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Horsefly Regional Emergency Spillway

Impact Assessment Agency of Canada

Detailed Project Description

February 2022

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Abbreviations

%	percent
µg/m^3	micrograms per cubic metre
AAAQG	Alberta Ambient Air Quality Guidelines
AAAQO	Alberta Ambient Air Quality Objectives
AADT	Average Annual Daily Traffic
ACRP	Alberta Community Resiliency Program
ACSW	Alberta Ministry of Culture and Status of Women
AEP	Alberta Environment and Parks
AER	Alberta Energy Regulator
ARIC	Alberta Railway and Irrigation Company
ASL	ambient sound level
AUC	Alberta Utilities Commission
CAAQS	Canadian Ambient Air Quality Standards
CAC	criteria air contaminants
cfu/100 mL	colony forming unit per 100 millilitres
cm^3/s	cubic centimetres per second
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide emissions
CP	Canadian Pacific
dam^3	cubic decametre
dBA	noise decibels adjusted for human hearing threshold
DFO	Fisheries and Oceans Canada
DMAF	Disaster Mitigation and Adaptation Fund

DPD	detailed project description
EA	environmental assessment
ECCC	Environment and Climate Change Canada
ECO Plan	Environmental Construction Operations Plan
EPEA	*Environmental Protection and Enhancement Act*
ESRD	Alberta Environment and Sustainable Resource Development
FTA	Federal Transit Administration
FWMIS	Alberta Fish and Wildlife Information System
GHG	greenhouse gas
H_2O	water vapour
ha	hectare
HADD	harmful alteration, disruption or destruction
HRA	*Historical Resources Act*
HRIA	Historic Resources Impact Assessment
IA	impact assessment
IAA	*Impact Assessment Act*
IAAC	Impact Assessment Agency of Canada
ICIP	Investing in Canada Infrastructure Program
IDA	*Irrigation Districts Act*
IDP	intermunicipal development plans
IPD	initial project description
km	kilometre
LSMOC	Lake St. Martin Outlet Channel
m	metre
M	million
m^3	cubic metre

m^3/s	cubic metre per second
MD	Municipal District
MD of Taber	Municipal District of Taber
mg/L	milligrams per litre
N_2	nitrogen
NO_2	nitrogen dioxide
NO_X	oxides of nitrogen
PAS	Palliser Airshed Society
$PM_{2.5}$	particulate matter
ppb	parts per billion
RAP	restricted activity period
SARA	*Species at Risk Act*
SMRID	St. Mary River Irrigation District
SO_2	sulphur dioxide
SOCC	species of conservation concern
SOMC	species of management concern
SRSMP	Southern Regional Stormwater Management Plan
the Agency	Impact Assessment Agency of Canada
the Air Zone	South Saskatchewan Air Zone
the Project	Horsefly Regional Emergency Spillway Project
TID	Taber Irrigation District
TSP	total suspended particulate matter
VOC	volatile organic compound
W4M	west of the fourth meridian

Preface

The Horsefly Regional Emergency Spillway (the Project, the Horsefly Spillway or the Spillway) is a flood mitigation project. It will use the existing Taber Irrigation District (TID) irrigation infrastructure to divert floodwaters from the area crossed by the St. Mary River Irrigation District (SMRID) Main Canal to the Oldman River in the vicinity of Taber, Alberta. The SMRID Main Canal runs from southwest of Magrath to Medicine Hat, Alberta. During stormwater events, which have occurred in the springs of 2010 and 2011, the SMRID Main Canal could not handle the increased volume of water and the surrounding lands were flooded. The Southern Regional Stormwater Drainage Committee for communities along the south Oldman River drainage basin commissioned the development of a Regional Stormwater Management Plan, completed in 2014. Following further flooding in the springs of 2013, 2014 and 2018, the decision was made that diversion of floodwaters to the Oldman River at a location approximately halfway along the length of the SMRID Main Canal would be the preferred flood mitigation method. The Project was chosen as the most economical and technically feasible alternative to reliably convey stormwater from the SMRID Main Canal to the Oldman River. The Project is being managed by the Municipal District of Taber (MD of Taber).

The TID, established in 1917, operates 138 kilometres (km) of water canals, 213 km of water pipelines and 84 km of water drains. The Project is expanding 14 km of canals and drains of the TID conveyance, a change to 3.2% of the irrigation system.

The Project is being designed to address the volume of water from a 1:100-year flood. In order to divert the desired volume of water, portions of the TID canal system need to be upgraded which involves enlarging the canal and upgrading canal structures and road and railway crossings. It also involves formalizing the last segment of the canal through the coulee that connects to the Oldman River.

Key aspects of the Project include the following:

- The Project is designed for a 1:100-year event, which is equivalent to the 2010 storm event.
- The Project will only be operational during 1:100-year or greater events.
- The Project infrastructure will continue to be used as part of the TID infrastructure, as it currently does, during non-flood events. However, the diversion of water to the Oldman River will not occur.
- The TID infrastructure is a licensed facility that has been operational since the early 20th century.
- Since the TID has to remain operational during the spring and summer months, Project construction will predominantly take place in the fall and winter months after the canals have been drained.
- Project construction will follow standard construction techniques for irrigation systems in southern Alberta. Contractors will be required to have an Environmental Construction Operations (ECO) Plan developed to Alberta Transportation standards and approved by the Project construction manager (MPE Engineering and Stantec Consulting Ltd.) and the MD of Taber.

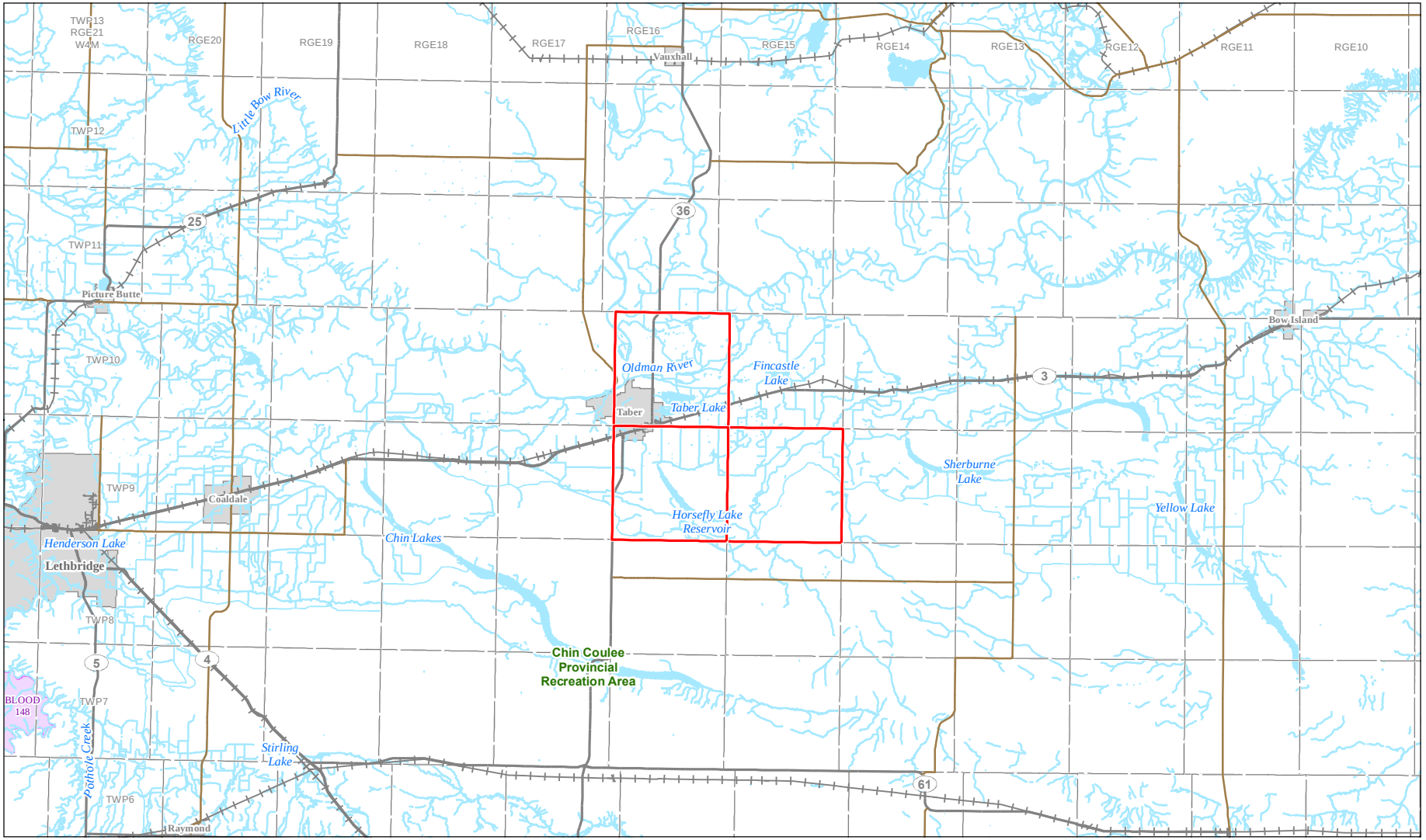
PART A: UPDATED GENERAL INFORMATION

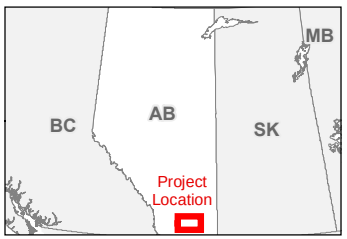
1.0 THE PROJECT'S NAME, TYPE OR SECTOR AND PROPOSED LOCATION

The Municipality of Taber (MD of Taber) is pleased to submit this Detailed Project Description of the Horsefly Regional Emergency Spillway Project (the Project, Horsefly Spillway or Spillway). This Detailed Project Description has been prepared following the Impact Assessment Agency of Canada's (IAAC or the Agency) *Guide to Preparing an Initial Project Description and a Detailed Project Description* (IAAC 2020).

The Project will involve upgrading the existing canal system, owned by the Taber Irrigation District (TID) and St. Mary River Irrigation District (SMRID), to collect flood waters, which would normally flow overland towards the Oldman River. Upgrading the existing canal system will prevent flooding of agricultural lands by diverting the water flow directly to the Oldman River. The general location of the Project is shown in Figure 1.1.

The Project is divided into three phases (Figure 1.2): Phase 1, from Taber Lake to the Oldman River; Phase 2, from Horsefly Reservoir to Taber Lake; and Phase 3, from the SMRID Main Canal to Horsefly Reservoir. Photos of all three Phases of the Project are presented in Appendix A.





- Project Area
- Primary Highway
- Secondary Highway
- Railway
- Watercourse
- Provincial Recreation Area/ Natural Area
- Reserve
- Urban Area
- Township
- Waterbody

N

0 5 10 Kilometres
(At original document size of 8.5x11)
1:500,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 12N
2. Data Sources: AltaLIS, NRCAN, Alberta Parks, GeoLogic, NRN, Alberta Government

MPE Engineering Ltd.

Stantec

Project Location
T9&10N, R15&16W
Town of Taber

Prepared by SL on 2022-01-25
TR by TQ on 2022-01-25
IR Review by JH on 2022-01-25

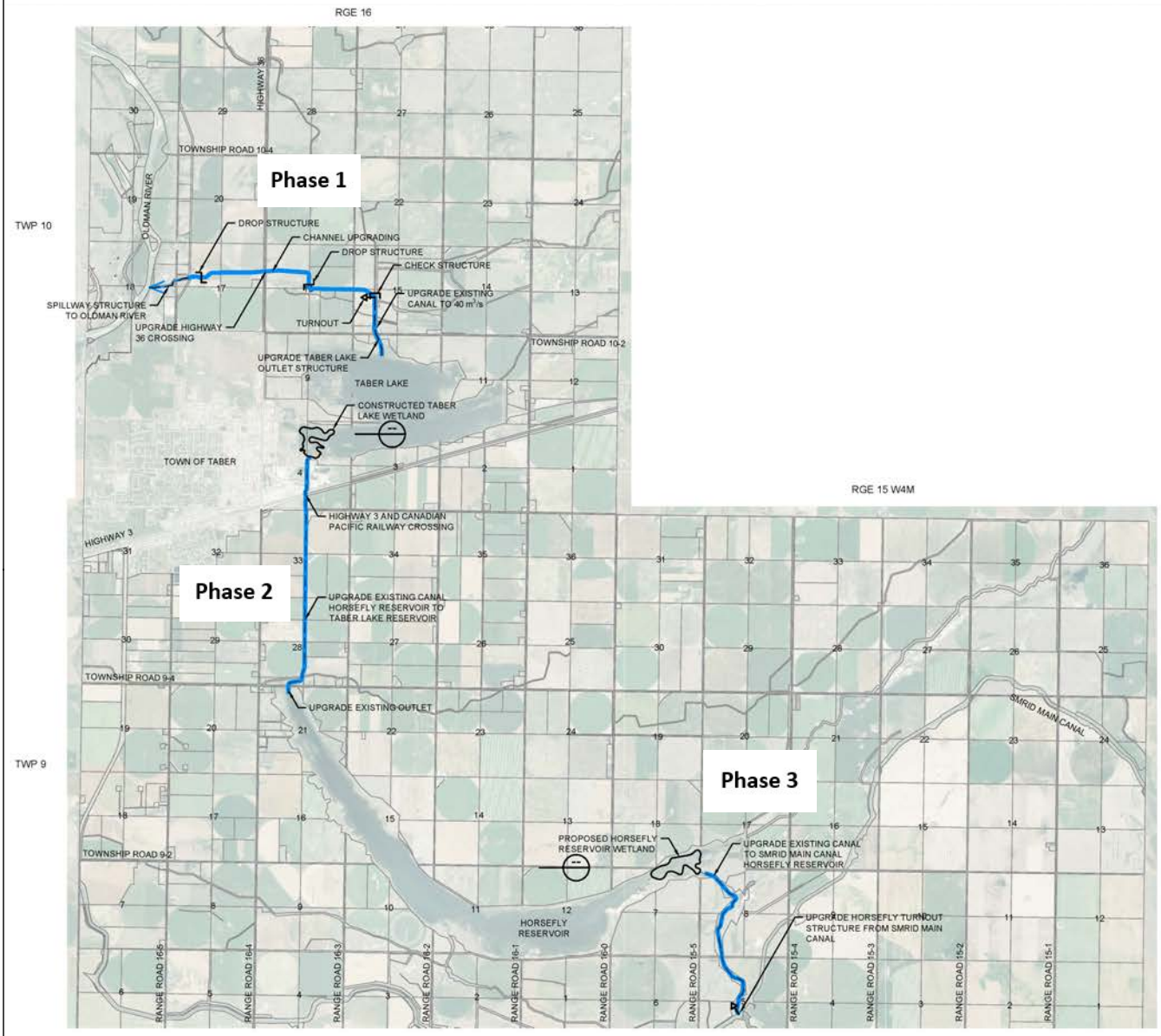
Client/Project
110773806-0001 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway
Report: Detailed Project Description

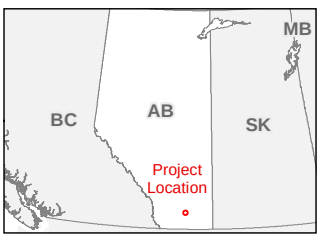
Figure No.
1.1

Title
Horsefly Regional Emergency Spillway Project – Location

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LEGEND

HORSEFLY REGIONAL EMERGENCY SPILLWAY CANAL

Notes

1. Original figure content provided by MPE Engineering Ltd.

Project Location
T9&10N, R15&16W
Town of Taber

Prepared by SL on 2022-01-25
TR by TQ on 2022-01-25
IR Review by JH on 2022-01-25

Client/Project 10773806-0003 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway
Report: Detailed Project Description

Figure No.
1.2

Title
Horsefly Regional Emergency Spillway Project – Project Phases

MPE Engineering Ltd.

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2.0 PROPONENT'S NAME AND CONTACT INFORMATION

Name of Project:	Horsefly Regional Emergency Spillway
Name of Proponent:	MD of Taber
Address of Proponent:	4900B 50th Street Taber, Alberta T1G 1T2
Municipal Administrator:	Mr. Arlos Crofts (403) 223-3541
Website	www.mdtaber.ab.ca
Principal Contact Person:	Mr. Arlos Crofts
Environmental Contact Person:	Mr. Jim Howell, Stantec Consulting Ltd. (403) 629-3741 jim.howell@stantec.com

PART B: PLANNING PHASE RESULTS

3.0 ENGAGEMENT WITH JURISDICTIONS OR AGENCIES

3.1 ENGAGEMMENT WITH FEDERAL AND PROVINCIAL AGENCIES

Federal and provincial agencies that have been consulted regarding the Project are listed in Table 3.1.

Table 3.1 Federal and Provincial Agencies Consulted

Agency	Purpose of Consultation	Outcome/Issues Raised
Federal		
Impact Assessment Agency of Canada	Introduction of Project and clarification of Project classification Ongoing meetings via email and teleconferencing to discuss Project planning	Project was deemed a Designated Project (June 25, 2021)
Fisheries and Oceans Canada (DFO)	Introduction of Project and DFO requirements	Request for Review by DFO in preparation
Infrastructure Canada	Application to Investing in Canada Infrastructure Program (ICIP)	• No *Impact Assessment Act* requirements under Section 82 • Blood Tribe and Métis Nation of Alberta Region 3 contacted • $8.8 million (M) grant received for Phase 1 (October 30, 2020)
	Application to Disaster Mitigation and Adaptation Fund (DMAF)	$9.8 M grant received for Phases 2 and 3 (November 23, 2020)
Provincial		
Alberta Environment and Parks (AEP)	Submission of Project Summary Table and Disclosure Document	Letter deeming that the Project does not require an environmental impact statement (July 14, 2021)
	Application to Alberta Community Resiliency Program (ACRP) TIER fund	• $7.4 M grant for Phase 1 (November 2019) • $12.9 M grant for Phases 2 and 3 (October 2020)
Alberta Culture and Status of Women (ACSW)	Historical Resources Application for Phase 1	• No *Historical Resources Act* requirements for archaeological resources required • Historic Resource Impact Assessment for palaeontological resources required (May 21, 2021)

The MD of Taber, being the proponent, has discussed the Project internally with the members of the Southern Regional Stormwater Drainage Committee since the committee's establishment in 2013. The MD of Taber is the managing partner of the committee, which includes the MD of Taber, and Lethbridge, Forty Mile, Cypress and Warner counties; the City of Medicine Hat, the towns of Taber, Coaldale and Bow Island; the TID and SMRID; and the Alberta government agencies of AEP, Alberta Agriculture and Alberta Transportation. All are supportive of the Project.

The MD of Taber held three public open houses about the Southern Regional Stormwater Management Plan, of which the Horsefly Regional Emergency Spillway Project is a component, in Coaldale, Taber and Medicine Hat in fall 2014. Summaries of the open houses are presented in Appendix B. The attendees were generally in support of the stormwater management plan with the only concern being water quality if water is pumped into the canals. Given the COVID-19 pandemic, a virtual open house is planned for Q1 or Q2 2022, focusing on the Horsefly component of the overall stormwater management plan.

3.2 RESPONSE TO THE SUMMARY OF ISSUES

The Initial Project Description (IPD) was posted on the Agency's website on November 8, 2021. The Agency invited public comments on the Summary of the IPD and also solicited comments from federal authorities. Comments were received from eight federal authorities, Alberta Environment and Parks, and two Indigenous groups. The Agency hosted two virtual information sessions on the Project on November 16 and 18, 2021. There was only one attendee to the sessions and the participant enquired about the construction schedule, A Summary of Issues on comments received on the IPD was posted on the Agency's website on December 8, 2021. Responses to the issues raised are incorporated into the Detailed Project Description (DPD) and summarized in Appendix C.

4.0 ENGAGEMENT WITH INDIGENOUS GROUPS

The communication tracking list of engagement with Indigenous groups and minutes of all meetings with the groups are included in Appendix D1 and D2.

As directed by Infrastructure Canada in their October 30, 2020, letter (Appendix E1), the MD of Taber has contacted the Blood Tribe/Kainai First Nation and the Métis Nation of Alberta Region 3 and provided information on Phase 1 of the Project. The Project notification letters are included in Appendix D3.

In discussions, the Métis Nation of Alberta Region 3 indicated that the area along the Canadian Pacific (CP) rail tracks would be the most likely to have artifacts and that if anything was found, ACSW should be informed. A letter from Métis Nation of Alberta Region 3 stating that they have no outstanding concerns with Phase 1 of the Project is included in Appendix D3.

A virtual meeting with Mike Oka, Consultation Coordinator of the Blood Tribe/Kainai First Nation was held on June 30, 2021. Mr. Oka expressed the interest of the Tribe in being notified of any chance artifact finds during construction and requested a copy of the Palaeontology HRIA when completed. Mr. Oka will contact ACSW for the report. The Tribe would like the chance to bid on contractor work for the Project. On July 15, 2021, members of the Blood Tribe/Kainai First Nation visited the Project site with members of the Project study team, focusing primarily on Phase 1. The Blood Tribe expressed no concerns with the Project at that meeting. On November 4, 2021, members of the Blood Tribe/Kainai First Nation together with members of the Siksika Nation visited all three phases of the Project site with members of the Project study team. The Blood Tribe/Kainai First Nation again expressed their interest of being notified of any artifact finds. They also expressed concern on the quality of water being discharged to the Oldman River when the Project is in use. Following the site visit, the Blood Tribe/Kainai First Nation stated they have no objections to the Project and indicated they will provide a letter stating so to MPE Engineering (MPE). A letter has not yet been received.

As suggested by IAAC, the following additional Indigenous groups were contacted by letter on July 21, 2021, describing the Project:

- Treaty 6
  - Samson Cree Nation
  - Louis Bull Tribe
  - Montana First Nation
  - Ermineskin Cree Nation
- Treaty 7
  - Stoney Nakoda Nations (Bearspaw, Chiniki, Wesley)
  - Tsuut'ina Nation
  - Siksika Nation
  - Piikani Nation
- Non-Treaty Nations
  - Foothills Ojibway First Nation

A virtual meeting with Samson Cree Nation was held on September 15, 2021. They expressed concerns about cutthroat trout in the Oldman River but were satisfied that mitigation would address these concerns. The Samson Cree Nation indicated that they have no objections to the Project and would forward a letter of their approval to MPE. A letter has not yet been received.

A virtual meeting was held with Ermineskin Cree Nation on September 22, 2021. They requested a site visit and expressed concern regarding effects on traditional plants and the presence of archaeological sites. On October 15, 2021, members of the Erminskin Cree Nation visited all three phases of the Project with members of the Project study team. The Erminskin Cree Nation expressed concern with effects of the quality of the water entering the Oldman River and the effects of the abandoned landfill on the north side of the coulee. The Erminskin Cree Nation stated that they have various partnerships with other

companies and would like the opportunity to be included in the tendering process of the Project and are interested in being involved in the wetland design process. They stated they had no objections to the Project. They said they would meet internally to discuss the findings of the site visit and would report back once they had received the minutes of the meeting. Minutes of the meeting 'were emailed to the Ermineskin Cree Nation on October 20, 2021. A letter has not yet been received.

Members of the Siksika Nation visited all three phases of the Project with members of the Project study team on November 4, 2021. They mentioned a desire to be notified of any artifact finds during construction and expressed a concern on Project effects on water quality in the Oldman River during flood operations. They also stated that they would like to be included in tendering opportunities for construction. Following the site visit, the Siksika Nation stated they have no objections to the Project and indicated they will provide a letter stating so to MPE. A letter has not yet been received.

The Tsuut'ina Nation sent a letter to MPE with their concerns with the Project on November 29, 2021. Their concerns included effects on water and fish, archaeological finds, medicinal plants, and climate change. Their letter and the Project team's response on December 3, 2021, are included in Appendix D3.

As of February 7, 2022, the only other comments received on the Project from Indigenous groups was a submission to the IAAC by the Piikani Nation. The Project team has responded to the Piikani Nation on January 25, 2022 and the response is included in Appendix D3.

As of February 7, 2022, the only letter expressing their position on the Project was the one received from the Métis Nation of Alberta, Region 3. The Louis Tribe has sent an email stating that they are not able to engage in the Project but that they are confident that the Nations of Treaty 7 and the Métis Nation of Alberta, Region 3 will raise concerns similar to theirs.

The MD of Taber will continue to respond to any enquiries from the Indigenous groups.

5.0 REGIONAL ASSESSMENTS AND RELEVANT ENVIRONMENTAL STUDIES

There are no known regional assessments under sections 92 or 93 of the *Act* of the area in which the Project is located. There have been several projects in southern Alberta for which environmental studies have been carried out, some of which have study areas that overlap with those of the Project. Some environmental assessments for projects that occur on traditional lands of the Indigenous groups identified in Section 4.0 contain Traditional Land Use studies but these are specific to the projects being assessed. The assessment for the Montana Alberta Tie Ltd. transmission line, which runs west of Taber, included Traditional Land Use studies for the Piikani First Nation and Blood Tribe/Kainai First Nation.

6.0 STRATEGIC ASSESSMENTS

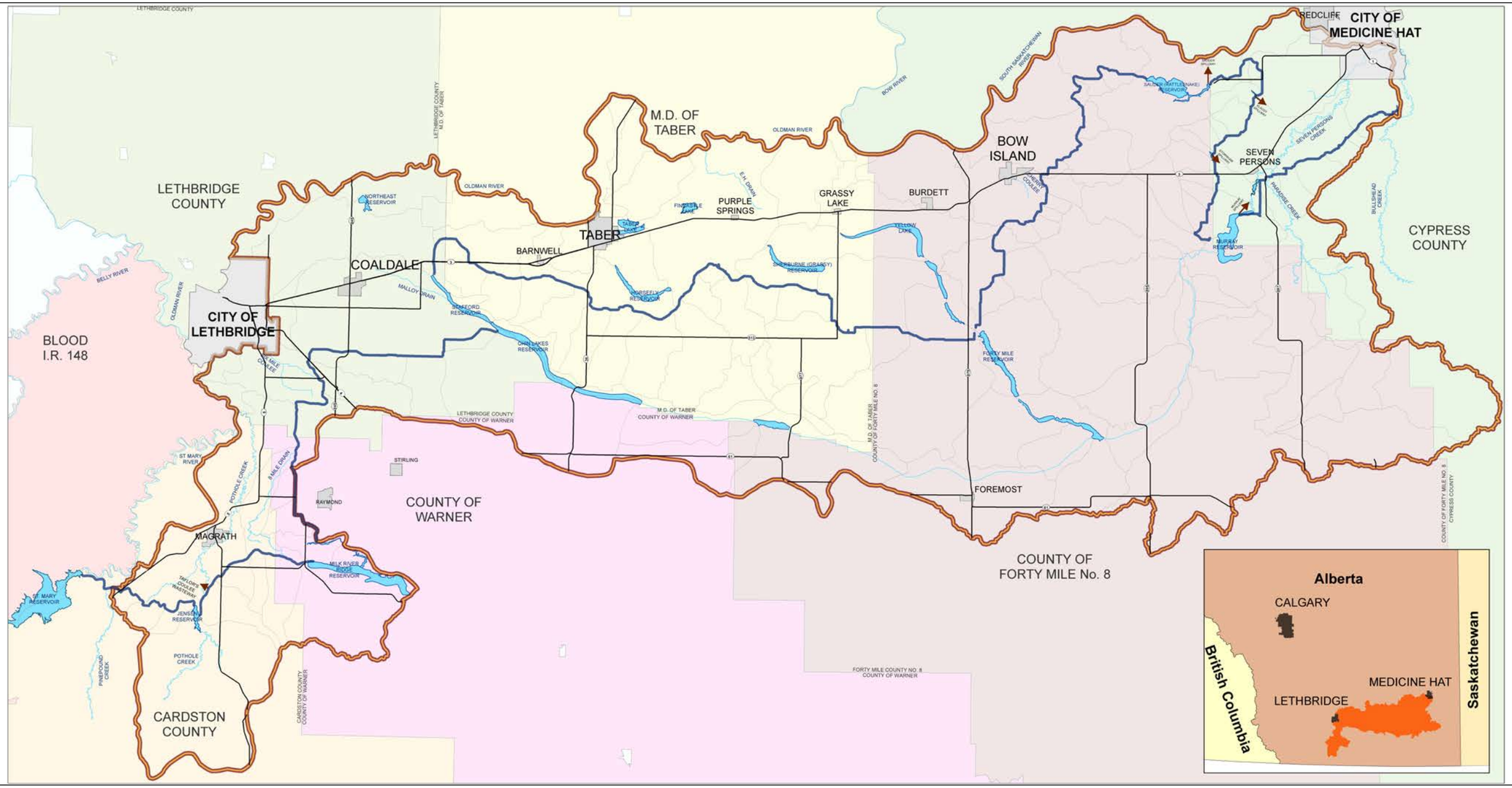
The Strategic Assessment of Climate Change (Government of Canada, 2020) conducted under subsection 95(2) of the *Impact Assessment Act* is applicable to the Project.

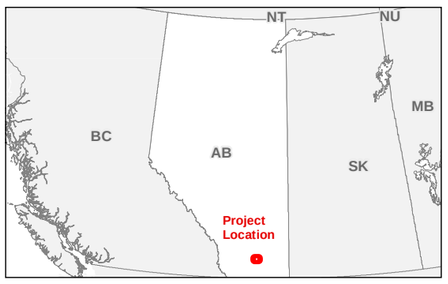
PART C: PROJECT INFORMATION

7.0 PROJECT PURPOSE AND NEED

The Horsefly Regional Emergency Spillway Project is proposed by the Southern Regional Stormwater Drainage Committee to address runoff water associated with extreme weather events in Southern Alberta that drain into existing irrigation infrastructure. During spring runoff, frequent storm events, and/or snow melt events, the irrigation system (which was not designed for drainage) does not adequately handle the volume of runoff water as was experienced during flooding events that occurred in 2010, 2011, 2013, 2014 and 2018. A strategically placed regional emergency spillway to the Oldman River from the SMRID Main Canal provides a solution to increase the flood attenuation capacity of the system. The Project is located near the midway point and major capacity reduction point on the 300 km long SMRID Main Canal system.

The SMRID Main Canal is the largest single drainage feature in the region, receiving stormwater runoff from approximately 565,000 hectares (ha) of land from Milk River Ridge in the west to Cypress Hills in the east. The location of the SMRID Main Canal is shown in Figure 7.1. The Main Canal is designed to deliver water primarily to agricultural producers but also provides water to towns, villages, hamlets, and domestic users for potable drinking water as well as water for industrial users. The SMRID canals are a gravity flow irrigation system.





Legend

- SMRID Main Canal
- Lakes & Reservoirs
- Major Rivers & Creeks
- Highways
- Existing Spillways
- Study Area Boundary - Southern Regional Stormwater Management Plan
- Cities & Towns

Notes

1. Original figure content provided by MPE Engineering Ltd.

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Stantec

Project Location
T9&10N, R15&16W
Town of Taber

Prepared by SL on 2022-01-25
TR by JH on 2022-01-25
IR Review by JH on 2022-01-25

Client/Project 110773806 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway
Report: Detailed Project Description

Figure No.
7.1

Title
St. Mary River Irrigation District Main Canal

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8.0 PHYSICAL ACTIVITIES REGULATION

The *Impact Assessment Act* (*IAA)*, administered by the Impact Assessment Agency of Canada (IAAC or the Agency), has two regulations that are most applicable to the Project: the *Physical Activities Regulations* and the *Information and Management of Time Limits Regulations*.

The *Physical Activities Regulations* list the activities and types of projects (designated projects) that require an impact assessment. Section 61 of the Regulations states:

> *61. The expansion of an existing structure for the diversion of water from a natural water body into another natural water body, if the expansion would result in an increase in diversion capacity of 50% or more and a total diversion capacity of 10,000,000 m^3/year or more.*

Both Taber Lake and the Horsefly Reservoir are constructed waterbodies. The Project is designed to allow the diversion of 9,886,882 cubic metres (m^3). This volume of water would pass through the Project in a 1:100-year flood event. The Project would only be operational during a 1:100-year or larger flood event, since the primary purpose of the canals is to provide water for irrigation purposes. For example, Taber Lake through the Big Bend Canal supplies an area of approximately 8,900 ha with approximately 36,856,000 m^3 of water annually. For floods less than a 1:100-year event, the Project from the Big Bend Canal to the Oldman River would not be used.

The *IAA* also includes, in Section 8, that:

> *8. A federal authority must not exercise any power or perform any duty or function conferred on it under any Act of Parliament other than this Act that could permit a designated project to be carried out in whole or in part and must not provide financial assistance to any person for the purpose of enabling that designated project to be carried out, in whole or in part, unless*
>
> *(a) the Agency makes a decision under subsection 16(1) that no impact assessment of the designated project is required and posts that decision on the Internet site; or*
>
> *(b) the decision statement with respect to the designated project that is issued to the proponent of the designated project under section 65 sets out that the effects that are indicated in the report with respect to the impact assessment of that project are in the public interest.*

Section 82 of *IAA* refers to financial assistance for projects on federal lands, however, the Project is not located on federal lands. A letter received from Infrastructure Canada on October 30, 2020 (see Appendix E1), confirms this for Phase 1 and states that there are no requirements for an IA under Section 82.

The Agency has determined that because Taber Lake and the Horsefly Reservoir were constructed on former sloughs (as is typical of reservoirs in southern Alberta), they are considered natural waterbodies. Although the maximum diversion of water to the Oldman River would be 9,886,882 m^3 during a 1:100-year flood or greater and would only occur during such events, floods greater than a 1:100-year flood could result in over 10,000,000 m^3 of water being diverted to the Oldman River. As a result, the Agency has deemed the Project to be a designated physical activity, potentially subject to an IA (see Appendix E2). An Initial Project Description, followed by a Detailed Project Description is required to be prepared and submitted to the Agency for their review to determine whether an IA is required. The IPD was submitted to the Agency on October 29, 2021.This document is the DPD of the Project.

9.0 PROJECT ACTIVITIES AND PHYSICAL WORKS

The Project is a three-phase project to prevent flooding of agricultural lands in the Taber area through the upgrading of the irrigation canal system to divert flood waters to the Oldman River. The Project is divided into three phases: Phase 1, from Taber Lake to the Oldman River; Phase 2, from Horsefly Reservoir to Taber Lake; and Phase 3, from the SMRID Main Canal to Horsefly Reservoir. Preliminary engineering has been completed for Phase 1; preliminary engineering for Phases 2 and 3 is in progress. As typical of irrigation reservoirs in Southern Alberta, both the Horsefly Reservoir and Taber Lake are constructed reservoirs located on former sloughs.

The TID commenced irrigating around Taber in 1919. Construction of Taber Lake as part of the system was started in 1939 but stopped because of World War II. The Prairie Farm Rehabilitation Administration constructed the Horsefly Reservoir in 1954. At that time, the construction of Taber Lake was completed, connecting it to the SMIRD Main Canal and extending irrigation north of the Rogers (now Lantic) sugar beet factory (Lantic Facility). Regular irrigation diversions from the SMRID Main Canal into the Horsefly Reservoir between 2016 and 2021 are shown in Table 9.1.

Table 9.1 Irrigation Diversions from SMRID to the Horsefly Reservoir

Year	Annual Diversions (m^3)
2021	100,851,116
2020	75,670,408
2019	80,529,172
2018	82,922,166
2017	98,284,199
2016	62,629,826

9.1 PROJECT PHASES

The Project activities and physical works are described for each phase.

9.1.1 Phase 1

Phase 1 (Figure 9.1) conveys water from Taber Lake, north and west to the Oldman River. The outlet from Taber Lake will be replaced and the first approximately 800 metres (m) of the existing canal (the Big Bend Lateral) will be enlarged from a capacity of 7.6 m^3/s to 40 m^3/s primarily by widening the canal. At this location, a turnout will direct water into the Big Bend Canal north for irrigation. From the west of the turnout, the next 3,500 m of the system is a constructed earthen drain. The existing drain, which normally carries a small volume of runoff from the adjacent fields, tile drain seepage from Big Bend Canal and leakage through old gates, will be enlarged and widened to carry 40 m^3/s. The final 1,000 m of the canal will consist of enlarging the existing drainage through a natural coulee to the Oldman River. This stretch will include concrete drop structures, a spillway and erosion protection measures.

Phase 1 will require an average of 5 to 10 m of additional right-of-way plus construction access easements. The total additional right of way will cover 5.5 ha; total construction easement will cover 7.44 ha. There will be no increase in the footprint of Taber Lake.

Access may be required to the Oldman River for completion of the spillway. The appropriate permits and authorizations from DFO will be obtained prior to work commencing within the river. All conditions to the permits and authorizations will be adhered to. Three MD of Taber road crossings and a crossing for Highway 36 will also require replacement. A wetland is presently being constructed on the west side of Taber Lake by the Town of Taber. This wetland is intended to collect stormwater from the east side of Taber and filter it before it is disposed of into Taber Lake. The Project will include the construction of an additional wetland at the inlet to Taber Lake to provide additional filtration of water from the canal and runoff into Taber Lake, reduce incoming water velocity to the lake, allowing sediment settling, and create wildlife and migratory bird habitat.

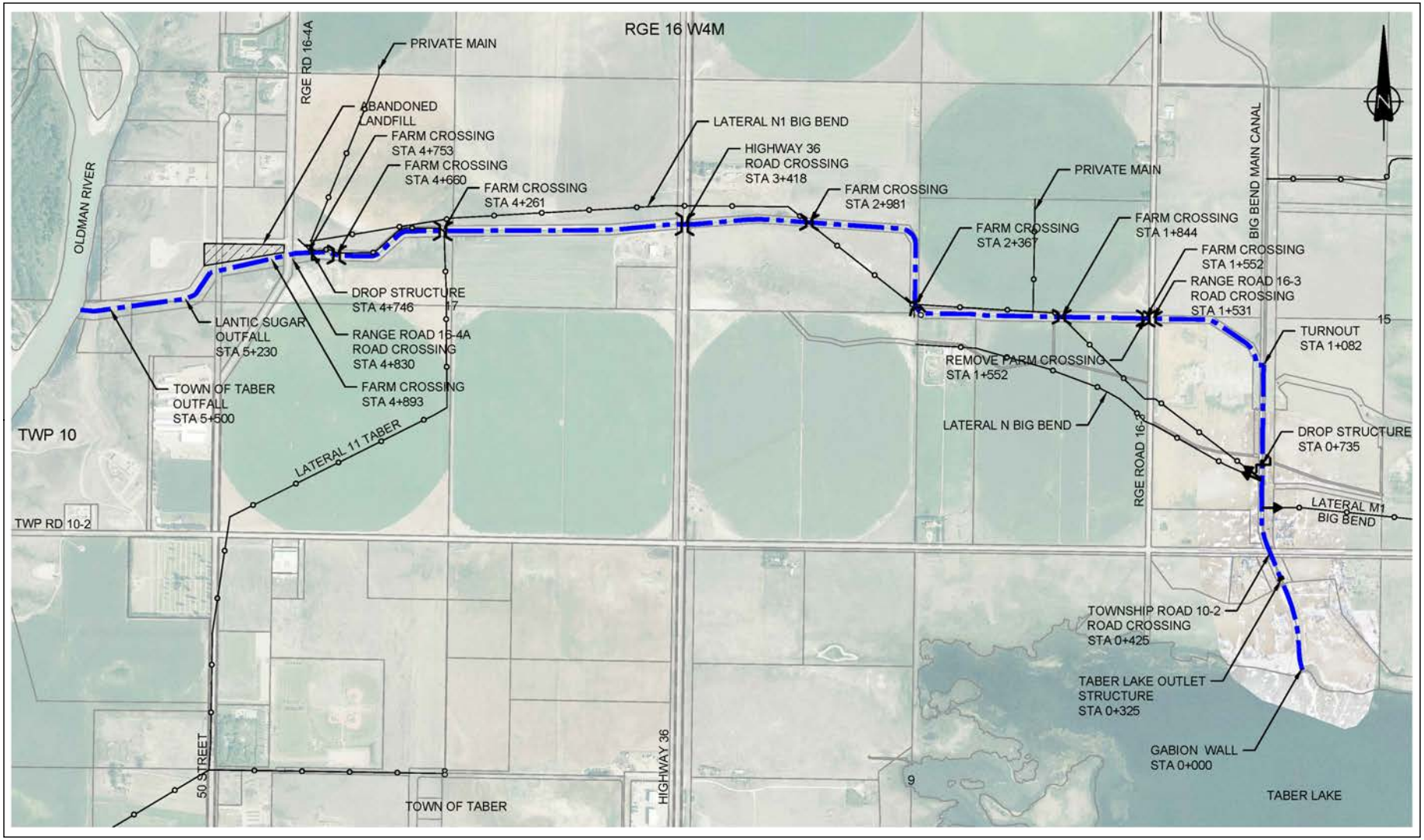
The TID is presently adopting water quality standards for runoff entering their irrigation system from urban municipalities and agricultural land. Implementation of these standards is an ongoing process and will take a number of years to be fully implemented.

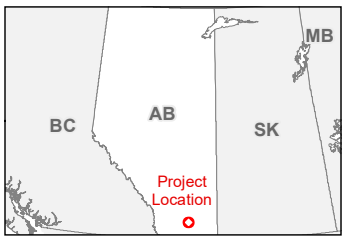
9.1.2 Phase 2

Phase 2 (Figure 9.2) includes enlarging 5,000 m of the existing Lateral 15 canal between Horsefly Reservoir and Taber Lake. The existing canal capacity of 7.1 m^3/s will be increased to 40 m^3/s. Concrete drop structures and two MD of Taber road crossings will need to be replaced to convey the additional flows. The outlet structure from Horsefly Reservoir will need to be replaced as will the crossing of Highway 3 and the CP Railway line. There will be no increase in the footprint of Horsefly Reservoir.

