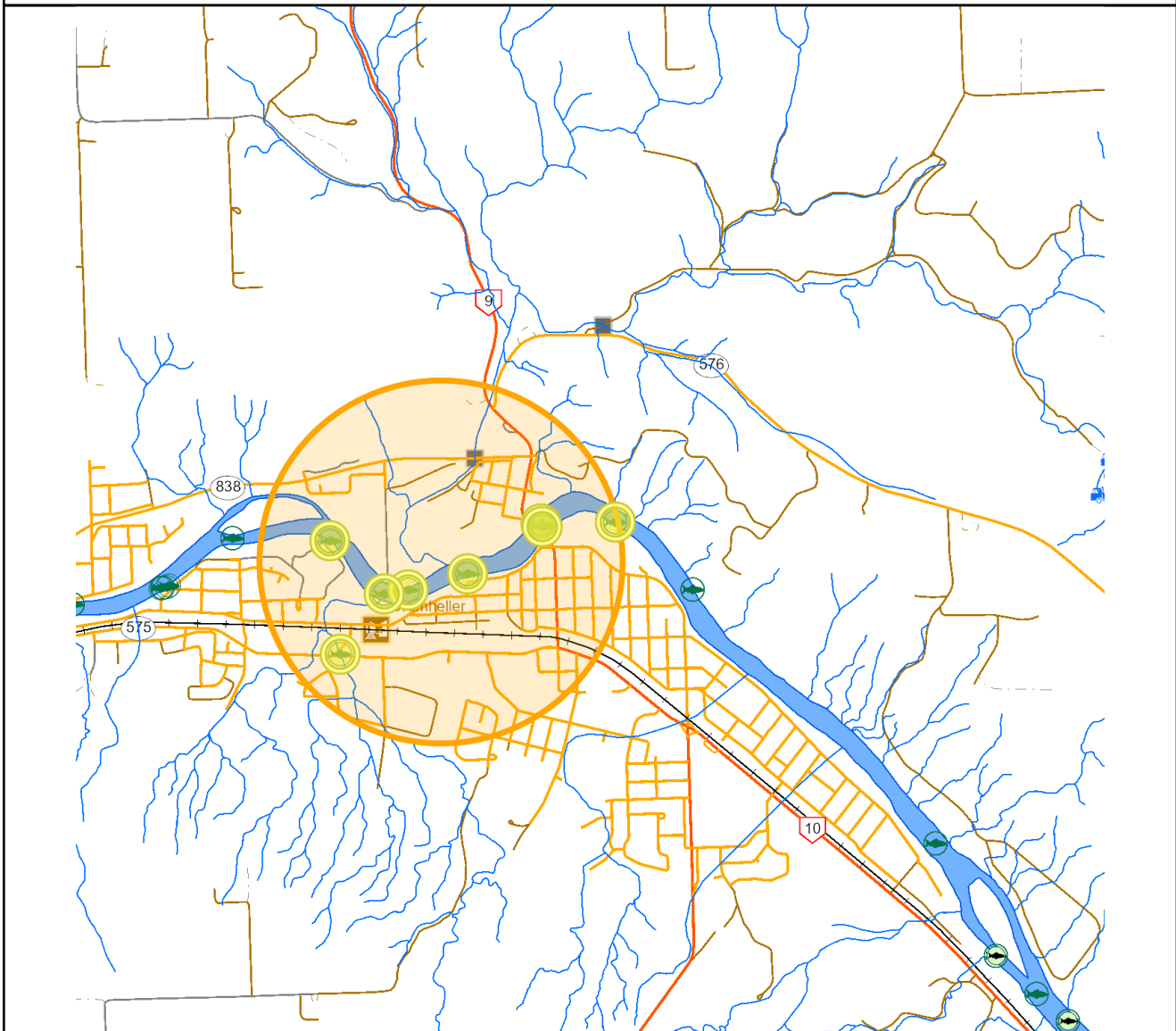
No Species Found in Search Extent

Buffer Extent

Centroid (X,Y)	Projection	Centroid (Qtr Sec Twp Rng Mer)	Radius or Dimensions
658325, 5701872	10-TM AEP Forest	SW 11 29 20 4	1 kilometers