9.1.3 Phase 3

Phase 3 (Figure 9.3) includes replacing the turnout structure on the SMRID Main Canal and enlarging 3,500 m of the SMRID-owned canal that delivers water to Horsefly Reservoir. The existing canal capacity of 28.3 m^3/s will be increased to 40 m^3/s. Drop structures and a MD of Taber road crossing will need to be replaced to convey the additional flow. The existing wetland at Horsefly Reservoir will be expanded and enhanced to improve water quality through the collection of sediment and reducing incoming water velocity to the Reservoir. The constructed wetland will also result in improved wildlife and migratory bird habitat.





LEGEND:
- DROP STRUCTURE
- TURNOUT STRUCTURE
- ROAD CROSSING
- HORSEFLY REGIONAL EMERGENCY SPILLWAY CANAL
- IRRIGATION PIPELINE

Notes
1. Original figure content provided by MPE Engineering Ltd.

Project Location
T9&10N, R15&16W
Town of Taber

Prepared by SL on 2022-01-25
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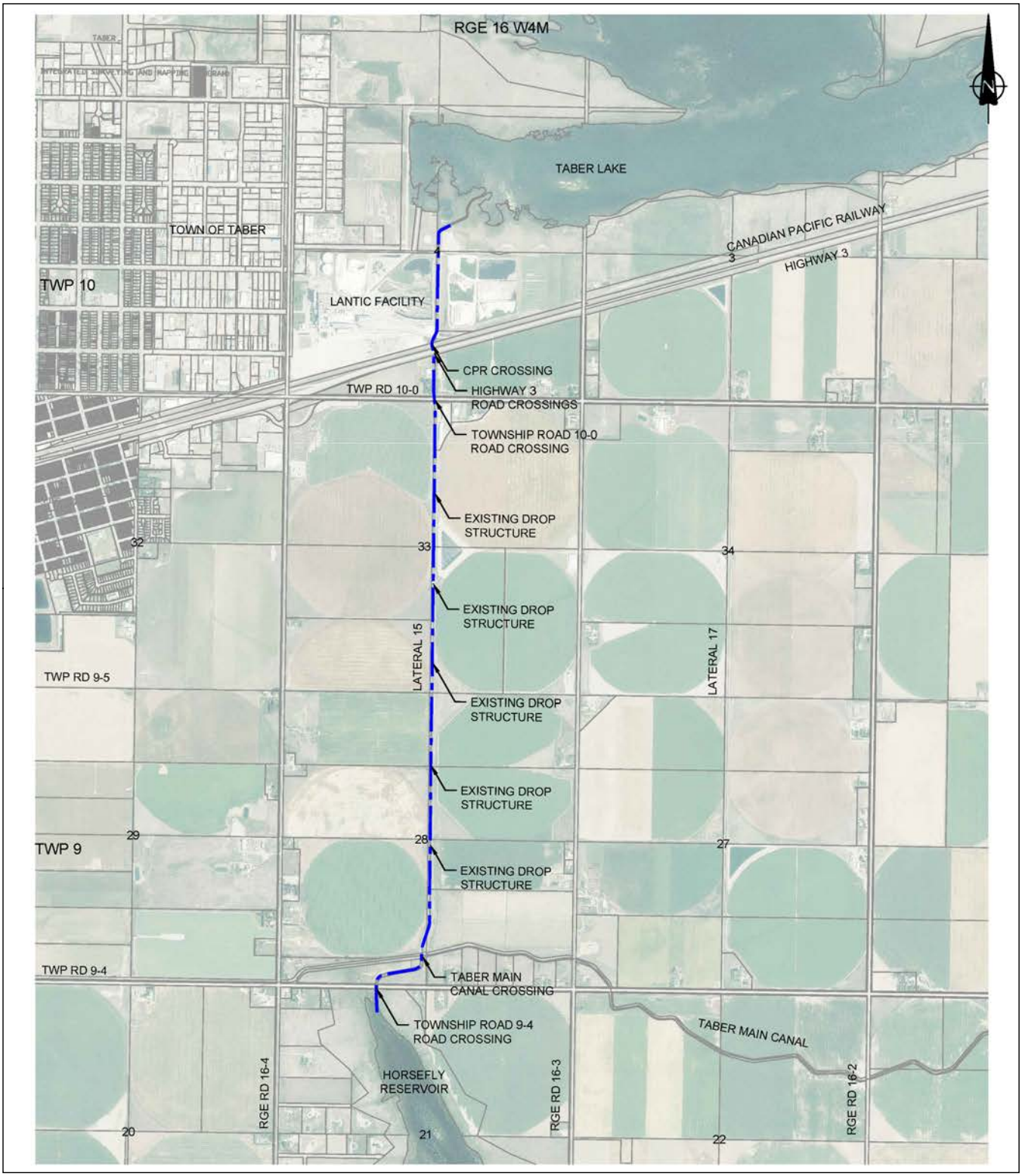
Figure No.
9.1

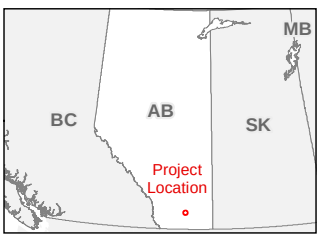
Title
Phase 1 Site Plan

MPE Engineering Ltd.

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LEGEND

HORSEFLY REGIONAL EMERGENCY SPILLWAY CANAL

Notes

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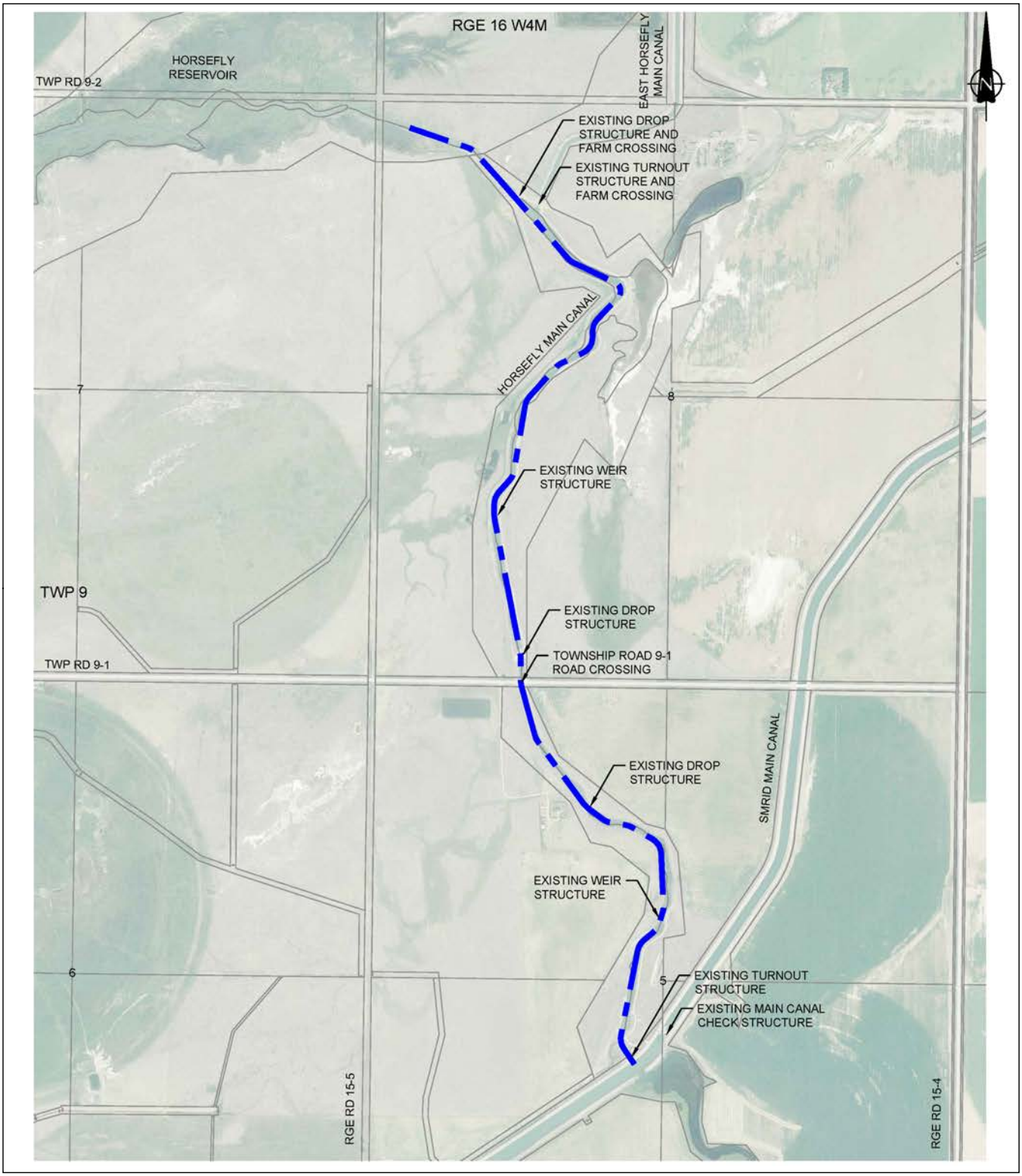
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9.2

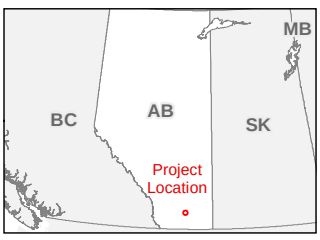
Title
Phase 2 Site Plan

MPE Engineering Ltd.

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LEGEND

HORSEFLY REGIONAL EMERGENCY SPILLWAY CANAL

Notes

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Client/Project 10773806-0003 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway
Report: Detailed Project Description

Figure No.
9.3

Title
Phase 3 Site Plan

MPE Engineering Ltd.

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9.2 DESCRIPTION OF PROJECT ACTIVITIES

Project construction, operation and decommissioning are discussed below.

9.2.1 Construction

Project construction incorporates the existing TID and SMRID infrastructure which must remain in operation from April to October. This results in a large portion of the work needing to be constructed in the winter months. Preliminary engineering has been completed for Phase 1 (MPE and Stantec 2021) and engineering for Phases 2 and 3 will follow a similar design.

Project Construction components are as follows:

- Canal enlargement from the SMRID Main Canal to the Oldman River will include stripping, salvage and stockpiling of topsoil, widening the canal to increase capacity, and replacing culverts at local road crossings, Provincial Highways 36 and 3, and a Canadian Pacific Railway crossing for the increased capacity. The channel will have a trapezoidal cross section with a bottom width between 4.0 and 6.0 m, depth between 2.7 m and 3.0 m, and 2.5H:1V side slopes. The full design capacity of the Spillway will be 40.0 m^3/s. A minimum freeboard of 0.60 m will be maintained during a local 1:100-year storm event while the Spillway is flowing at design capacity. The Spillway will be able to pass 55 m^3/s with no freeboard.
- For Phase 1, the Spillway will be reconstructed in its present location with minor adjustments to the centreline, wherever necessary, to improve general alignment and bank stability, and to otherwise optimize earthwork. Minor adjustments will also be made where existing irrigation equipment is located adjacent to the spillway.
- As the Spillway will only be operated intermittently, there will be no gravel armour erosion protection downstream of the proposed Big Bend Turnout (see Figure 9.1).
- The outside slopes of embankments and other areas within the canal right-of-way will be spread with topsoil, graded, and seeded to grass. All haul roads and any disturbed areas within construction easements will be stripped before the start of construction, spread with topsoil after use and reclaimed by grading and cultivating, and/or seeding to grass.
- There are various concrete structures located on the Big Bend Lateral and the Spillway. These existing structures will be replaced by 1 to 1.5 m and 1 to 3.0 m check/drop structures controlled with electrically operated overshot gates on the Big Bend Lateral and 2 to 2.2 m drop structures on the Spillway.
- The Spillway through the coulee west of Range Road 164A will have a semi natural cross section and riprap will be used to mitigate erosion and stabilize the coulee long term. This more natural look will be less obtrusive than a hard engineering solution such as cast-in-place concrete. The channel will have a cross section 8.0 m wide and 2.0 m deep. Using the existing coulee bed is less obtrusive and more economical than other options.
- Outflow from the Lantic Facility will be diverted around the construction site.

- A cofferdam will be constructed at the confluence of the Spillway and the Oldman River; fish salvage will occur behind the cofferdam.
- Control structures in Phases 2 and 3 are still in the preliminary design phase but all inline control structures will need to be replaced for the increased capacity of the Spillway. Where required, gates will be installed to provide water levels that are high enough to facilitate irrigation during normal operations.
- All road crossings need to be replaced with either corrugated steel pipes, concrete box culverts, or single span bridges. There are three major crossings: Highway 36, Highway 3, and the Canadian Pacific Railway that need to be replaced to accommodate the enlarged capacity.
- To control flows into the Spillway, the turnout structure at the SMRID Main Canal will be replaced with a new cast-in-place concrete structure controlled with gates.
- Wetlands are proposed to be constructed where the Spillway enters Horsefly Reservoir and Taber Lake to enhance the riparian areas. The wetlands are intended to improve water quality of the reservoirs during normal canal operations. The wetlands will have an area of approximately 20-30 ha.
- Control structures will have chain link fencing and the canals will have barbed wire fencing to control access and for safety purposes.
- Reservoir outlet structures will have safety booms and signage in place warning of potential danger. Where recreational activities occur, controlled access will be provided.

Construction traffic will be limited to the rights-of-way and easements obtained for the Project. The entire Spillway will be fenced along the right-of-way boundaries. Texas gates will be installed at all road crossings. Access control gates will be installed where required. Temporary fencing will be installed during construction, if necessary.

Construction will be carried out by contractors hired through a competitive bidding process by the MD of Taber. Contractors will meet MD construction standards and Alberta Transportation standards for water management projects (Government of Alberta 2017).

All contractors are required to have an Environmental Construction Operations (ECO) Plan developed to Alberta Transportation standards and approved by the Project construction manager (MPE and Stantec) and the MD of Taber. The ECO Plan provides information on the contractor’s understanding of potential impacts of their work and mitigation to avoid and mitigate impacts. It includes an erosion and sediment control plan and emergency prevention and response plans. ECO Plans are common for many infrastructure projects in Alberta. The framework of an ECO Plan is included as Appendix F.

Some incidental items related to the construction of the Spillway include the relocation of gas line crossings to accommodate the enlarged spillway, and replacement of irrigation delivery points due to enlargement of the existing canals. Highway 3 twinning is also occurring at the same time as the Project and as such the crossing of the Horsefly Spillway will be accommodated into the Highway design.

Post-construction activities will involve clean-up and restoration of the temporary work laydown areas. The stockpiled soil will be used for reclamation. Construction waste will be collected and disposed of at licensed waste facilities.



9.2.2 Operation

During non-flood conditions, the Project will operate as it currently does as a component of the TID canal system. Water will be delivered to the Big Bend Canal, with no water flowing west of the turnout structure to the Oldman River. Canal maintenance includes mowing of vegetation on the inside banks of the canals for vegetation control.

During 1:100-year event or greater floods, water will be diverted through the Spillway to the Oldman River. The SMRID Main Canal can handle floods up to the 1:100-year event. During a flood event staff from SMRID and TID monitor the inflow coming into the SMRID Main Canal. No water will be diverted to the Horsefly Reservoir until the capacity of the main canal is full. Approximately 40% of flow in the SMRID Main Canal will then be diverted to the Horsefly Reservoir and through the Project to the Oldman River. The Horsefly Spillway will be operated by SMRID and TID staff to confirm that the design operating levels of the Horsefly Reservoir and Taber Lake are not exceeded.

Stormwater will pass through the Horsefly Reservoir over three to four days during a 1:100-year flood event. The existing reservoir has a design storage capacity of 6,374 cubic decametre (dam^3) but is normally operated at a lower water level with a storge capacity of 4,641 dam^3 (a difference of 1,733 dam^3). During a storm event, water volume in the Reservoir will increase by approximately 1,460 dam^3 which is still below the design capacity of the Reservoir. Water will be diverted through the Reservoir to Taber Lake and to the Oldman River.

The design-full supply levels of the Horsefly Reservoir and Taber Lake will not be exceeded during operation of the Horsefly Spillway. If water levels in Taber Lake do rise, flows from the SMRID Main Canal and Horsefly Reservoir will be decreased as required. The Horsefly Spillway is being designed for a capacity of 40 m^3/s but the system has freeboard in it to pass 55 m^3/s.

Timing of water diversion into the Spillway will be based on several factors including the capacity and storage in current irrigation reservoirs, forecasted rainfall and snowmelt conditions, and the condition of the SMRID Main Canal downstream of the Spillway (i.e., ice in the canal). SMRID and TID will be in contact with AEP and the local municipalities during storm events to determine a coordinated operation. For floods greater than the 1:100-year event, water will continue to be diverted with excess water overtopping the canals and flooding the adjacent lands. Spillway operations will require no storage of materials or solid waste production. All gated control structures in the Spillway will be powered by the existing electrical grid system with provisions for portable electrical power in the event of a power outage. All gated control structures will have the capability of being operated remotely.

9.2.3 Decommissioning

The Project components will be part of the TID canal system, which is expected to operate in perpetuity; as such, they are not expected to be decommissioned.

10.0 ESTIMATED MAXIMUM PROJECT CAPACITY

The three phases of the Project and their current and planned capacities are shown in Table 10.1.

Table 10.1 Capacity of Project Phases

Phase	Function	Existing Capacity (m^3/s)	Proposed Capacity (m^3/s)
1	Transfer water from Taber Lake to the Oldman River	7.6*	40
2	Transfer water from Horsefly Reservoir to Taber Lake	7.1	40
3	Transfer water from SMRID Main Canal to the Horsefly Reservoir	28.3	47
NOTE: * Capacity of Big Bend Canal			

The Project would divert water to the Oldman River only during 1:100-year flood events or greater.

Ongoing engineering work on the Project has determined that the system will be designed for a maximum flow of 9,886,882 m^3, which could occur during a 1:100-year flood event.

11.0 PROJECT SCHEDULE

If the Project does not require an Impact Assessment, construction of Phase 1 of the Project is planned to commence in summer 2022 and to be completed by fall 2023. Construction of Phase 2 is scheduled to occur from 2023 to 2025. Construction of Phase 3 is scheduled from 2024 to 2026. Canal enlargement will occur during the non-operational months of the irrigation system, early October to late April. If an Impact Assessment is required, the schedule is expected to be delayed by two years. The Project components are part of the Taber irrigation system, operational since 1919; as such, the Project is expected to operate in perpetuity.

12.0 PROJECT ALTERNATIVES

12.1 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

Major flooding occurred in the south Oldman River drainage basin in 2010 and 2011. After major snow melt and precipitation events, significant damage occurred, including numerous road and culvert washouts, tracts of flooded cropland, stranded residences, and a breach of the Seven Persons Reservoir. As a result, the Regional Drainage Committee for municipalities along this drainage basin commissioned the development of a regional stormwater management plan.

12.1.1 Southern Regional Stormwater Management Plan

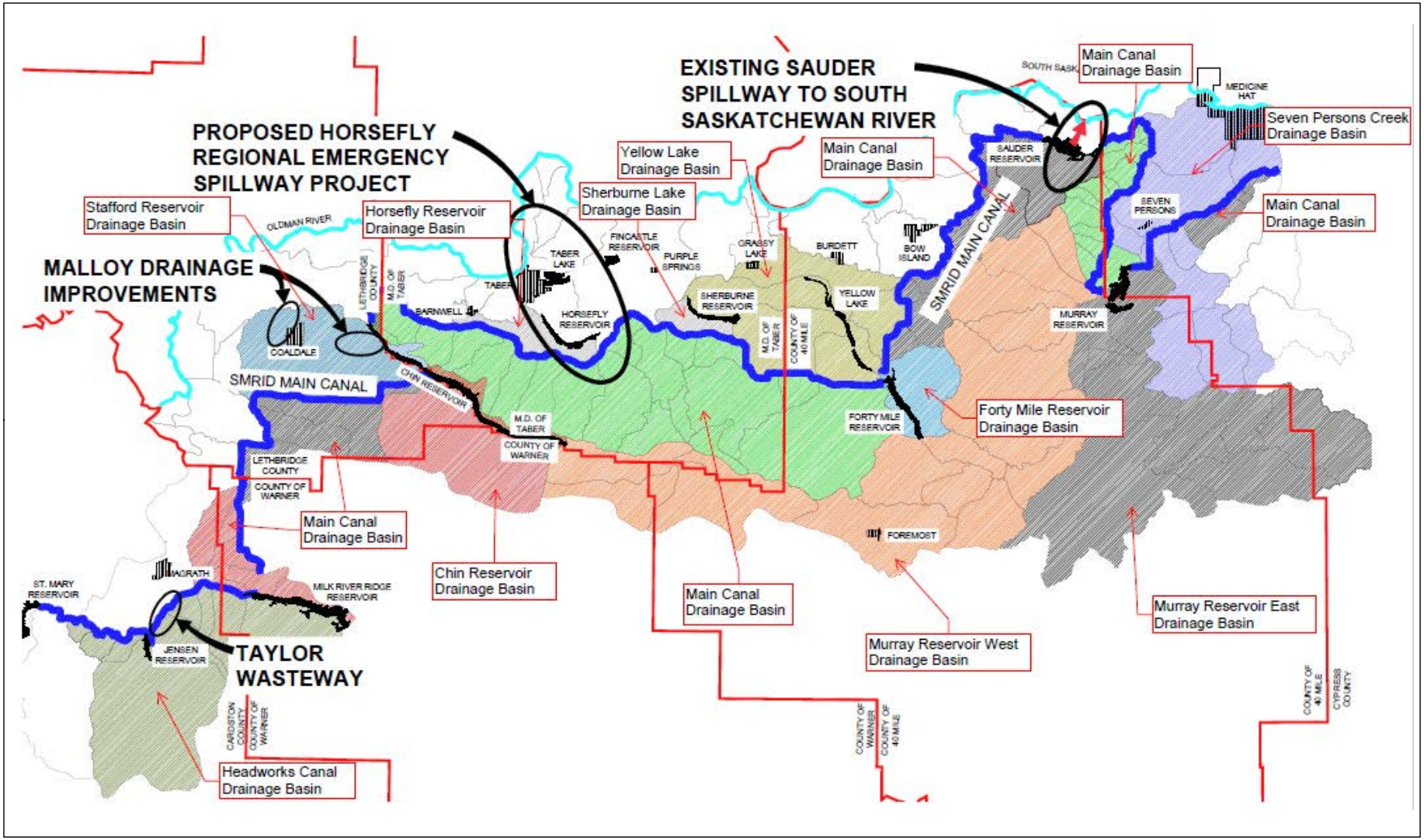
12.1.1.1 Overview

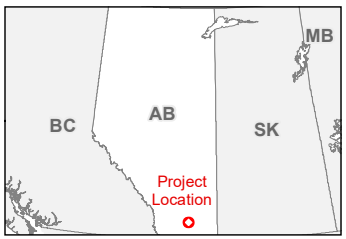
The Southern Regional Stormwater Management Plan (SRSMP) (MPE Engineering Ltd. 2014) examined drainage issues in the south Oldman River drainage basin, focusing on the SMRID Main Canal. Figure 12.1 shows the study area for the SRSMP.

Flood mitigation alternatives along the Main Canal consisted of additional or upgraded diversion spillways and increased reservoir storage.

Modelling was performed to assess the effectiveness of several canal spillway alternatives that divert excess water from the canal, thereby enabling it to accept more runoff where drain inlets are normally closed.

Six hypothetical scenarios under the 1:100-year event were modelled for the SRSMP area along the Main Canal between the Stafford Reservoir and the Seven Persons Creek basin, which flows into South Saskatchewan River at Medicine Hat (Figure 12.1). Table 12.1 describes the options and provides a comparison of their costs and anticipated benefits. All options require the upgrading of the Taylor Wasteway.





Notes

1. Original figure content provided by MPE Engineering Ltd.

Project Location
T9&10N, R15&16W
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Figure No.
12.1

Title
Southern Regional Stormwater Management Plan Study Area

MPE Engineering Ltd.

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Table 12.1 Flood Mitigation Options: Costs and Benefits

Region/Scenario	Cost, ($M)	Description	Benefitted Areas
Stafford to Sauder			
Scenario 1 – Construct sufficient additional storage at Chin Reservoir to capture all Main Canal upstream flow; no discharge from Chin Reservoir during storm			
Scenario 1.1 – Chin Reservoir Expansion and Horsefly Spillway	97	Construct canal spill into Horsefly Reservoir to divert all Main Canal flow at this point.	Trapped low land along canal between Stafford and Sauder; Town of Taber; flooded areas southeast of Taber.
Scenario 1.2 – Chin and Sherburne Reservoir Expansion and Horsefly/Sherburne Spillways	98	Construct equal capacity canal spills into Horsefly and Sherburne (Grassy) Reservoirs to divert all Main Canal flow accumulated up to Sherburne (i.e., zero flow in canal just downstream of Sherburne).	Trapped low land along canal between Stafford and Sauder; Town of Taber; flooded areas southeast of Taber.
Scenario 1.3 – Chin Reservoir Expansion and Chin/Horsefly/ Sherburne Spillways	119	Construct equal capacity canal spills into the Oldman River (downstream of Stafford Reservoir) and into Horsefly Reservoir and utilize existing Sherburne Reservoir supply canal to divert additional spill.	Trapped low land along canal between Stafford and Sauder; Town of Taber; flooded areas southeast of Taber.
Scenario 2 - No additional storage is constructed at Chin Reservoir. Instead, a new spillway is constructed downstream of Stafford Reservoir, diverting all flow in the Main Canal at that point into the Oldman River[1] (i.e., zero flow in Main Canal immediately downstream of this spillway.			
Scenario 2.1 – Chin Spillway and Horsefly Spillway	115	Construct canal spill into Horsefly Reservoir to divert all Main Canal flow at this point.	Trapped low land along canal between Stafford and Sauder; Town of Taber; flooded areas southeast of Taber.
Scenario 2.2 – Chin, Horsefly, and Sherburne Spillways	123	Construct equal capacity canal spills into Horsefly and Sherburne (Grassy) Reservoirs to divert all Main Canal flow accumulated up to Sherburne (i.e., zero flow in canal just downstream of Sherburne).	Trapped low land along canal between Stafford and Sauder; Town of Taber.
Sauder to Murray			
Scenario 3 – Replacement Sauder Spillway	13	Construct a larger capacity spillway at Sauder Reservoir, capable of spilling all of the design storm inflow. Downstream, Klaudt, and Stornham spillways are both used to maximum capacity.	Seven Persons Creek flood plain; small area along canal just west of Murray Reservoir.
Scenario 4 – Secondary Sauder Spillway	11		
Seven Persons Creek Basin			
Scenario 5 – Murray Reservoir expansion	25	Increase storage at Murray Reservoir to maintain spill into Seven Persons at no more than 28 m^3/s.	Seven Persons Creek flood plain.
Scenario 6 – Paradise Creek Dam	13	Construct a dry dam capable of capturing all the run-off during the design event.	Mitigates only portion of Seven Persons Creek flow. Possible beneficial use of water stored at dam.

Table 12.1 Flood Mitigation Options: Costs and Benefits

Region/Scenario	Cost, ($M)	Description	Benefitted Areas
All			
Taylor's Coulee Wasteway	15	Construct wasteway	Frees up capacity in Milk River Ridge and Chin Reservoirs. Constructed in 2019.
Pumped Drain Inlets	2	Pump out drain inlets	Trapped low land behind drain inlets. Approximately 20 sites would significantly benefit. Essential for flood mitigation of trapped lows behind canal drain inlets.
NOTE: [1] Inflows to the Oldman and South Saskatchewan rivers from the SMRID Main Canal will typically be less than 10% of the natural river flow (MPE Engineering Ltd. 2014).			

12.1.1.2 Chosen Flood Mitigation Option

In February and March 2018, severe flooding was experienced from Taber to Bow Island due to snow melt. During this event, the SMRID Main Canal was at capacity at the Horsefly Spillway location causing the canal to be breached at several locations and the adjacent farmland to be flooded. Fortunately, repairs were completed prior to the system being required to deliver water for irrigation. The event demonstrated that the construction of the Horsefly Spillway would allow diversion of water from the Main Canal, freeing up downstream capacity to accept additional runoff. The Project would therefore benefit not only SMRID and TID, but multiple rural and urban communities. The Regional Drainage Committee re-prioritized the flood mitigation projects, placing the Horsefly Regional Emergency Spillway at the top (MPE Engineering Ltd. 2018). Additional rationale for prioritizing the Horsefly Regional Emergency Spillway is it is the shortest route from the SMIRD Main Canal to the Oldman River using existing canals and it is at a significant bottleneck on the SMRID Main Canal, providing a greater amount of flood mitigation than diversions further upstream.

12.1.2 Horsefly Emergency Spillway Alternatives

The design of the Horsefly Spillway is ongoing. Alternates to the Project were considered including a spillway channel to the west of the Town of Taber and increasing storage in the Horsefly Reservoir and Taber Lake to store stormwater. Both alternates were eliminated for the following reasons:

- Routing the Spillway to the west of the Town of Taber requires routing through a large country residential subdivision and establishing a new corridor for the Spillway rather than following an existing canal. Acquiring this land would have been difficult and public opposition was anticipated.
- Increasing the storage in Taber Lake and Horsefly Reservoir is impractical due to their already small size compared to the volume required to be stored. Gaining enough volume was not practicable. The reservoirs are surrounded by urban areas or highly developed agriculture and obtaining land would have been more expensive than the spillway alternative.

Currently the Project is the most economical and technically feasible alternative to reliably convey stormwater from the SMRID Main Canal to the Oldman River.

Alternatives have been considered for the Phase 1 alignment in the coulee and alternatives are being considered for the Phase 2 alignment between Horsefly Reservoir and Taber Lake.

The canal alignment in the coulee considered two primary options. One option would be to route the drain to the north of the coulee and use a concrete chute structure to drop the water to the Oldman River. This option was eliminated early in the design process as the grades to the north of the coulee would require extensive excavation. Ultimately the route through the existing coulee was chosen as it required less excavation and disturbance.

Two options are being considered for the Project alignment between Horsefly Reservoir and Taber Lake. Option 1 retains the existing alignment that crosses the Lantic Facility; Option 2 runs one mile east of Option 1 and avoids the Lantic Facility. Option 2 avoids interaction with the Lantic wastewater ponds and a crossing of the TID main canal; the Canadian Pacific Railway crossing will be simpler with this option. However, it would involve the construction of a new canal. Currently, Option 1 is the preferred routing for Phase 2.

12.2 ALTERNATIVES TO THE PROJECT

A regional stormwater management plan is the only feasible means to address the issue of flooding in the basin at a regional scale.

PART D: LOCATION INFORMATION AND CONTEXT

13.0 GEOGRAPHIC INFORMATION

Phase 1 of the Project is in Sections 10, 15, 16, 17 and 18, Township 10, Range 16, West of the fourth meridian (W4M). Phase 2 of the Project is in Sections 21, 28, 33 Township 9, Range 16 and Section 4, Township 10 W4M. Phase 3 of the Project is in Sections 5, 7, 8 and 18, Township 9, Range 15 W4M. The southern geographic location of the Project and the exit from SMRID Main Canal is Latitude 49° 42' 14.26" N (49.703961) Longitude 112° 00' 14.54" W (-112.004039). The northern geographic location of the Project an outlet to the Oldman River is Latitude 49° 49' 19.25" N (49.822014) Longitude 112° 09' 21.63" W (-112.156008).

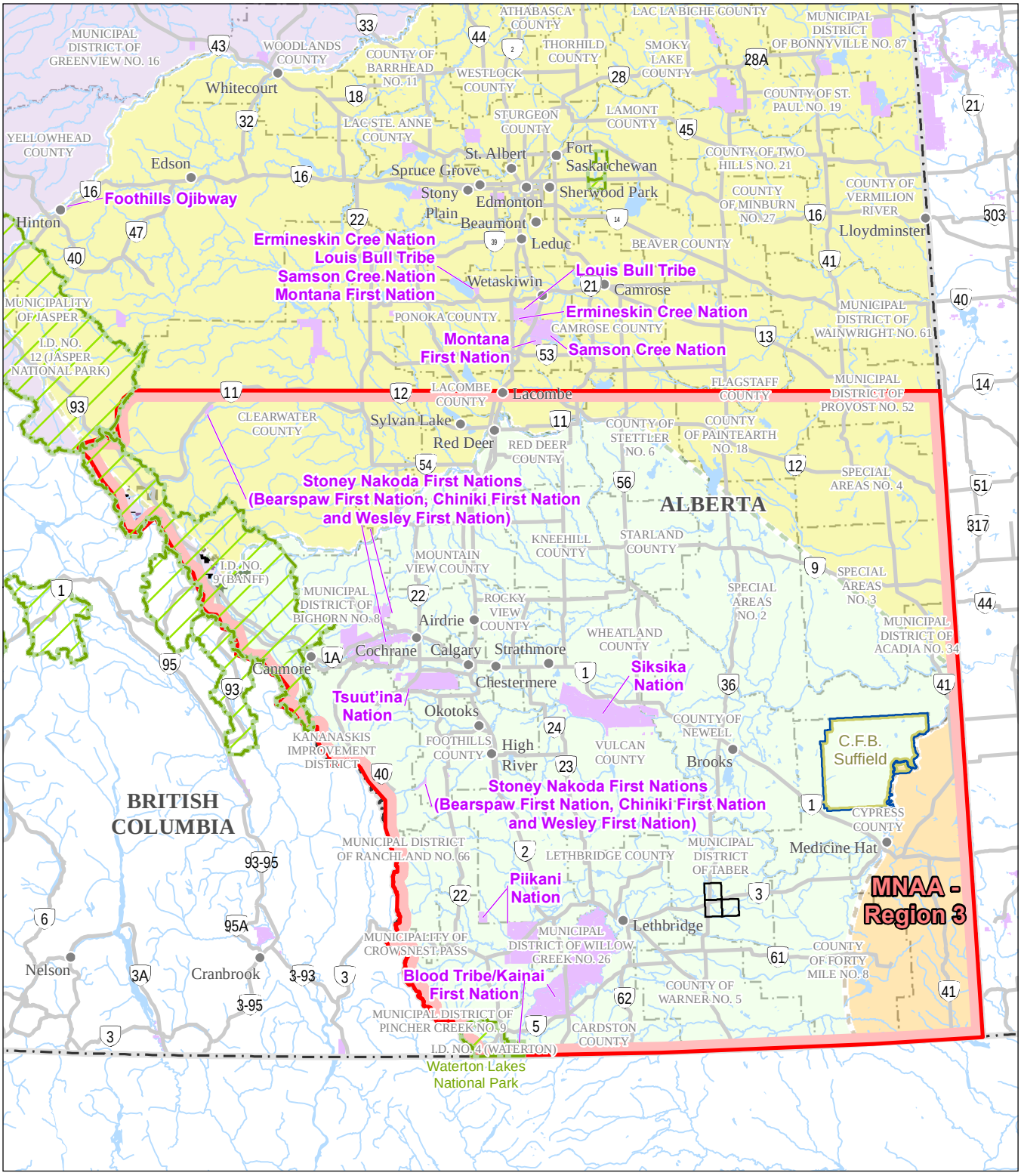
The Project's location is adjacent to the Town of Taber, as shown in Figure 1.2.

The Project is on private land, mainly utilized for agriculture, and on land belonging to the TID, Town of Taber and Lantic Inc. Most of the land is privately owned and there are residences along the canals. There are 15 residences within 300 m of the existing canal: eight in Phase 1, four in Phase 2 and three in Phase 3.

The Project is located within Treaty 7 and Métis Nation of Alberta Region 3. Figure 13.1 shows the Project in relation to Indigenous groups and nearby federal lands. Table 13.1 presents the distances to reserves of Indigenous groups, as identified by IAAC.

Table 13.1 Distances from the Project to Reserves

Indigenous Group or Organization	Distance from Project Centre (km)
Blood Tribe/ Kainai First Nation	57
Piikani Nation	102
Siksika Nation	99
Tsuut'ina Nation	190
Stoney Nakoda Nations (Bearspaw, Chiniki, Wesley)	228
Samson Cree Nation	334
Louis Bull Tribe	354
Montana First Nation	334
Ermineskin Cree Nation	346
Foothills Ojibway First Nation	546



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Project Location
T9&10N, R15&16W
Town of Taber

Prepared by SL on 2022-01-25
TR by JH on 2022-01-25
IR Review by JH on 2022-01-25

Client/Project 10773806-0008 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway
Report: Detailed Project Description

Figure No.
13.1

Title
Location of Indigenous Groups and Nearby Federal Lands

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Based on discussions with Indigenous peoples to date (January 25, 2022), while the Project is within traditional territory of Indigenous groups, it is not specifically on land used for traditional purposes by Indigenous peoples of Canada. The Project is not on land:

- in a reserve as defined in subsection 2(1) of the *Indian Act*
- First Nation land as defined in subsection 2(1) of the *First Nations Land Management Act*
- land that is subject to a comprehensive land claim agreement or a self-government agreement
- land set aside for the use and benefit of Indigenous peoples of Canada

The nearest federal lands to the Project are Waterton Lakes National Park (136 km from the Project) and the Canadian Forces Base, Suffield (83 km from the Project).

14.0 PHYSICAL AND BIOLOGICAL ENVIRONMENT

14.1 OVERVIEW

The description of the biophysical setting is taken from Cottonwood Consultants Ltd. (1988).

The physical setting is described in some detail by Beaty (1975). Only one major physical landscape, the Great Plains, is represented in the Project area. It is an area which is underlain by essentially flat-lying rocks. These have been modified extensively by glacial action and are dissected by major river valleys and glacial spillways.

The Great Plains are quite distinct from other landscapes in the Oldman River Region. While large areas are essentially level, there are some areas of strongly rolling terrain.

The Plains owe their surface character primarily to events surrounding glaciation. These surficial features include moraines, glacial lake basins, meltwater channels and spillways, dune fields, eskers and kames, drumlinized terrain, and outwash plains.

Along the stream valleys of the Oldman and South Saskatchewan Rivers, and along glacial spillways such as Chin Coulee, there are local areas of eroded bedrock some of which have a characteristic "badlands" appearance. Massive slumping is found along portions of the Oldman River.

The Plains region is underlain by Tertiary and Cretaceous, marine and non-marine, sandstones and shales of the Paskapoo, Oldman, Bearpaw and Foremost Formations.

The Project area is representative of the Grassland Natural Region, principally the Mixed Grassland Section.

Spear grasses (*Stipa spp.*) and wheat grasses (*Agropyron spp.*) predominate. Plant and animal species in Mixed Grasslands have adapted to a variety of grazing regimes ranging from light to extremely heavy (Wallis 1982). Detailed descriptions of Mixed Grassland vegetation can be found in Coupland (1950).

Inhabitants of these dry grasslands Include typical Mixed Grassland plants and animals. Some areas are important habitat for antelope and provide feeding areas for rare or threatened birds of prey like the ferruginous hawk (*Buteo regalis)* and burrowing owl (*Athene cunicularia)*. Rare plants and animals tend to concentrate in springs, sand plains and sand dunes, badlands, and along the rims of valleys and gullies.

Wetlands are locally numerous, especially in areas of rolling topography and in association with irrigation developments. Most large waterbodies are constructed or maintained, including the Horsefly and Chin Reservoirs and Taber Lake. Natural wetlands in the Mixed Grasslands tend to be more alkaline and temporary. Many of these wetlands are important for waterfowl production and migration and support a variety of marsh birds. A few sites provide important shorebird habitat.

Riverside (riparian) woodlands are confined to the Oldman River. Extensive woodlands are very localized. Plains cottonwood (*Populus deltoides*) dominates.

Riparian areas are typically diverse with habitats ranging from newly-forming sand and gravel bars to low and tall shrub thickets, grassland, open-growth cottonwoods, cottonwoods with a dense shrub understory, and abandoned channel wetlands. These habitats are dependent on major flood events for renewal.

Riparian habitats are some of the most productive breeding bird habitats in the semi-arid plains. About three-quarters of birds occurring in Alberta's Grassland region use riparian habitats for some portion of their life cycle (Wallis 1982). Some uncommon birds like pileated woodpeckers *(Dryocopus pileatus*) are found in these habitats. Colonies of great blue herons (*Ardea Herodias)* nest in a few of the riparian woodlands.

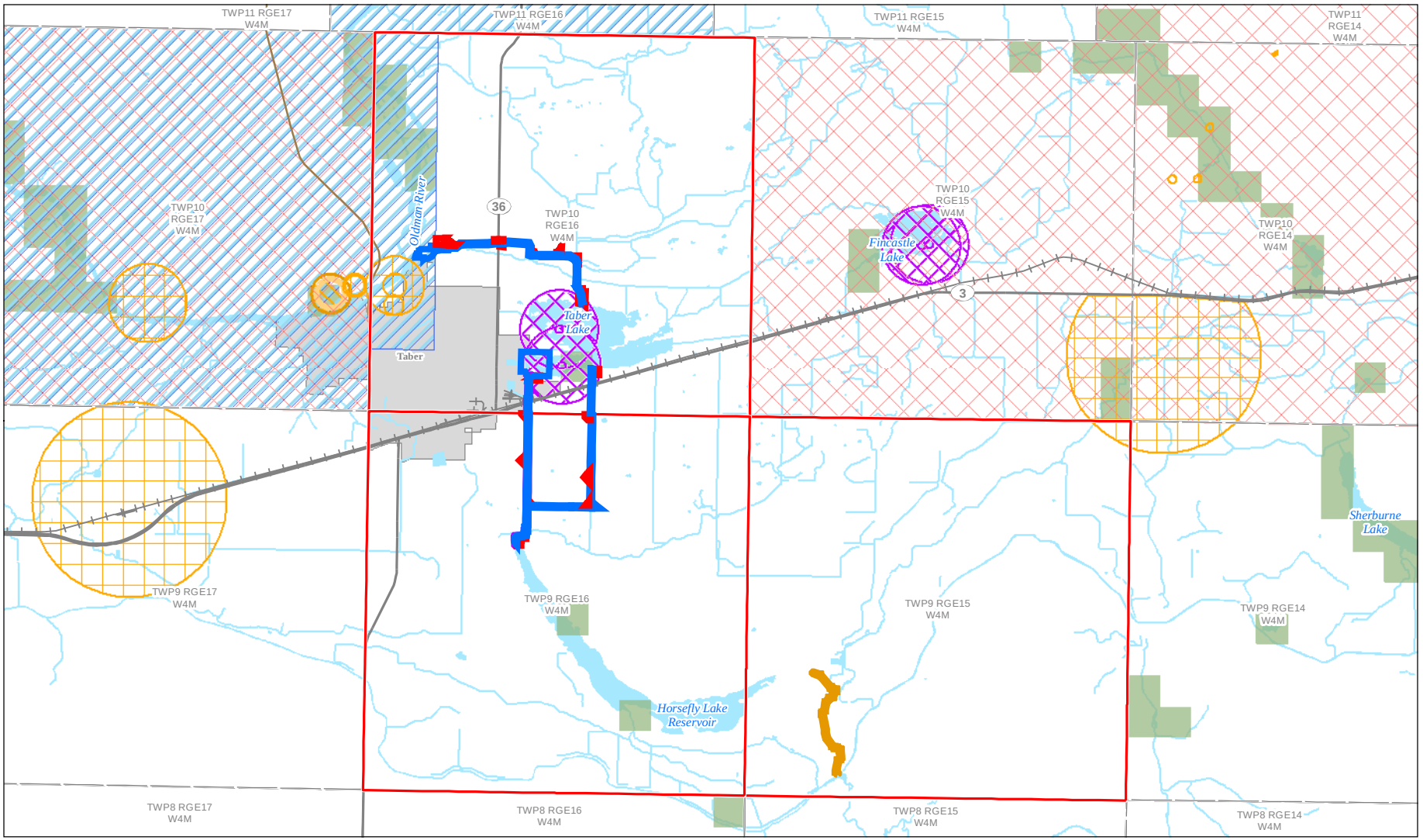
Other valley habitats such as badland outcrops and eroded banks are important for birds of prey including the threatened ferruginous hawk (*Buteo regalis*). The diverse valley environments also support significant deer populations. Widely distributed fish species characterize the area's rivers and reservoirs.

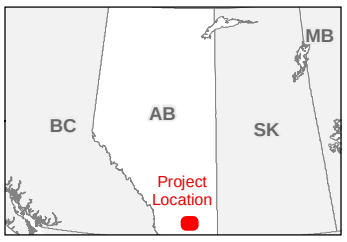
Areas of grassland persist in the Project area, however, most of the native vegetation has been converted to cropland.

There is locally heavy grazing in the grasslands. Heavy grazing is the major disturbance in riparian habitats and few areas of ungrazed or lightly grazed riparian vegetation remain.

14.2 PROJECT ENVIRONMENTAL SETTING

Figure 14.1 presents biophysical considerations in the Project area. The Project footprint is largely on agricultural land under irrigation. The western-most section of Phase 1 is a coulee leading down to the Oldman River. The area north of the coulee was a former landfill used by the Town of Taber. Some landfill waste is present on the north slopes of the coulee.





- Laydown
- Phase 1 Project Footprint
- Phase 2 Project Footprint
- Phase 3 Project Footprint
- Project Area
- Colonial Nesting Bird
- Provincial ESA (Score >0.189)
- Hibernacula Buffer
- Non-Sensitive Plant Species
- Sensitive Plant Species
- Sensitive Snake Habitat
- Primary Highway
- Secondary Highway
- Railway
- Watercourse
- Township
- Urban Area
- Waterbody

N

0 2,000 4,000 metres

(At original document size of 8.5x11)
1:150,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 12N
2. Data Sources: AltaLIS, NRCAN, Alberta Parks, GeoLogic, NRN, Alberta Government
3. Constraints: The project area is completely within: White Zone, M.D. of Taber, Treaty 7 (1877), Bird Nesting Zone B3, Burrowing Owl Range, Sensitive Amphibian Range, Sensitive Raptor Range (Prairie Falcon, Golden Eagle, Ferruginous Hawk), Sharp-tailed Grouse

MPE Engineering Ltd.

Stantec

Project Location
T9&10N, R15&16W
Town of Taber

Prepared by SL on 2022-01-25
TR by TQ on 2022-01-25
IR Review by JH on 2022-01-25

Client/Project 110773806-0006 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway
Report: Detailed Project Description

Figure No.
14.1

Title
Horsefly Regional Emergency Spillway Project Biophysical Considerations

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14.2.1 Air Quality

The Project area falls within an airshed managed by the Palliser Airshed Society (PAS) that collects air quality data using continuous and passive monitoring stations. The annual air reports from PAS describe general air quality within the PAS area by comparing the measured concentrations against the Alberta Ambient Air Quality Objectives (AAAQO).

The maximum measured 1-hour average nitrogen dioxide ($NO_{2)}$ concentrations in the Palliser Airshed region were 49.3, 55.7, and 41.7 ppb in 2018, 2019, and 2020, respectively. The maximum measured annual average NO_2 concentrations were 7.2, 6.8, and 5.6 parts per billion (ppb) in 2018, 2019, and 2020, respectively. All maximum measured NO_2 concentrations were less than the Alberta Ambient Air Quality Objectives (AAAQO) of 159 ppb and 24 ppb for 1-hour and annual average concentrations, respectively.

The maximum measured 1-hour particulate matter ($PM_{2.5}$) concentrations within Palliser Airshed regional were less than the AAAQO of 80 micrograms per cubic metre ($\mu g/m^3$) for 2018 but exceeded the 1-hour AAAQO 24 times in 2019 and 25 times in 2020.The maximum measured 24-hour $PM_{2.5}$ concentrations exceeded the AAAQO of 29 $\mu g/m^3$ one time in 2018, five times in 2019, and 18 times in 2020. The 1-hour and 24-hour exceedance events were attributed to wildfire smoke and high wind speed events. The maximum measured sulphur dioxide (SO_2) and carbon monoxide (CO) concentrations from 2018 to 2019 in the airshed were less than 7% of the Alberta air quality objective.

The Project area in general has good air quality when compared to AAAQO. Any exceedance of air quality objectives is attributed to natural causes such as wildfire or high wind speed conditions.

14.2.2 Acoustic Environment

Provincial noise guidelines such as the Alberta Utilities Commission (AUC) Rule 012: Noise Control (AUC 2020) and Alberta Energy Regulator (AER) Directive 038: Noise Control (AER 2017) provide recommendations for estimated ambient sound level (ASL) in rural and populated areas. The ASL does not include noise from any energy-related facilities or from wind. The AUC Rule 012 and AER Directive take a similar approach to ASL recommendations.

AUC Rule 012 recommends the average nighttime ASL in rural Alberta is approximately 45 decibels (human hearing threshold) (dBA) during the daytime (7 AM to 10 PM) and 35 dBA during the nighttime period (10 PM to 7 AM). AUC Rule 012 prescribes adjustments to the ASL for receptors located in a higher population density and in close proximity to transportation (i.e., proximity to heavily-travelled roadways and rail lines) areas. Maximum adjustment is up to 10 dB for receptor within 50 m of a heavily-travelled roadways and rail lines. Traffic volume along Highway 3 east of Highway 36 is considered a heavily-travelled roadway, based on the Average Annual Daily Traffic (AADT) volume of 7680 vehicles (Alberta Transportation 2020). In addition, a maximum adjustment of up to 6 dB is applicable to receptors located in population density of more than 160 dwellings per quarter section.

AUC Rule 012 acknowledges that the ASL may be higher or lower in areas where there is non-energy industrial activity that would impact the ambient sound levels or where pristine. A pristine area is defined as a natural area that might have a dwelling but no industrial presence, including energy, agricultural, forestry, manufacturing, recreational, or other industries that affect the noise environment provides. Residential receptors closest to the Project are not considered as pristine due to industrial presence within the area.

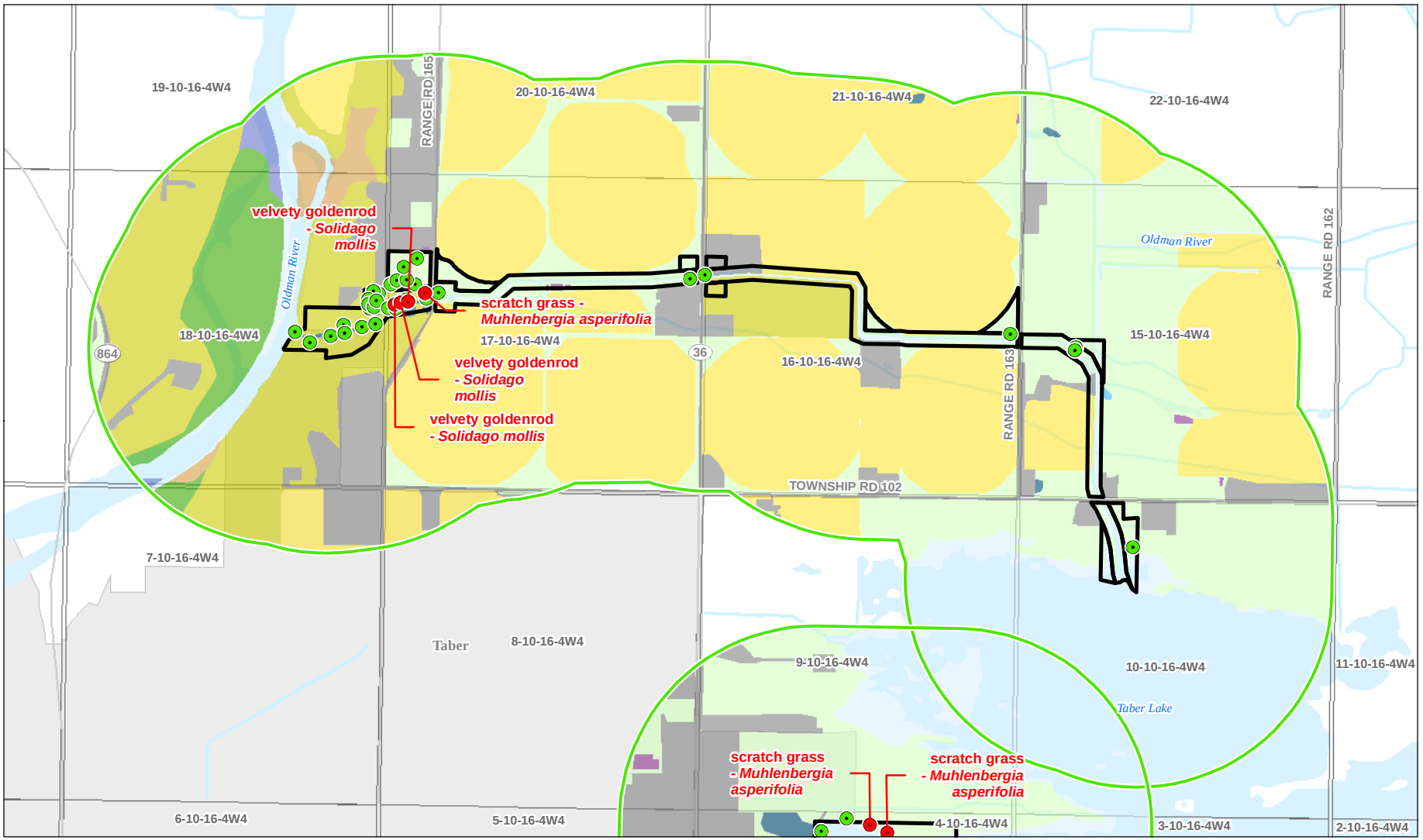
The lowest ASL for receptors closest the Project are assumed to be 45 dBA and 35 dBA for the daytime and nighttime periods, respectively. The assumed nighttime ASL of 35 dBA is not intended to describe ambient conditions at a particular receptor on a particular night; instead, this value is intended to describe typical or representative ambient conditions for receptors in rural areas where agricultural and/or oil and gas activity is also taking place. This approach of using the nighttime ASL of 35 dBA is consistent with Noise Impact Assessments conducted for other regulated developments (e.g., oil and gas, conventional power generations, solar or wind energy) for rural areas in Alberta.

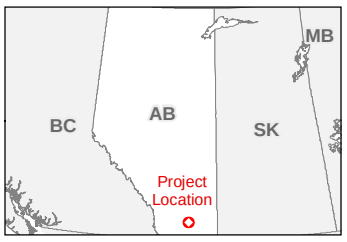
14.2.3 Vegetation and Wetlands

Vegetation land cover, species of conservation concern (SOCC) and weed occurrences along all three Project phases are shown in Figure 14.2, Figure 14.3 and Figure 14.4. A vegetation and rare plant survey for Phase 1 was conducted on June 22, 2021, and a second rare plant and wetland survey of all three phases of the Project was conducted on August 20 and 21, 2021. A data report on these surveys is provided in Appendix G1. Although the coulee at the west end of the Phase 1 Project footprint has been disturbed by previous land use activities, native prairie is present along portions of the coulee at the western end of Phase 1. Two rare plant species were found during the surveys: scratchgrass (*Muhlenbergia asperifolia*) and velvety goldenrod (*Solidago mollis*). Both species are provincially ranked S3 and are on the Alberta watchlist (ACIMS 2017). S3 species are known from 100 or fewer occurrences and is considered somewhat vulnerable due to restricted range or small population sizes, or other factors (ACIMS 2018).

There are historical occurrences of one plant species of conservation concern (SOCC), smooth goosefoot (*Chenopodium subglabrum*), located west of the Oldman River approximately one kilometre west of the confluence of the coulee with the Oldman River (ACIMS 2017). This species grows in sandy soil in native grassland and is unlikely to occur in the vicinity of the Project; however, this species was searched for during the field surveys for the Project along with other potential rare plant species that could occur in the Project area and no other rare species or rare ecological communities were found. There are no other historical occurrences of plant SOCC or ecological communities of conservation concern within 5 km of the Project (ACIMS 2017).

Ten weed species were observed during surveys of the Project footprint, including one prohibited noxious species: Russian knapweed (*Rhaponticum repens*), and nine noxious species. Noxious and prohibited noxious weed species were recorded at 68% of the surveyed sites and were widely distributed in the Project footprint for all three phases. The most commonly observed weed species were creeping thistle (*Cirsium arvense*), 64 occurences, and perennial sow thistle (*Sonchus arvensis*), 39 occurrences.





Rare Plant Occurrence
Weed Observation

Agricultural
Crop
Tame Pasture

Disturbed
Disturbed Land

Native Upland
Deciduous
Native Prairie
Native Upland, Shrub

Water
Waterbody

Wetland/Waterbody
Dugout
Graminoid Marsh
Shrubby Swamp
Shallow Open Water

Vegetation and Wetland Study Area
Project Footprint

N

0 375 750 metres
(At original document size of 8.5x11)
1:30,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 12N
2. Data Sources: AltaLIS, NRCAN, Alberta Parks, GeoLogic, NRN

MPE Engineering Ltd.

Stantec

Project Location
T9&10N, R15&16W
Town of Taber

Prepared by SL on 2022-01-25
TR by DS on 2022-01-25
IR Review by JH on 2022-01-25

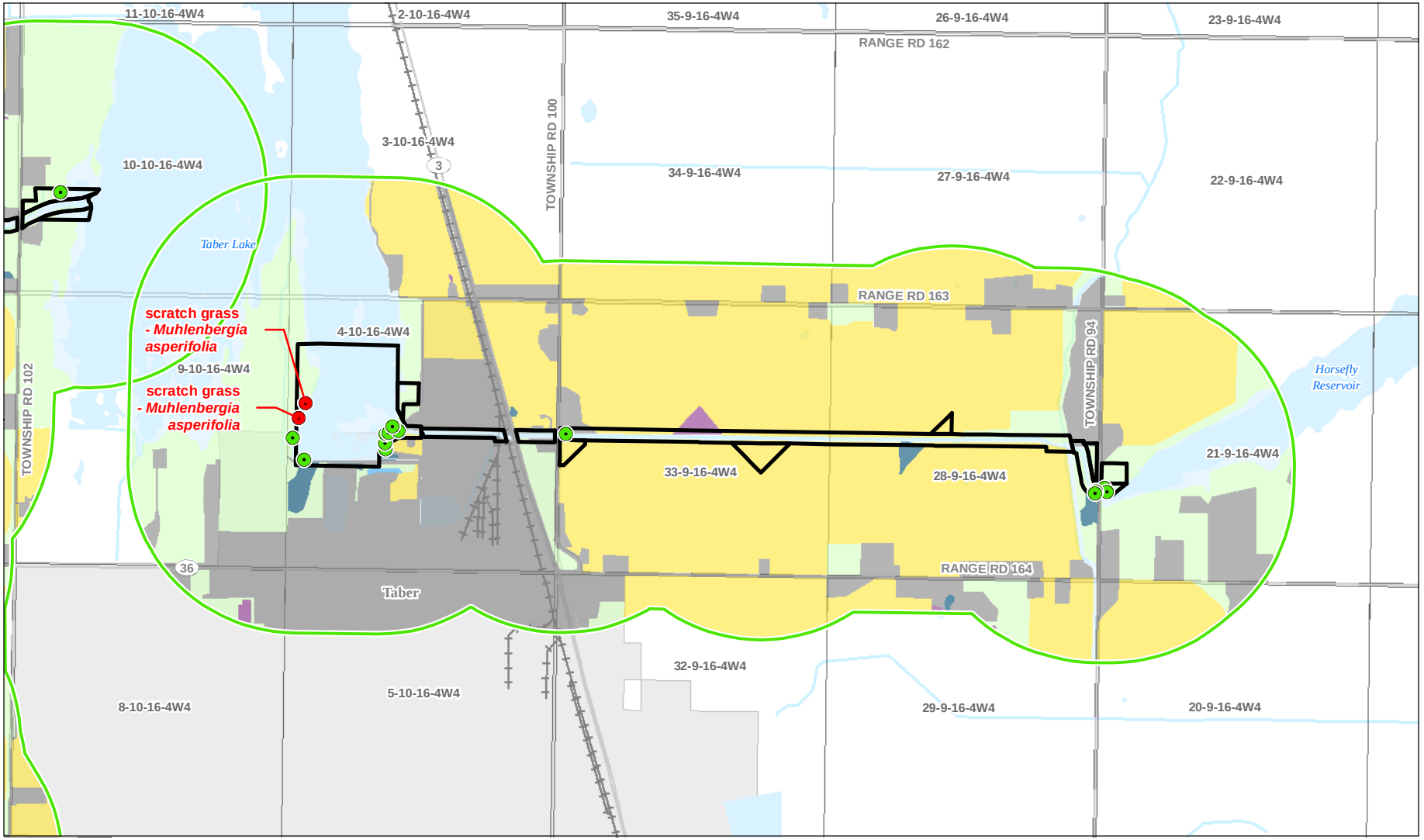
Client/Project 110773806-0017 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway
Report: Detailed Project Description

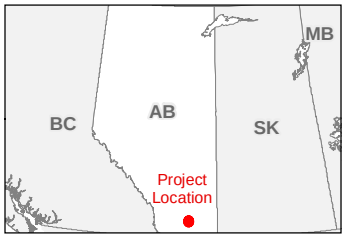
Figure No.
14.2

Title
Horsefly Regional Emergency Spillway Project Vegetation Land Cover and Species of Conservation Concern and Weed Occurrences - Phase 1

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- Rare Plant Occurrence
- Weed Observation

Agricultural
- Crop
- Tame Pasture

Disturbed
- Disturbed Land

Native Upland
- Native Prairie

Water
- Waterbody

Wetland/Waterbody
- Dugout
- Graminoid Marsh
- Shallow Open Water

- Vegetation and Wetland Study Area
- Project Footprint

N

0 440 880 metres
(At original document size of 8.5x11)
1:35,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 12N
2. Data Sources: AltaLIS, NRCAN, Alberta Parks, GeoLogic, NRN

MPE Engineering Ltd.

Stantec

Project Location
T9&10N, R15&16W
Town of Taber

Prepared by SL on 2022-01-25
TR by DS on 2022-01-25
IR Review by JH on 2022-01-25

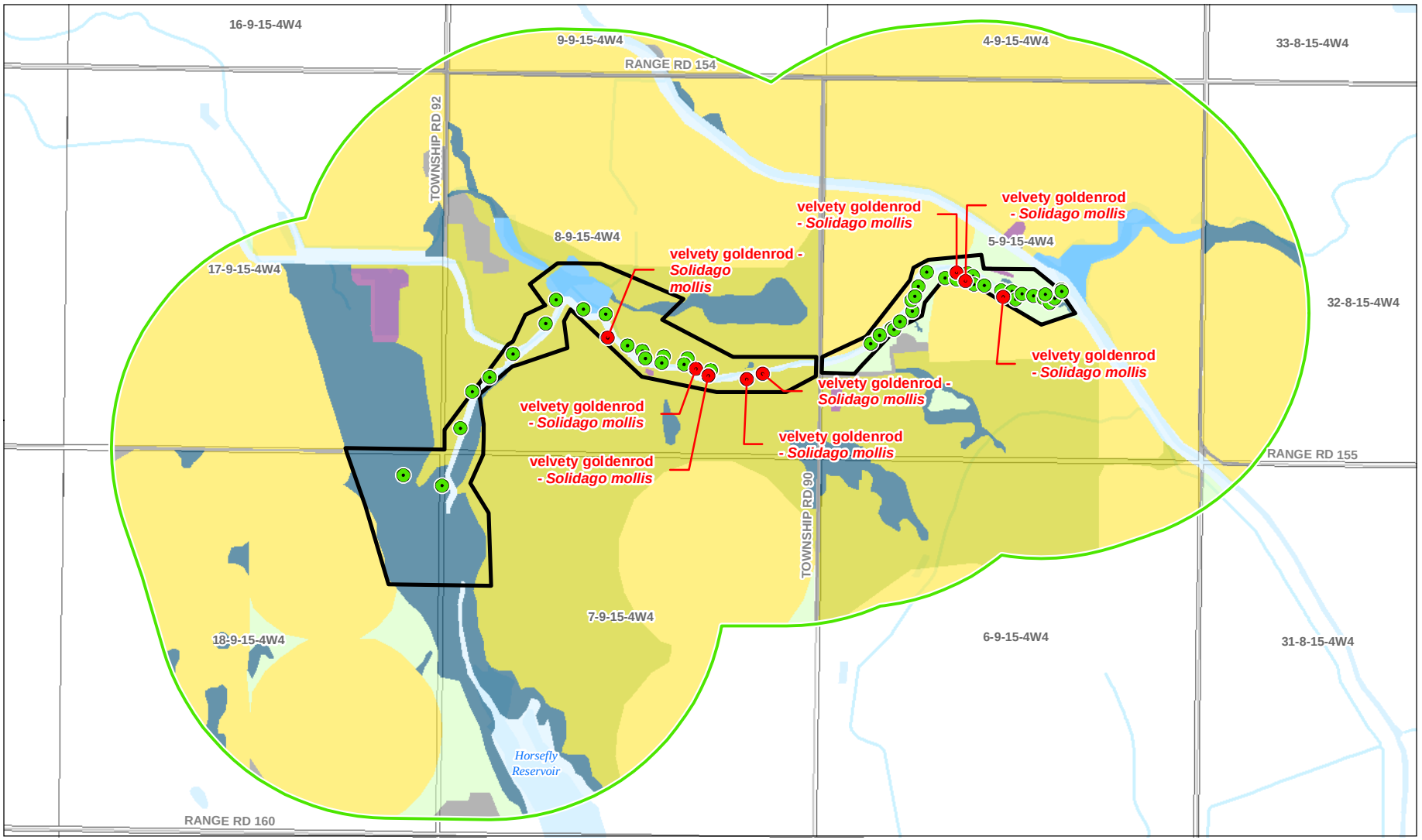
Client/Project
110773806-0017 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway
Report: Detailed Project Description

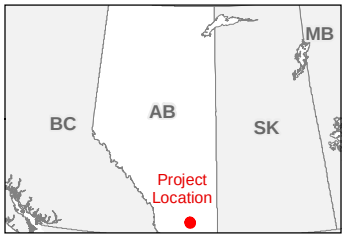
Figure No.
14.3

Title
Horsefly Regional Emergency Spillway Project Vegetation Land Cover and Species of Conservation Concern and Weed Occurrences - Phase 2

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Rare Plant Occurrence
Weed Observation

Agricultural
Crop
Tame Pasture

Disturbed
Disturbed Land

Native Upland
Native Prairie

Water
Waterbody

Wetland/Waterbody
Dugout
Graminoid Marsh
Shallow Open Water

Vegetation and Wetland Study Area
Project Footprint

N

0 310 620 metres
(At original document size of 8.5x11)
1:25,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 12N
2. Data Sources: AltaLIS, NRCAN, Alberta Parks, GeoLogic, NRN

Project Location
T9&10N, R15&16W
Town of Taber

Prepared by SL on 2022-01-25
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IR Review by JH on 2022-01-25

Client/Project
110773806-0017 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway
Report: Detailed Project Description

Figure No.
14.4

Title
Horsefly Regional Emergency Spillway Project Vegetation Land Cover and Species of Conservation Concern and Weed Occurrences - Phase 3

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14.2.4 Wildlife

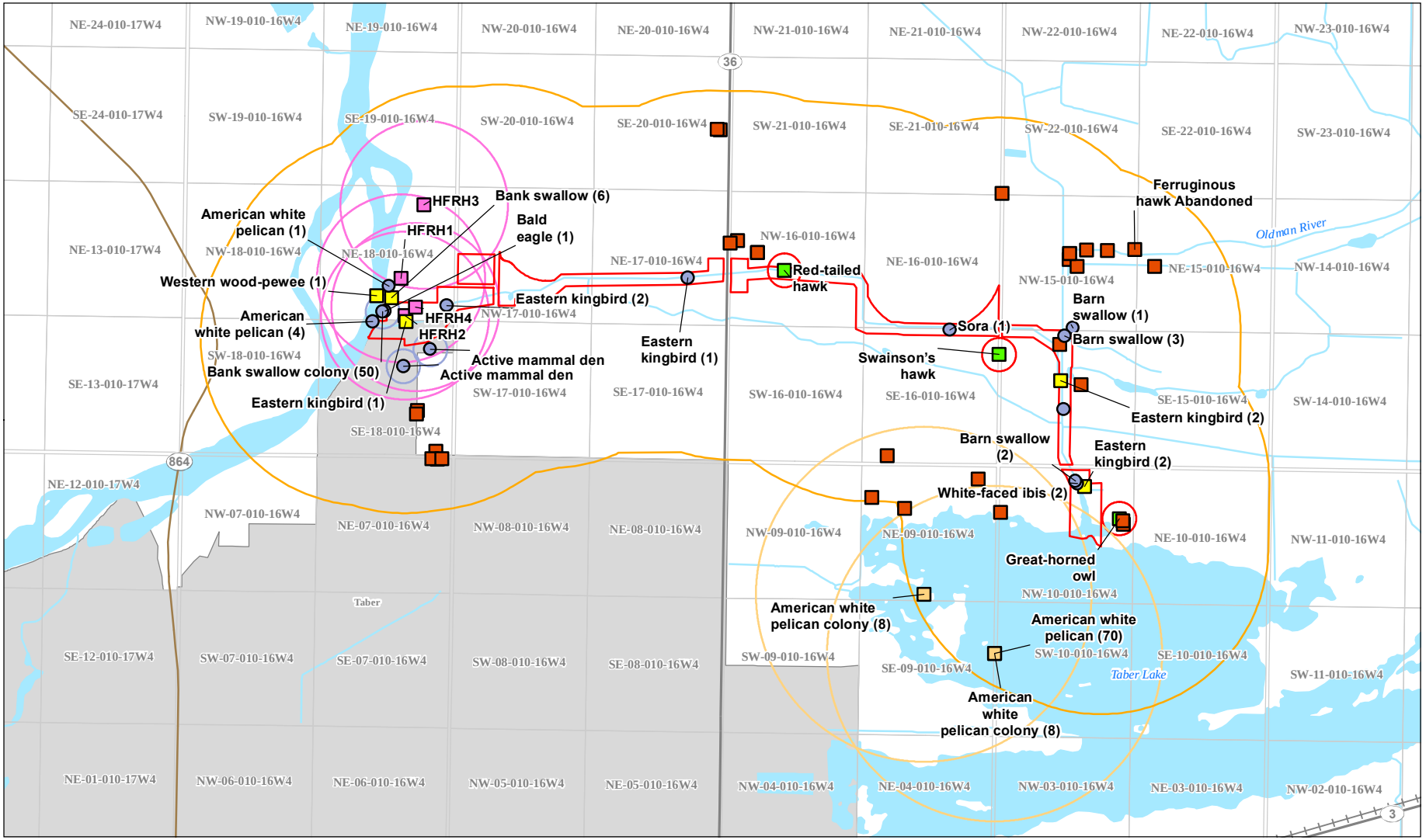
Phase 1 of the Project overlaps provincial sharp-tailed grouse (*Tympanuchus phasianellus*) range, burrowing owl (*Athene cunicularia)* range, sensitive raptor range (for ferruginous hawk [*Buteo regalis*], sensitive snake habitat, sensitive amphibian range and the setback buffer for colonial nesting bird habitat (for American white pelican [*Pelecanus erythrorhynchos*] nesting sites on Taber Lake). Phases 2 and 3 overlap sharp-tailed grouse range, burrowing owl range, sensitive raptor range (for ferruginous hawk) and sensitive amphibian range. Phase 2 also intersects the setback buffer for colonial nesting bird habitat (for American white pelican on Taber Lake).

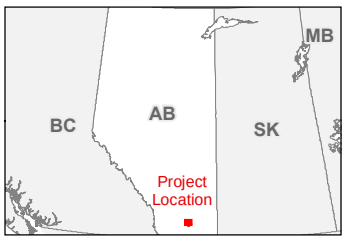
A field survey program was conducted for Phase 1 of the Project in 2021. A data report from these surveys is included in Appendix G2. Surveys for Phases 2 and 3 are scheduled to occur in 2022. The following surveys have been completed for Phase 1:

- Snake hibernacula (April 15 and May 1, 2021)
- Sharp-tailed grouse lek (April 16 and May 2, 2021)
- Waterbird activity (Taber Lake, April 16 and May 2, 2021)
- Raptor nest (April 15-16, May 1-2, May 14, June7 June 15, 2021)
- Nocturnal amphibian (May 14, June 7 and June 15, 2021)
- Burrowing owl (June 8, 2021)
- Breeding bird (May 15 and June 8, 2021)

Findings of the Phase 1 field surveys are shown in Figure 14.5. During the 2021 surveys, four small potential hibernacula were identified within 500 m of the Phase 1 Project footprint. These sites are presumed to be hibernacula based on the number of snakes and/or snake sheds observed and presence of a deep underground burrow or cavity; bullsnake (*Pituophus catenifer*) and/or prairie rattlesnake (*Crotalus viridis*) and snake sheds were found near burrow entrances. Both bullsnake and prairie rattlesnake have restricted range in Alberta and low numbers and both are listed under Schedule 1 of the *Species At Risk Act* (SARA), Two of the potential hibernacula burrows are located within the Phase 1 Project footprint.

Three active raptor nests were recorded within 1,000 m of the Phase 1 Project footprint, including a Swainson's hawk (*Buteo swainsoni*) nest approximately 106 m south of the Phase 1 Project footprint, a red-tailed hawk (*Buteo jamaicensis*) nest within the Phase 1 Project footprint, and a great horned owl (*Bubo virginianus*) nest approximately 108 m east of the Phase 1 Project footprint. A stick nest was occupied by two adult ferruginous hawks (*Buteo regalis*) on April 16, 2021 (adults perched on nest); however, the nest was no longer occupied by ferruginous hawk (or any other bird species) on May 2, 2021 and it remained unoccupied during subsequent nest checks for the remainder of the 2021 field season. Because this nest was abandoned early in the breeding season (i.e., prior to egg incubation) it is not considered to be occupied by ferruginous hawk in 2021. A bank swallow colony with approximately 50 adults was also observed at the western periphery of the Phase 1 Project footprint above the Oldman River.





Wildlife Observation
- Breeding bird SOMC
- Incidental SOMC
- Raptor nest (Active)
- Raptor nest (Inactive)
- Snake hibernaculum (HRFH Sites)
- Waterbird activity

Recommended Setback (m)
- Incidental observation (100m)
- Raptor nest (100m)
- Snake hibernaculum (500m)
- Waterbird activity (1000m)
- Local Assessment Area
- Primary Highway
- Secondary Highway

- Railway
- Watercourse
- Quarter Section
- Urban Area
- Waterbody

N

0 0.35 0.7 Kilometres
(At original document size of 8.5x11)
1:35,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 12N
2. Data Sources: AltaLIS, NRCAN, Alberta Parks, GeoLogic, NRN, Alberta Government

MPE Engineering Ltd.

Stantec

Project Location
T9&10N, R15&16W
Town of Taber

Prepared by NF on 2022-01-25
TR by ND on 2022-01-25
IR Review by JH on 2022-01-25

Client/Project
110773806-0015 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway
Report: Detailed Project Description

Figure No.
14.5

Title
Horsefly Regional Emergency Spillway Project Phase 1 - Wildlife Observations

W:\Clients\110773806\Figures\Detailed_Project_Description\110773806_0015_wildlife_observations.mxd Revised: 2022-01-26 By: slemay

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Forty bird species, comprising 256 individual bird observations, were recorded within the 100 m survey point count radii during the two breeding bird survey visits. Four bird species of management concern (SOMC) were recorded during the surveys. Red-winged blackbird (*Agelaius phoeniceus*) was the most commonly observed species (n = 45), accounting for 17.6% of individuals detected in survey plots, followed by brown-headed cowbird (*Molothrus ater* (n = 18), accounting for 7.0% of individuals observed.

The historic American white pelican breeding colony was active in 2021 and another potential breeding colony was observed on a nearby island in Taber Lake. Eight adult pelicans were observed at each colony. In addition, seventy pelicans were observed on the lake adjacent to a colony during the second visit. The nesting colonies are located 831 m and 937 m from the Phase 1 Project footprint, respectively

No sharp-tailed grouse leks, burrowing owl burrows or individual grouse or burrowing owl were observed incidentally or during targeted surveys for these species. Amphibian SOMC were not detected during Phase 1 nocturnal amphibian surveys.

A total of 10 SOMC were observed during 2021 surveys for Phase 1, these were: bull snake, prairie rattlesnake, American white pelican, sora (*Porzana carolina*), bald eagle (*Haliaeetus leucocephalus*), ferruginous hawk, white-faced ibis (*Plegadis chihi*), eastern kingbird (*Tyrannus tyrannus*), bank swallow (*Riparia riparia*) and barn swallow (*Hirundo rustica*). Two active mammal dens were observed incidentally during surveys, both are located outside of the Phase 1 Project footprint.

14.2.5 Fish

A total of 23 fish species have been documented within the Alberta Fish and Wildlife Information System (FWIMS) for the Project area:

- Horsefly Lake (Reservoir): northern pike (*Esox lucius*), yellow perch (*Perca flavescens*), white sucker (*Catostomus commersoni*), fathead minnow (*Pimephales promelas*), walleye (*Sander vitreus*), spottail shiner (*Notropis hudsonius*) and lake whitefish (*Coregonus clupeaformis*). No provincially or federally listed fish species are present in the lake.
- Taber Lake: there is no historical fish species data in FWIMS. Anecdotal angling data indicates that northern pike are the most abundant with small numbers of walleye and lake whitefish present. No provincially or federally listed fish species are present in the lake.
- Oldman River (from 10 km upstream to 10 km downstream of outlet): longnose dace (*Rhinichthys cataractae*), shorthead redhorse (*Moxostoma macrolepidotum*), emerald shiner (*Notropis atherinoides*), mountain whitefish (*Prosopium williamsoni*), longnose sucker (*Catostomus Catostomus*), walleye, white sucker, silver redhorse (*Moxostoma anisurum*), yellow perch, spottail shiner, mooneye (*Hiodon tergisus*), mountain sucker (*Catostomus platyrhynchus*), quillback (*Carpiodes cyprinus*), sauger (*Stizostedion canadense*), lake sturgeon (*Acipenser fulvescens*), lake whitefish and burbot (*Lota lota*). Lake sturgeon are provincially as “At Risk”. Sauger is considered sensitive. No other fish species are provincially listed and no fish species are federally listed.

A fish and fish habitat assessment for all three phases of the Project was conducted in September 2021 by a Stantec Qualified Aquatic Environment Specialist to supplement desktop results. A data report on this survey is included in Appendix G3. Figure 14.6 shows the location of the survey sites. Species captured during the fish assessment were consistent with species with historical presence in Horsefly Reservoir including northern pike, yellow perch, walleye, spottail shiner, and also brook stickleback (*Culaea inconstans*).

Habitat potential was assessed for:

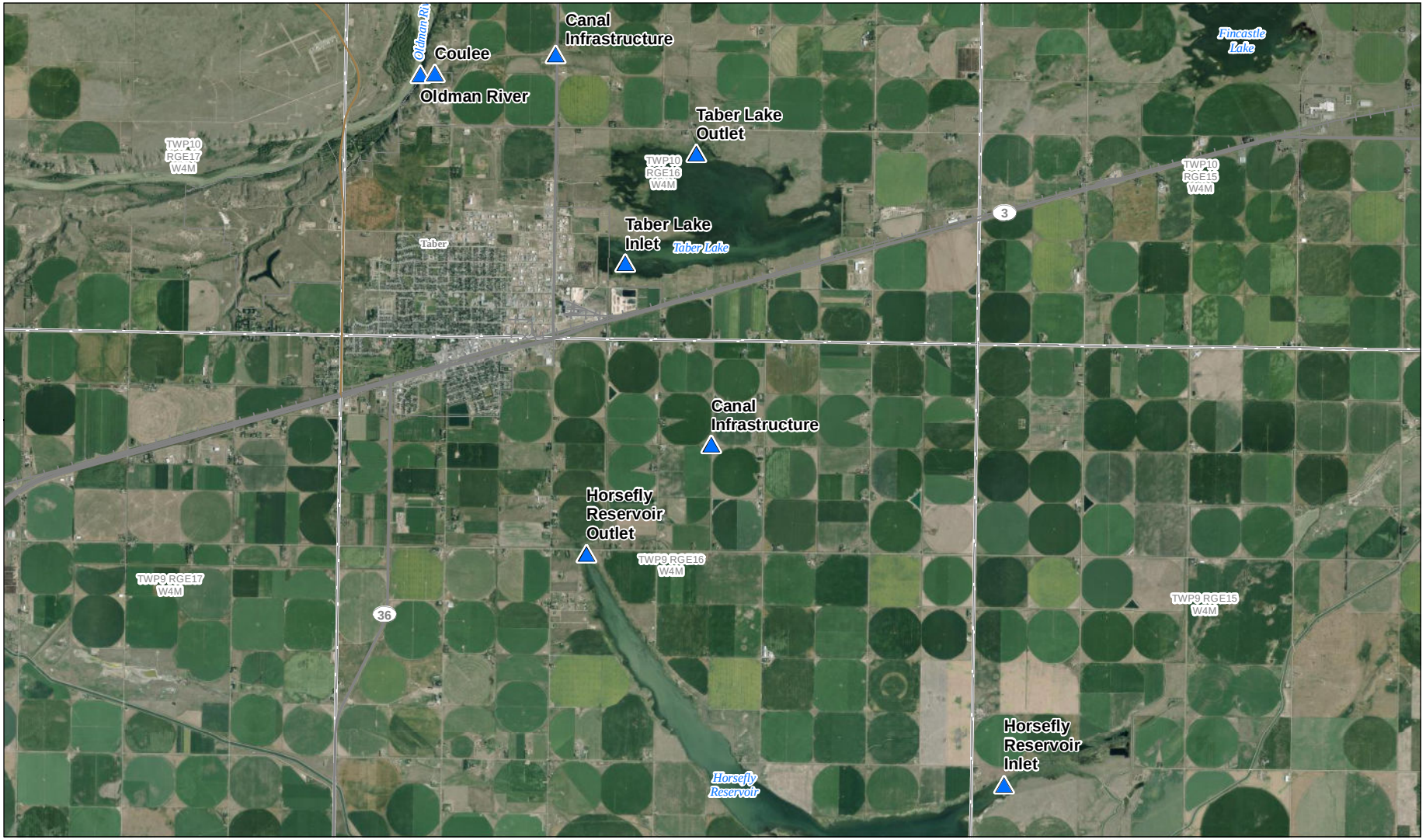
- the Oldman River
- the coulee from the Oldman River to the top of slope at Range Road 164A
- the inlet and outlet of Taber Lake
- the inlet and outlet of Horsefly Lake

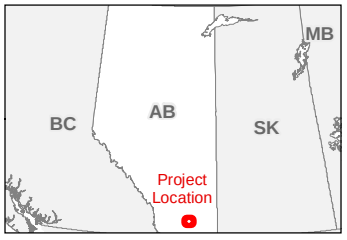
Overall, the Oldman River has poor to moderate habitat within the assessed area due to lack of habitat complexity. Spawning potential is poor for salmonids and forage fish but may be more suitable for coarse fish. Rearing potential throughout the assessed area was moderate because cover was predominately provided by depth; however, some boulders and aquatic vegetation afford additional cover for resident fish. No overhead cover (i.e., from riparian vegetation) was observed. Year-round flow and suitable depths provide moderate overwintering potential for all resident fish; however, no pools were observed in the assessment area. No barriers to migration were observed.