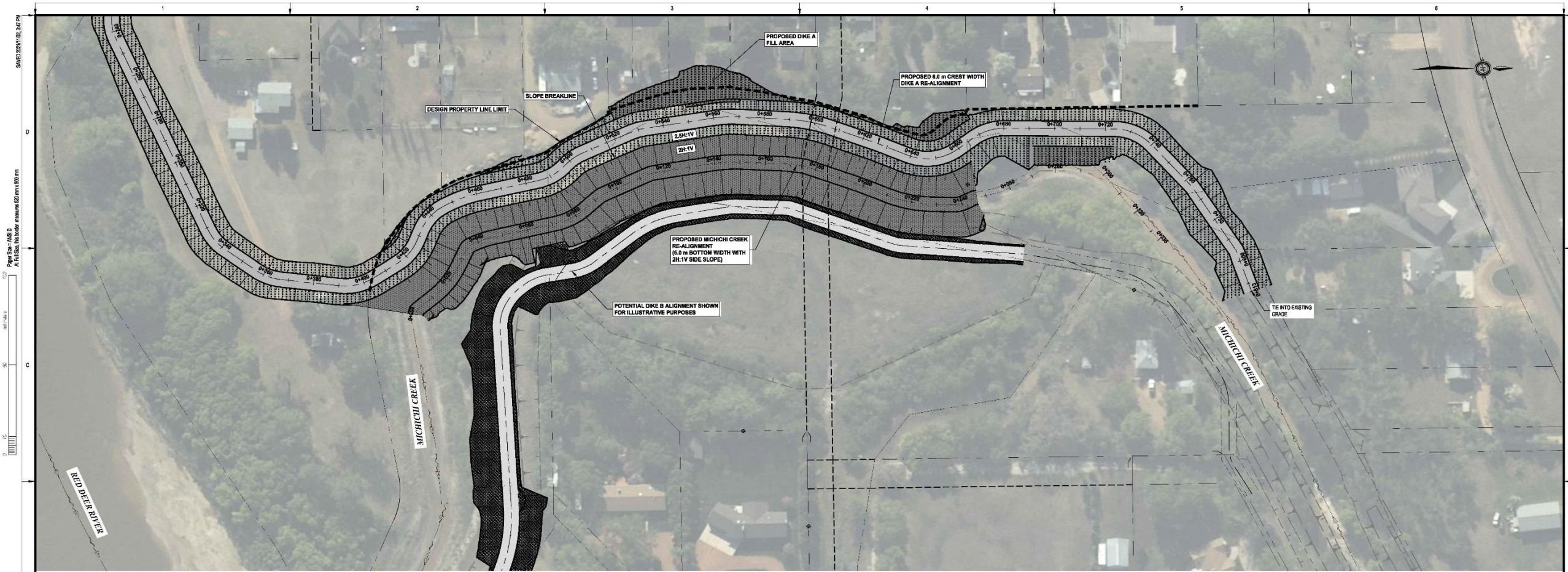
Contact Information

For contact information, please visit:
<https://www.alberta.ca/fisheries-and-wildlife-management-contacts.aspx>