The coulee provides moderate fish habitat potential overall. Spawning potential for salmonids is poor and more suitable for forage fish and northern pike. There is substantial overhead cover that provides good opportunities for rearing resident fish; however, stream velocities may limit holding areas for small-bodied fish. There is poor overwintering potential due to shallow depth which is likely to freeze to bottom in winter. Velocity barriers may impede upstream migration of small-bodied fish but would not impede upstream movement of large-bodied fish with stronger swimming abilities.

Both Taber Lake and the Horsefly Reservoir are expected to afford good habitat for all life stages of resident fish species. Spawning suitability for salmonids is poor due to low velocities and lack of coarse substrate and is more suitable for other sportfish (e.g., walleye, northern pike). Extensive rearing habitat exists within each waterbody and is of good quality for resident fish species. Both waterbodies afford good overwintering habitat to resident fish. Migration within the waterbodies was unimpeded; however, canal infrastructure at the inlets and outlets likely impede fish passage into or out of both waterbodies.

The canal system connecting Horsefly Reservoir and Taber Lake was assessed as it affords connectivity between fish-bearing waterbodies, despite not being designed for fish habitat. Generally, spawning is poor for salmonids and moderate for other sport and coarse fish but good for forage fish. Generally, the canals provide good rearing habitat as there is good instream and overhead cover and low velocity areas for holding. Overwintering within the canals is generally poor to non-existent since the canals are drained in October of each year, however, opportunity may exist in scour pools that do not freeze to the bottom. Migration through the canal system is considered poor due to stepped spillway structures which could impede fish passage.





- Aquatics Site
- Primary Highway
- Secondary Highway
- Railway
- Watercourse
- Township
- Urban Area
- Waterbody

N

0 1,250 2,500 metres

(At original document size of 8.5x11)
1:90,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 12N
2. Data Sources: AltaLIS, NRCAN, Alberta Parks, GeoLogic, NRN, Alberta Government
3. Constraints: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

MPE Engineering Ltd.

Stantec

Project Location
T9&10N, R15&16W
Town of Taber

Prepared by SL on 2022-01-25
TR by TQ on 2022-01-25
IR Review by TS on 2022-01-25

Client/Project 110773806-0013 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway
Report: Detailed Project Description

Figure No.
14.6

Title
Horsefly Regional Emergency Spillway Project
Aquatics Overview

W:\Clients\110773806\Figures\Detailed_Project_Description\110773806_0013_Aquatics.mxd Revised: 2022-01-25 By: slemay

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14.2.6 Water Quality

Taber has high quality drinking water. Raw, untreated water is also available, primarily for the major food processing industries, irrigation of the golf course and other green areas. Taber's water supply originates from two sources: from October through April, raw water is pumped from the Chin Reservoir. During May through September raw water is taken from the TID main canal. The Town's wastewater treatment facility was constructed in the early 1980s and is sized for a population of 18,000. The Town also operates an industrial aerated lagoon plant for industrial effluent. Treated effluent can be diverted to the lagoon system to supply the irrigation system for five-quarter sections of farmland. Treated wastewater from the processing of sugar beets at the Lantic Facility runs from a pipeline on the southwest corner of Taber Lake for disposal through the coulee into Oldman River. This is a licensed wastewater disposal site.

Water quality data is collected throughout Alberta's irrigation districts as part of the Irrigation District Water Quality Project (Agriculture and Agri-Food Canada 2020). The water quality of the Taber Irrigation District (site T-S2) and St. Mary River Irrigation District (site SMC-P1) has been rated as excellent over the last several years.

The pH averaged from 8.4 to 8.7 indicating that the water was in the basic range. Conductivity averaged from 0.328 to 0.360 ds/m and the concentration of total dissolved solids from 197 to 221 milligrams per litre (mg/L), indicating the presence of lower amounts of solutes. The water was fairly clear with low total suspended solids averaging from 7 to 11 mg/L.

The water was classified as hard averaging from 139 to 141 mg/L, and alkalinity averaged from 118 to 127 mg/L. Bicarbonate, sulfate, calcium, magnesium and sodium were the ions found in the highest concentrations, followed by smaller amounts of carbonate, chloride and potassium. Chloride concentrations were low, averaging less than 3 mg/L.

Fecal coliform counts (*Escherichia coli)* can be highly variable depending on conditions and potential sources such as geese and other wildlife. Fecal coliforms averaged from 98 to 123 colony forming unit per 100 millilitres (cfu/100 mL) and occasionally exceeded the guideline of 100 cfu/100 mL

Total phosphorus concentrations averaged from 0.042 to 0.056 mg/L and dissolved phosphorus from 0.025 to 0.038 mg/L, indicating that the water was eutrophic. Total nitrogen and Kjeldahl nitrogen concentrations averaged from 0.509 to 0.756 mg/L. Nitrate-nitrite nitrogen concentrations were generally less than the detection limit with occasional concentrations just above detection. Total ammonia concentrations averaged from 0.058 to 0.103 mg/L.

Metals occur naturally in surface waters and their concentrations are usually associated with suspended solids content which was low in the water. Metal concentrations were below guidelines with the exception of the occasional concentration of manganese just above the guideline.

14.3 ENVIRONMENTALLY SIGNIFICANT AREAS

Alberta Parks (2014) scored all quarter sections in the province as to the presence of four environmental criteria:

1. areas that contain rare, unique or focal species
2. areas that contain rare, unique or focal habitat
3. areas with ecological integrity
4. areas that contribute to water quality and quantity

Quarter sections with a score greater than 0.189 are classified as environmentally significant areas. Four such areas have been designated in the Project area: the south side of Taber Lake, a portion of the Oldman River, downstream of the canal outlet, and two areas on Horsefly Reservoir (Figure 14.1).

14.4 TRADITIONAL LAND USE

Traditional Land Use studies have not been conducted specifically for the Project. Such studies were conducted by the Blood Tribe/Kainai First Nation and Piikani First Nation along the Montana Alberta Tie Ltd. transmission line which runs approximately 20 km west of the Town of Taber (AMEC Earth and Environmental 2009, 2010).

The current major economic base of the reserves is agriculture (Blood Tribe/Kainai First Nation) and ranching (Piikani First Nation). Although parts of the regional area continue to be productive for berry picking and the collection of traditional plants, much of the area is disturbed by agricultural cultivation and ranching. Specific sites with stone cairns and rock alignments suggestive of bison jumps continue to be frequented for traditional spiritual practise.

The AMEC Earth and Environmental reports indicated negligible impacts on traditional plant harvesting and hunting and that construction activities occurring along the proposed transmission line right-of-way may have indirect adverse effects to the environmental aesthetics in the area, restricted to the construction seasons.

15.0 HEALTH, SOCIAL AND ECONOMICS OF MD OF TABER

The MD of Taber includes the Towns of Taber and Vauxhall, the Village of Barnwell and the Hamlets of Grassy Lake, Hays, Enchant, Johnsons Addition, and Purple Springs. The population of the MD in 2016 (Federal Census) was 7,098, which was an increase of 25% over the preceding two decades (MD of Taber 2019). Most residents (5,762) live in rural areas. The age composition of the MD shows the largest proportion being families with children and youth residing at home. Median household income was $76,544. In the 2016 census, 64% of the population in the Taber region were employed and the unemployment rate was 4.5 %. Approximately 40% of the region were employed in agriculture.

Economic indicators of the MD are agriculture, food processing and energy. The MD is an agriculturally diversified and intensively farmed district, producing a wide variety of crops and livestock (Municipal District of Taber 2015). Farm operations range from large dryland grain farms and grassland leases to productive irrigated farms producing a wide range of valuable crops. Main crops and livestock include sugar beets, corn, potatoes, hogs, beef, sheep and poultry. The agri-food processing industry in the MD include the Lantic sugar beet Facility (located in the Town of Taber), and Lamb Weston (french fries). The energy sector includes oil and gas services, and wind farms. Major employers are health care and education, agriculture and agri-processing; and oil and gas/energy.

A summary of the community health profile for the MD of Taber (Government of Alberta 2019) is presented in Table 15.1.

Table 15.1 Health-related Indicators, MD of Taber

Indicators	MD of Taber	Alberta
Population Health Indicators (for Alberta South Zone that includes Taber)		
Obese Adults	23.3%	22.1%
Inactive People	32.0%	22.1%
Demographics		
Population Increase 1988-2018	22.5%	49.1%
Largest Age Group (35-64 years old)	32.9%	40.2%
Children under 17	31.4%	22.4%
Individuals 65 and older	11.5%	12.6%
Social Determinants of Health Indicators		
Proportion of First Nations and Inuit People	0.6%	2.8%
Female lone-parent families	7.7%	11.0%
Proportion of families with an after-tax low-income level	17.2%	15.6%
Most common non-official languages spoken at home in the MD of Taber are German, Germanic languages, Tagalog, Dutch and Spanish		
Chronic Disease Prevalence		
Hypertension was the highest per 100	19.1	20.6
Maternal Health		
Birth rate per 1,000 women	36.3	26.0
Teen birth rate per 1,000 women	15.4	10.6
Sexually Transmitted Infections		
None of the top 5 STI rates in the MD of Taber were higher than the provincial rates.		
Mortality		
Mortality rate per 100,000 population	755.4	699.5

Table 15.1 Health-related Indicators, MD of Taber

Indicators	MD of Taber	Alberta
Emergency Service Utilization		
Semi and non-urgent emergency visits accounted for 52.7% of all emergency visits in the MD of Taber in 2017/2018.		
Acute upper respiratory infections, per 100,000 population in 2017 were most common	3,462.3	2,777.5
Inpatient Service Utilization		
Ischemic heart disease, pneumonia, and diabetes were the top three main reasons for inpatient separations in 2018		
Mental and Behavioral Disorders		
Emergency department visit rate for mental and behavioral disorders per 100,000 population in 2017	403.8	786.9
Primary Health Care Indicators		
Ambulatory care sensitive conditions separation rate per 100,000 population	379.0	360.7
Rate of people with three or more chronic diseases per 100 population	3.4	4.2
Life expectancy at birth	80.6 years	81.2
Access to Health Care Services		
In 2017/2018, ambulatory care visits made up 69.8% of all ambulatory care visits and most to the Chinook Regional Hospital in Lethbridge.		

For most health-related indicators, the MD of Taber numbers are similar to the provincial numbers; exceptions are:

- population increase in the MD of Taber between 1988 and 2018 is less than half the provincial average
- the proportion of First Nations and Inuit people in the MD of Taber is 0.6% compared to the provincial figure of 2.8%
- the overall birth rate and teen birth rate per 1,000 women is 1.4 times the provincial figures
- emergency department visit rate for mental and behavioral disorders per 100,000 population in 2017 was 51% that of the provincial rate

Medical services in the MD include the Taber Hospital, and the Taber and Vauxhall Associate Medical Clinics. The Taber region offers a wide variety of health and wellness services to residents including primary care physicians, dentists, chiropractic services, optometrists, physiotherapy, supportive living facilities, as well as other health and wellness practitioners.

The Taber Equality Alliance Society was incorporated in 2016 to create a safe space in the community for sexual and gender identity minorities and their allies,



The MD of Taber offers several tourism and recreational activities including parks (Taber Confederation Park, MD of Taber Park), golf courses, swimming pools, fishing in the Oldman River and lakes (Horsefly Reservoir, Taber Lake) Taber Irrigation Impact Museum, MD Gun/Archery Range, and MD Motorcross Track.

The Taber and District Community Adult Learning Association has implemented a Temporary Foreign Worker Support Program to help temporary foreign workers in understanding the meaning of regulations and how they will affect them. This includes information and orientation sessions on illness prevention; personal protection; self-care; employee rights and responsibilities; one-on-one support & referrals to meet the basic essential needs of those affected; resources & services to enable temporary foreign workers to exercise their rights; support in areas including but not limited to case management; health and income support referrals; trauma counselling, assistance in applying for benefits; interpretation services; short-term shelter and housing; food, clothing, and transportation for workers in distress.

The construction work force for the Project is estimated at 30 to 40 persons for each phase. Construction workers are expected to be from the area, working from Taber or surrounding communities; construction camps will not be required. Contractors are expected to follow the Alberta Construction Association Code of Ethics and the Alberta Obligations of Work Site Parties. During operations, the work force is estimated at two or three persons. Project operations are expected to be carried out by the existing TID staff. During flood events, additional staff will be present to observe Project operations.

The MD of Taber and its consultants, through their mission statements are committed to equality, social justice and positive change. The MD of Taber has no barriers to equality with respect to decision-making, participation, access or control over the Horsefly Regional Emergency Spillway Project. Engagement and consultation activities to date have been inclusive of women and diverse groups.



PART E: FEDERAL, PROVINCIAL, TERRITORIAL, INDIGENOUS, AND MUNICIPAL INVOLVEMENT AND EFFECTS

16.0 FINANCIAL SUPPORT FROM FEDERAL AUTHORITIES

Approved funding for the Project includes $39 million dollars in funding from the provincial and federal governments, including $8.8 million for Phase 1 through the ICIP by the Government of Canada, and $9.8 million for Phases 2 and 3 from the federal Ministry of Infrastructure and Communities. Phases 1 and 2 will be owned by TID. Phase 3 will be owned by SMRID.

17.0 USE OF FEDERAL LANDS FOR PROJECT

The Project will not be constructed or operated on federal lands.

18.0 JURISDICTIONS THAT HAVE POWERS, DUTIES OR FUNCTIONS IN RELATION TO AN ASSESSMENT OF THE PROJECT'S ENVIRONMENTAL EFFECTS

18.1 FEDERAL REGULATORY REQUIREMENTS

In addition to the current IAAC process under the *Impact Assessment Act*, the Project will be subject to:

- the *Fisheries Act*
- the *Canadian Navigable Waters Act*
- the *Migratory Birds Convention Act*
- the *Species at Risk Act*

18.1.1 *Fisheries Act*

A non-compliance with the *Fisheries Act* could occur if the Project results in any of the following:

- the death of any life stage of fish
- the harmful alteration, disruption or destruction (HADD) of fish habitat
- the introduction of a deleterious substance (for example hydrocarbons from heavy equipment or sediment during construction) into a watercourse or Oldman River to which it is connected
- the alteration of flow that would impede fish migration in a watercourse

If the coulee into which the canal drains supports fish or provides viable habitat for fish and the Project permanently alters a watercourse, an Authorization under Section 35(2) of the *Fisheries Act* would be required. Before DFO will issue an Authorization, an Offsetting Plan would have to be prepared. The plan would involve improving habitat elsewhere to compensate for the loss of habitat in the drainage.

If the coulee does not contain fish or fish habitat, a *Fisheries Act Authorization* would not be required and Fisheries and Oceans Canada (DFO) would issue a *Letter of Advice* for the Project to proceed.

On October 19, 2001, TID received an Authorization under the *Fisheries Act* for the operation and maintenance of the TID. The Project activities involve the maintenance of the TID; however, DFO will be notified of the Project and the MD of Taber will adhere to any additional requirements to the Authorization.

A Request for Review of the Project by DFO is in preparation. The information in this DPD on the Project design, construction methodology and proposed mitigation will be included in the Request for Review.

18.1.2 *Canadian Navigable Waters Act*

The *Canadian Navigable Waters Act* protects waters on which the public has the right to travel.

The only navigation that occurs on the Oldman River is canoeing, rafting or small fishing boats because the water is too shallow for navigation by power boats. Construction of the Spillway in the coulee leading to the Oldman River will cause minimal disturbance to the river since as much work as possible will be completed on land. The Project is not in operation during non-flood events so there will be no anticipated effect on navigation on the Oldman River. SMRID and TID do not allow boating on their irrigation canals. Boating on reservoirs is allowed where there are adequate facilities to launch boats into the reservoir.

Project plans do not include any structure being placed in Oldman River; therefore, a *Navigable Waters Act* application is not expected to be necessary.

18.1.3 *Migratory Birds Convention Act*

Section 6.1 of the *Migratory Birds Regulations* states that without a permit, the disturbance, destruction, or removal of a nest, egg, nest shelter, eider duck shelter, or duck box of a migratory bird, or possession of a migratory bird, carcass, skin, nest, or egg of a migratory bird are prohibited. The timing window for Project construction activities is from October through March. From April through August migratory birds are nesting and fledging; any construction activities during this period would require a nest search and species-specific buffer zones around observed active nests.

18.1.4 *Species at Risk Act*

The *Species at Risk Act* (SARA*)* provides regulatory protection and includes prohibitions against the killing, harming, harassment, capture, or taking of species listed as extirpated, endangered, or threatened. The damage and destruction of residence are prohibited under SARA.

Project activities are not anticipated to result in any violations to SARA.

18.2 PROVINCIAL REGULATORY REQUIREMENTS

Provincial regulatory requirements that may affect the Project are those associated with:

- the *Environmental Protection and Enhancement Act* (EPEA)
- the *Natural Resources Conservation Board Act*
- the *Irrigation Districts Act* (IDA)
- the *Water Act*
- the *Historical Resources Act* (HRA)

18.2.1 *Environmental Protection and Enhancement Act*

The EPEA includes the Environmental Assessment (Mandatory and Exempted Activities) Regulation, which lists the types of projects that require an environmental assessment (EA). Under Schedule 1, Mandatory Activities, the construction, operation, or reclamation of (d) a water diversion structure and canals with a capacity greater than 15 m^3/s requires an EA. Under Schedule 2, Exempted Activities (g) the maintenance and rehabilitation of a water management project, including a dike, dam, weir, floodgate, breakwater, drain, groyne, ditch, basin, reservoir, canal, tunnel, bridge, culvert, crib, embankment, headwork, fishway, flume, aqueduct, pipe, pump or measuring weir does not require an EA.

The MD received notice on July 13, 2021, that an EA is not required for the Project (see Appendix E3).

18.2.2 *Natural Resources Conservation Board Act*

The *Natural Resources Conservation Board Act*, administered by the Natural Resources Conservation Board, is applicable for a water management project, such as a canal. A water management project is defined as:

i. a project to construct a dam, reservoir, or barrier to store water or water containing any other substance for which an environmental impact assessment report has been ordered, or

ii. a project to construct a water diversion structure or canal capable of conducting water or water containing any other substance for which an environmental impact assessment report has been ordered.

Since the Project does not require an environmental impact assessment, the *Natural Resources Conservation Board Act* does not apply.

18.2.3 *Irrigation Districts Act*

The *Irrigation Districts Act* (IDA) applies to the structure, governance, powers and duties of the 13 irrigation districts in Alberta. The purpose of the *Act* is to provide for the formation and governance of irrigation districts in order that the management and delivery of water in the districts occur in an efficient manner that provides for the needs of the users. Under 6(1) of the IDA, the purpose of each district is (a) to convey water through the irrigation works of the district, (b) to divert and use quantities of water in accordance with the terms and conditions of its licence under the *Water Act*, and (c) to construct, operate and maintain the irrigation works of the district. Under 21(2)(b) irrigation districts can issue a Water Conveyance Agreement for the removal of drainage water, stormwater or wastewater from an area. Such an agreement must comply with [21(6)] the requirements, if any, of the *Water Act*, the EPEA and the regulations under those Acts. The MD of Taber will apply for a Water Conveyance Agreement for the removal of stormwater from the area.

18.2.4 *Water Act*

The *Water Act* requires a licence for the diversion of water, such as for a canal. The *Water Act* also includes the *Alberta Dam and Canal Safety Directive*. The Alberta Railway and Irrigation Company (ARIC) obtained a licence to divert water in 1915, an agreement between ARIC and TID in 1919, and a transfer to the TID in 1968. The licence provides the rights to the canal and the diversion of water for irrigation and domestic use. The licence was amended in 1992 to allow the delivery of water for the following purposes: municipal, agricultural, irrigation, commercial, industrial, management of fish, wildlife, habitat enhancement and recreation. The licence did not allow the injection of water into the ground for the purpose of enhancing oil and gas production. Section 6 (1) of the *Water Act* states that the Minister may enter into an agreement regarding terms and conditions with respect to flood control and management. The MD of Taber will request an agreement from the Minister regarding flood control and management.

The *Water Act* requires an authorization for permanent removal of a wetland and a code of practice notification for disturbance to wetlands. The MD of Taber will apply for authorizations and notifications, as appropriate, for the construction of the Taber Lake wetland and expansion of the Horsefly Reservoir wetland and for work affecting existing wetlands.

The *Alberta Dam and Canal Safety Directive* states that the construction or major repair for a dam or canal must receive an Authorization from AEP under the *Water Act*. The Project must meet the requirements of the *Alberta Dam and Canal Safety Directive*. If classified as a new canal it will require a detailed description and, as per EPEA, an EA. If classified as a major repair of an existing canal, an EA is not required, although environmental considerations are included in the engineering requirements for an application for an Authorization. The Project will apply for an authorization to repair the existing canal to meet the needs for flood control.

18.2.5 *Historical Resources Act*

Prior to any surficial disturbance on the Project site, an HRA approval must be obtained and a Letter of Clearance issued. The first step is to submit an Historic Resources Application to the ACSW. The Heritage Division will determine if an Historic Resources Impact Assessment (HRIA) is required. The MD of Taber submitted an Historic Resources Application for Phase 1 of the Project on April 16, 2021 and for Phases 2 and 3 on September 28, 2021. An HRA Approval for Phase 1 was received on May 21, 2012 and for Phases 2 and 3 on October 22, 2012 (see Appendix E4 and E5), which state that an HRIA for archaeological resources is not required, however an HRIA for palaeontological resources in the coulee in Phase 1 is required. The MD of Taber will follow the conditions of the Approval. A palaeontological field survey was conducted in August 2021. A few fossils were found in the coulee. A palaeontological HRIA was submitted to ACSW on November 22, 2021, and a letter of approval for the Project with the condition that a palaeontologist be present during any excavation activities in the coulee was received on December 20, 2021 (see Appendix E6). The MD of Taber will comply with this condition.

18.3 MUNICIPAL REGULATORY REQUIREMENTS

Regulatory requirements from the MD of Taber that may affect the Project are described in Table 18.1.

Table 18.1 Municipal Regulatory Requirements

Bylaw or Policy	Description
Bylaw No. 1771 – Irrigation of Roads Bylaw	Prohibits the escape of irrigation water into or on public highways, roads, or road allowances by irrigation installations on adjacent lands.
Drainage Approval Policy	Addresses any work conducted within a Municipal Right of Way for drainage improvement.
Electrical and Pipeline Road Crossing for Irrigation Purposes Policy	Addresses constructing a water pipeline that crosses a municipal road.
Restricting Access of Public Road Allowance Policy	Addresses temporary occupation or use of a road allowance that will require a closure to the public.

18.4 REGIONAL PLANS AND MANAGEMENT FRAMEWORKS

Table 18.2 lists development plans applicable to the MD of Taber.

Table 18.2 Regional Plans and Management Frameworks Applicable to the MD of Taber

Plan	Description
South Saskatchewan Regional Plan	Uses a cumulative effects management approach to set policy to achieve desired environmental, economic, and social outcomes.
Intermunicipal Development Plans (IDPs)	These plans foster collaboration on planning within municipal jurisdictions. The draft 2021 IDP for the MD of Taber and Town of Taber includes the footprint of the Project. The draft IDP includes the Horsefly Regional Emergency Spillway as a land use.
Municipal Development Plan	The MD of Taber Municipal Development Plan Bylaw No. 1723, adopted in 2004, guides future growth and development in the MD. The plan includes mention of policies to minimize risks to health, public safety, and loss of property from potential hazards such as flooding.
Area Structure Plans	These plans establish the framework for subsequent subdivision and development within the MD and address matters including drainage control.

There are no constraints to Project development identified in any applicable Regional Plan authorized by the *Alberta Land Stewardship Act* of any Management Frameworks established by AEP. In fact, the 2021 draft IDP for the MD of Taber and Town of Taber includes the Horsefly Regional Emergency Spillway as a land use in the area.

PART F: POTENTIAL EFFECTS OF THE PROJECT

19.0 POTENTIAL EFFECTS ON FISH AND FISH HABITAT, AQUATIC SPECIES AND MIGRATORY BIRDS

19.1 OVERVIEW OF ENVIRONMENTAL EFFECTS

The Project is the expansion of an existing irrigation system to provide mitigation for large floods. The expansion consists of enlarging the capacity of the existing canals and drains and associated upgrades to irrigation control structures and road and rail crossings. The Project-environment interactions occur during standard irrigation system upgrades and operations. Construction work on the canal enlargement will take place during the non-operational times which extend from early October to late April.

19.1.1 Effect Pathways - Construction

Potential biophysical effects are those associated with a regular construction project: air emissions, noise, water quality effects, soil excavation, vegetation removal, and fish and wildlife issues. Project pathways for biophysical effects during construction include the following:

19.1.1.1 Air Quality

Air emissions during the construction phase result from construction equipment exhaust and from fugitive dust associated with the construction activities. Exhaust emissions from construction equipment include, but are not limited to, excavators, rock movers, graders, packers, dozers, haul dump trucks, zoom-boom, concrete trucks, and tunnel casing pullers. This equipment consumes diesel fuel, and the products of combustion are emitted to the atmosphere. Diesel-powered equipment also includes generators, light plants and in-line heaters. The exhaust emissions are primarily nitrogen (N_2), carbon dioxide (CO_2), and water vapour (H_2O); with trace amounts of substances such as oxides of nitrogen (NO_X), sulphur dioxide (SO_2), carbon monoxide (CO), particulate matter (PM), and volatile organic compounds (VOCs). These gases and particles are common by-products of fossil fuel combustion.

Fugitive dust emissions from surface disturbance activities result in particle emissions of various size ranges (e.g., $PM_{2.5}$, PM_{10} and total suspended particulate matter [TSP]) that can also be deposited to off-site ground surfaces (i.e., dustfall). $PM_{2.5}$ refers to respirable particulate matter that has an aerodynamic diameter less than 2.5 µm and total suspended particulate (TSP) includes larger particles, nominally up to 30 µm in diameter. The larger dust particles are removed near the disturbance area by gravitational settling and is the main contributor to dustfall. TSP, PM_{10} and $PM_{2.5}$ emissions are carried off-site by wind; the smaller PM_{10} and $PM_{2.5}$ fraction tends to be transported further downwind than the TSP.

The magnitude of the construction emissions is directly related to the construction activity intensity. Project-related transportation and construction of Project components involve the movement of the most material, and hence these two activities are expected to generate the largest emissions during the construction phase. Smaller emissions associated with other activities, such as site preparation may occur.

A preliminary construction equipment list is provided in the Greenhouse Gas Mitigation Assessment (RWDI 2020a) (Appendix H1). The equipment list includes equipment types, specifications, and operational factors for earth moving, concrete work, country road crossings, and highway and railway crossings.

This equipment list was adopted to calculate criteria air contaminants (CAC), SO_2, NO_X, TSP, PM_{10}, $PM_{2.5}$, CO, and volatile organic compounds (VOC) emissions for the Project. While construction could occur over a nominal two to three-year period, the air substance emission rates would not be constant and would vary greatly during this period. Similarly, construction activities will not occur simultaneously at the same location. However, for the purposes of this assessment, it was conservatively assumed that all construction activities will occur simultaneously, at the same location, and will all be undertaken over a 1-year period.

Exhaust emissions from off-road diesel equipment are based on the US EPA off-road compression-ignition exhaust engine emission standards (US EPA 2016). It is assumed that Tier 4 (i.e., built after 2015) off-road equipment will be used during construction. Diesel is assumed to contain 15 mg/kg sulphur, consistent with the Sulphur in Diesel Fuel Regulations. (ECCC 2010).

Dust and particulate matter emissions from the operation of the construction equipment are calculated based on equipment type, average equipment speed, operating hours, and load factor. Equipment type, operating hours and load factor are taken from RWDI (2020a). Average equipment speed is assumed to be half of the maximum operating speed for the equipment type. Natural dust mitigation is applied based on the number of days with precipitation greater than 0.2 mm or snow greater than 1 cm at the Lethbridge, Alberta Climate Normals Station (ECCC 2022). On this basis, natural dust mitigation occurs over 40% of the year.

The volume of earth to be moved is currently unknown. Therefore, PM emissions associated with wind erosion were not estimated. Dust control measures will be implemented as required in the ECO plan.

The total Project combustion emissions are presented in Table 19.1 and dust and particulate matter emissions are presented in Table 19.2.

Table 19.1 Total Project CAC Emissions

Construction Activity	Project Component	CAC Emissions (tonnes)						
		NO_X	SO_2	TSP	PM_{10}	$PM_{2.5}$	CO	VOC
Earth moving	SMRID Main Canal to Horsefly Reservoir	0.607	0.010	0.020	0.020	0.020	5.369	0.313
	Horsefly Reservoir to Taber Lake	0.867	0.014	0.029	0.029	0.029	7.669	0.448
	Taber Lake to Oldman River	0.953	0.016	0.032	0.032	0.032	8.436	0.493
Concrete work	SMRID Main Canal to Horsefly Reservoir	0.254	0.002	0.009	0.009	0.009	1.462	0.085
	Horsefly Reservoir to Taber Lake	0.381	0.004	0.014	0.014	0.014	2.193	0.128
	Taber Lake to Oldman River	0.254	0.002	0.009	0.009	0.009	1.462	0.085
	Taber Lake Outlet Structure	0.191	0.002	0.007	0.007	0.007	1.096	0.064
Highway/Railway Crossings		0.077	0.001	0.003	0.003	0.003	0.598	0.036
Country Road Crossings		0.026	0.000	0.001	0.001	0.001	0.225	0.013
Total		**3.610**	**0.051**	**0.124**	**0.124**	**0.124**	**28.510**	**1.665**

Table 19.2 Total Project Dust Emissions

Construction Activity	Project Component	PM Emissions (tonnes)		
		TSP	PM_{10}	$PM_{2.5}$
Earth moving	SMRID Main Canal to Horsefly Reservoir	173	49.3	4.93
	Horsefly Reservoir to Taber Lake	247	70.4	7.04
	Taber Lake to Oldman River	272	77.4	7.74
Concrete work	SMRID Main Canal to Horsefly Reservoir	24.1	6.9	0.687
	Horsefly Reservoir to Taber Lake	36.1	10.3	1.03
	Taber Lake to Oldman River	24.1	6.87	0.687
	Taber Lake Outlet Structure	18.1	5.15	0.515
Highway/Railway Crossings		7.55	2.15	0.215
Country Road Crossings		1.92	0.549	0.055
Total		**803**	**229**	**22.9**

Due to the short-term nature and small magnitude of the Project construction emissions, it is unlikely that the increase in emissions due to the Project will cause a substantial change to ambient air quality in the area. For example, the NOx emissions for the Springbank Off-stream Reservoir project are approximately 1.5 tonnes/day over a three-year construction period. The Horsefly Spillway t NO_x emissions are 3.6 tonnes over the 105-year project lifetime. Dispersion modelling for larger construction projects has shown that predicted concentrations of substances such as $PM_{2.5}$, NO_X, SO_2, and CO decrease with increasing distance from the project development area (PDA) (Stantec 2018). It is also unlikely that the Project emissions will cause ambient air quality to exceed the respective AAAQOs at most locations for most CACs. Historically measured exceedances of the $PM_{2.5}$ AAAQO and AAAQG are due to wildfire smoke and high wind speed events; it is unlikely that any future exceedances due to wildfire smoke and high wind speed events will be exacerbated by the Project.

Compliance with the Canadian Ambient Air Quality Standards (CAAQS) for the South Saskatchewan Air Zone (the Air Zone) is determined based on three years of measurement data collected by monitoring stations located in Calgary, Lethbridge, and Medicine Hat. Although the Air Zone is currently considered to be in the Orange management category (i.e., requiring action to improve air quality and prevent exceedances of the CAAQS), the Project is unlikely to affect the Air Zone CAAQS status.

19.1.1.2 Acoustic Environment

The predicted noise level included conservative assumptions as follows:

- Listed equipment will be used at maximum usage factor.
- All mobile equipment is assumed to be in the same location; in reality some equipment will be further away.
- Barrier effect from natural terrain is not considered.

Construction activities include site clearing, earth moving and concrete work. Mobile noise emitting equipment includes excavators, rock movers, graders, packers, dozer, haul dump trucks, zoom-boom, concrete trucks, and tunnel casing pullers. Stationery noise emitting equipment includes generators and light plants.

Noise emissions associated with these activities are due to on-site mobile and stationery equipment. Workers are required to operate up to 20 pieces of construction related equipment during earth works. In comparison, local Highway 26 traffic volume and the main MD of Taber Access Road has an AADT of 2,500 and 390, respectively. Construction related traffic will increase marginally during workers' arrival and departure on site during the daytime period. The noise effect associated with worker mobilization is expected to be low. Other traffic will be confined to the mobile equipment within the construction area.

The noise assessment focus on the earth moving and concrete work phase of the construction phase due to the higher quantity of type of equipment usage. Equipment types and quantity are preliminary and are based on information presented in the Greenhouse Gas Mitigation Assessment (Appendix H1).



Neither the AUC Rule 12 nor AER Directive 38 are applicable to construction noise. Construction noise effects were estimated based on the method prescribed in the US Federal Transit Administration (FTA) noise guidelines (FTA 2018) and the equations provided in the FTA guidelines were used for the assessment. The construction equipment noise emission levels are based on noise levels at reference distance of 50 ft (feet) as prescribed in the prediction methods of the FTA guidelines. The usage factors for each equipment are based on the fraction of time each piece of construction equipment is operating at full power (i.e., its loudest condition) during construction.

The one-hour equivalent noise level at the FTA reference distance of 50 ft (17 m) is presented in Table 19.3.

Table 19.3 Construction Equipment Noise at 50 ft

Construction Activities	Total Noise Level at 50 ft (dBA)
Earth Moving	92.6
Concrete Work	82.6

The construction noise prediction was assessed at a distance (e.g., minimum buffer distance) for which the noise level results meet the recommended threshold of 80 dBA during the daytime. The 80 dBA threshold is the sound level, in decibels, above-which prolonged exposure can have health effects. The nighttime threshold of 70 dBA is not applicable because no nighttime construction activities are planned for the Project. Table 19.4 summarizes the minimum buffer distance for earth moving and concrete work activities. Residential receptors at or greater than the minimum buffer distances are predicted to meet the FTA noise threshold. Construction noise levels at other receptors less than the minimum buffer distances are predicted to experience noise levels higher than the FTA threshold.

Table 19.4 Construction Activities Minimum Buffer Distance

Construction Activities	Minimum Buffer Distance (m)	Predicted Sound Level (dBA)		FTA Threshold (dBA)	
		Daytime	Nighttime	Daytime	Nighttime
Earth Moving	50	79.4	-	80	70
Concrete Work	30	80.0	-		

Residential receptors are located at various distance from the Project construction activities. A screening assessment indicates that the closest receptors are located approximately 40 m (Township Road 102 and canal north of Taber Lake outlet) from the Project construction activities. Project noise effect during earth moving activities is predicted to exceed the FTA daytime threshold of 80 dBA.

The construction activities noise levels are predicted to be higher than the daytime ASL of 55 dBA at distances of 1,100 m and 700 m for earth moving and concrete work activities, respectively. Receptors with these distances are predicted to experience increase noise level in comparison to the ASL.



The earth moving and concrete work activities are short-term and seasonal. The construction activities are not planned for summer months when there are outdoor residential activities. Noise from the construction phase of the Project is expected to be not dissimilar to that of other construction activities, agricultural operations and traffic in the Taber vicinity. Given the timing of construction activity, outside of bird breeding and nesting periods, wildlife in the area is not expected to experience any additional effects from construction noise.

19.1.1.3 Water Quality

Surface disturbance during the widening of the canals and the installation of canal structures and road crossings could result in suspended sediment concentrations in irrigation water. However, the upgrade of the canals will be accomplished during the winter months when the canals are drained and do not have running water in them. Erosion and sediment control measures, and the management of hazardous materials required in the contractors' ECO Plan, will address the release of sediment into the canal and spills in waterbodies. The diversion of flood waters to the Oldman River has the potential to affect the water quality of the river. The TID is presently adopting water quality standards for runoff entering their irrigation system from urban municipalities and agricultural land. Implementation of these standards is an ongoing process and will take a number of years to be fully implemented.

Atmospheric emissions from Project construction may affect water quality. However, construction will occur away from the main waterbodies and the short-term exposure will not contribute to long-term emissions effects on surface water.

The function of the expanded wetlands at the Horsefly Reservoir and Taber Lake is to filter stormwater before it enters the TID irrigation canals. The wetlands will help enhance riparian areas, reduce nutrient and sediment inputs to the reservoir and lake, and reduce incoming water velocity. The wetlands will provide some water quality mitigation function during the flood events when the Project is operational.

19.1.1.4 Soils

Canal enlargement from the SMRID Main Canal to the Oldman River will include stripping, salvage and stockpiling of topsoil. Following the earthwork, the outside slopes of embankments and other areas within the canal right-of-way will be spread with topsoil, graded and seeded to grass. Excavation for canal expansion may cause soil erosion. Erosion and sediment control measures during construction will be implemented as required in the contractor's ECO Plan.

19.1.1.5 Vegetation and Wetlands

The Project will remove vegetation, affecting native and non-native vegetation communities, plant species diversity and wetland function. A total of 63.3 ha will be altered or removed during Phase 1, 82.4 ha during Phase 2 and 79.4 ha during Phase 3 (Table 19.5). Phase 1 will remove 15.1 ha of native prairie (6.4% reduction in the existing area of native upland vegetation in the vegetation study area) and Phase 3 will remove 27.4 ha of native prairie (9.0% reduction in the existing area of native upland vegetation in the Vegetation Study Area). No native upland vegetation, including native prairie, will be removed during



Phase 2 and no areas of deciduous forest or native shrubland identified in the Vegetation Study Area will be removed by the Project.

Existing wetlands will be partially or completely removed on all three phases of the Project, with 1.7 ha (20.1% of existing wetland area) removed by Phase 1, 1.5 ha (12.1% of existing wetland area) removed by Phase 2 and 30.7 ha (24.7% of existing wetland area) removed by Phase 3 (Table 19.5). The greatest effect from Phase 1 will be to seasonal drainages, 98.9% of existing area removed, and temporary graminoid marshes, 60.0% of existing area removed. Phase 2 wetland removal will be largely to human-made dugouts, 17.0% of existing area removed, followed by temporary graminoid marshes at 11.8% of existing area removed, and seasonal graminoid marshes at 10.9% of existing area removed. Effects from Phase 3 will be mostly to shallow open water bare ground wetlands with 95.5% of existing area removed. Phase 3 will also remove 32.9% of semi-permanent marsh graminoid wetland, 18.1% of the existing area of seasonal graminoid marsh, and smaller proportions of temporary drainages, dugouts and temporary graminoid marshes.

Retained wetland areas are expected to persist on Phase 1, and all three of the intersected wetlands on Phase 2 will persist because upslope drainage area wetlands will not be affected by the Project or the intersected areas are small in relation to the overall wetland area. Wetland area bordering the Horsefly Reservoir will persist and will be expanded as part of the Project resulting in an increase in wetland area. Five smaller wetland areas intersected by the canal expansion in Phase 3 will be completely removed and remaining wetland areas are not expected to persist due to the small size of the remaining portion and altered water inputs to those wetlands. Any wetland disturbance will occur in accordance with the Provincial Wetland policy. Plant composition in retained wetland areas that are expected to persist in Phase 1 will likely shift to species better adapted to drier, less frequently flooded conditions, but the wetlands are expected to remain graminoid marshes. Hydrology and plant composition of retained wetland areas of Phase 2 are not expected to be altered except when rainfall is greater than 125 mm in a 48-hour period (i.e., during a 1:100-year flood event) as changes in wetland area are small, equaling 9.4% to 16.8% of the existing wetland area, and the contributing drainages are unchanged. One of the existing wetlands that will be retained in Phase 2 is in a cropped field and may be periodically disturbed by cultivation. Retained wetlands not regularly disturbed by cultivation in quarter sections adjacent to the canals will have altered hydrology and plant composition following 1:100-year flood events because increased overland flow will be directed to the canal system by the Project. Wetland hydrology and plant composition in the glaciated prairie region, including southern Alberta, fluctuate in response to temperature and moisture conditions, going from a bare ground largely unvegetated state to emergent vegetation and finally open water with submerged aquatic and flooded emergent vegetation (Stewart and Kantrud 1971). Where grading and stripping of topsoil are required, vegetation will be altered temporarily until it is re-established during post-construction reclamation activities. Clearing will be kept to a minimum and will only occur within the approved Project area. Residual effects will be limited to the temporary loss of riparian grasses and shrubs until vegetation can re-establish. Riparian loss is proportionately low relative to availability throughout the Project area and is reversible through reclamation efforts.



Table 19.5 Changes to Land Cover Classes in the Horsefly Emergency Regional Spillway Project

	Phase 1					Phase 2					Phase 3				
	Vegetation Study Area[1]		Project Footprint		Percent Change in Area	Vegetation Study Area[1]		Project Footprint		Percent Change in Area	Vegetation Study Area[1]		Project Footprint		Percent Change in Area
Cover Class	**ha**	**%**	**ha**	**%**	**%**	**ha**	**%**	**ha**	**%**	**%**	**ha**	**%**	**ha**	**%**	**%**
Native Upland															
Deciduous	47.2	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Native prairie	177.0	11.4	15.1	23.8	31.9	0.0	0.0	0.0	0.0	0.0	304.2	24.8	27.4	34.5	9.0
Shrub	12.7	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Native Upland Subtotal	**236.9**	**15.2**	**15.1**	**23.8**	**6.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**304.2**	**24.8**	**27.4**	**34.5**	**9.0**
Wetlands and Waterbodies															
Marsh Graminoid – Temporary (MGII)	1.0	0.1	0.6	0.9	60.0	2.6	0.2	0.2	0.3	9.4	9.6	0.8	0.2	0.2	1.7
Marsh Graminoid – Seasonal (MGIII)	0.8	<0.1	0.0	0.0	0.0	5.4	0.3	0.6	0.7	10.9	14.1	1.2	2.6	3.2	18.1
Marsh Graminoid – Semi-permanent (MGIV)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.4	5.7	23.2	29.2	32.9
Swamp Shrubby – Temporary (SSII)	4.9	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shallow Open Water Bare – Seasonal (WBIII)	0.2	<0.1	0.0	0.0	8.3	0.6	<0.1	0.0	0.0	0.0	3.8	0.3	3.7	4.6	95.5
Shallow Open Water Bare – Permanent (WBV)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.1	0.0	0.0	0.0
Drainage Marsh Graminoid – Temporary (MGII-D)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6	0.6	0.9	1.1	11.5

Table 19.5 Changes to Land Cover Classes in the Horsefly Emergency Regional Spillway Project

	Phase 1					Phase 2					Phase 3				
	Vegetation Study Area[1]		Project Footprint		Percent Change in Area	Vegetation Study Area[1]		Project Footprint		Percent Change in Area	Vegetation Study Area[1]		Project Footprint		Percent Change in Area
Cover Class	**ha**	**%**	**ha**	**%**	**%**	**ha**	**%**	**ha**	**%**	**%**	**ha**	**%**	**ha**	**%**	**%**
Drainage Marsh Graminoid – Seasonal (MGIII-D)	0.9	0.1	0.9	1.4	98.9	0.0	0.0	0.0	0.0	0.0	5.1	0.4	0.0	0.0	0.0
Drainage Shallow Open Water Aquatic Vegetation – Permanent (WAV-D)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.5	0.0	0.0	0.0
Dugout	0.8	0.1	0.2	0.3	23.8	4.2	0.3	0.7	0.9	16.8	5.9	0.5	0.2	0.3	4.1
Wetland and Waterbodies Subtotal	**8.6**	**0.6**	**1.7**	**2.7**	**20.1**	**12.7**	**0.8**	**1.5**	**1.9**	**12.1**	**124.1**	**10.1**	**30.7**	**38.6**	**24.7**
Water															
Canal	11.7	0.7	7.2	11.3	61.6	17.0	1.1	12.6	15.3	74.1	35.7	2.9	10.9	13.7	30.5
Lake	193.4	12.4	3.2	5.0	1.6	183.8	11.8	36.8	44.7	20.0	0.0	0.0	0.0	0.0	0.0
Reservoir	0.0	0.0	0.0	0.0	0.0	31.0	2.0	0.4	0.5	1.4	12.4	1.0	0.0	0.0	0.2
River	28.1	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Subtotal	**233.1**	**15.0**	**10.4**	**16.4**	**4.4**	**231.8**	**14.9**	**49.8**	**60.5**	**21.5**	**48.2**	**3.9**	**10.9**	**13.8**	**22.7**
Agricultural															
Crop	641.9	41.3	4.7	7.4	0.7	741.1	47.7	15.4	18.7	2.1	687.1	56.0	1.8	2.2	0.3
Tame pasture	311.9	20.1	28.8	45.5	9.2	213.0	13.7	11.5	14.0	5.4	37.5	3.1	8.6	10.8	23.0
Agricultural Subtotal	**953.8**	**61.4**	**33.5**	**52.9**	**3.5**	**954.1**	**61.4**	**26.9**	**32.7**	**2.8**	**724.6**	**59.1**	**10.4**	**13.1**	**1.4**

Table 19.5 Changes to Land Cover Classes in the Horsefly Emergency Regional Spillway Project

	Phase 1					Phase 2					Phase 3				
	Vegetation Study Area[1]		Project Footprint		Percent Change in Area	Vegetation Study Area[1]		Project Footprint		Percent Change in Area	Vegetation Study Area[1]		Project Footprint		Percent Change in Area
Cover Class	**ha**	**%**	**ha**	**%**	**%**	**ha**	**%**	**ha**	**%**	**%**	**ha**	**%**	**ha**	**%**	**%**
Disturbed															
Industrial	5.3	0.3	0.0	0.0	0.0	151.2	9.7	1.6	2.0	1.1	0.0	0.0	0.0	0.0	0.0
Road	21.0	1.3	0.0	0.0	0.0	44.3	2.8	0.8	0.9	1.7	16.3	1.3	0.1	0.1	0.4
Settled	94.9	6.1	2.6	4.2	2.8	160.5	10.3	1.7	2.1	1.1	9.4	0.8	0.0	0.0	0.0
Disturbed Subtotal	**121.2**	**7.8**	**2.6**	**4.2**	**2.2**	**356.0**	**22.9**	**4.1**	**5.0**	**1.2**	**25.7**	**2.1**	**0.1**	**0.1**	**0.2**
Total	**1,553.6**	**100.0**	**63.3**	**100.0**	**4.1**	**1,554.6**	**100.0**	**82.4**	**100.0**	**5.3**	**1,226.8**	**100.0**	**79.4**	**100.0**	**6.5**

NOTE:
[1] Vegetation Study Area equals a 1 km buffer on the Project footprint.

Construction of wetlands will be undertaken where the Spillway enters Horsefly Reservoir and Taber Lake to help enhance riparian areas, reduce nutrient and sediment inputs to the reservoir and lake, and reduce incoming water velocity. The design has not been finalized but will potentially be a graminoid marsh wetland with gentle slopes which will support multiple wetland depth and water permanency zones. The constructed wetlands are intended to improve water quality of the reservoirs during normal canal operations. An increase in wetland area has potential to offset Project losses of existing wetlands and associated wetland ecological function, help to maintain water quality and provide aquatic invertebrate, wetland plant and animal habitat.

Two plant SOCC, velvety goldenrod and scratchgrass, were documented during the field surveys in the Project footprint of all three project phases and will be removed during Project construction (Figure 14.2, Figure 14.3 and Figure 14.4). Multiple locations of each SOCC plant were observed in the in the Project suggesting they are locally common; however, none have been documented elsewhere in the Vegetation Study Area by the Alberta Conservation Information Management System (ACIMS 2017). No effects to ecological communities of conservation concern are expected as none have been documented in the Vegetation Study area by ACIMS (2017) and none were observed during Project surveys.

The commonly observed weeds species creeping thistle and perennial sow thistle produce abundant seeds, over 40,000 per plant and 4,000 per plant respectively, and can spread asexually by creeping horizontal underground stems (i.e., rhizomes) (Royer and Dickinson 1999; Alberta Invasive Species Council 2014a [AISC]). Several of the less common weed species can also be difficult to eradicate once established, including leafy spurge (*Euphorbia esula*) and dalmation toadflax (*Linaria dalmatica*) (AISC 2014b, 2014c).

The seeds of these regulated weed species will likely remain in the seedbank in stockpiled material and are anticipated to persist following construction. Ground disturbance during construction will provide increased opportunity for weeds to establish and spread. The canal sides will also provide an opportunity for greater dispersal as this existing linear disturbance could act as a corridor for establishment and spread over longer distances. Weeds are expected to be common and widespread in the Vegetation Study Area based on the frequent observations at surveyed sites. Regular site inspection during the growing season when construction is occurring, and actively reclaiming Project disturbed areas with either agronomic or native plants suited to the weather conditions of the Dry Mixedgrass Natural Subregion moisture and temperature conditions will be important for managing weeds and reducing effects to surrounding areas. Ongoing weed control after construction may be necessary to control weed spread. No wetland weeds (e.g., pale yellow iris [*Iris pseudacorus*], purple loosestrife [*Lythrum salicaria*]) were observed during Project surveys.

Project-related emissions will occur during the construction phase from vehicle and equipment use and movement. Species most susceptible to deposition of emissions (i.e., particulate matter, acidifying nitrogen oxides and sulfur oxides) are mosses and lichens due to several factors, including lack of cuticle, low growth form, shallow anchor system (lack of true roots), and lack of true leaves. Effects from sulfur dioxide on lichens and mosses include reduced photosynthesis and respiration, damage to the algal symbiont, loss of electrolytes, loss of nitrogen fixation, reduced potassium absorption, and structural changes. Emissions such as oxides of nitrogen and sulfur can also cause changes of growth and carbon



allocation (root: shoot ratio) in vascular plants, which can increase their susceptibility to fires, drought, and wind as well as increase competition between plants, which can cause change in species composition and community structure.

Up to 10 pieces of construction related equipment will be required during Project earth works and 5 pieces during Project concrete works. The Phase 1 Project footprint intersects Highway 36, and various range roads and township roads intersect all three project phases (e.g., Range Road 164, Township Road 90). The population of the Town of Taber in 2020 was 8,711, with 3,474 households. The population of the surrounding area was estimated to equal 24,000 people. Local Highway 36 annual average daily traffic (AADT) equals 2,500. Assuming daily use of one vehicle per household, the Project contribution to local emissions will be less than 1% of local Taber vehicle traffic and approximately 1% of Highway 36 AADT. Therefore, additional effects to vegetation from emissions are not expected because of Project construction. To help mitigate potential effects to vegetation, Project construction will be completed during winter months, outside of the growing season when plants are dormant or potentially covered by snow or ice.

19.1.1.6 Fish

Construction will take place during the period when the irrigation system has been drained and is not in operation. The existing irrigation system is not designed for or intended as fish habitat. Effects on fish habitat may occur during construction of the canal inlets and outlets to the Horsefly Reservoir and Taber Lake and the outlet to the Oldman River. Overall, the Oldman River has poor to moderate habitat within the area of its confluence with the coulee given the lack of habitat complexity. Work in the Oldman River will be minimized.

To support the new infrastructure, instream construction will be required at the inlets and outlets of Horsefly Lake and Taber Lake, the Oldman River, and the coulee which has connectivity downstream with the Oldman River. This will result in temporary and permanent footprints within fish habitat which can result in temporary and permanent alteration and some habitat loss. The extents of the footprints associated with temporary and permanent works will be further refined during the regulatory review process with Fisheries and Oceans Canada. Any work in the canal infrastructure will take place during winter months when the canal has been drained.

Instream works will be minimized to the extent possible and will be completed within an isolated workspace to reduce interactions with fish and fish habitat. Isolations may temporarily restrict fish passage; however, instream works are expected to be completed outside of the restricted activity period (RAP) where possible. Habitat within the isolated workspaces will be temporarily unavailable to fish. Relative to the area of the affected waterbodies, the instream workspaces will be small, and the rest of the waterbody will remain available to fish during and after construction. Once instream works are completed, temporary structures will be removed.

19.1.1.7 Wildlife

Canal expansion has the potential to cause changes in wildlife habitat, movement and mortality risk. Changes in habitat are anticipated during construction and are associated with direct loss or alteration of habitat from vegetation removal and ground disturbance (habitat adjacent to existing canals) as well as changes in habitat effectiveness associated with sensory disturbance. The majority of potential habitat for wildlife in the Project footprint is modified by human activity (e.g., tame pasture and cultivation) and of lower suitability for wildlife, especially for wildlife species at risk. Although existing disturbance in the area, such as vehicle traffic (e.g., highway traffic, industrial development) and agricultural activities might habituate some wildlife to elevated levels of noise emissions and human presence, some species might exhibit habitat avoidance of an area because of noise, artificial light, or vibration. However, sensory effects will be limited to non-migratory, winter active wildlife species as clearing and construction are scheduled to occur when the irrigation system is not operating in the fall and winter months when migratory species are on their wintering grounds or migrating.

The removal of the two potential bullsnake and prairie rattlesnake hibernacula in the Project footprint in the coulee will require approval from AEP, as they are listed as being Special Concern under Schedule 1 of SARA. The destruction of a residence of a species listed as Special Concern is not prohibited under SARA.

Potential changes in movement are associated with alteration or impediment of wildlife movement due to physical barriers and sensory disturbance associated with construction and/or operation. This includes effects associated with widening of existing infrastructure (canals), installation of fencing, and new spillway construction within the coulee to the Oldman River (Phase 1).

Changes in mortality risk may occur during construction as a result of Project-related works and activities resulting in physical destruction of key habitat features (e.g., nests, dens, hibernacula), Project-related works and activities can result in accidental mortality of small, less mobile species or individuals (e.g., amphibians, juvenile birds), trapped wildlife (e.g., within open excavations) and vehicle-wildlife collisions. Project clearing and construction is scheduled to avoid the Primary Nesting Period for migratory birds and the active season for other wildlife (e.g., amphibians), reducing mortality risk for these species. Construction is anticipated to be completed by a small crew of 30 to 40 workers, which will reduce the risk associated with vehicle collisions. Operation of the Project is not predicted to result in a further adverse change in mortality risk.

19.1.1.8 Health, Social and Economic Conditions

Potential health, social and economic effects associated with Project construction include air quality and noise effects on human health, effects on water quality from spills of fuels, and the removal of country food sources; disturbance of archaeological and palaeontological sites; and land use changes.

As discussed in Section 19.1.1.1, emissions from construction equipment are expected to be short-term, intermittent and to not exceed CAAQS. Similarly, noise level exceedances are expected to be short-term and seasonal, primarily during winter months. Water quality effects from fuel spills are expected to be

negligible, given mitigation measures for fuel spills and response and that most of the construction will take place during times when the canals have been drained. Construction along the canals will take place away from potable water supplies. The Indigenous groups that have commented on the Project have not identified any country food sources along the Project footprint.

Excavation for canal expansion may disturb archaeological or palaeontological sites. The approval for the Project from ACSW includes the standard requirement that if an historic find is encountered during the course of a project, activities that may impact the resource must cease while it is being evaluated and must be reported on immediately.

Construction may disrupt existing land use; access issues may arise due to construction traffic. The Project is not expected to affect recreational activities on Taber Lake or Horsefly Reservoir which have been in operation for over seventy years. The recreational opportunities on both waterbodies are very limited due to their small size and lack of park facilities. Fishing on Horsefly Reservoir is the main recreational activity on the waterbodies.

Construction of the Project is expected to employ 30 to 40 persons who will likely be from the local area. No work camps will be required and the work force is not expected to disrupt local activities or put pressure on local services.

19.1.2 Effect Pathways - Operation

During non-flood operations, the irrigation system will operate as it presently does. During the operations and maintenance phase, associated activities would be limited to periodic inspections and routine maintenance. Air emissions are therefore also expected to be limited and exceedances of the AAAQO and AAAQG are not anticipated. Noise emissions during the operations and maintenance are negligible as there is no equipment used (i.e., pumps, powered equipment). When the Project is in operation during flood conditions, biophysical effects are associated with the discharge of water into the Oldman River. The increased flow of water has the potential to cause fish habitat alteration or destruction, fish mortality, and water quality degradation in the river. However, the river will be in flood conditions at that time and the additional water from the Project is not expected to cause a substantive effect on the river conditions. Peak discharge of the Oldman River during a 1:100-year flood is 3,900 m^3/s; the Project will be adding 40 m^3/s at that time, an increase of 1%. The water quality of discharge from the canal is expected to be better than that of the Oldman River during flood conditions as the river will include sediment and debris from upstream while the discharge from the canal will have been filtered by passing through the Horsefly Reservoir, Taber Lake and the wetlands.

Operation of the Project is not predicted to result in further adverse change in wildlife habitat. The expansion of wetland habitat at Taber Lake (Phase 2) and at the Horsefly Reservoir (Phase 3) will increase the availability of habitat for wetland associated species. Operation of the Project is not predicted to result in a further adverse change in mortality risk.



Changes in water levels due to the Project during 1:100-year floods may alter the duration of increased wetland flooding and duration of natural shifts in plant composition and cover, but since wetlands occupy lower topographic positions than the surrounding landscape, the Project will likely reduce flooding to upland areas. Water levels of Horsefly Reservoir and Taber Lake will increase during 1:100-year flood events and this will likely temporarily decrease the extent of emergent vegetation in wetlands bordering the reservoir and lake as vegetation is submerged. With greater moisture, the wetlands may expand outward in locations not constrained by land use and topography. Wetland expansion will be limited on Taber Lake as surrounding land use is primarily agriculture and human disturbed land (i.e., Town of Taber). Emergent wetland vegetation is expected to re-establish in Horsefly Reservoir and Taber Lake once water levels recede after a flood to pre-flood conditions.

During a 1:100 year or greater flood, water diverted from the SMRID Main Canal to the Oldman River will take three or four days to pass through the Horsefly Reservoir. Mercury methylation is a chemical process that occurs associated with organic matter decomposition in a waterbody. Stormwater will not be stored in the Horsefly Reservoir and the Project will not be a cause of mercury methylation.

19.1.3 Mitigation Measures - Construction

19.1.3.1 Environmental Construction Operations (ECO) Plan

Project construction will be carried out by third-party contractors hired by the MD of Taber. Contractors are required to meet Alberta Transportation standards for water control projects. An ECO Plan (Alberta Transportation, City of Calgary, City of Edmonton 2020) is required prior to commencing construction. The ECO Plan includes a description of potential environmental impacts and controls, hazardous materials and waste management, and environmental emergency procedures specific to the project.

Appendix F1 is the ECO Plan framework and Appendix F2 is Greenfield Construction Ltd.'s ECO Plan for Emergency Spillway and related Work on the Jensen Dam Flood Handling Upgrades near Magrath, Alberta. The Jensen Dam project is the construction of an emergency spillway as part of the Taylor Wasteway Replacement which is a part of the South Regional Stormwater Master Plan (see Figure 12.1). MPE managed the project.

The ECO Plan framework outlines the five steps in an ECO Plan:

1. Description of Site Activities
2. Potential Environmental Impacts and Controls
3. Hazardous Materials and Waste Management
4. Environmental Emergencies
5. ECO Plan Implementation

The Jensen Dam ECO Plan includes measures to meet requirements of the applicable federal and provincial acts including *Canadian Navigable Waters Act*, *Fisheries Act*, *Migratory Birds Convention Act*, *Canadian Environmental Protection Act*, Alberta *Environmental Protection and Enhancement Act*, *Alberta*

Wildlife Act, *Historical Resources Act*, and *Species at Risk Act*. Step 2 of the Jensen Dam ECO Plan addresses erosion and sediment control and includes temporary erosion and sediment controls, contingency materials, best management practices and a revegetation guide. Step 3 identifies the on-site representative, training and communication, monitoring and reporting, documentation and ECO Plan update. The structure and content of the Horsefly Spillway ECO Plan will be similar to that of the Jensen Dam ECO Plan.

The MPE/Stantec team, as the MD of Taber's representative, will review the ECO Plan and monitor the contractor's implementation of the mitigation measures. The MD of Taber will also hire their own project manager.

19.1.3.2 Air Quality

Potential air quality effects of the Project will be confined to the construction phase. Mitigation measures include the following:

- Vehicles and equipment will be required to meet emission control standards.
- All work shall be conducted in a manner that minimizes the raising of dust from construction or maintenance operations
- Dust control measures such as watering roads to suppress dust distribution and ceasing operations during periods of high winds will mitigate the distribution of particulate matter during construction activities.
- Disturbed surfaces will be revegetated promptly following construction to prevent wind erosion and to control dust.
- Surfaces of temporary soil and overburden stockpiles will be stabilized during extended periods between usage, by means of vegetating or covering the exposed surfaces.
- Silt fences and other erosion control methods such as mulching and application of tackifiers will be used to prevent soil loss from soil stockpiles due to wind erosion.
- The concentration of sulphur in diesel fuel shall not exceed 15 mg/kg to comply with Sulphur in Diesel Fuel Regulations.
- Construction vehicle idling times will be reduced to the extent possible in order to reduce emissions, as a best management practice.

19.1.3.3 Acoustic Environment

Noise levels will increase during construction. Mitigation measures include the following:

- Construction activities will be limited to the daytime period and largely restricted to seasons (e.g., late fall, winter) with fewer outdoor activities.
- Construction machinery and factory-supplied noise abatement equipment (i.e., mufflers) will be maintained in good working order.

- Machinery idling will be minimized.
- Residents near to construction noise-generating activities will be notified prior to construction.
- A complaint response procedure will be implemented to address noise complaints should they arise.

19.1.3.4 Water Quality

Sediment from erosion of the disturbed surface soils during excavations to increase the canal size may be deposited into the canal. Construction in the canals will take place in the fall and winter months after the canals have been drained for the year. Mitigation includes the removal of soil deposited in the canals prior to the irrigation system start up in April. The contractor's ECO Plan (see Appendix F) includes an Erosion and Sediment Control Plan, structured after the Alberta Transportation Erosion and Sediment Control Manual (Alberta Transportation 2011), which includes best management practices for surface water management. Any water drainage from upstream areas of the canal will be diverted around the construction site wherever practical using ditches, berms, pipes, or culverts.

19.1.3.5 Soils

Soil stripping and excavation to enlarge the canals may result in soil erosion. Mitigation measures include the following:

- Soils excavated during construction will be stockpiled and the piles will be protected by mulching or the application of tackifiers to prevent erosion into the canal.
- Channel banks, berms, dikes and ditches will be seeded and revegetated with an appropriate native seed or erosion control mix to improve stability of these features, unless these features are being stabilized by riprap.
- Erosion and sediment control measures include maintenance of vegetation cover, where possible, long-term, temporary or emergency stabilization of soil, revegetation of disturbed areas, and runoff diversion to prevent undesirable soil movement or soil releases and discharges to the canals.

19.1.3.6 Vegetation and Wetlands

Mitigation measures for vegetation and wetlands include the following:

- Activities will be restricted to the Project footprint to reduce vegetation loss. Construction traffic will be limited to the rights-of-way and easements obtained for the Project
- Protective layers such as matting or biodegradable geotextile and clay ramps or other approved materials between wetland root/seed bed and construction equipment will be used if ground conditions have the potential for rutting, admixing or compaction
- Where possible, grading/drainage will be directed away from wetlands and ground level cutting/mowing/mulching of wetland vegetation will be conducted instead of grubbing. An appropriate native seed mix that is suitable for wetlands will be used to reclaim Project-disturbed wetland areas

- Cross drainage will be maintained where there are permanent or temporary access roads, to allow water to move freely from one side of the road to the other
- *Water Act* approval for disturbance to wetlands will be obtained from Alberta Environment and Parks prior to Project construction.
- A native custom seed mix will be used to reclaim Project disturbed native upland areas. An agronomic seed mix composed of plants adapted to the Dry Mixedgrass Natural Subregion will be used to reclaim Project disturbed non-native areas.
- Cover crop seed mixtures or riprap will be used to assist in weed and erosion control on exposed soils
- Seed or plants of the observed SOCC plant species will be collected and sown/transplanted to reclaimed native grassland areas disturbed by the Project.
- Project disturbed areas, including topsoil and subsoil piles, will be monitored for weed growth during construction and corrective measures (e.g., spraying, mowing, hand-pulling) implemented to avoid growth and establishment of regulated weeds.
- Reclaimed Project disturbed areas will be monitored for weed establishment and growth until vegetation has established. Weed control will be conducted as needed prior to weed maturity and seed set and corrective measures, such as additional seeding, conducted as needed.
- Herbicide will not be applied within 30 m of plant SOCC, wetlands or waterbodies. Spot spraying, wicking, mowing, or hand picking are acceptable measures for control of regulated weeds in these areas

19.1.3.7 Fish

Work in waterbodies is expected to occur at the outlets of Horsefly Reservoir and Taber Lake and may be required at the Oldman River and the coulee. Detailed mitigation measures will be developed for each waterbody and will be reviewed by DFO. A summary of measures to mitigate effects on fish and fish habitat will include the following:

- In-water work will be timed to respect the respective timing windows (i.e., outside the RAP [April 1 to July 31]) to protect fish during sensitive time periods, wherever possible. If work is required during the RAP, approval will be obtained from DFO.
- The duration of in-water works will be minimized and any in-water work in the Oldman River will be conducted during periods of low flow, where possible, to further reduce the risk to fish and their habitat and to allow work to be isolated from the waterbody.
- Machinery will arrive on site in a clean condition and will be maintained free of fluid leaks, invasive species, and noxious weeds.
- All aquatic field gear and equipment working in-water will be disinfected (i.e., rinsed with soapy water, rinsed with QUAT Plus, and allowed to air-dry) before moving to another watershed to prevent the spread of infectious pathogens and invasive species (e.g., whirling disease).

- The contractor's ECO Plan will include plans for erosion and sediment control and emergency prevention and response plans for spills to minimize the risk of accidental spills or releases from entering any waterbody.
- The ECO Plan also includes a requirement for Turbidity Monitoring Plan for any planned instream construction.
- Machinery will be washed, refueled, and serviced and fuel and other materials will be stored in such a way as to prevent any deleterious substances from entering the water.
- Before any isolation or dewatering works commence, an aquatic biologist will be retained to confirm applicable permits for relocating fish are obtained and will capture any fish trapped within an isolated/enclosed area at the worksite and safely relocate them to an appropriate location. A fisheries research licence will be obtained from AEP prior to commencement of construction activities.
- Clearing of riparian or aquatic vegetation will be kept to a minimum. Existing trails, roads, and approaches will be used wherever possible to avoid disturbance to the vegetation and prevent soil compaction. Where practicable, vegetation will be pruned or topped.
- The bed and banks of the waterbody will be restored to their original contour and gradient; if the original gradient cannot be restored due to instability, a stable gradient that does not obstruct fish passage will be restored.

19.1.3.8 Wildlife

Established general protection measures and practices, along with specific mitigation measures for wildlife features observed in or adjacent to the Project footprint are outlined below and will be implemented to avoid or reduce potential effects on wildlife and wildlife habitat.

- Activities will be confined to the Project footprint.
- Prior to the start of construction activities, all sensitive resources (e.g., raptor nests) and their setback buffers, will be marked, and setback distances will be followed, where appropriate.
- Construction personnel will not be permitted to have dogs on the construction footprint. Firearms are not permitted in Project vehicles or on the Project footprint.
- Noise abatement equipment on machinery will be in good working order.
- Project personnel are prohibited from hunting or fishing on the construction footprint, and from harassing, feeding, collecting or possessing wildlife species.
- The MD of Taber will develop and deliver an environmental orientation to inform the construction workforce of Project- specific environmental requirements, sensitivities and mitigation measures prior to accessing the Project site.
- Any previously unidentified listed or sensitive wildlife species or their site-specific habitat (e.g., dens, nests) identified during Project construction will be reported to the Environmental Inspector(s) or designate(s).
- As required in the contractor's ECO Plan, all construction debris and other waste materials will be collected and disposed at an approved facility.



- Where clearing or construction activities overlap the nesting period for owls and raptors (March 1 to August 31, a nest survey may be undertaken prior to activities if warranted, based on recommendations from a qualified wildlife biologist. In the event an active nest is found, it will be subject to site-specific mitigation measures (i.e., clearly marked protective buffer around the nest and/or non-intrusive monitoring) based on recommendations from a Wildlife Resource Specialist.
- Clearing and construction activities are schedule to occur during frozen conditions or early spring when sensitive amphibians are not active. If physical activities extend beyond April 1, pre-construction surveys may be undertaken for amphibian breeding activity based on recommendations from a Wildlife Resource Specialist.
- The two potential hibernacula in the coulee will be removed (upon approval from AEP) in early September before snakes enter hibernation. A qualified wildlife biologist will be on site to capture and relocate snakes encountered during removal activities.
- Fencing along the canal will be wildlife friendly with spacing for antelope passage on the bottom wire.
- Treed habitats which provide nesting and roosting habitat for birds, bats, and other mammals, will be retained where safe and technically feasible to do so.
- To reduce the possibility of vehicle collisions with wildlife, vehicle speed will not exceed posted speed limits and wildlife warning signs will be installed where appropriate. Where practical and applicable, multi-passenger vehicles will be used for the transport of crews to and from job sites.

19.1.3.9 Archaeology and Palaeontology

All conditions to approval from ACSW regarding archaeological and palaeontological sites will be adhered to. These include:

- Construction activities will be stopped if there is the exposure of a historic resource (e.g., artifact). An archaeologist will examine and catalogue the discovery and it will be reported to the Heritage Division of ACSW.
- A palaeontologist will be present to monitor any excavation activities in the coulee down to the Oldman River. If any significant palaeontological resources are encountered, the Royal Tyrrell Museum of Palaeontology will be contacted.

19.1.3.10 Land Use

Construction activities may affect existing land uses. Mitigation measures to avoid this include the following:

- Construction activities and equipment will be managed to avoid damage and disturbance to adjacent properties, structures and operations.
- Channel excavation and disturbance will be limited to defined rights-of-way and access routes.
- Signs directing traffic to detours will be installed during construction to address public safety.
- A traffic management plan will be developed for the construction activities in order to minimize any traffic disruptions.

19.1.4 Mitigation Measures - Operations

There are no specific mitigation measures identified during normal Project operation activities either in non-flood or flood conditions. If effects to the Oldman River fish habitat or fish species are observed during monitoring of flood activities, solutions will be developed in consultation with DFO.

19.1.5 Accidents and Malfunctions

The Project will be constructed by contractors. All contractors are required to submit an ECO Plan prior to working on the Project. The ECO Plan, which will be reviewed and approved by the MPE/Stantec team, as the MD of Taber's representative, will include hazardous materials handling and emergency prevention and response procedures.

All construction equipment will be cleaned and inspected before it arrives on site. All leak and spill, containment and cleanup procedures are detailed in the ECO Plan.

Construction of the Project is largely related to earth moving. Burning is not allowed on site.

Spills will be reported to AEP, as per the *Alberta Environmental Protection and Enhancement Act* 'A Guide to Release Reporting' (2005).

Potential accidents and malfunctions that may occur during Project construction include hazardous material spills, fires and vehicle accidents. The prevention of and response to these events will be discussed in the environmental emergency procedures section of the ECO Plan. Operations during flood conditions could experience overtopping of the canals.

19.1.5.1 Hazardous Material Spills

Hazardous materials are primarily those associated with equipment fuel coolants and lubrication. Spills may occur as the result of improper handling, use, or storage of these materials on-site. Spills could affect soils and vegetation, water quality and wildlife. Incident prevention includes:

- Machinery will arrive on site in a clean condition free of fuel, oil or fluid leaks.
- Refueling of vehicles and equipment will be carried out in such a way as to prevent any deleterious substances from entering the water.
- All employees involved in the handling and storage of fuels will have Workplace Hazardous Materials Information System and spill response training.
- Materials required for spill containment and cleanup will be available at all work sites and designated areas. All vehicles will carry materials and equipment for emergency spill containment.

Incident response and mitigation includes:

- All spills will be cleaned up immediately
- A spill kit or sufficient supply of materials for clean-up or spill containment will always be available on site and replenished as needed.
- The Contractor will designate a qualified supervisor(s) as the onsite emergency response coordinator(s) who will be on site at all times that work is undertaken.

19.1.5.2 Fires

Fire may be caused by natural events such as lightning strikes and wildfire, electrically powered Project component malfunction (e.g., outlet channel control structures), equipment malfunction, or anthropogenic activities. In the unlikely event of an accidental fire, effects could be loss of life, air quality degradation, vegetation loss, wildlife habitat and individuals loss, agricultural loss and infrastructure loss. Incident prevention includes:

- Fires or burning will not be allowed on the construction site.
- No activity will be conducted which may cause a fire to spread. Similarly, burning or smoldering matter will not be placed where it may cause a fire to spread.

Incident response and mitigation includes:

- All reasonable steps will be taken in order to prevent a fire from burning out of control or spreading from land owned or occupied for construction purposes.
- In the event that a wildfire is identified where construction activities are taking place, all reasonable attempts will be made in order to extinguish the wildfire. All available equipment, services and labor will be made available for the purposes of wildfire protection operations.
- All construction and related activities taking place in the vicinity of a wildfire will cease until it is safe to resume operations.

19.1.5.3 Vehicle Accidents

Movement of vehicles, equipment and personnel to the Project area could result in collisions resulting in injury or death to humans and wildlife. Incident prevention includes compliance with traffic laws and regulations. Preventative measures to reduce the risk of collisions include signage, traffic control flag persons, road surface controls (e.g., dust suppression), maintaining vehicles and reducing traffic to Taber and the Project area during construction. Response measures may include contacting on-site emergency response personnel or regional emergency services.

19.1.5.4 Overtopping of Canals

The purpose of the Project is to increase the flood attenuation capacity of the SMRID system. Presently, during large flood conditions water from the SMRID Main Canal can overtop the canal and flood the adjacent lands. The Project will allow water from the Main Canal to be diverted to the Horsefly Reservoir and thus to Taber Lake and then to the Oldman River. This will allow the Main Canal to manage more flood waters from upstream and downstream of the Horsefly Reservoir without overtopping. The volume of water diverted from the Main Canal is controlled at the turnout structure (see Figure 9.3). The turnout structure will be closed when the canal from Taber Lake is at capacity (passing 40 m^3/s). With floods greater than the 1:100-year event, flood waters from the Main Canal would then flood the adjacent lands as has occurred without the Project.

The lagoons at the Lantic Facility are approximately five metres above the existing natural ground and irrigation canals. Water overtopping the Spillway canal would have to reach a depth of five metres to mix with water in the Lantic lagoons. Given topography of the area, floods greater than the 1:100-year flood would flow into Taber Lake and the surrounding lands and would not be able to reach a depth of five metres unless the whole area was flooded to that depth.

All gated control structures in the Spillway will be powered by the existing electrical grid system with provisions for portable electrical power in the event of a power outage and will have the capability of being operated remotely. Failure of the control structure to close could result in overtopping of the Project canals and flooding of the adjacent lands. The environmental effects would be similar to a flood without the Project.

19.2 FISH AND FISH HABITAT

Effects on fish and fish habitat are expected to be minor to negligible. Project construction will occur along the existing canals and through the coulee, which has fish habitat. At the confluence with the Oldman River, the channel in the coulee will be constructed to have a semi-natural cross section and be 8 m wide and 2 m deep. Construction will take place during the October to April period when the channel has little or no flow in the upper sections but more regular flow in the lower sections with the outflow from the Lantic Facility. Flow only occurs in upper sections due to drainage from existing agricultural lands and discharge from seepage collection systems. Outflow from the Lantic Facility occurs during processing of sugar beets in the fall and winter months and will be diverted around the site during construction.

The section of Spillway at the confluence of the Oldman River will require dewatering and a fish salvage operation will be undertaken as part of the dewatering process. There is no anticipated work within the Oldman River itself.

The discharge of water to the Oldman River will occur during flood conditions. The expected discharge during a 1:100-year flood will be 40 m^3/s at which time the peak discharge of the Oldman River is 3,900 m^3/s. The increase is 1% of the peak flow at that time.

Upgrades to the outlet from Taber Lake will require dredging to deepen the channel. A coffer dam will be used to mitigate any effects on fish in the lake. Upgrade to the outlet of Horsefly Reservoir will be carried out in the canal; there will be no work in the reservoir.

19.3 AQUATIC SPECIES

Effects to aquatic species, as defined in subsection 2(1) of the *Species Risk Act* are not anticipated as marine plants are not found in the Project area.

19.4 MIGRATORY BIRDS

Mitigation measures for minimizing Project effects on migratory birds include the following:

- Clearing and construction will not occur during the Primary Nesting Period of April 1 and August 31, which includes the extended period for species at risk to avoid disturbance to nesting migratory birds, including colonial nesting birds on Taber Lake.
- Treed habitats will be retained where safe and technically feasible to do so.
- To reduce the possibility of vehicle collisions with wildlife, vehicle speed will not exceed posted speed limits and wildlife warning signs will be installed where appropriate.
- Project construction will occur largely during the winter and early spring when the irrigation system is not operational. For any activities occurring during the migratory birds Primary Nesting Period in potential nesting habitat, a qualified wildlife biologist will complete a nest search for active nests within seven days prior to the start of the proposed work.
- In the event an active nest is found, it will be subject to site-specific mitigation measures (i.e., clearly marked protective buffer around the nest and/or non-intrusive monitoring) based on recommendations from a Wildlife Resource Specialist

19.5 SUMMARY OF EFFECTS

The TID, operational for over a century, includes 435 km of canals, drains and pipelines providing water to over 800 irrigation systems in southern Alberta. The Project, a flood mitigation project, will enlarge four of the TID canals (the Horsefly Main Canal, Lateral 15, a portion of the Big Bend Main Canal and a drain to the Oldman River) to divert water to the Oldman River. Construction will affect 14 km or 3.2% of the TID system. The Project will be operational only during a 1:100-year flood or greater. In non-flood times, the system will operate as part of the TID infrastructure providing irrigation water to the area. The drain from the Big Bend Main canal will not be operational during non-flood times and the Project will not divert water to the Oldman River.

The Project is divided into three phases and is planned to be constructed over a four-year period by a work force of 30 to 40 persons. Construction will be carried out primarily in the fall/winter months when the irrigation system is shut down. Construction will be similar to the annual maintenance activities carried out on the infrastructure by the TID. The work will be accomplished by contractors, managed by MPE and

Stantec who have extensive experience in the development of irrigation and municipal infrastructure in the area. Contractors will develop and implement an ECO Plan which provides information on the contractor's understanding of potential impacts of their work and mitigation to avoid and mitigate impacts. It includes an erosion and sediment control plan and emergency prevention and response plans. Such plans are common for many infrastructure projects in Alberta.

The implementation of mitigation measures, including those listed in the preceding sections will lessen the environmental effects of the Project. Environmental effects will be concentrated on the construction phase of the Project.

Atmospheric emissions will result in temporary air quality effects and noise will increase in the area surrounding construction activities, as occurs with any construction project in the MD of Taber. The effects will be short term and atmospheric emissions are not expected to exceed CAAQS. Noise level exceedances are expected to be short-term and seasonal, primarily during winter months. Residents near to construction noise-generating activities will be notified prior to construction.

Vegetation and soil removal will result in the loss of vegetation communities along the canals, loss of some wetlands and temporary exposure of soil to erosion. *Water Act* approval for disturbance to wetlands will be obtained from Alberta Environment and Parks prior to Project construction. Exposed soil surfaces will be reclaimed. Construction will take place during the non-operating conditions of the irrigation system and any soil deposited in the dry canals will be removed.

Replacement of control structures on the Horsefly Reservoir and Taber Lake and the construction of the outfall to the Oldman River will involve work in the water but using cofferdams and following Alberta Water Codes of Practice.

Work in waterbodies is expected to be limited to construction of the Spillway outlet to the Oldman River and the inlet and outlets to the Horsefly Reservoir and Taber Lake. Work will follow standard codes of practice and direction from DFO. The Project will not result in a harmful alteration, disruption or destruction of fish or fish habitat.

Project construction will not take place near any Taber potable water canals. Water discharged to the Oldman River during floods will add approximately 1 % to the flow of the flooding river.

Wildlife habitat and mortality effects are expected to be minor to negligible, given the extent of new surface disturbance from the Project and small construction crews. Wildlife movement across the enlarged canals will be restricted by the protective fencing installed and some snake hibernacula will be removed. Construction and upgrading of wetlands on Taber Lake and the Horsefly Reservoir may provide new wildlife habitat.

The Project construction will have limited effects on human health since the atmospheric emissions and noise will be short term and intermittent. The operation of the Project will have a positive effect on health, social and economic conditions because of its purpose – flood mitigation.

Approval requirements from ACSW, including construction monitoring by a palaeontologist and reporting any finds, will address any potential effects on archaeology and palaeontology.

Effects on land use will be minimized by restricting work to the Project footprint and implementation of a Traffic Management Plan.

The Project will not affect Indigenous peoples' current use of lands and resources for traditional purposes. It will not affect Indigenous peoples' health, social or economic conditions and will not affect their rights. The Project will not affect Indigenous peoples' spiritual, physical or cultural heritage.

The nature of the Project, flood mitigation, will benefit all inhabitants of the SMRID. It is not expected to result in negative effects to vulnerable population groups or result in gender-based violence.

Accidents and malfunctions include hazardous material spills, fire and vehicle accidents. The ECO Plan prepared by construction contractors will include sections on hazardous materials and waste management, and environmental emergency procedures specific to the Project. These sections and a Traffic Management Plan will address accidents and malfunctions.

Flow from the SMRID Main Canal is controlled at the turnout structure at the southern end of the Project. Failure of this structure to close when the Project canals are at capacity or during floods greater than the 1:100-year event may cause the Project canals to be overtopped. The adjacent lands would be flooded similarly to a flood without the Project.

The Project's reduction of losses (including economic, physical and emotional) that are incurred during a flood event will benefit all communities in the Taber area and downstream, regardless of gender, race or social status. Consultation with the public and Indigenous groups have not identified adverse effects of the Project on social, economic or health of inhabitants of the area nor on any diverse or vulnerable groups.

Indigenous groups have not indicated opposition to the Project.

Given the summary of effects described, the Project is expected to not have significant effects on the environment and to benefit residents of the St. Mary River Irrigation District through flood control.

20.0 POTENTIAL EXTRA-PROVINCIAL AND FEDERAL EFFECTS

Environmental changes as a result of the carrying out of the Project are benefits associated with flood control. These will be felt downstream of the Project area to Medicine Hat where the SMRID canal empties into the South Saskatchewan River. Effects will be confined to this area of Alberta and will not occur on federal lands, in a province other than Alberta, or outside Canada.