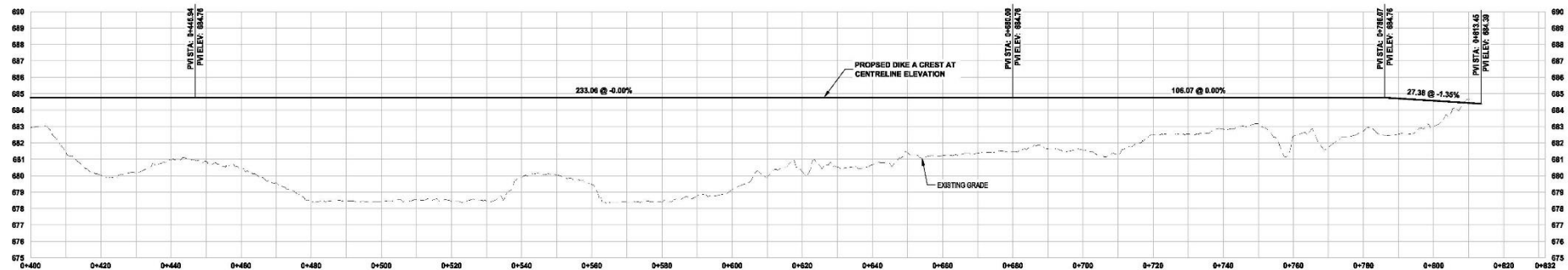
Display may contain: Base Map Data provided by the Government of Alberta under the Alberta Open Government Licence. Cadastral and Dispositions Data provided by Alberta Data Partnerships. (c)GeoEye, all rights reserved. Information as depicted is subject to change, therefore the Government of Alberta assumes no responsibility for discrepancies at time of use

APPENDIX B Construction Plans



MICHICHI CREEK DIKE A PLAN

Scale 1:750



MICHICHI CREEK DIKE A PROFILE

Scale H 1:750 V 1:150



PRELIMINARY
 DO NOT USE FOR CONSTRUCTION

APPENDIX C Featured Images

Date & Time: Thu, Oct 20, 2022, 13:49:50 MDT
Position: +051.465259° / -112.718506° (±35.0m)
Altitude: 683m (±1.9m)
Datum: WGS-84
Azimuth/Bearing: 079° N79E 1404mils True (±14°)
Elevation Angle: -10.0°
Horizon Angle: +00.7°
Zoom: 0.5X
CCI 3236



Plate 1. Confluence of Michichi Creek with the Red Deer River (0m) (October 20, 2022).

Date & Time: Thu, Oct 20, 2022, 13:49:59 MDT
Position: +051.466142° / -112.719181° (±3.5m)
Altitude: 678m (±3.0m)
Datum: WGS-84
Azimuth/Bearing: 299° N61W 5316mils True (±14°)
Elevation Angle: -03.7°
Horizon Angle: -00.2°
Zoom: 0.5X
CCI 3236



Plate 2. View upstream from confluence of Michichi Creek with the Red Deer River (October 20, 2022)



Plate 3. View 50 m upstream of confluence (October 20, 2022)



Plate 4. View downstream at 90 m (October 20, 2022)



Plate 5. View of 100 m transect (October 20, 2022)



Plate 6. View upstream of 100 m transect (October 20, 2022)



Plate 7. View upstream at 200 m transect (October 20, 2022)



Plate 8. View downstream at 200 m transect (October 20, 2022)



Plate 9. View of boulder and silty substrate at approximately 290 m (October 20, 2022)



Plate 10. View of 300 m transect (October 20, 2022)



Plate 11. View upstream of 300 m transect (October 20, 2022).



Plate 12. View of sewage feature approximately 340 m upstream of the confluence (October 20, 2022)



Plate 13. View immediately downstream of sewage feature (October 20, 2022)



Plate 14. View downstream at 400 m transect (October 20, 2022)



Plate 15. View upstream at 450 m transect (October 20, 2022)



Plate 16. View of Alberta Transportation road drainage ditch located approximately 480 m upstream of the confluence, on the west bank of Michichi Creek (October 20, 2022).



Plate 17. View immediately upstream of beaver dam at approximately 500 m (October 20, 2022)



Plate 18. View of 550 m transect (October 20, 2022)



Plate 19. View upstream of 550 m transect (October 20, 2022)



Plate 20. Additional evidence of beaver activity (October 20, 2022)