21.0 EFFECTS TO INDIGENOUS GROUPS INCLUDING TRADITIONAL LAND USE, PHYSICAL AND CULTURAL HERITAGE, AND HISTORICAL, ARCHAEOLOGICAL, PALAEONTOLOGICAL OR ARCHITECTURAL RESOURCES

Portions of the Project area have historic resource values of 4 (contains a historic resource that may require avoidance) or 5 (high potential to contain a historic resource). A pre-contact scatter archaeological site has been identified in the Phase 1 Project footprint. Within 100 m of the Project footprint there are two precontact scatter sites and a precontact campsite. Historic Resources Applications were submitted to ACSW for all three Project phases. ACSW responded on May 21, 2021 and October 22, 2021, stating there were no HRA requirements associated with archaeological resources but that an HRIA is required for palaeontological resources in the Phase 1 coulee (see Appendix E4 and E5). A palaeontological field survey was conducted in August 2021. A few fossils were found in the coulee. A palaeontological HRIA was submitted to ACSW on November 22, 2021 and a letter of approval for the Project with the condition that a palaeontologist be present during any excavation activities in the coulee was received on December 20, 2021. The MD of Taber will comply with this condition. Indigenous groups will be notified of archaeological and palaeontological finds.

As shown in Figure 9.1 to Figure 9.3, the Project area is largely agricultural and there is no record of current use of Project lands for traditional purposes by Indigenous groups. Project-related issues identified by Indigenous groups have been the potential for effects on medicinal plants, undiscovered archaeological sites and water quality effects on the Oldman River. Communication with Indigenous groups has not identified any Project effects on physical or cultural heritage, or structures or sites of historical, archaeological, palaeontological or architectural significance to Indigenous peoples. Indigenous groups are invited to visit the site prior to construction to see if any medicinal plants are present in the coulee and harvest them if desired.

22.0 EFFECTS TO INDIGENOUS HEALTH, SOCIAL, AND ECONOMIC CONDITIONS

The Project is not expected to affect the health, social and economic conditions of Indigenous peoples of Canada. The Blood Tribe/ Kainai First Nation expressed no concerns with the Project and requested to be included in the list of bidders for contractor work on the Project. A letter from Métis Nation of Alberta (Region 3) stated that they have no outstanding concerns with Phase 1 of the Project. The MD of Taber will include any Indigenous groups who express interest on the contractor bidding list for the Project. Engagement and consultation activities to date have been inclusive of women and diverse groups. Site visits by the Blood Tribe/Kainai First Nation and Ermineskin Cree Nation included women members of their nation.

23.0 GREENHOUSE GAS EMISSIONS ASSOCIATED WITH THE PROJECT

As a requirement for funding from the ICIP, the MD of Taber commissioned RWDI Consultants to conduct a Climate Lens assessment of the Project. The report (RWDI 2020a; see Appendix H1) assessed the expected total annual direct and indirect net greenhouse gas emissions for the life of the Project, including emissions to 2030, which aligns with the Strategic Assessment of Climate Change requirement to provide an estimate of GHG emissions. The report assumed that current operations of the irrigation canal produced zero baseline emissions and that the Project is assumed to exhibit zero emissions during operation and maintenance activities. A Project lifespan was required for the Climate Lens assessment. RWDI assumed a 100-year operational lifespan commencing with a five-year construction period from 2021 to 2026. Cumulative emissions over the 105 years are predicted to be 5,625 tonnes of carbon dioxide emissions (CO_{2e}), which is attributable to the construction phase. The Project is expected to have a positive, yet small effect on carbon sink capacity from the wetland construction at Taber Lake and wetland expansion at the Horsefly Reservoir. Vegetation in the wetlands dies and sinks below the water, depositing carbon while peat acidity slows decomposition, creating layers of stored carbon. Although the Project lifetime extends beyond 2050, GHGs after 2050 will be zero, so a net zero plan is not required.

24.0 WASTE AND EMISSIONS GENERATED BY THE PROJECT

The Horsefly Regional Emergency Spillway Project is a flood mitigation project; it does not produce a product. Waste generated during the construction of the Project including metal, wood, plastic and paper and human waste, will be collected and disposed of at licensed disposal facilities. Atmospheric emissions during construction will be those associated with the upgrading of the canals and these are discussed in Section 23.0 and Appendix H1. Noise associated with construction activities will be intermittent and short term. Atmospheric emissions and noise during operation and maintenance of the Project will be minimal. Spills or leaks of petroleum products and coolants from construction equipment and vehicles will be cleaned up and disposed of at a licensed disposal facility as will be described in the contractor ECO Plan for the Project.

Potable water for the Town of Taber's is supplied by a pipeline from Chin Reservoir from October through April and from the TID main canal from May through September. The Project does not involve any work on the TID main canal.



25.0 EFFECTS OF CLIMATE CHANGE ON THE PROJECT

RWDI (2020b) prepared a climate change resiliency assessment for the Project (see Appendix H2). Climate change may cause an increase in the frequency and intensity of precipitation and the need for the Project to divert water from SMRID Main Canal to the Oldman River. Modelling of climate change and effects on precipitation and flows of the Oldman River were not conducted for the Project. However, climate trends assessed for the Springbank Off-stream Reservoir Project on the Elbow River (Alberta Transportation 2019a, 2019b) provide some generalizations to effects of climate change on the Project.

The hydrological regime of the Elbow River watershed in Alberta was investigated by Marceau et al. (2014) to determine how climate change might affect it. The study concluded that climate change might cause a decrease in average annual overland flow, baseflow, and streamflow. There may be an increase in evapotranspiration, creating conditions for water scarcity. In addition, an increase in temperature during winter and spring will increase snowmelt and peak river flow, creating an increased flood risk from April to June. Kunkle et al. (2013) found that the probable maximum precipitation values for the Elbow River may increase in the future with a warming climate due to higher levels of atmospheric moisture content. However, the degree of probable maximum precipitation change is uncertain due to the potential climatic effects on storm convergence. Should the probable maximum precipitation increase due to climate change, the probable maximum flood would increase, although it may be offset somewhat from reduced contribution from snowmelt. Although Kunkle et al. suggest a reduced contribution from snowmelt, both studies predict increased flooding with climate change.

Alberta Transportation (2019b) used modelling of the Elbow River to estimate the effect of climate change on flood magnitude and frequency. Results showed climate change projections resulting in an 8% increase in stream flows of a 1:10-year flood and a 12% increase for 1:100 through 1:240-year floods.

Mahat and Anderson (2013) modelled the headwaters of the Oldman River for future climatic conditions in the 2020s, 2050s and 2080s. Their results projected a less than 10% increase in precipitation in winter and a similar amount of precipitation decrease in summer. These changes resulted in up to a 200% increase in winter streamflow in February and up to 63% decrease in summer flow in June. The increase in streamflow is mostly driven by the projected increase in temperature that is predicted to melt winter snow earlier.

Alberta Water Portal Society (2021) address climate change in the Oldman River basin. Citing St-Jacques et al. (2018), they state that climate projections show that more severe droughts may occur in the future due to climate change and that with air temperatures in the basin also projected to continue increasing in the coming decades, the average total yearly precipitation may decrease even further. Other modelling projections show that the warmer temperatures may cause mountain snow to melt during the winter and the winter snow in the mountains to completely melt much earlier in the spring. These changes to the snow in the mountains could result in peak flows in the river occurring earlier than at present.

The studies presented above suggest that late winter and spring flooding in the Project area will have greater volumes and become more frequent in the future.



26.0 FUTURE ACTIVITIES

Following the submission of the DPD, the MD of Taber has scheduled the following Project activities for 2022:

- Preliminary engineering for Phases 2 and 3 will continue.
- Detailed engineering of Phase 1 will commence.
- Spring wildlife programs for Phases 2 and 3 will be conducted. These will include surveys for sharp-tailed grouse leks, amphibians, raptor nests, burrowing owls, breeding birds, waterbird activity and snake hibernacula.
- Following the decision from the Agency on the requirement of an Impact Assessment, a virtual open house will be held in Q1 or Q2.
- If an Impact Assessment is not required, plans for the commencement of construction of Phase 1 will proceed.
  - Construction tendering documents will be prepared, including the mitigation measures developed for the Project.
  - Construction of Phase 1 will commence in fall of 2022.
- A Request for Review of the Project will be submitted to DFO.
- The MD of Taber will continue consultation with Indigenous groups.

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APPENDIX A

Photos

Appendix A PHOTOS

Photo 1 Phase 1- Taber Lake Outlet Structure



Photo 2 Phase 1 – Beginning of Channel Drain looking west



Photo 3 Phase 1- Channel Drain looking east; Taber Lake in right background



Photo 4 Phase 1 – Drainage down coulee to the Oldman River



Photo 5 Phase 2 – Horsefly Outlet Channel Looking North



Photo 6 Phase 2 – Horsefly Canal Looking North, Highway 3 Crossing in the Distance



Photo 7 Phase 3 - Inlet Canal from SMRID Main Canal to Horsefly Reservoir



APPENDIX B

Summary of Open Houses, 2014

MPE Engineering Ltd.

Proud of our Past... Building the Future

SOUTHERN REGIONAL STORMWATER MANAGEMENT PLAN (SRSWMP)

1

Southern Regional Stormwater Master Plan Open House

- Significant economic development has occurred along the regional corridor linking Lethbridge, Taber, and Medicine Hat over past decades, and development is expected to continue.
- This increase in economic activity has contributed to drainage issues, and land management issues, recent flood events have resulted in a focus on stormwater management.
- A more robust and reliable system is needed to convey drainage water from urban and rural areas safely, and efficiently.

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2

Regional Drainage Committee

A Regional Drainage Committee was established in 2013 to address the drainage problems in the region. The following Municipalities and Organizations are members of the committee.

- **MDs & Counties:** Taber, Cardston, Warner, Lethbridge, 40 Mile, Cypress
- **Cities**: Medicine Hat
- **Towns & Villages**: Taber, Barnwell, Bow Island, Coaldale, Magrath, Raymond, Stirling
- **Irrigation Districts**: SMRID, TID, RID, MID
- **Government Agencies:** Alberta Environment and Sustainable Resources, Alberta Agriculture, Alberta Transportation

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3

Study/Catchment Areas

The study area is located in southern Alberta. It is bounded to the north by the Oldman River and South Saskatchewan River, and extends south and west to include the entire drainage area of the St. Mary River Irrigation District (SMRID) Main Canal, which is the most significant drainage feature of the region. The eastern boundary is defined by the drainage basin of Seven Persons Creek, which discharges into the South Saskatchewan River in Medicine Hat.

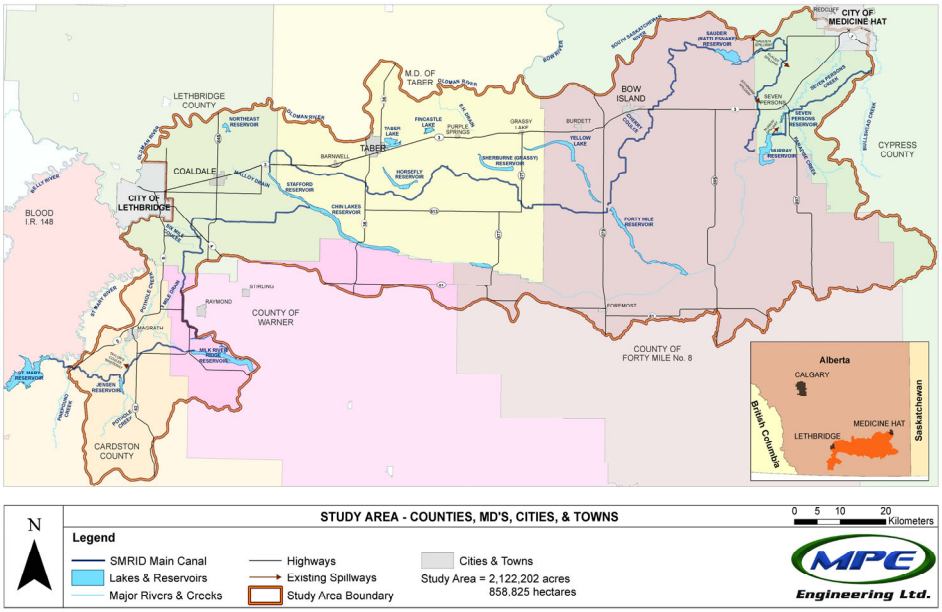
The total study area comprises approximately 8,000 km^2 (2,000,000 acres) of land. The table below summarizes the land uses within the study area.

Land Use Type	Area, km^2	Area, Acres	%
Irrigated farmland (Water supplied by an Irrigation District)	1926	475,925	24%
Non-irrigated and private irrigation farmland	5528	1,366,044	61%
Rural roads & highways	162	40,031	2%
Irrigation right-of-way	81	20,015	1%
Reservoirs	83	20,510	1.%
Medicine Hat	42.9	10,600	0.5%
Towns & Villages	35.4	3,748	0.4%
Undeveloped land	750	185,329	9%
Total	8590	2,122,202	

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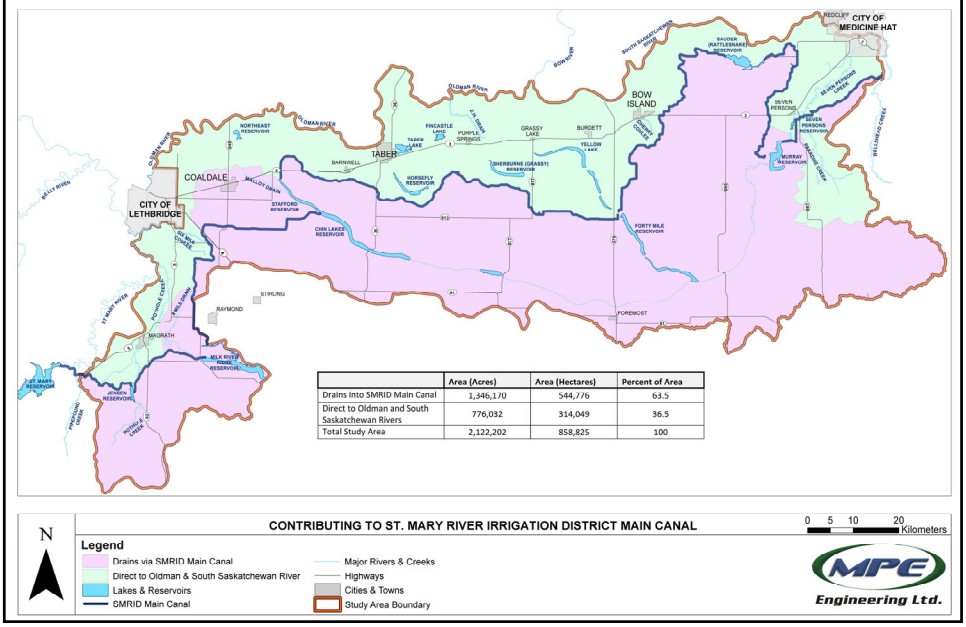
4

Study Area



5

Main Canal Catchment Area



	Area (Acres)	Area (Hectares)	Percent of Area
Drains into SMRID Main Canal	1,346,170	544,776	63.5
Direct to Oldman and South Saskatchewan Rivers	776,032	314,049	36.5
Total Study Area	2,122,202	858,825	100

6

Flooding Events

The problems in 2010 were caused by a 1% (1:100 year) rainfall in the eastern and western portions of the Study Area. In the rest of the area, the rainfall was significantly less, somewhere between a 1:10 and 1:25 year event.

Recorded rainfall in 2011 was well below the magnitude of the 1:100 storm, significant snow melt in conjunction with drainage channel restrictions caused by snow and ice contributed to the overland flooding seen in the study area.

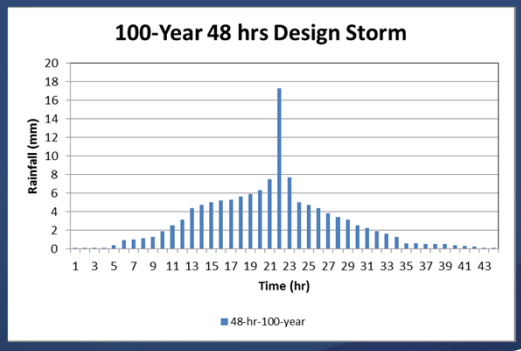
Flooding in June 2013, was primarily limited to Medicine Hat. This flooding was not caused by rainfall in the study area but rather from intense rainfall in the Rocky Mountains and Foothills, which led to high flows in the Bow River basin.

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7

Design Storm

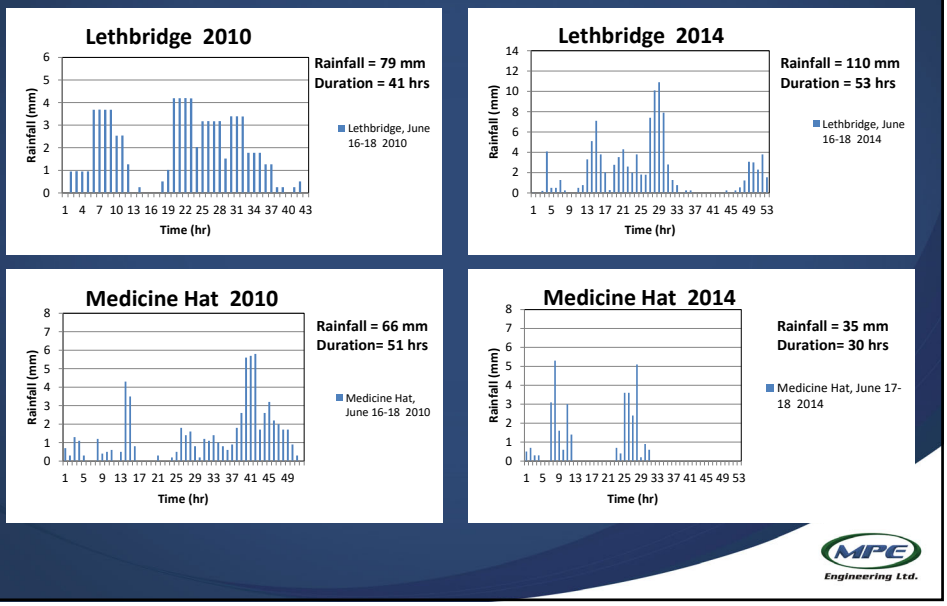
- A 1% (1:100 year) rainfall event was developed from previous rainfall events that have been recorded within the Study Area over the last 50 years.
- The 1% (1:100 year) rainfall event used is 125mm of rain in 48 hours.



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June Rainfall Events



9

Recommended Mitigation Options

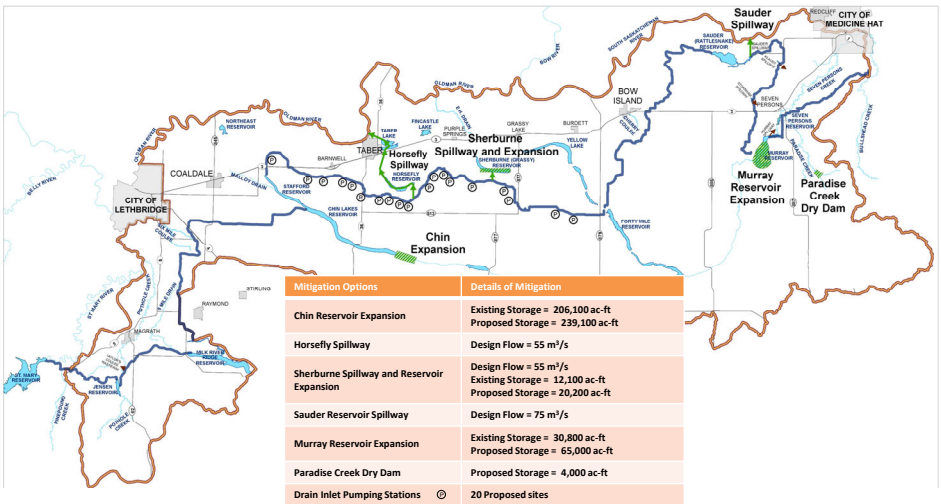
Alternatives for flood mitigation measures along the St. Mary River Irrigation District Main Canal system were investigated with the aid of hydraulic modeling. Mitigation alternatives consisted of additional or upgraded diversion spillways, and increased reservoir storage.

The recommended plan for storm water management improvements consists of the following:

- Expansion of Chin Reservoir, Sherburne Reservoir and Murray Reservoir
- Construction of diversion spillways into Horsefly and Sherburne Reservoirs
- Increase capacity of Sauder (Rattlesnake) spillway
- Construction of dry dam detention facility on Paradise Creek
- Construction of pump-out facilities at flooded sites adjacent to canal

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Recommended Mitigation Options



Mitigation Options	Details of Mitigation
Chin Reservoir Expansion	Existing Storage = 206,100 ac-ft Proposed Storage = 239,100 ac-ft
Horsefly Spillway	Design Flow = 55 m^3/s
Sherburne Spillway and Reservoir Expansion	Design Flow = 55 m^3/s Existing Storage = 12,100 ac-ft Proposed Storage = 20,200 ac-ft
Sauder Reservoir Spillway	Design Flow = 75 m^3/s
Murray Reservoir Expansion	Existing Storage = 30,800 ac-ft Proposed Storage = 65,000 ac-ft
Paradise Creek Dry Dam	Proposed Storage = 4,000 ac-ft
Drain Inlet Pumping Stations	20 Proposed sites

RECOMMENDED FLOOD MITIGATION PROJECTS

0 5 10 20 Kilometers

N

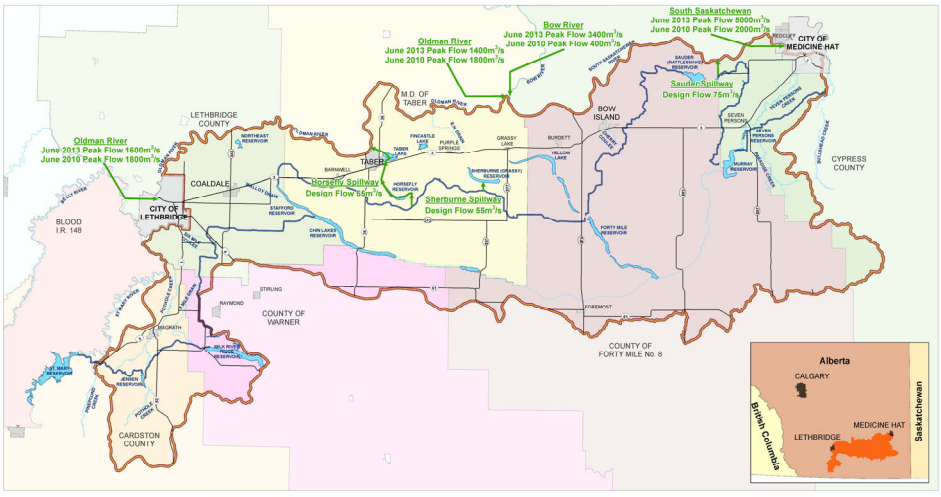
Legend

- Proposed Drain Inlet Pumps
- Reservoir Expansions
- Recommended Spillways
- Existing Spillways
- SMRID Main Canal
- Major Rivers & Creeks
- Lakes & Reservoirs
- Highways
- Cities & Towns
- Study Area Boundary

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11

River and Spillway Flows



SPILLWAY DISCHARGES & RIVER FLOOD FLOWS

0 5 10 20 Kilometers

N

Legend

- Spillway & River Discharges
- Lakes & Reservoirs
- Major Rivers & Creeks
- Highways
- SMRID Main Canal
- Study Area Boundary
- Cities & Towns

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Summary of Mitigation Costs

Mitigation Option		Cost
Chin Reservoir Expansion	$	39,000,000
Horsefly Spillway	$	46,000,000
Sherburne Spillway and Reservoir Expansion	$	13,000,000
Sauder (Rattlesnake) Reservoir Spillway	$	13,000,000
Murray Reservoir Expansion	$	25,000,000
Paradise Creek Dry Dam	$	13,000,000
Drain Inlet Pumping Stations (20 sites)	$	2,000,000
Total	$	151,000,000

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Contact Information

Please contact the following MPE personnel if you have any further questions or comments regarding the proposed Southern Regional Stormwater Management Plan.

MPE Engineering Ltd. Phone: 403 329-3442

Jeff Hust, P.Eng. Phone: 403 317-3634

Email : jhust@mpe.ca

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Open House #1

Client: M.D. of Taber **File:** N:\17\20\024\OH1.DOC
Project: Southern Regional Stormwater Management Plan
Date: November 24, 2014
Time: 4:00 pm

Attendance: See sign-in sheet attached

Location: Gem of the West Museum - Coaldale

Purpose: 1st of 3 Open Houses for the Public

Distribution:

1.0 Purpose

First of 3 open houses to present Southern Regional Stormwater Management Plan to the public. General comments and concern will be collected and may be incorporated into the final report.

2.0 Comments and Concerns Received

- The scope of the project is hard to grasp and people were generally more interested in local issues.
- Reluctance of Lethbridge County to address culvert installation requests in chronic drainage areas,
- A lot of problems could be addressed by undertaking regarding of small areas and the installation of a few culverts. There does not seem to be any funding available from Lethbridge County to undertake these small projects.
- The County rebuilds roads but does not reinstall culverts in their previous locations and this creates flooding problems,
- Alberta Environment is hard to deal with in regards to Surface Drainage Act. There does not seem to be any enforcement present Alberta Environment only reacts to complaints.
- The Irrigation Districts seem to have their own agenda and do not really listen to landowner concerns or suggestions unless they are very large landowners.
- Neighbours blame each other for local storm water issues.
- Where will project funding come from?
  Provincial Government,
  Will there be long term commitments from local and provincial government?
  How long to get funding for the project?
  Who will spearhead and operate the proposed mitigation works?

- Water Quality including salinity is becoming an issue. Alberta Environment needs to set standards and enforce them.

- Should SMRID be charging a fee to accept drainage water to help fund upgrades?

- Different organizations rend to blame other organizations for flooding and drainage problems. It is refreshing to see cooperation between landowners, MD's, Irrigation Districts, County's, Municipalities and government organizations in trying to find solutions to these flood issues that have been experienced over the past several years.

Open House ended at 7:00 pm

Minutes recorded by: Chris Hust, MPE Engineering

If there are any errors, omissions or discrepancies please contact this office.

Open House #2

Client: M.D. of Taber **File:** N:\17\20\024\OH2.DOC
Project: Southern Regional Stormwater Management Plan
Date: November 25, 2014
Time: 4:00 pm

Attendance: See sign-in sheet attached

Location: Heritage Inn Hotel - Taber

Purpose: 2nd of 3 Open Houses for the Public

Distribution:

1.0 Purpose

Second of 3 open houses to present Southern Regional Stormwater Management Plan to the public. General comments and concern will be collected and may be incorporated into the final report.

2.0 Comments and Concerns Received

- Who is the main beneficiary of this study?
  Beneficiaries from this project include Land Owners, Counties, MD's Irrigation Districts and Municipalities.

- The public is generally unaware of the area that drains into the SMRID system. The public at the meeting could see the need for additional spillways along SMRID system.

- Concerns were expressed regarding the water quality if pumps are used to divert water into the SMRID system. This past year seemed to be worse than other years as the water in the SMRID system was quite dirty for the month of July. Water quality monitoring along SMRID canal and in reservoirs should be increased.

  Replacement of canals with pipelines is common and contributes to the problem of dirty water as the cattails and vegetation acted as a filter in past years. Back filling of natural low areas in recent years also contributes to the water quality problem as the water is moving downstream faster without sufficient time to settle out sediments and other contaminants.

- The public at the meeting liked the Chin Expansion and the Horsefly Spillway options. These options would provide extra capacity in the SMRID system for accepting drainage water and providing extra storage for irrigation use.

- How would the Town Taber drainage get affected?
  Presently the Town pumps water into Taber Lake, the proposed Horsefly Spillway would allow the Town to drain directly into the drain.

- Public is curious about next steps and how funding will be procured for this project getting fund.
  - When will the project implement?
  - Where will project funding come from?
  - How long to get funding for the project?

Open House ended at 7:00 pm

Minutes recorded by: Chris Hust, MPE Engineering

If there are any errors, omissions or discrepancies please contact this office.

Open House #3

Client: M.D. of Taber **File:** N:\17\20\024\OH3.DOC
Project: Southern Regional Stormwater Management Plan
Date: December 1, 2014
Time: 4:00 pm

Attendance: See sign-in sheet attached

Location: Medicine Hat Lodge – Medicine Hat

Purpose: 3rd of 3 Open Houses for the Public

Distribution:

1.0 Purpose

Third of 3 open houses to present Southern Regional Stormwater Management Plan to the public. General comments and concern will be collected and may be incorporated into the final report.

2.0 Comments and Concerns Received

- Concern was expressed regarding the management of extra capacity in the Chin and Sherburne Reservoir Expansion options. Will this extra capacity be reserved for flood management or will it be used for irrigation storage.
- Concerns were expressed regarding the consequence to Medicine Hat if water is spilled into the Oldman and South Saskatchewan rivers. Recorded flood events in past years at Medicine Hat shows the Horsefly and Sauder Spillway options would not have a significant effect on Medicine Hat.
- The Public at the meeting commented that the Horsefly Spillway and Chin and Sherburne Expansions increase the flexibility to store and release drainage water.
- Questions arose about Ross Creek system and if this was included in the study.
- How would the Medicine Hat get benefit from this project?

  Murray Reservoir Expansion option will reduce the peak flood in Seven Person Creek and reduce flooding impacts in Medicine Hat.

  Paradise Creek Dry Dam Option will reduce the peak flood in Paradise Creek and therefore reduce the peak flood in the Seven Persons
- Where will the funding for this project come from?
- Will there be a public consultation process?

Open House ended at 7:00 pm

Minutes recorded by: Shahram Karimi, MPE Engineering

If there are any errors, omissions or discrepancies please contact this office.

APPENDIX C

Horsefly Regional Emergency Spillway Issues List

Appendix C HORSEFLY REGIONAL EMERGENCY SPILLWAY ISSUES LIST

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
Accidents and Malfunctions			
1	Clarity on the nature and potential for accidents and malfunctions that may occur as a result of the Project, such as leaks, fuel spills and fires, and corresponding adverse effects to air quality, water quality, wildlife and wildlife habitat such as from the accidental release of high concentrations of hydrocarbons and other contaminants to surrounding waters. Include planned protocol to notify Indigenous peoples on the land in the event of an accident or malfunction.	The Project will be constructed by contractors. All contractors are required to submit an Environmental Construction Operations (ECO) Plan prior to working on the Project. The ECO Plan will include hazardous materials handling and emergency prevention and response procedures. All construction equipment will be cleaned and inspected before it arrives on site. All leak and spill, containment and cleanup procedures are detailed in the ECO Plan which is submitted to the Owner and Engineer for review, comment and acceptance before construction commences. Construction of the Project is largely related to earth moving. Burning is not allowed on site. Spills will be reported to Alberta Environment and Parks (AEP), as per the *Alberta Environmental Protection and Enhancement Act* 'A Guide to Release Reporting' (2005). The effect of leaks, spills, overtopping of the canals and fires on the environment is discussed in Section 19.1.5 of the DPD. The nearest Indigenous group, the Blood Tribe/Kainai First Nation, is 57 miles from the Project; this is more than a one-hour drive from Taber. There is no protocol to specifically notify Indigenous groups of an accident or malfunction. The contractors' ECO Plan details the proper authorities that need to be contacted in the case of an emergency this would include Alberta Environment, Royal Canadian Mounted Police (RCMP), Chinook Regional Health, Taber Irrigation District, Town of Taber and the Municipal District (MD) of Taber.	19.1.5

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
2	Potential effects to surface water and water quality during construction and operation phases of the Project. Include effects from erosion, sedimentation, runoff, deposition of airborne particles, and contact water (run-off, discharges, and spills). Lack of information on planned mitigation measures and monitoring activities.	Construction along the existing canals will be carried out in the fall/winter months since irrigation canals need to be operational from April to October. The contractors' ECO Plan includes an Erosion and Sediment Control Plan and a Spill Prevention and Response Plan as well as dust management procedures. These plans and procedures provide mitigations for effects on surface water. The monitoring of their success is a requirement of the ECO Plan. Work on the enlargement of the canals will occur during the fall and winter months when the canals are drained and have no water in them. Effects on surface water may occur during construction of the canal inlets and outlets to the Horsefly Reservoir and Taber Lake and outlet to the Oldman River. Work in the Oldman River will be minimized. Work on the inlets and outlets to the Horsefly Reservoir and Taber Lake will be primarily outside the water bodies. The Project will be operational only during 1:100-year flood events or greater. During these events water quality will be dependent on the quality of the flood waters.	19.1.1.3, 19.1.3.4, Appendix F
Acoustic Environment			
3	Potential impacts on ambient noise levels from the increase in machinery use, construction activities, and increased traffic during the construction phase of the Project. Clarity on what studies will be implemented.	All construction equipment is required to meet current noise emission guidelines. There are no noise studies planned as Project construction will take place in an agricultural area. Construction will take place in the daylight hours with an estimated eight to ten pieces of earthmoving equipment on site at any one time. Neither the AUC Rule 12 nor AER Directive 38 are applicable to construction noise. Construction noise effects were estimated based on the method prescribed in the US Federal Transit Administration (FTA) noise guidelines. Traffic volumes are not anticipated to increase dramatically as this area is located adjacent to highway 36 which has an annual average daily traffic count of 2,500 and the main MD of Taber access road has an annual average daily traffic count of 390. Traffic volumes will increase in the morning when workers arrive on site and in the evening when they leave. During the day, traffic will be confined to the construction area. The effect of construction noise levels on wildlife and wildlife habitat are not expected to differ from existing traffic and agricultural activities in the area.	19.1.1.2

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
Atmospheric Environment			
4	Clarity on potential changes to air quality due to Project emissions of sulfur oxides, nitrogen oxides, volatile organic compounds, fugitive dust, particulate matter, and other identified air pollutants, their deposition in surrounding environments, the resulting potential adverse local, regional and cumulative effects to human health, terrestrial and aquatic ecosystems, the standards to assess potential Project effects to air quality, and planned mitigation measures.	Emissions and their effects are discussed in the Effects Pathways – Construction Section 19.1.1.1. Due to the short-term nature and small magnitude of the Project construction emissions, it is unlikely that the increase in emissions due to the Project will cause a substantial change to ambient air quality. For example, the NOx emissions for the Springbank Off-stream Reservoir project are approximately 1.5 tonnes/day over a three-year construction period. The Horsefly project NO_x emissions are 3.6 tonnes over the 105-year project lifetime. It is also unlikely that the Project emissions will cause ambient air quality to exceed the respective Alberta Ambient Air Quality Objectives and Guidelines. Mitigation measures are presented in Section 19.1.3.2.	19.1.1.1, 19.1.3.2
5	Clarity on whether federal or provincial air quality standards, such as the Canadian Ambient Air Quality Standards or Alberta Ambient Air Quality Objectives, were used to assess potential effects to human health from air pollutants, based on predicted concentrations.	As stated in the response to Issue 4, it is unlikely that the Project emissions will cause ambient air quality to exceed the respective Alberta Ambient Air Quality Objectives and Guidelines. Given the short-term construction period, small magnitude of Project construction emissions, the predicted concentrations are not expected to result in effects to human health. As discussed in the reply to Issue No. 21, atmospheric emissions from construction, with up to 15 pieces of equipment operating is considerably less than local Highway 36 annual average daily traffic number of 2,500 vehicles.	19.1.1.1

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
Climate Change and Greenhouse Gas Emissions			
6	Potential contribution to climate change due to greenhouse gas emissions from the Project, impacts to carbon sinks, including forested areas and wetlands, and through direct removal or indirectly through changes to regional hydrology.	As discussed in Section 23.0 of the Detailed Project Description (DPD), carbon dioxide emissions expected from construction are 5,625 tonnes over the predicted 105-year project lifespan used in the Climate Lens Assessment of the Project. The Project is assumed to exhibit zero emissions during operation and maintenance activities. The Project is not expected to negatively affect carbon sinks because additional land, including forested areas, will not be cleared for the Project. The Project includes the construction of two proposed wetlands, located where flow enters the Horsefly Reservoir and at Taber Lake (see Figure 1.2 of the DPD). These wetlands are expected to have a positive, yet small, effect on carbon sink capacity, as vegetation in the wetlands dies and sinks below the water, depositing carbon while peat acidity slows decomposition, creating layers of stored carbon.	23.0
7	Clarity on the implications on whether the Project may hinder or contribute to the Government of Canada's ability to meet its commitments in respect of climate change, the circumstances in which an upstream GHG assessment will be required, and the circumstances in which a credible plan to achieve net-zero GHG emissions by 2050 will be required.	The emissions during construction represents 0.0008% of Canada's 2019 Greenhouse Gas (GHG) emissions and 0.001% of Canada's 2030 GHG reduction target. The Project is therefore not expected to materially contribute or hinder the Government of Canada's ability to meet its commitments in respect of climate change. Although the Project lifetime extends beyond 2050, direct GHG emissions are expected to cease following construction. Therefore, the Project will have achieved net zero by 2050.	23.0

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
Cumulative Effects			
8	Potential cumulative effects to riparian habitat and the South Saskatchewan Watershed, including the Oldman River, due to Project activities impairing natural processes and affecting water quality, quantity, and biological indicators.	Project construction will consist of enlarging the existing irrigation canals, including replacing canal structures and culverts. Work in the Oldman River will be minimal and will adhere to established mitigation measures and codes of practice for the protection of fish and fish habitat. The Project will not be operational during normal river flow conditions and will only operate during 1:100-year floods (the design flood) or greater. A 1:100-year flood will add 40 m^3/s of water to the Oldman River flowing at 3,900 m^3/s, an increase of 1%. Water quality during a design flood or greater is expected to be similar to that of the Oldman River at that time. Project construction may affect riparian habitat along the canals but the habitat will return following construction, similar to what is present along the existing canals. Instream work on the Horsefly Reservoir, Taber Lake and Oldman River will be restricted to the minimum extent reasonable to conduct the work and will follow established mitigation measures and codes of practice. Cumulative effects of the Project on the riparian habitat of the South Saskatchewan Watershed are expected to be negligible.	9.2.1, 19.1.1.6
Effects of the Environment on the Project			
9	Consideration of climate change on the Project, including the alteration of the likelihood or magnitude of sudden weather events, predicted changes to baseline conditions, and contributions to long-term changes.	The Project enlarges the existing irrigation infrastructure to serve as mitigation for 1:100-year or greater floods. The studies presented in Section 25 of the DPD suggest that late winter and spring flooding in the Project area will have greater volumes and become more frequent in the future. As the Project is designed for the 1:100-year flood, increased frequency of such floods will mean its benefit will be felt more frequently. Floods of greater volume will allow the Project to contribute to the mitigation of such events.	25.0

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
10	Potential impacts on the Project infrastructure and activities and resiliency to these impacts.	The existing infrastructure was not designed for the conveyance of stormwater and runoff. The Project will enhance the existing infrastructure so it is able to pass a 1:100-year flood reliably. Floods greater than the 1:100-year event would result in flood waters from the Main Canal flooding the adjacent lands as has occurred without the Project. The Project infrastructure will operate as designed during the greater floods and will remain intact following such floods as the volume of water flowing through the canals is a function of their size. Following flooding, the infrastructure will return to its pre-flood condition. Increased drought conditions could affect wetland benefits such as water retention, water filtration, wildlife habitat protection and erosion and sediment control. Mitigation for drought effects on wetlands include drawing water from Horsefly Reservoir or Taber Lake if wetland desiccation occurs and including drought-resistance plants in wetland design.	25.0
Fish and Fish Habitat			
11	Clarity needed on the potential effects of each Project component on fish and fish habitat, including habitat alteration, disruption, and destruction, and fish mortality. Include detailed descriptions of the Project design, construction methodology, and proposed mitigation strategies.	The effects of the Project on fish and fish habitat are discussed in the DPD (Section 19.1.1.6). Project design and construction methodology will follow industry standards and best practices. Mitigation measures will be reviewed by Fisheries and Oceans Canada as part of the regulatory approvals process. Construction activities in the Oldman River will be minimized with as much work as possible being conducted on land. Water and fish-related components of the contractors' ECO Plan include Turbidity Monitoring, Fish Capture and Release, and Erosion and Sediment Control. Prior to work in the Oldman River, Fisheries and Oceans Canada will be contacted, a cofferdam will be constructed and any additional Fisheries and Oceans Canada conditions will be followed.	19.1.1.6 19.1.3.7

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
12	Potential effects to fish and fish habitat, including to Bull Trout and species of cultural importance to Indigenous peoples, in waterbodies within and near the Project area including existing canals.	An irrigation system is not designed for nor intended to provide fish habitat or passage in the canals. The fish field survey (Section 14.2.5) found that the canals afford limited habitat to resident fish species; however, more suitable habitat is found within Taber Lake and the Horsefly Reservoir. Overall, the Oldman River has poor-moderate habitat within the area of its confluence with the coulee given the lack of habitat complexity. There is poor spawning habitat for salmonids and forage fish. Spawning habitat is moderate for coarse fish. There has been no documentation of bull trout within the Oldman River near the confluence with the coulee nor in the Horsefly Reservoir or Taber Lake. Project effects on fish and fish habitat are expected to be minimal given that work in the Oldman River, Horsefly Reservoir and Taber Lake will be restricted to the smallest area required, will be discussed with Fisheries and Oceans Canada and any conditions from them will be followed. Construction will follow the ECO Plan which addresses erosion and sediment control and a turbidity monitoring plan. Work in the canals will take place during the fall and winter months when the canals are drained and no fish are present. Clearing of riparian vegetation will be minimized and beds and banks of waterbodies will be restored following construction.	14.2.5, 19.1.1.6, Appendix F
13	Clarity needed on measures and strategies to mitigate fish entrainment within the Project.	The Taber Irrigation District (TID) has a 2001 Authorization from Fisheries and Oceans Canada for the operation and maintenance of the canals. The Authorization has conditions requiring reduction of the water diversions to occur gradually of a minimum of 3 days to allow fish sufficient time to move out of the canal system, the identification of significant fish stranding locations during dewatering of the canals and mitigation options to reduce fish stranding. Proposed changes to the operating plan must be reviewed by Fisheries and Oceans Canada. The Project will be submitted for review and the conditions for an Authorization will be adhered to. Significant fish stranding locations following operation of the Project during 1:100-year or greater flood events will be identified and fish will be salvaged.	19.1.3.7

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
Gender Based Analysis+			
14	Collection of disaggregated baseline data and disaggregated gender analysis, including potential impacts on communities potentially affected by the Project, including information such as social, economic and health impacts, gender and poverty, division of labour, consideration of key indicators, and subgroups, including diverse or vulnerable groups, within the population.	The Project is a flood mitigation measure. The Project's reduction of losses (including economic, physical and emotional) that are incurred during a flood event will benefit all communities in the Taber area and downstream, regardless of gender, race or social status. Consultation with the public and Indigenous groups have not identified adverse effects of the Project on social, economic or health of inhabitants of the area nor on any diverse or vulnerable groups. Project effects during construction include some access disruption due to construction traffic. Atmospheric emissions and noise are expected to be similar to small-scale construction projects in the region and are not expected to affect human health. The small size of the construction workforce (30 to 40 persons) is expected to be from the local communities and will not provide additional pressure on accommodation, health or emergency services of the MD of Taber. Employment of the workforce will provide an economic benefit to the area.	15.0
15	Clarity on the health, social and economic conditions of, and the Project's potential effects to nearby population centres, including non-Indigenous populations and employees (e.g., MD of Taber).	As discussed in the response to Issue No. 14, the effects of the construction of the Project on health, social and economic conditions of the MD of Taber will be minimal. The Project will provide employment in the Taber area and will have economic benefits from the purchasing of supplies and services from vendors in Southern Alberta.	15.0, 19.1.1.8
16	Clarity on key gender gaps issues, and other disparities and identifying mitigation measures to narrow these issues, as demonstrated through GBA+ (gender based analysis plus) assessment, and means of mitigation including a GBA+ implementation framework.	The Project primarily involves earthwork construction. The construction industry has typically been male dominated but it employs all genders. Given the relatively small size of the construction workforce (30 to 40 persons) and the fact that the Project primarily involves earthwork construction, it was not surprising that gender gap issues and other disparities were not identified in any of the consultation with the public or Indigenous groups.	15.0, 19.1.1.8

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
17	Clarity on the inclusivity of engagement and consultation activities including a description of plans to adequately consult with women or diverse groups in a transparent manner such that it will support the identification of different needs.	Open houses for the Southern Regional Stormwater Management Plan held in late 2014 in Coaldale, Taber and Medicine Hat were open to all. No issues specific to women or diverse groups were raised at these meetings. The Impact Assessment Agency advertised two virtual Public Information Sessions on the Initial Project Description (IPD) in November 2021 and only one local resident, interested in the construction schedule, attended. The MD of Taber will hold a virtual open house on the Project in Q1 or Q2 2022. The MD of Taber will consult and engage with any group that has concerns with the Project.	Appendix B
18	Clarity on data gaps in both quantitative and qualitative data and steps to narrow those gaps regarding Indigenous peoples, women, low income, under or unemployed, disabled, seniors and systematically marginalized groups.	The Project is flood mitigation primarily involving earthwork construction mainly occurring in fall/winter along existing canals. Indigenous groups have been informed of the Project and some groups have participated in site visits of the Project. Open houses held in 2014 were open to all as will be the planned open house for Q1 or Q2 2022. Engagement and consultation activities have not identified any differentially affected subpopulations negatively affected by a flood mitigation Project which benefits all persons in the area.	15.0, 19.1.1.8
19	Clarity needed on the Proponent's commitment to promoting equality, social justice, and positive change.	The MD of Taber and its consultants, through their mission statements are committed to equality, social justice and positive change.	15.0
Human Health and Well-Being			
20	Clarity on the locations of all potential human receptors in the local and regional study area, including residences and sensitive receptors, the distance of these receptors from key Project components and activities, and potential effects to human health at these receptor locations from changes to air quality, water quality, noise levels, and visual disruptions.	Figures 9.1, 9.2, and 9.3 in the DPD show residences along the existing TID canals which will be upgraded as part of the Project. There are 15 residences within 300 m of the existing canals. These residences will be subject to short-term air quality and noise effects during project construction. As construction will take place during the fall and winter months when the canals have been drained, there are no effects on water quality in the canals. Potable water supplies are not affected by the Project. Temporary visual disruptions will occur during construction but the appearance of the upgraded canals will be similar to the existing canal infrastructure.	13.0 Figure 9.2, 9.2 and 9.3

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
21	Potential effects from related deposition of pollutants on terrestrial vegetation or surface water and emissions.	Project-related emissions will occur during the construction phase. These will be short term and will be restricted to the area adjacent to the canals. These emissions are not expected to result in substantive effects on terrestrial vegetation or surface water. Up to 10 pieces of construction equipment will be required during Project earth works and 5 pieces during Project concrete works. Phase 1 Project footprint intersects Highway 36, and various range roads and township roads intersect all three project phases (e.g., Range Road 164, Township Road 90). The population of the Town of Taber in 2020 was 8,711 and the population of the surrounding area was estimated to equal 24,000 people. Local Highway 36 annual average daily traffic (AADT) equals 2,500. Assuming daily use of one vehicle per household, the Project contribution to local emissions will be less than 1% of local Taber vehicle traffic and approximately 1% of Highway 36 AADT. Therefore, additional effects to vegetation from emissions are not expected because of Project construction. To help mitigate potential effects to vegetation, Project construction will be completed during winter months, outside of the growing season when plants are dormant or potentially covered by snow or ice. Project construction will occur away from the main waterbodies and short-term exposure will not contribute to long-term emissions effects on surface water. The main affect from construction vehicles and equipment on surface water is from road runoff of pollutants in the immediate area of the construction activity rather than emissions. Having construction activities occurring in winter also lessens the effects of emissions on surface water quality.	19.1.1.1, 19.1.1.3, 19.1.1.5, 19.1.3.2

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
22	Potential impacts on waterbodies with current and potential use for recreational and ceremonial purposes.	The Project does not include changes to water bodies. It is not expected to affect recreational activities on Taber Lake or Horsefly Reservoir which have been in operation for over seventy years. The recreational opportunities on both water bodies are very limited due to their small size and lack of park facilities, including a lack of boat launching facilities. Fishing on Taber Lake and Horsefly Reservoir is the main recreational activity on the waterbodies. Construction work on the inlets and outlets to Taber Lake and the Horsefly Reservoir will not prevent access to the waterbodies. Operation of the Project during non-flood conditions will be as it presently is for the irrigation system. During flood conditions there will not be recreational activities on the lake or reservoir. To our knowledge, these water bodies are not used for ceremonial purposes. This was not raised by the Indigenous groups who visited the Project site.	19.1.2
23	Confirm the use of appropriate control to the canals for public safety.	The TID and St. Mary River Irrigation District (SMRID) both restrict public access to their infrastructure to provide public safety. All control structures are fenced and locked to prevent access, reservoir outlet structures have safety booms and signage in place warning of potential danger and canals are fenced and gated to prevented unauthorized access. Where recreational activities occur, controlled access is provided.	9.2.1
Indigenous Consultation and Engagement			
24	Need for continued consultation with Indigenous groups to strengthen relationships and build partnerships through the regulatory process including the post-decision phase.	The MD of Taber has been in contact with Indigenous groups about the Project since early 2021, providing Project information and invitations to meet and discuss the Project and visit the Project site. The MD of Taber will continue to provide information on the Project, provide bidding opportunities for Project construction and offer to meet with Indigenous groups who are interested in doing so.	4.0, Appendix D

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
25	Need for proper consultation and engagement to be carried out in a timely, effective, responsive, transparent, accessible, predictable, fair, flexible, and respectful manner throughout the impact assessment process, including providing capacity support for Indigenous groups to participate.	The MD of Taber has strived to consult and engage with Indigenous groups in a timely, effective, responsive, transparent, accessible, predictable, fair, flexible, and respectful manner and has provided capacity support to groups that wished to meet with the Project team and visit the Project site. Letters introducing the Project were sent to Indigenous groups and these were followed with emails and telephone calls offering virtual meetings and site visits to interested groups. Virtual meetings were held with Métis Nation of Alberta Region 3, Blood Tribe/Kainai First Nation and Samson Cree Nation. Site visits were held with any Indigenous Group expressing an interest to do so. These were Blood Tribe/Kainai First Nation, Ermineskin Cree Nation and Sikiska Nation.	4.0, Appendix D
26	Clarity required on methods of engagement with Indigenous peoples to assess impacts to their rights.	The MD of Taber has offered to meet with any of the Indigenous groups who are interested in the Project and discuss if it impacts their rights.	4.0, Appendix D
Indigenous Knowledge			
27	Inclusion of known and available traditional land use studies in the Project Description, and Impact Statement, if one is required.	Information from available traditional land use studies prepared by the Piikani First Nation and the Blood Tribe/Kainai First Nation for the Montana Alberta Tie Ltd. transmission line which runs near the Project was reviewed for the IPD and DPD.	14.4
Indigenous Peoples' Current Use of Lands and Resources for Traditional Purposes			
28	Clarity on the types medicinal plants in the Project area harvested by Indigenous peoples, how the information will be relayed to Indigenous peoples, and what opportunities will be provided to harvest medicinal plant species.	As part of the MD of Taber's engagement with Indigenous groups, they have been invited to visit the Project site and identify medicinal plants that may be present. To date, the Indigenous groups that have come to site have not identified medicinal plants that they would harvest. Before construction commences an invitation will be extended to visit the site and harvest medicinal plants that are present.	4.0

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
Indigenous Peoples' Health Conditions			
29	Potential impacts on Indigenous health from contamination of water bodies used for traditional purposes and drinking water sources.	The TID canals, Horsefly Reservoir and Taber Lake are not used as a source of drinking water. The Indigenous groups that have responded to our request for consultation and engagement have not indicated the use of these water bodies for ceremonial purposes. Mitigation for the protection of water quality and fish and fish habitat are presented in Section 19.1.3.	4.0, 19.1.3
30	Potential impacts to the health of Indigenous peoples through consumption or use of drinking water, country foods, and medicinal plants exposed to contaminants from the Project in water, air, or soil. Include consideration of impacts to food security and the associated impacts to health and well-being.	The Project will result in a small volume of atmospheric emissions during the construction period (Section 19.1.1.1). The emissions will be similar to other short-term construction projects and will be contained in the area round the Project footprint. The TID canals, Horsefly Reservoir and Taber Lake are not used as a source of drinking water. Emissions during construction are not expected to affect drinking water, country foods, medicinal plants or Indigenous health and well-being.	19.1.1 22.0
Indigenous Peoples' Rights			
31	Need to consider the historical connection of Indigenous groups to the Project area in determining potential impacts to Indigenous rights, rather than the current location of reserve lands and/or band offices.	The Project involves the upgrading of a canal system that has been in operation on lands used for agriculture for over a century. The MD of Taber recognizes that the Project is on the traditional lands of the Treaty 7 and Métis Nation of Alberta Region 3.	4.0 13.0
Indigenous Peoples' Social and Economic Conditions			
32	Clarity on if training and employment opportunities will be offered to Indigenous peoples, and if Indigenous peoples expressed interest on this.	This Project involves earthwork construction. Once completed it will be a passive system with no need for dedicated staff to operate and maintain it. No special training programs are anticipated at this time. Construction of the Project will be put out to tender to the general public and all Indigenous construction companies will be encouraged to submit tenders for the Project	9.2, 15

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
Indigenous Peoples' Spiritual, Physical, and Cultural Heritage			
33	Potential impacts to physical and cultural heritage and structures, sites, and things of historical, archaeological, paleontological, or architectural significance to Indigenous communities, including cultural and ceremonial sites. Lack of information on strategies and opportunities for Indigenous involvement for mitigation of impacts.	As per Section 21.0, a pre-contact scatter archaeological site was identified in the Phase 1 Project footprint. Within 100 m of the Project footprint there are two precontact scatter sites and a precontact campsite. A few fossils were found in the coulee. No other physical and cultural heritage and structures, sites, and things of historical, archaeological, paleontological, or architectural significance to Indigenous communities have been identified in the Project footprint. Any archaeological or palaeontological finds during construction will be reported to Alberta Culture and the Status of Women, as per conditions for *Historical Resources Act* approval. Aboriginal groups will be notified of such finds through emails. Mitigation for Project impacts follow standard mitigations for earth moving projects. Comments from Indigenous groups on the mitigation of Project impacts during construction are welcome.	21.0
34	Clarity on the preservation and protection of any historical resources of importance to Indigenous communities discovered within the Project footprint, and the protocol for notifying Indigenous groups of any chance finds.	Any historical resources of importance to Indigenous communities discovered will be preserved and protected following standard archaeological and palaeontological procedures and reported to Alberta Culture and the Status of Women, as per conditions for *Historical Resources Act* approval. Indigenous groups will be notified of such finds through email.	21.0
Migratory Birds and their Habitat			
35	Potential effects through all phases of the Project on migratory birds, including species at risk, and their habitat.	These are addressed in section 19.4 of the DPD.	19.4
36	Potential effects, including cumulative effects, to migratory birds from accidental spills and degradation of habitat.	These are addressed in section 19.4 of the DPD.	19.4

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
37	Potential effects and cumulative effects to migratory birds, including species at risk and species of cultural significance to Indigenous peoples, from habitat alteration or fragmentation, exposure to deleterious substances, movement obstruction, effects to reproduction, loss of habitat for reproduction, migratory patterns, avoidance of habitats adjacent to the Project, disorientation from or attraction to the Project area resulting in injury or death from sensory disturbance (i.e. noise, vibrations, light) or Project related collisions (e.g. infrastructure or vehicles), and the presence of workers.	These are addressed in section 19.4 of the DPD. However, the scope of the Project is the upgrading of an existing canal system to provide flood mitigation. Construction activities will be planned during the fall and winter period when the irrigation system is not in use. The constructed Project will be similar to the existing irrigation infrastructure that has been in place for over a century.	19.4
Navigation			
38	Potential effects to navigation and which existing regulatory mechanisms would address these effects.	The only navigation that occurs on the Oldman River is canoeing, rafting or small fishing boats because the water is too shallow for navigation by power boats. Construction of the Spillway in the coulee leading to the Oldman River will cause minimal disturbance to the river since as much work as possible will be done on land. The Project is not in operation during non-flood events so there will be no effect on navigation on the Oldman River. During flood events, which is when the Project is operational, diverted water will add approximately 1% to the floodwaters of the Oldman River. It is not expected to result in additional navigation effects on a flooding river. SMRID and TID do not allow boating on their irrigation canals. Boating on reservoirs is allowed where there are adequate facilities to launch boats into the reservoir.	18.1.2

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
Project Description and Other			
39	Clarity on the need for additional approvals (e.g., Fisheries Act Authorization, Canadian Navigable Waters Act, Explosives Act) from other regulatory authorities.	Section 18 of the DPD has been revised to include this information.	18.0
40	Positive and negative impacts on natural ecosystem processes.	Both positive and negative effects of the Project have been included in Section 19.0.	19.0
41	Provide more detailed maps and figures of routes.	Figures 9.1, 9.2, and 9.3 in the DPD provide more detail of the routes and Project components.	9.0
42	Clarity on potential effects to the existing canal footprint.	Preliminary design has been completed on Phase 1. The existing right of way, owned by the TID, is 25.7 ha. The proposed works will require the purchase of an additional 5.5 ha from adjacent landowners. This represents a footprint increase of approximately 17.6%. Work is just commencing on Phases 2 and 3; it is expected that the increase will be similar. There will be no increase in the footprint of the Horsefly Reservoir or Taber Lake.	9.0
43	Clarity on the frequency of Project use and the effects of repeated operation on the Region's waterbodies, including the Oldman River, wetlands, and other lakes.	The Project will only be operational in the event of a 1:100-year flood or greater. A 1:100-year flood has a 1% likelihood of occurring any year. During such events, water will be diverted to the Oldman River which would already be in a flood condition. A 1:100-year flood will add 40 m^3/s of water to the Oldman River flowing at 3,900 m^3/s, an increase of 1%. The Horsefly Regional Emergency Spillway is a flood mitigation project. Its repeated use will see the repeated diversion of stormwater into a flooding Oldman River, lessening the adverse effects of flooding in the region.	9.0

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
Vulnerable Population Groups (Gender Based Analysis Plus)			
44	Identify and assess potential issues of gender-based violence as a result of the Project, such as sexual harassment, violence against women, human trafficking, and means to mitigate and avoid these potential issues.	The Project is flood mitigation involving the upgrading of an existing canal system. Construction primarily involves earthwork and will employ 30 to 40 persons for each of the three phases. Construction workers are expected to be from the area, working from Taber or surrounding communities; construction camps will not be required. During operations, the work force is estimated at two or three persons. Contractors are expected to follow the Alberta Construction Association Code of Ethics and the Alberta Obligations of Work Site Parties. These documents state that employers and employees are expected to work in an environment free of harassment, discrimination and violence and that the employer is to have internal policies and procedures to deal with complaints and to enforce its policies. With this code and obligation, it is not anticipated to see the potential for gender-based violence in the construction or operations of the Project.	15.0
45	Clarity on the inclusivity of engagement and consultation activities including a description of plans to adequately consult with women or diverse groups in a transparent manner such that it will support the identification of different needs including negotiations and agreements.	Engagement and consultation activities to date have been inclusive of women and diverse groups. Site visits by the Blood Tribe/Kainai First Nation and Ermineskin Cree Nation included women members of their nation. The MD of Taber will consult and engage with any group that has concerns with the Project.	15.0, 22.0
46	Identify barriers to equality for various groups with respect to decision-making, participation, access, and control over resources.	Although it cannot speak for various groups, the MD of Taber has no barriers to equality with respect to decision-making, participation, access or control over the Horsefly Regional Emergency Spillway Project.	15.0
47	Potential impacts to Indigenous people related to gender-based violence, discrimination, and cultural heritage for all phases of the Project.	The Project is being constructed and operated on an existing irrigation infrastructure in an area that has had an existing agricultural use since the early 1900s. Engagement and consultation efforts to date with Indigenous groups have not resulted in the identification of any issues of impacts to cultural heritage. Indigenous contractors will be invited to bid on the construction work. As further discussed in the response to Item 44 above, given the scope of the Project, impacts to Indigenous people related to gender-based violence, discrimination, and cultural heritage are not expected.	4.0, 15.0, 22.0

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
Water – Groundwater and Surface Water			
48	Potential impacts on waterbodies, including those used or that could be used, from methyl mercury and information on the methylmercury monitoring plan.	During a 1:100 year or greater flood, water diverted from the SMRID Main Canal to the Oldman River will take three or four days to pass through the Horsefly Reservoir. The existing reservoir has a design storage capacity of 6,374 dam^3 but is normally operated at a lower water level with a storge capacity of 4,641 dam^3 (a differences of 1,733 dam^3). During a storm event water volume in the Reservoir will increase by approximately 1,460 dam^3 which is still below the design capacity of the Reservoir. Taber Lake will not be used to store any water, stormwater will flow through the lake. Mercury methylation is a chemical process that occurs associated with organic matter decomposition in a waterbody. Stormwater will not be stored in the Horsefly Reservoir and the Project will not be a cause of mercury methylation. No monitoring program for methyl mercury is planned.	9.2.2, 19.1.2
49	Describe the return period for an event that would result in a flow rate of 40m^3/s.	The Project is designed for a 1:100-year flood event. Water will be diverted from the SMRID Main Canal at 47 m^3/s to the Horsefly Reservoir and will be discharged to Taber Lake at 40 m^3/s.	10.0
50	Potential impacts to water quality and quantity released in the Oldman River from the Project, and clarity on conditions of release.	The Project will divert water to the Oldman River during a 1:100-year or greater flood event. A 1:100-year flood will add 40 m^3/s of water to the Oldman River flowing at 3,900 m^3/s, an increase of 1%. The water from the canal is expected to have less debris than the flooding Oldman River since larger debris entering the Project canals will be retained at the drop structures. The water will not be tested for water quality prior to diversion during a flood.	19.1.2

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
51	Clarity on the operating parameters of the Project, including turndown structures and the SMRID Main Canal, under flood conditions.	During a flood event staff from SMRID and TID monitor the inflow coming into the SMRID Main Canal. No water will be diverted to the Horsefly Reservoir until the capacity of the main canal is full. Approximately 40% of the SMRID Main Canal flow will then be diverted to the Horsefly Reservoir and the Horsefly Spillway. This will only occur with storms with a 1:100-year or greater return period. The Horsefly Spillway will be operated by SMRID and TID staff to confirm that the design operating levels of the Horsefly Reservoir and Taber Lake are not exceeded. For floods greater than the 1:100-year event, water will continue to be diverted with excess water overtopping the canals and flooding the adjacent lands.	9.2.2
52	Potential impacts on the Town of Taber, including increased flooding, from the increased inputs to the Taber Lake and Horsefly Reservoir.	The design full supply levels of the Horsefly Reservoir and Taber Lake will not be exceeded during operation of the Horsefly Spillway. Therefore, there will be no impact to the Town of Taber due to increased flooding as a result of the Project. If water levels in Taber Lake do rise, flows from the SMRID Main Canal and Horsefly Reservoir will be decreased as required. The Horsefly Spillway is being designed for a capacity of 40 m^3/s but the system has adequate freeboard to pass 55 m^3/s.	9.2.2
53	Potential effects of floodwater overtopping the spillway canal between Horsefly Reservoir and Taber Lake and subsequently mixing with water in lagoons on the Lantic Industrial complex.	The Project is designed to handle the 1:100-year flood event. Floods greater than this would overtop the spillway canal. The lagoons at the Lantic Facility are approximately five metres above the existing natural ground and irrigation canals. Water overtopping the Spillway canal would have to reach a depth of five metres to mix with water in the Lantic lagoons. Given the topography of the area, floods greater than the 1:100-year flood would flow into Taber Lake and the surrounding lands and would not be able to reach a depth of five metres unless the Town of Taber and environs were flooded to that depth.	19.1.5.4
54	Potential effects from equipment contact with waterbodies including the canals and water flowing into the canals.	Construction in the canal will occur during the non-operating season (October through April) when the canal does not have flowing water. Construction of new structures at the reservoir will be isolated by cofferdams. The contractor's ECO Plan will detail containment methods to avoid contamination. Cofferdams will be high enough to prevent overtopping and will be sealed to minimize the amount of water to be managed. Dewatering behind the coffer dams will be monitored for water quality. Any water found to be silt laden will be pumped to a vegetated areas a minimum of 30 m from the water body.	9.2.1

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
55	Potential impacts on water quality and quantity of downstream waterbodies as a result of all phases of the Project.	A 1:100-year flood will add 40 m^3/s of water to the Oldman River flowing at 3,900 m^3/s, an increase of 1%. The water from the canal is expected to have less debris than the flooding Oldman River since larger debris entering the Project canals will be retained at the drop structures. The effects on water quantity and quality in the Oldman River from the operation of the Project will be minimal. Water is diverted during the operation of the Project and is not stored and, therefore water quality is not tested during a flood. Monitoring of water quality in the Oldman River in post-flood conditions is the responsibility of AEP.	19.1.1.3, 19.1.2
56	Potential impacts to surface water, water quality, and the terrestrial environment from contaminants during all phases of the Project. Include effects from erosion, sedimentation, runoff, deposition of airborne particles, contact water (runoff, discharges, and spills) and chemicals from the Lantic Industrial Complex. Provide planned mitigation measures and monitoring activities.	Potential impacts are addressed in Section 19 of the DPD. All contractors are required to submit an ECO Plan prior to working on the Project. The ECO Plan includes an Erosion and Sediment Control Plan and a Spill Prevention and Response Plan as well as dust management procedures. The monitoring of their success is a requirement of the ECO Plan. MPE/Stantec, as manager of the Project construction, will review the content of the plan and monitor its implementation. The plan will provide a level of detail similar to that of the Jensen Dam ECO Plan presented in Appendix F2. As was stated above in the response to Issue 53, the Lantic sugar lagoons are located approximately five metres above the natural ground and irrigation canals. Runoff from construction is contained as per the ECO Plan and not allowed to enter the canal or reservoir.	19.1.3, Appendix F1, Appendix F2
57	Potential impacts to ecosystem receptors (fish and fish habitat, migratory birds, plants, species at risk, and wildlife) from water quality degradation. Include planned mitigation measures.	As has been stated, the project is flood mitigation, transferring water from the SMRID Main Canal to the Oldman River. When the Project is in operation (which is only during 1:100-year flood events or greater), water in the canal will be transferred to the flooding Oldman River, adding approximately 1.0% to the river volume in a 1:100-year event. The canal water is expected to carry less debris than would be in the Oldman River under such conditions. The Project is not expected to cause water quality degradation affecting ecosystem receptors (fish and fish habitat, migratory birds, plants, species at risk, and wildlife). Mitigation presented in Sections 19.1.3, 19.2 and 19.4 will provide protection of ecosystem receptors during Project construction and operations. Operation of the Project during large flood events will protect ecosystem receptors from flooding effects by lessening effects on habitat and mortalities.	19.1.3, 19.2, 19.4

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
Wetlands			
58	Additional detail on the footprint and associated effects of the expanded wetland at the inlet of Taber Lake.	The proposed wetland has not yet been designed. The design and construction plan will be similar to that for the wetland designed by Stantec for the MD of Taber adjacent to the Horsefly Reservoir. The design and construction of the wetland will require a *Water Act* Application. The wetlands will help enhance riparian areas (improving wildlife and migratory bird habitat), reduce nutrient and sediment inputs to the reservoir and lake, and reduce incoming water velocity. Water quality of the canals is regularly monitored by the TID and the results are publicly available at http://www.idwq.ca/. The water quality of the Taber Irrigation District (site T-S2) and St. Mary River Irrigation District (site SMC-P1) has been rated by Agriculture and Agri-Food Canada as excellent over the last several years. The TID is presently adopting water quality standards for runoff entering their irrigation system from urban municipalities and agricultural land. Implementation of these standards is an ongoing process and will take a number of years to be fully implemented.	9.1.1, 9.1.3, 9.2.1
59	Potential impacts to wetlands, their ecological functions, the hydrological regimes, and quality and availability of habitat for migratory birds, species at risk, and other wildlife for breeding migration, foraging, and nesting from the Project and associated activities.	The function of the expanded wetlands at the Horsefly Reservoir and Taber Lake is to filter stormwater before it enters the TID irrigation canals. The wetlands will help enhance riparian areas, reduce nutrient and sediment inputs to the reservoir and lake, and reduce incoming water velocity. As mentioned in the response to Issue 58, the TID is in the process of adopting water quality standards for runoff entering the canals. The construction of the wetland on Taber Lake and expansion of the Horsefly Reservoir wetland will result in new and improved areas for wildlife and migratory bird habitat.	9.1.1, 9.1.3, 9.2.1, 19.1.1.5

Table C.1 Horsefly Regional Emergency Spillway Issues List

Issue No.	Issue	Response	DPD Reference
60	Potential impacts to wetlands due to the Project's linear disturbance including the introduction of invasive species.	The Project will upgrade the existing irrigation infrastructure to provide mitigation for 1:100-year floods or greater. The additional linear disturbance is the widening of the existing canals; no new linear disturbance is planned. Project effects to wetlands are unavoidable due to the location of existing wetlands and the canals. Existing wetlands are intersected and portions may be infilled during construction. This infilling will alter hydrology and habitat in some locations. Hydrology and habitat in the Horsefly Reservoir and Taber Lake will also be temporarily altered during 1:100-year flood events. Planned Project mitigation, including constructed additional wetland area in the Horsefly Reservoir and Taber Lake will help offset losses from Project construction and support water quality and ecological functions of waterbodies in the local area. Potential for spread or introduction of weeds will be increased during construction, but the cleaning of equipment prior to arriving on site and regular monitoring of Project disturbed areas will limit the increased weed abundance and dispersal to surrounding lands.	19.1.1.5 19.1.3.6

APPENDIX D

Indigenous Correspondence

D1

Tracking List – Communications with Indigenous Groups

Date	From	To	Indigenous Community Contact Details	Medium	Communication Description	Nature of Concern	Follow Up Required? (Yes/no)
15-Mar-21	MPE Engineering	Metis Region 3	LAWRENCE GERVAIS, REGION PRESIDENT, lgervais@metis.org. NICOLE SHEPHERD, REGION 3 CONSULTATION COORDINATOR, nshepherd@metis.org	Email	Letter of Notification Sent		Yes
15-Mar-21	MPE Engineering	Blood Tribe	Mike Oka, Consultation Coordinator mike.oka@bloodtribe.org. JJ Shade, TLUOS Coordinator jjshade@bloodtribe.org	Email	Letter of Notification Sent		Yes
15-Mar-21	Blood Tribe	MPE	Mike Oka, Consultation Coordinator mike.oka@bloodtribe.org. JJ Shade, TLUOS Coordinator jjshade@bloodtribe.org	Email	Questioned if there was an FNC number or all on private land.	Land rights	Yes
15-Mar-21	MPE Engineering	Blood Tribe	Mike Oka, Consultation Coordinator mike.oka@bloodtribe.org. JJ Shade, TLUOS Coordinator jjshade@bloodtribe.org	Email	MPE followed up and clarified all work is on private land.	Land Rights	Yes
26-Apr-21	Metis	MPE Engineering	Nicole Shepherd, nshepherd@metis.org, 403-702-1677	Email	Metis would like to set up a virtual meeting to understand the project.	Meeting Setup	Yes
28-Apr-21	MPE Engineering	Metis	Nicole Shepherd, nshepherd@metis.org, 403-702-1677	Email	Meeting set up for May 6th, 2021 at 10:00am.	Meeting Setup	Yes
06-May-21	MPE Engineering	Metis Region 3	LAWRENCE GERVAIS, REGION PRESIDENT, lgervais@metis.org. NICOLE SHEPHERD, REGION 3 CONSULTATION COORDINATOR, nshepherd@metis.org	Microsoft Teams	Video conference meeting was held to explain the project in more detail and address preliminary concerns of the MNA. The MNA identified concern over discovery of artifacts, and would like to include a clause to ensure they are notified if any artifacts are discovered during construction. Timeline for receiving additional concerns from the MNA was set for end of the summer/beginning of fall.	Preliminary Discussion Between Metis and MPE Engineering	
01-Jun-21	MPE Engineering	Blood Tribe	JJ Shade, TLUOS Coordinator jjshade@bloodtribe.org	Email	Notification letter was resent to JJ Shade for review.	Notification Letter Follow Up	Yes
04-Jun-21	Metis Region 3	MPE	LAWRENCE GERVAIS, REGION PRESIDENT, lgervais@metis.org. NICOLE SHEPHERD, REGION 3 CONSULTATION COORDINATOR, nshepherd@metis.org	Email	Letter of Approval	Metis Region 3 Approval Letter	No
24-Jun-21	MPE Engineering Engineering	Blood Tribe	JJ Shade, TLUOS Coordinator jjshade@bloodtribe.org	Email	Follow up email sent.	Follow Up	No
24-Jun-21	Blood Tribe	MPE Engineering	Mike Oka, Consultation Coordinator mike.oka@bloodtribe.org.	Email	Set up virtual meeting for June 30th to discuss project.	Meeting on June 30th 9am.	Yes
30-Jun-21	MPE Engineering	Blood Tribe	Mike Oka, Consultation Coordinator mike.oka@bloodtribe.org. JJ Shade, TLUOS Coordinator jjshade@bloodtribe.org	Microsoft Teams	Virtual meeting held to discuss Horsefly Spillway. Blood Tribe would like to be notified if any artifacts are found during construction. Would like to hold a site meeting to view Taber Lake and surrounding area.	Set up Site Meeting	Yes
07-Jul-21	MPE Engineering	Blood Tribe	Mike Oka, Consultation Coordinator mike.oka@bloodtribe.org.	Email	Meting request sent to MD of Taber, TID, and Blood Tribe for a site visit July 15, 2021 at 1pm.	Attend Site Meeting	Yes
15-Jul-21	MPE Engineering	Blood Tribe	Mike Oka, Consultation Coordinator mike.oka@bloodtribe.org. JJ Shade, TLUOS Coordinator jjshade@bloodtribe.org	On Site Meeting	Meeting held in Taber to complete a site visit with members of the Blood Tribe. Blood Tribe concluded saying they had no objections and they will send an approval letter.	Site Meeting	Yes
21-Jul-21	MPE Engineering	Blood Tribe	Mike Oka, Consultation Coordinator mike.oka@bloodtribe.org.	Email	Follow up email sent to Blood Tribe requesting approval letter.	Blood Tribe Approval Letter	Yes
23-Jul-21	MPE Engineering	Ermineskin Cree Nation	Ermineskin Cree Nation, Carol M Wildcat, Consultation Coordinator, carol@ermineskin.ca, 780-585-3779	Email	Letter of Notification Sent		Yes
23-Jul-21	MPE Engineering	Samson	Samson Cree Nation, Kaylyn Buffalo, Consultation Project Officer, scnconsultation.pc@gmail.com, 780-335-1842	Email	Letter of Notification Sent		Yes
23-Jul-21	MPE Engineering	Louis Bull Tribe	Louis Bull Tribe, Shaleigh Raine, Consultation Officer, consultation@louisbulltribe.ca, 780-585-3978	Email	Letter of Notification Sent. Might need to do online submission.		Yes
23-Jul-21	MPE Engineering	Montana FN	Montana First Nation, Jodie Currie, Consultation Manager, jodiecurrie@montanafirstnation.com, 780-297-9006	Email	Letter of Notification Sent		Yes
23-Jul-21	MPE Engineering	Stoney	Stoney Nakoda Nations, William (Bill) Snow, Acting Director of Consultation Stoney Tribal Administration, bills@stoney-nation.com, 587-580-6212	Email	Letter of Notification Sent		Yes
23-Jul-21	MPE Engineering	Tsuut'ina	Tsuut'ina Nation, Violet M. Meguinis, Consultation Director, vmenguinis@tsuutina.com, 403-796-9408	Email	Letter of Notification Sent		Yes
23-Jul-21	MPE Engineering	Siksika	Siksika Nation, Richard Sparvier, Tribal Manager, richards@siksikanation.com, 403-499-8064	Email	Letter of Notification Sent		Yes
23-Jul-21	MPE Engineering	Piikani	Piikani Nation, Ira Provost, Manager, Pikani Nation Consultation, ira.provost@piikaniconsultation.com, 403-894-3639	Email	Letter of Notification Sent		Yes
23-Jul-21	MPE Engineering	Foothills	Foothills Ojibway First Nation, Chief, Jimmy O'Chiese, fos1865@gmail.com	Email	Letter of Notification Sent		Yes
29-Jul-21	Siksika	MPE	Siksika Nation, Richard Sparvier, Tribal Manager, richards@siksikanation.com, 403-499-8064	Phone	Wants to set Up site meeting. I requested he email some dates that work. Wants preliminary site visit will send budget. Based on preliminary visit may need a second one with elders.	Site Meeting	Yes
08-Apr-21	MPE Engineering	Blood Tribe	Mike Oka, Consultation Coordinator mike.oka@bloodtribe.org.	Email	Follow up email sent to Blood Tribe requesting approval letter.	Blood Tribe Approval Letter	Yes
11-Aug-21	Samson Cree	MPE	Samson Cree Nation, Kaylyn Buffalo, Consultation Project Officer, scnconsultation.pc@gmail.com, 780-335-1842	Email	Wants to set up a preliminary project meeting in september	Meeting Setup	Yes
25-Aug-21	MPE Engineering	Samson	Samson Cree Nation, Kaylyn Buffalo, Consultation Project Officer, scnconsultation.pc@gmail.com, 780-335-1842	Email	Set up initial consultation meeting for September 15th a 1:00 pm	Meeting Setup	Yes
25-Aug-21	MPE Engineering	Ermineskin Cree Nation	Ermineskin Cree Nation, Carol M Wildcat, Consultation Coordinator, carol@ermineskin.ca, 780-585-3779	Email	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
25-Aug-21	MPE Engineering	Louis Bull Tribe	Louis Bull Tribe, Shaleigh Raine, Consultation Officer, consultation@louisbulltribe.ca, 780-585-3978	Email	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
25-Aug-21	MPE Engineering	Montana FN	Montana First Nation, Jodie Currie, Consultation Manager, jodiecurrie@montanafirstnation.com, 780-297-9006	Email	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
25-Aug-21	MPE Engineering	Stoney	Stoney Nakoda Nations, William (Bill) Snow, Acting Director of Consultation Stoney Tribal Administration, bills@stoney-nation.com, 587-580-6212	Email	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
25-Aug-21	MPE Engineering	Tsuut'ina	Tsuut'ina Nation, Violet M. Meguinis, Consultation Director, vmenguinis@tsuutina.com, 403-796-9408	Email	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
25-Aug-21	MPE Engineering	Piikani	Piikani Nation, Ira Provost, Manager, Pikani Nation Consultation, ira.provost@piikaniconsultation.com, 403-894-3639	Email	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
25-Aug-21	MPE Engineering	Foothills	Foothills Ojibway First Nation, Chief, Jimmy O'Chiese, fos1865@gmail.com	Email	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
15-Sep-21	MPE Engineering	Samson	Samson Cree Nation, Kaylyn Buffalo, Consultation Project Officer, scnconsultation.pc@gmail.com, 780-335-1842	Microsoft Teams	The meeting was held with the SCN to provide project details and address any preliminary concerns the Nation may have.	Meeting	Yes
22-Sep-21	MPE Engineering	Ermineskin Cree Nation	Ermineskin Cree Nation, Danny Bellrose	Phone	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
22-Sep-21	MPE Engineering	Ermineskin Cree Nation	Ermineskin Cree Nation, Danny Bellrose, Carol M. Wildcat, Terry Ermineskin	Email	Letter of Notification re-sent	Notification Letter Follow Up	Yes
22-Sep-21	MPE Engineering	Louis Bull Tribe	Louis Bull Tribe, Shaleigh Raine, Melanie Daniels, Consultation & Land Manager 780-585-3978	Phone	Reminder of Letter of Notification Sent/Request for Response/Will Call back	Notification Letter Follow Up	Yes
22-Sep-21	MPE Engineering	Montana FN	Montana First Nation, Jodie Currie, Consultation Manager, jodiecurrie@montanafirstnation.com, 780-297-9006	Phone	Left Message-Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
22-Sep-21	MPE Engineering	Stoney	Stoney Nakoda Nations, William (Bill) Snow, Acting Director of Consultation Stoney Tribal Administration, bills@stoney-nation.com, 587-580-6212	Phone	Left Message-Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes

Date	From	To	Indigenous Community Contact Details	Medium	Communication Description	Nature of Concern	Follow Up Required? (Yes/no)
22-Sep-21	MPE Engineering	Tsuut'ina	Tsuut'ina Nation, Violet M. Meguinis, Consultation Director, vmenguinis@tsuutina.com, 403-796-9408	phone	Left Message-Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
22-Sep-21	MPE Engineering	Piikani	Piikani Nation, Ira Provost, Manager, Pikani Nation Consultation, ira.provost@piikaniconsultation.com, 403-894-3639	Phone	Left Message-Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
22-Sep-21	MPE Engineering	Foothills	Foothills Ojibway First Nation, Chief, Jimmy O'Chiese, fos1865@gmail.com 780-865-1865	Phone	Phone number is no longer in use	Notification Letter Follow Up	Yes
22-Sep-21	Ermineskin Cree Nation	MPE	Ermineskin Cree Nation, Danny Bellrose	Phone	Phoned to get a description of the project and indicated they would like to do a site visit to search for plants and sites and to better understand the project	Site Meeting Setup	Danny to provide a request for a site visit and provide a budget
05-Oct-21	Louis Bull Tribe	MPE	Louis Bull Tribe, Shaleigh Raine, Melanie Daniels, Consultation & Land Manager 780-585-3978	Phone	Phoned to indicate they would review the initial package sent in July and they will respond with any concerns.	Follow Up	Yes
15-Oct-21	MPE Engineering	Ermineskin Cree Nation	Ermineskin Cree Nation, Danny Bellrose	On Site Meeting	The meeting was held with the Ermineskin Cree Nation to provide project details and address any preliminary concerns the Nation may have.	Site Meeting	Yes
26-Oct-21	MPE Engineering	Montana FN	Montana First Nation, Jodie Currie, Consultation Manager, jodiecurrie@montanafirstnation.com, 780-297-9006	Phone	Left Message-Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
26-Oct-21	MPE Engineering	Stoney	Stoney Nakoda Nations, William (Bill) Snow, Acting Director of Consultation Stoney Tribal Administration, bills@stoney-nation.com, 587-580-6212	Phone	Left Message-Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
26-Oct-21	MPE Engineering	Tsuut'ina	Tsuut'ina Nation, Violet M. Meguinis, Consultation Director, vmenguinis@tsuutina.com, 403-796-9408	phone	Reminder of Letter of Notification Sent/Request for Response/Will look into Letter and will Call back	Notification Letter Follow Up	Yes
26-Oct-21	MPE Engineering	Piikani	Piikani Nation, Ira Provost, Manager, Pikani Nation Consultation, ira.provost@piikaniconsultation.com, 403-894-3639	Phone	Left Message-Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
26-Oct-21	MPE Engineering	Foothills	Foothills Ojibway First Nation, Chief, Jimmy O'Chiese, fos1865@gmail.com	Email	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
26-Oct-21	MPE Engineering	Siksika	Siksika Nation, Richard Sparvier, Tribal Manager, richards@siksikanation.com, 403-499-8064	Email	Reminder to set up a preliminary site meeting and provide a Budget.	Site Meeting Setup	Yes
26-Oct-21	Siksika	MPE	Siksika Nation, Richard Sparvier, Tribal Manager, richards@siksikanation.com, 403-499-8064	Email	Richard to pass along request for site visit and budget to their consultation office	Site Visit And Budget Passalong	Yes
28-Oct-21	Siksika	MPE	Siksika Nation, Scotty Manyguns, Consultation Officer, scottymanyguns7@gmail.com 587-437-5188	Phone	Scotty requested initial Letter of Notification be sent again. Will provide budget for site visit. Proposed November 4th or 5th to conduct visit.	Site Meeting Setup	Yes
04-Nov-21	Blood Tribe/Siksika Nation	MPE	Mike Oka, Consultation Coordinator mike.oka@bloodtribe.org. JJ Shade, TLUOS Coordinator jjshade@bloodtribe.org Siksika Nation, Scotty Manyguns, Consultation Officer, scottymanyguns7@gmail.com 587-437-5188	On Site Meeting	The meeting was held with the Blood Tribe & Siksika to provide project details and address any concerns they may have on Phase 1, 2, and 3	Site Meeting	No
25-Nov-21	MPE Engineering	Samson	Samson Cree Nation, Kaylyn Buffalo, Consultation Project Officer, scnconsultation.pc@gmail.com, 780-335-1842	Email	Reminder of Letter of Letter of Approval	Letter of Approval Reminder	Yes
25-Nov-21	MPE Engineering	Ermineskin Cree Nation	Ermineskin Cree Nation, Danny Bellrose	Email	Reminder of Letter of Letter of Approval	Letter of Approval Reminder	Yes
25-Nov-21	MPE Engineering	Siksika	Siksika Nation, Scotty Manyguns, Consultation Officer, scottymanyguns7@gmail.com 587-437-5188	Email	Reminder of Letter of Letter of Approval	Letter of Approval Reminder	Yes
25-Nov-21	MPE Engineering	Blood Tribe	Mike Oka, Consultation Coordinator mike.oka@bloodtribe.org. JJ Shade, TLUOS Coordinator jjshade@bloodtribe.org	Email	Reminder of Letter of Letter of Approval	Letter of Approval Reminder	Yes
25-Nov-21	MPE Engineering	Foothills	Foothills Ojibway First Nation, Chief, Jimmy O'Chiese, fos1865@gmail.com	Email	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
25-Nov-21	MPE Engineering	Piikani	Piikani Nation, Ira Provost, Manager, Pikani Nation Consultation, ira.provost@piikaniconsultation.com, 403-894-3639	Email	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
25-Nov-21	MPE Engineering	Montana FN	Montana First Nation, Jodie Currie, Consultation Manager, jodiecurrie@montanafirstnation.com, 780-297-9006	Email	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
25-Nov-21	MPE Engineering	Louis Bull Tribe	Louis Bull Tribe, Shaleigh Raine, Melanie Daniels, Consultation & Land Manager 780-585-3978	Email	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
25-Nov-21	MPE Engineering	Stoney	Stoney Nakoda Nations, William (Bill) Snow, Acting Director of Consultation Stoney Tribal Administration, bills@stoney-nation.com, 587-580-6212	Email	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
25-Nov-21	MPE Engineering	Tsuut'ina	Tsuut'ina Nation, Violet M. Meguinis, Consultation Director, vmenguinis@tsuutina.com, 403-796-9408	Email	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
25-Nov-21	Tsuut'ina	MPE	Tsuut'ina Nation, Violet M. Meguinis, Consultation Director, vmenguinis@tsuutina.com, 403-796-9408	Email	Response to Reminder of Notification Letter	Preliminary Discussion Between Tsuut'ina and MPE Engineering	Violet to Follow up with comments and a written response the week of Nov 29 to Dec 3, 2021
29-Nov-21	Tsuut'ina	MPE	Tsuut'ina Nation, Violet M. Meguinis, Consultation Director, vmenguinis@tsuutina.com, 403-796-9408	Email	Letter of Response	Water & Fish, Archeological Studies, Medicinal Plants, Climate Change	Yes
30-Nov-21	Samson Cree	MPE	Samson Cree Nation, Kyra Northwest, Samson Cree Nation, Traditional Land Use Lead, kyra@consultsamson.com, (780) 421-4279	Email	Letter of Response to be sent after the Consultation Committee's review meeting on December 6th 2021.	Notification Letter Follow Up	Yes
03-Dec-21	MPE	Tsuut'ina	Tsuut'ina Nation, Violet M. Meguinis, Consultation Director, vmenguinis@tsuutina.com, 403-796-9408	Email	Letter addressing Concerns identified in the Letter of Response	Follow Up to initial Letter	No
07-Dec-21	Ermineskin Cree Nation	MPE	Ermineskin Cree Nation, Danny Bellrose	Email	Update on Letter of Response. Danny will send update by the end of the week. (December 10th 2021)	Notification Letter Follow Up	Yes
25-Jan-22	Stantec	Piikani	Piikani Nation, Ira Provost, Manager, Pikani Nation Consultation, ira.provost@piikaniconsultation.com, 403-894-3639	Email	Letter of Response to the Piikani Nation's concerns submitted to the Impact Assessment Agency regarding the Initial Project Description.	Follow up to letter of concern	Yes
01-Feb-22	MPE Engineering	Samson	Samson Cree Nation, Kaylyn Buffalo, Consultation Project Officer, scnconsultation.pc@gmail.com, 780-335-1842	Email	Reminder of Letter of Letter of Approval	Letter of Approval Reminder	Yes
01-Feb-22	MPE Engineering	Ermineskin Cree Nation	Ermineskin Cree Nation, Danny Bellrose	Email	Reminder of Letter of Letter of Approval	Letter of Approval Reminder	Yes
01-Feb-22	MPE Engineering	Siksika	Siksika Nation, Scotty Manyguns, Consultation Officer, scottymanyguns7@gmail.com 587-437-5188	Email	Reminder of Letter of Letter of Approval	Letter of Approval Reminder	Yes

Date	From	To	Indigenous Community Contact Details	Medium	Communication Description	Nature of Concern	Follow Up Required? (Yes/no)
01-Feb-22	MPE Engineering	Blood Tribe	Mike Oka, Consultation Coordinator mike.oka@bloodtribe.org. JJ Shade, TLUOS Coordinator jjshade@bloodtribe.org	Email	Reminder of Letter of Letter of Approval	Letter of Approval Reminder	Yes
01-Feb-22	MPE Engineering	Foothills	Foothills Ojibway First Nation, Chief, Jimmy O'Chiese, fos1865@gmail.com	Email	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
01-Feb-22	MPE Engineering	Piikani	Piikani Nation, Ira Provost, Manager, Pikani Nation Consultation, ira.provost@piikaniconsultation.com, 403-894-3639	Email	Reminder of Letter of response/invitation to further comments, questions or meeting	Follow up to letter of concern	Yes
01-Feb-22	MPE Engineering	Montana FN	Montana First Nation, Jodie Currie, Consultation Manager, jodiecurrie@montanafirstnation.com, 780-297-9006	Email	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
01-Feb-22	MPE Engineering	Louis Bull Tribe	Louis Bull Tribe, Shaleigh Raine, Melanie Daniels, Consultation & Land Manager 780-585-3978	Email	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
01-Feb-22	MPE Engineering	Stoney	Stoney Nakoda Nations, William (Bill) Snow, Acting Director of Consultation Stoney Tribal Administration, bills@stoney-nation.com, 587-580-6212	Email	Reminder of Letter of Notification Sent/Request for Response	Notification Letter Follow Up	Yes
01-Feb-22	MPE Engineering	Tsuut'ina	Tsuut'ina Nation, Violet M. Meguinis, Consultation Director, vmenguinis@tsuutina.com, 403-796-9408	Email	Reminder of Letter of response/invitation to further comments, questions or meeting	Follow up to letter of concern	Yes
02-Feb-22	Siksika	MPE	Siksika Nation, Scotty Manyguns, Consultation Officer, scottymanyguns7@gmail.com 587-437-5188	Phone	Phoned to indicate they would provide a letter of Approval during the week of February 7, 2022.	Letter of Approval Reminder	Yes
07-Feb-22	Louis Bull Tribe	MPE	Louis Bull Tribe, Melanie Daniels, Consultation & Land Manager 780-585-3978	Email	Response to Reminder of Notification Letter. Due to extensive work load they will not engage the project at this time. They have decided that they have confidence that the Nations of Treaty 7 and the MNA Region 3 will raise concerns similar to theirs.	Letter of Approval Reminder	No

D2

Minutes of Meetings with Indigenous Groups

Blood Tribe/Kainai First Nation - June 30, 2021

Meeting Minutes #1
Horsefly Regional Emergency Spillway
Blood Tribe Consultation

Client: MD Taber
Project: Horsefly Spillway
Date: June 30, 2021
Time 9:00 am

File: N:\17\20\054-00\MM01

Attendance:	Arlos Croft	MD of Taber (MD)
	Jack Dunsmore	MD
	Jared Brown	MD
	Ron Hust	MPE Engineering Ltd. (MPE)
	Jeff Hust	MPE
	Julia Tokarz	MPE
	Mike Oka	Blood Tribe
`	Mark Libby	Infrastructure Canada (INFC)
	Meaghan Ferguson	INFC
	Jim Howell	Stantec
	Marty Anderson	Stantec
Location:	Microsoft Teams	
Purpose:	Blood Tribe Consultation	
Distribution:	Arlos Croft	MD of Taber (MD)
	Jack Dunsmore	MD
	Jared Brown	MD
	Ron Hust	MPE Engineering Ltd. (MPE)
	Jeff Hust	MPE
	Julia Tokarz	MPE
	Jim Howell	Stantec
	Marty Anderson	Stantec

1.0 Meeting Purpose

The meeting was held with the Blood Tribe to provide project details and address any preliminary concerns the Blood Tribe may have.

An overview of the project was presented by MPE to the Blood Tribe. The overall project plan was explained and descriptions of phases 1, 2, and 3 were presented. MPE highlighted the existing

infrastructure to be upgraded and the new work to be done along the coulee into the Oldman River. A PDF copy of the presentation will be sent to attendees.

Action: Info

2.0 Project Status

Construction is expected to begin early summer 2022 with completion in 2023. Environmental surveys, geotechnical investigations, and First Nation consultations are currently underway for Phase 1. Construction for Phases 2 and 3 are expected to begin the subsequent years. Due to federal funding all work must be completed by 2027, however it is expected to be completed sooner than that.

Action: Info

3.0 Blood Tribe Consultation

The Blood Tribe provided an overview of the history of the land and their culture. They mentioned that the Blood Tribe has contracting capabilities and expressed interest in being considered for the work of the project.

Action: Info

4.0 Artifacts

The Blood Tribe expressed concern over artifacts found in the project area and would like to be notified if anything were to be found. Similar to past projects involving the Blood Tribe, MPE will ensure contract documents include a notification procedure to involve the Blood Tribe.

Action: MPE

5.0 Paleontological Historical Resources Impact Assessment (HRIA)

Stantec is conducting a Paleontological Historical Resources Impact Assessment (HRIA) of Phase 1. The field work is scheduled for August 2021. The Blood Tribe would like a copy of the report, which they will have to request from Alberta Culture, Multiculturalism, and Status of Women (ACMSW). Stantec to include the Blood Tribe (Mike Oka) on the submission letter to ACMSW.

Action: Stantec

6.0 Site Visit

The Blood Tribe would like to conduct a site inspection for Phase 1, specifically the area around Taber Lake. MPE to coordinate with the MD and Blood Tribe to determine a day and time to conduct a site visit in the next couple of weeks.

Action: MPE

Meeting was adjourned at 9:35 am.

Recorded By: Julia Tokarz

If there are any errors, omissions, or discrepancies, please contact the writer at jtokarz@mpe.ca.

Blood Tribe/Kainai First Nation – July 15, 2021

Meeting Minutes #2
Horsefly Regional Emergency Spillway
Blood Tribe Consultation

Client: MD Taber
Project: Horsefly Spillway
Date: July 15, 2021
Time 1:00 pm

File: N:\17\20\054-00\MM02

Attendance:	Jack Dunsmore	MD of Taber (MD)
	Jared Brown	MD
	Ron Hust	MPE Engineering Ltd. (MPE)
	Julia Tokarz	MPE
	Jim Howell	Stantec
	Mike Oka	Blood Tribe
	Angel Oka	Blood Tribe
	Mike Tailfeathers	Blood Tribe
	Chris Gallagher	Taber Irrigation District (TID)
	Colin Haugan	TID

Location: Taber Irrigation District Office and Site Visit to Phase 1

Purpose: Blood Tribe Consultation

Distribution:	Arlos Croft	MD
	Jack Dunsmore	MD
	Jared Brown	MD
	Ron Hust	MPE Engineering Ltd. (MPE)
	Jeff Hust	MPE
	Julia Tokarz	MPE
	Jeff Hust	MPE
	Jim Howell	Stantec
	Mike Oka	Blood Tribe
	JJ Shade	Blood Tribe
	Mike Tailfeathers	Blood Tribe
	Angel Oka	Blood Tribe

1.0 Meeting Purpose

The meeting was held with the Blood Tribe to provide project details and complete a site visit.

An overview of the Horsefly Spillway project was presented by MPE to the Blood Tribe. A map was provided to attendees showcasing the locations of Phases 1, 2, and 3. The Blood Tribe provided an overview of their history and presented concerns they may have. The attendees then proceeded to drive to the site location and conduct a short tour of the area.

Action: Info

2.0 Project Background

The Horsefly Spillway project was originally proposed in the Southern Regional Stormwater Master Drainage Plan. The purpose of the project is to provide flooding relief to the SMRID main canal. The SMRID main canal is over 300 km long and collects drainage from a large area in Southern Alberta. In the past snow melt and rainfall have caused major flooding in the area, most recently in 2018. The proposed Horsefly Spillway project will help prevent future flooding and will be designed to accommodate the 100 year event. Phase 1 is expected to begin construction in early summer 2022 with Phases 2 and 3 following subsequently. All work is on private land.

Action: Info

3.0 Project Status

Preliminary design is currently underway for Phase 1. Geotechnical and environmental investigations began on site. Environmental surveys identified various species in the area. Further investigation to determine the extent of the landfill found at the Coulee is expected to occur in the next few weeks.

Action: Info

4.0 Blood Tribe History

The Blood Tribe provided an overview of their history with the land. The Blood Tribe is a part of the Blackfoot Confederacy. Their territory stretched from the Rocky Mountains to present-day Saskatchewan and down south to present-day Montana prior to reservations. They heavily relied on buffalo as a food source and were a nomadic tribe.

Action: Info

5.0 Artesian Wells

The Blood Tribe inquired about artesian wells in the area, as the Blood Tribe would have typically settled in these locations. The TID mentioned there are artesian wells located to the North of the project, however nothing near where the work is to be completed.

Action: Info

6.0 Artifacts

The Blood Tribe would like to be notified should any artifacts be found during construction. MPE will ensure contract documents include a notification procedure to involve the Blood Tribe should anything be found.

Action: MPE

7.0 Blood Tribe Consultation

The Blood Tribe mentioned they had no objections to the project and will forward an approval letter to MPE.

Action: Blood Tribe

8.0 Site Visit

Upon conclusion of the indoor meeting, the attendees drove to the Horsefly Spillway site. A tour starting near the Oldman River was conducted. The location of the existing landfill site was identified as well as the point of discharge into the Oldman River. The attendees drove along the existing drain that would be expanded and concluded the tour at the Taber Lake outlet structure.

Action: Info

Meeting was adjourned at 2:30 pm.

Recorded By: Julia Tokarz

If there are any errors, omissions, or discrepancies, please contact the writer at jtokarz@mpe.ca.

Samson Cree Nation - September 15, 2021

Meeting Minutes #1
Horsefly Regional Emergency Spillway
Samson Cree Nation Consultation

Client: MD Taber
Project: Horsefly Spillway
Date: September 15, 2021
Time 1:00pm

File: N:\17\20\054-00\MM01

Attendance:	Arlos Crofts	MD of Taber (MD)
	Jack Dunsmore	MD
	Brian Peers	MD
	Ron Hust	MPE Engineering Ltd. (MPE)
	Jeff Hust	MPE
	Devon Van Dasselaar	MPE
	Kyra Northwest	Samson Cree Nation (SCN)
	Kaylyn Buffalo	SCN
Location:	Microsoft Teams	
Purpose:	Samson Cree Nation Consultation	
Distribution:	All Present	
	Jim Howell	Stantec
	Marty Anderson	Stantec

1.0 Meeting Purpose

The meeting was held with the SCN to provide project details and address any preliminary concerns the Nation may have.

A brief introduction of The Horsefly Spillway project was given. The Horsefly Spillway project was originally proposed in the Southern Regional Stormwater Master Drainage Plan along with 7 other projects. The purpose of the project is to provide flooding relief to the SMRID main canal. The SMRID main canal is over 300 km long and collects drainage from a large area in Southern Alberta. In the past snow melt and rainfall have caused major flooding in the area, most recently in 2018. The proposed Horsefly Spillway project will help prevent future flooding in southern Alberta.

Action: Info

An overview of the project was presented by MPE to the SCN. The overall project plan was explained and descriptions of phases 1, 2, and 3 were presented. MPE highlighted the existing infrastructure to be upgraded and the new work to be done along the coulee into the Oldman River. A PDF copy of the presentation will be sent to attendees.

Action: Info

2.0 Project Status

Construction is expected to begin early summer 2022 with completion in 2023. Environmental surveys, geotechnical investigations, and First Nation consultations are currently underway for Phase 1. Construction for Phases 2 and 3 are expected to begin the subsequent years.

Action: Info

3.0 Paleontological Historical Resources Impact Assessment (HRIA)

Stantec has conducted a Paleontological Historical Resources Impact Assessment (HRIA) of Phase 1. The field work has been completed. Consultations with Alberta Culture has indicated that there are no sites of significance near the project. Due to the findings during Palaeontologic investigations, a Paleontologist will be required to be on site for excavations in the coulee in the bed rock layers.

Action: Info

4.0 Samson Cree Nation Consultation

The SCN noted during their background investigations, the area of the project had already been extensively disturbed by agricultural and other uses. The SCN indicated area of the project was not a high use area for traditional hunting and medicine gathering grounds.

Action: Info

The SCN expressed concerns about endangered cutthroat trout in the Oldman River. The SCN was satisfied that fisheries surveys were being conducted and that the mitigation methods recommended would be adhered to. The SCN requested a copy of the environmental reports once completed to keep with their consultation record.

Action: Info/MPE

The SCN inquired if consultation had been considered with the other nations. The project has initiated consultation with the; Blood Tribe, Metis Region 3, Erminskin Cree Nation, Louis Bull Tribe, Montana First Nation, Stoney Nakoda Nations, Tsuut'ina Nation, Siksika Nation, Piikani Nation and Foothills Ojibway First Nation.

Action: Info

The SCN mentioned they had no objections to the project and will forward an approval letter to MPE. The SCN would report the outcome of this meeting to their consultation committee at their regularly scheduled meeting on October 4, 2021. The SCN indicated the approval letter would be issued shortly after the October meeting.

Action: Info/SCN

Meeting was adjourned at 1:40 pm.

Recorded By: Devon Van Dasselaar

If there are any errors, omissions, or discrepancies, please contact the writer at dvandasselaar@mpe.ca.

Erminskin Cree Nation – October 15, 2021

Meeting Minutes #1
Horsefly Regional Emergency Spillway
Ermineskin Cree Nation Consultation

Client: MD Taber
Project: Horsefly Spillway
Date: October 15, 2021
Time 9:00am

File: N:\17\20\054-00\MM01

Attendance:	Jack Dunsmore	MD of Taber (MD)
	Colin Haugan	Taber Irrigation District (TID)
	Danny Bellerose	Ermineskin Cree Nation (ECN)
	Larry Cutarm	ECN
	Clara Wildcat	ECN
	Carol M. Wildcat	ECN
	Ron Hust	MPE Engineering Ltd. (MPE)
	Devon Van Dasselaar	MPE
	Jim Howell	Stantec
Location:	TID Office, On site at Phases 1, 2, and 3.	
Purpose:	Ermineskin Cree Nation Consultation	
Distribution:	All Present	
	Marty Anderson	Stantec

1.0 Meeting Purpose

The meeting was held with the ECN to provide project details and address any preliminary concerns the Nation may have.

A brief introduction of The Horsefly Spillway Project was given. The Horsefly Spillway Project was originally proposed in the Southern Regional Stormwater Master Drainage Plan along with seven other projects. The purpose of the project is to provide flood relief to the SMRID main canal. The SMRID main canal is over 300 km long extending from Waterton in the west to Medicine Hat in the east and collects drainage from a large area. In the past snow melt and rainfall have caused major flooding in the area, most recently in 2018. The proposed Horsefly Spillway Project will help prevent future flooding in southern Alberta.

Action: Info

An overview of the project was presented by MPE to the ECN. The overall Project plan was explained and descriptions of phases 1, 2, and 3 were presented. MPE highlighted the existing infrastructure to be upgraded and the required work in the coulee at the Oldman River. A PDF copy of the presentation was sent to attendees.

Action: Info

2.0 Project Status

The Project is designed to handle a 1:100-year flood. The system is designed to convey about 9.8 million cubic metres of water during such an event. Construction is scheduled to begin in the summer of 2022 with completion in 2023 depending on outcome of the Federal Impact Assessment Agency review. The Project has been deemed a *Designated Project* by the Agency because it transfers water from one natural water body to another and it may divert over 10 million cubic metres of water in a single year between the water bodies. This could happen if a flood greater than a 1:100-year event occurred or if more than 1 1:100 yr event were to occur. Construction of Phases 2 and 3 is expected to begin in subsequent years. Currently the design team (Stantec/MPE) is in the process of preparing and submitting an Initial Project Description. The Assessment Agency then has up to 180 days to review and collect comments from Indigenous groups and the public on the Initial Project Description. The comments collected during the review will be presented to the MD of Taber who will include responses to these comments and updated project design information in the Detailed Project Description. Upon submission of this document, the Agency has 10 days to determine if a full Impact Assessment is required. If a full impact assessment is required, the project start will be delayed until the Impact Assessment is reviewed and the Project is approved.

Alberta Environment and Parks (AEP) has determined they will not require a Provincial Environmental Impact assessment as the Project is enlarging existing irrigation works.

To date surveys including wildlife, vegetation, fisheries, and geotechnical investigations have been carried out. First Nation Consultations are currently underway.

Action: Info

3.0 Palaeontological Historical Resources Impact Assessment (HRIA)

Stantec has submitted an Historical Resources Act application for Phase 1 of the Project to Alberta Culture and the Status of Women (ACSW). The Ministry determined that given the development in the area, an archaeological survey for Phase 1 is not required. However, a Palaeontological Historical Resources Impact Assessment (HRIA) of the coulee is required. The field work for the HRIA has been completed. Due to the findings during the palaeontologic investigations, a Paleontologist will be required to be on site for excavations in the coulee. An Historical Resources Act application for Phases 2 and 3 is being submitted to ACSW. If any artifacts are discovered during construction, work will stop, and an archaeological specialist will review the findings.

The ECN would like to be notified should any artifacts be found during construction. MPE will ensure contract documents include a notification procedure to involve the ECN should anything be found.

Action: Info

4.0 Ermineskin Cree Nation Consultation

The ECN noted during their background investigations, the area of the project had already been extensively disturbed by agricultural and other uses.

The ECN expressed concerns about endangered species in the Oldman River. Stantec indicated there may be some species at risk, they will submit plans once complete to Fisheries and Oceans Canada (DFO) for comment. DFO does not review conceptual or preliminary plans, therefore, plans will be submitted once the final design is completed. Irrigation Districts do not have to submit plans or receive approval from DFO to modify or reconstruct there existing infrastructure. The DFO submission will focus on the outlet to the Oldman River.

The ECN asked which species of fish can be found with in Horsefly Reservoir and Taber Lake Reservoir. These reservoirs typically support Northern Pike, Walleye, Perch and numerous minnow species. They are both shallow reservoirs constructed at existing slough locations in the early 1900's, there are no constructed recreation facilities at either reservoir.

The ECN commented that they were pleased that fisheries surveys had been conducted and that the mitigation methods recommended would be adhered to. They were disappointed they were not asked to participate in the fish and archaeological surveys.

The ECN expressed concerns about the abandoned landfill on the north side of the coulee upstream of the river. The ECN asked if the landfill would be cleared out before construction of the spillway channel commenced. The landfill according to local information was primarily used between the 1940's and early 1970's (no records of the landfill exist). The landfill area was drilled, and test pitted to determine its limits, the proposed spillway will not extend into the landfill area. If garbage is encountered during construction appropriate remedial measure will be taken.

The ECN expressed concerns about agricultural chemicals in the storm water effluent. The ECN indicated their concern with the quality of the water being discharged into the Oldman River. The TID is very aware of water quality concerns in the area and are very proactive in taking measures to improve the quality of the water being returned to the river system. This Project will include constructed wetland areas at Horsefly Reservoir and Taber Lake to help improve water quality.

The ECN inquired if there was going to be a water quality monitoring system installed at the Oldman River. Currently there are no plans to install a water quality monitoring station. Currently during flood events AEP and the TID monitor water quality through sampling during release events. During a 1:100-year storm (1% probability), flood flows in the Oldman River approach 3,900m^3/s. The flow that will be added through the proposed spillway is 40m^3/s which would account for 1% of the total flows.

The ECN inquired if there is any coalbed methane in the area. This is unknown, there were coal mines to the west of Taber.

Action: Info/MPE

The ECN inquired if consultation has been undertaken with the other First Nations. Consultations have been initiated with the following first Nations: Blood Tribe, Metis Region 3, Samson Cree Nation, Louis Bull Tribe, Montana First Nation, Stoney Nakoda Nations, Tsuut'ina Nation, Siksika Nation, Piikani Nation and Foothills Ojibway First Nation.

To date only the Blood Tribe, Metis Region 3, Samson Cree and the ECN have met with the project team to discuss this project.

Action: Info

The ECN stated that they have various partnerships with other companies and would like the opportunity to be included in the tendering process of this project. The ECN indicated they would share their company profile including all existing partnerships.

Action: Info

5.0 Site Visit

Upon conclusion of the indoor meeting, the attendees drove to the Horsefly Spillway site. A tour was conducted starting at the south end of Phase 3. The tour went through Phases 3, 2 and 1 and ended at the location of the existing landfill site and the outlet to the Oldman River.

The ECN expressed interest in seeing the location of the proposed wetlands. The exact areas could not be accessed at this time. There are no existing trails or roads at the Horsefly Reservoir site and the Taber Lake site was inaccessible due to the current sugar beet harvest traffic.

The ECN expressed interest in being involved in the wetland design process.

Action: Info

The ECN mentioned they had no objections to the project but are concerned with quality of the water being discharged to the Oldman River. The ECN would meet internally to discuss the findings of the site visit. They indicated they would report back once they had received the minutes of this meeting.

Action: Info/ECN

Meeting was adjourned at 1:40 pm.

Recorded By: Devon Van Dasselaar

If there are any errors, omissions, or discrepancies, please contact the writer at dvandasselaar@mpe.ca.

Blood Tribe/Kainai First Nation and Siksika Nation – November 4, 2021

Meeting Minutes #1
Horsefly Regional Emergency Spillway
Blood Tribe & Siksika Nation Consultation

Client: MD Taber
File: N:\17\20\054-00\MM01
Project: Horsefly Regional Emergency Spillway Phase 1, 2 and 3
Date: November 4th, 2021
Time 9:30 AM

Attendance:	Jack Dunsmore	MD of Taber (MD)
	Colin Haugan	Taber Irrigation District (TID)
	Scotty Manyguns	Siksika Nation
	Fred Breaker	Siksika Nation
	Cody Munro	Siksika Nation
	David Striped Wolf	Blood Tribe
	Mike Tailfeathers	Blood Tribe
	Dennis First Rider	Blood Tribe
	JJ Shade	Blood Tribe
	Mike Oka	Blood Tribe
	Devon Van Dasselaar	MPE Engineering Ltd. (MPE)
	Jordan Lonsdale	MPE

Location: Taber Irrigation District Office and Site Visit to Phase 1, 2 and 3.

Purpose: Blood Tribe & Siksika Nation Consultation

Distribution:	All Present	
	Ron Hust	MPE Engineering Ltd.
	Jeff Hust	MPE Engineering Ltd.
	Jim Howell	Stantec.

1.0 Meeting Purpose

The meeting was held with the Blood Tribe & Siksika to provide project details and address any concerns they may have.

A brief introduction of The Horsefly Spillway Project was given. The Horsefly Spillway Project was originally proposed in the Southern Regional Stormwater Master Drainage Plan along with seven other projects. The purpose of the project is to provide flood relief to the SMRID main canal. The SMRID main canal is over 300 km long extending from Waterton in the west to Medicine Hat in the east and collects drainage from a large area. In the past, snow melt and rainfall have caused major flooding in the area, most recently in 2018. The proposed Horsefly Spillway Project will help prevent future flooding in southern Alberta.

Action: Info

The Siksika Nation provided an overview of their history with the land. The Siksika Nation and the Blood Tribe are part of the Blackfoot Confederacy. Their territory stretched from the Rocky Mountains to present-day Saskatchewan and down south to present-day Montana prior to reservations. They heavily relied on buffalo as a food source and were a nomadic tribe.

Action: Info

An overview of the project was presented by MPE to the Blood Tribe and the Siksika Nation. The overall Project plan was explained and descriptions of phases 1, 2, and 3 were presented. MPE highlighted the existing infrastructure to be upgraded and the required work in the coulee at the Oldman River. A PDF copy of the presentation was given to all attendees.

Action: Info

2.0 Project Status

The Project is designed to handle a 1:100-year flood. The system is designed to convey about 9.8 million cubic meters of water during such an event. Construction is anticipated to begin in the summer of 2022 with completion in 2023 depending on outcome of the Federal Impact Assessment Agency review. The Project has been deemed a *Designated Project* by the Agency because it transfers water from one natural water body to another and it may divert over 10 million cubic meters of water in a single year between the water bodies. This could happen if a flood greater than a 1:100-year event occurred. Construction of Phases 2 and 3 is expected to begin in subsequent years. The design team (Stantec/MPE) has submitted an Initial Project Description and the Assessment Agency has up to 180 days to review and collect comments from Indigenous groups and the public. The comments collected during the review will be presented to the MD of Taber who will include responses to these comments and updated project design information in the Detailed Project Description. Upon submission of this document, the Agency has 10 days to determine if a full Impact Assessment is required. If a full impact assessment is required, the project start will be delayed until the Impact Assessment is reviewed, and the Project is approved.

Alberta Environment and Parks (AEP) has determined they will not require a Provincial Environmental Impact assessment as the Project is enlarging existing irrigation works.

To date surveys including wildlife, vegetation, fisheries, and geotechnical investigations have been carried out. First Nation Consultations are currently underway. To date, the Blood Tribe, Metis Region 3, Samson Cree Nation, Ermineskin Cree Nation and Siksika have met with the project team to discuss.

Action: Info

3.0 Artifacts

The Blood Tribe and Siksika would like to be notified should any artifacts be found during construction. MPE will ensure contract documents include a notification procedure to involve the Nations should anything be found.

Action: MPE

4.0 Blood Tribe and Siksika Consultation

The Blood Tribe and Siksika asked which species of fish can be found with in Horsefly Reservoir and Taber Lake Reservoir. These reservoirs typically support Northern Pike, Walleye, Perch and numerous minnow species. They are both shallow reservoirs constructed at existing slough locations in the early 1900's, there are no constructed recreation facilities at either reservoir.

The Blood Tribe and Siksika expressed concerns about silt and agricultural chemicals in the storm water effluent, with the primary concern of water quality being discharged to the Oldman River. The TID is very aware of water quality concerns in the area and are very proactive in taking measures to improve the quality of the water being returned to the river system. This Project will include constructed wetland areas at Horsefly Reservoir and Taber Lake to help improve water quality. Currently during flood events AEP and the TID monitor water quality through sampling during release events. During a 1:100-year storm (1% probability), flood flows in the Oldman River approach 3,900m^3/s. The flow that will be added through the proposed spillway is 40m^3/s which would account for 1% of the total flows.

Siksika stated that they have various partnerships with other companies and would like the opportunity to be included in the tendering process of this project. Siksika indicated they would share their company profile including all existing partnerships.

Action: Info

5.0 Site Visit

Upon conclusion of the indoor meeting, the attendees drove to the Horsefly Spillway site. A tour was conducted starting at the south end of Phase 3. The tour went through Phases 3, 2 and 1 and ended at the location of the existing landfill site and the outlet to the Oldman River.

Siksika and the Blood Tribe expressed interest in seeing the location of the proposed wetlands. The exact areas could not be accessed at this time there are no existing trails or roads at the Horsefly Reservoir site. The Taber Lake site was accessed through the west dam of Taber Lake.

Action: Info.

The Blood Tribe and Siksika confirmed they had no objections to the project and will provide an approval letter to MPE.

Action: Blood Tribe & Siksika

Meeting was adjourned at 3:30 pm.

Recorded By: Jordan Lonsdale

If there are any errors, omissions, or discrepancies, please contact the writer at jlonsdale@mpe.ca.

D3

Correspondence Letters

Sample Letter to Indigenous Groups

Municipal District of Taber
Horsefly Regional Emergency Spillway

July 21, 2021

Kaylyn Buffalo
Samson Cree Nation
PO Box 159
Maskwacis, Alberta
T0C 1N0

Sent via Email

Subject: Horsefly Regional Emergency Spillway

Dear Kaylyn Buffalo:

I am writing to notify you that the Municipal District of Taber has been approved for financial support under Infrastructure Canada's (INFC) Investing in Canada Infrastructure Program – to construct the Horsefly Regional Emergency Spillway. I am also writing to provide you with information on the proposed project and then provide you with the opportunity to convey any issues or concerns regarding possible impacts to Aboriginal rights or title or any other concerns that the Samson Cree Nation may have regarding this project.

Major Components of the Horsefly Regional Emergency Spillway Project include:

- Upgrades to 14,000 metres of existing irrigation canal and drainage ditch between the St. Mary River Irrigation District (SMRID) Main Canal and the Oldman River,
- Upgrades to existing crossings at Highway 3, Highway 36, Canadian Pacific Rail (CPR), and six local roads,
- Upgrades to the Taber Lake outlet structure, Horsefly Reservoir outlet structure, and Horsefly turnout on the SMRID Main Canal,
- Construction of eight concrete drop/check structures,
- Construction of a spillway outlet structure to the Oldman River,
- Construction of wetlands at Horsefly Reservoir and Taber Lake.

The proposed project is to be constructed to prevent a breach of the St. Mary River Irrigation District (SMRID) Main Canal during a significant flood event. Further information on the project can be found in Appendix A.

Prior to proceeding with this project, we would like to know if the Samson Cree Nation have any questions or concerns regarding impacts to Aboriginal rights or title or if there are any other concerns regarding the proposed project. Furthermore, should you require additional information on the proposed project, please contact Jeff Hust with MPE Engineering Ltd. by telephone at (403) 329-3442, by email at jhust@mpe.ca, or by mail at:

MPE Engineering Ltd.
#300, 714 – 5 Avenue S,
Lethbridge, Alberta, T1J 0V1

I would appreciate hearing back from you by August 30th. If it is not possible to respond within this timeframe, would you kindly contact me to establish a mutually agreed upon timeframe.

I would like to thank you in advance for your consideration to this request and look forward to hearing back from you.

Sincerely Yours,

Arlos Crofts
Chief Administrative Officer
Municipal District of Taber

cc:
Simon Tétreault - Section Leader, Environmental Review and Approvals, Quebec-West Region, Indigenous Consultation and Environmental Services, INFC
Jared Bone, Acting - Senior Environmental Review and Approvals Officer, INFC
Robin Strong, Manager – West Region, INFC
Jack Dunsmore – Municipal District of Taber
Kyra Northwest, Traditional Land Use Lead – Samson Cree Nation

Appendix A Additional Information

Horsefly Regional Emergency Spillway

Please consider this notification of a proposed project to upgrade existing irrigation and drainage infrastructure to accommodate stormwater flows along the Horsefly Spillway. The Horsefly Regional Emergency Spillway project involves the diversion of stormwater runoff intercepted by the St. Mary River Irrigation District (SMRID) Main Canal through works owned and operated by the SMRID and Taber Irrigation District (TID) to the Oldman River.

The SMRID Main Canal receives stormwater runoff from approximately 565,000 ha of land in Southern Alberta. Flood events have been occurring more frequently especially in June when irrigation demand for crops is nearing peak demand, as compared to the past when snowmelt events represented a larger flood risk. This stormwater that falls as rain is taxing the irrigation system and creates the risk of failure of the SMRID Main Canal during a significant runoff event. The SMRID Main Canal only has one outlet to release this stormwater to the river system, near the end of the 300 km long canal near the City of Medicine Hat into the South Saskatchewan River.

The Horsefly Regional Emergency Spillway project will be constructed in three phases.

Phase 1 includes the following:

- Upgrading 5,500 metres of existing irrigation canal and drainage ditch between Taber Lake and the Oldman River,
- Upgrading existing crossings at Highway 36 and three Municipal District (M.D.) of Taber road crossings,
- Construction of a spillway outlet structure to the Oldman River,
- Construction of three concrete drop structures,
- Upgrading the Taber Lake outlet structure.

Phase 2 includes the following:

- Upgrading 5,000 metres of irrigation canal between Horsefly Reservoir and Taber Lake,
- Upgrading existing Highway 3, Township Road 94, Township Road 100, and Canadian Pacific Rail (CPR) crossings,
- Construction of a wetland at Taber Lake to improve water quality,
- Construction of three concrete drop structures,
- Upgrading the existing Horsefly Reservoir outlet structure.

Phase 3 includes the following:

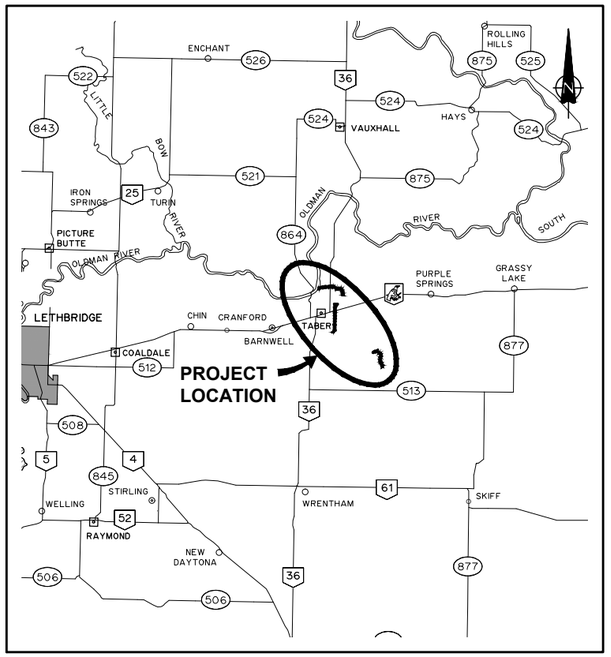
- Upgrading 3,500 metres of irrigation canal between the SMRID Main Canal and Horsefly Reservoir,
- Upgrading existing Township Road 91 crossing,
- Construction of two concrete drop structures,
- Upgrading the SMRID turnout structure,
- Construction of a wetland at Horsefly Reservoir to improve water quality.

The following five drawings are attached and detail the components of the project:

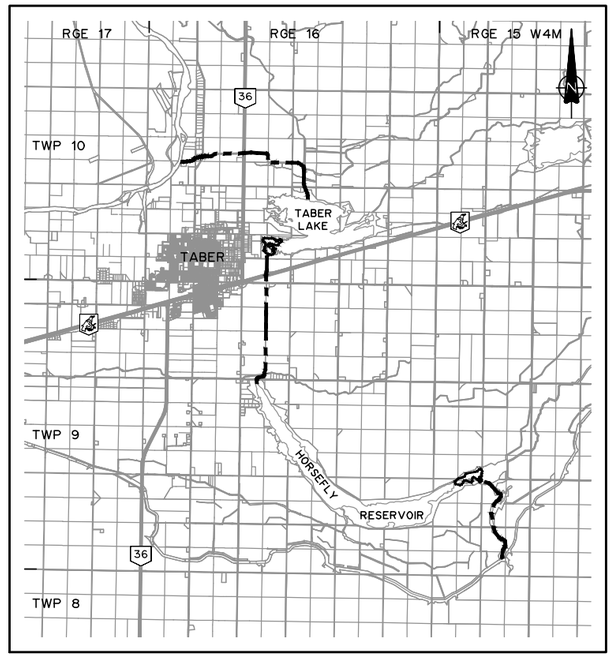
1. Drawing 1: Cover Sheet and Project Location Plan,
2. Drawing 2: Overall Site Plan,
3. Drawing 3: Phase 1 Plan Profile,
4. Drawing 4: Phase 2 Plan Profile,
5. Drawing 5: Phase 3 Plan Profile.

There will be appropriate mitigation measures included in the contract specifications to minimize any adverse impact to Horsefly Reservoir, Taber Lake, Oldman River, and the surrounding environment during construction. All work will take place on private land, there are now federal or crown lands within the project area.

If current conditions permit, Phase 1 is expected to commence July 1, 2022, and be completed by March 31, 2023. Phases 2 and 3 will follow subsequently. We do not anticipate that this work, or the result of this work, will have any adverse impacts on the exercise of treaty rights or traditional uses.



LOCATION PLAN



SITE PLAN

SET _____

LIST OF DRAWINGS

TITLE PAGE
1 OVERALL SITE PLAN
2 PHASE 1 PLAN PROFILE
3 PHASE 2 PLAN PROFILE
4 PHASE 3 PLAN PROFILE

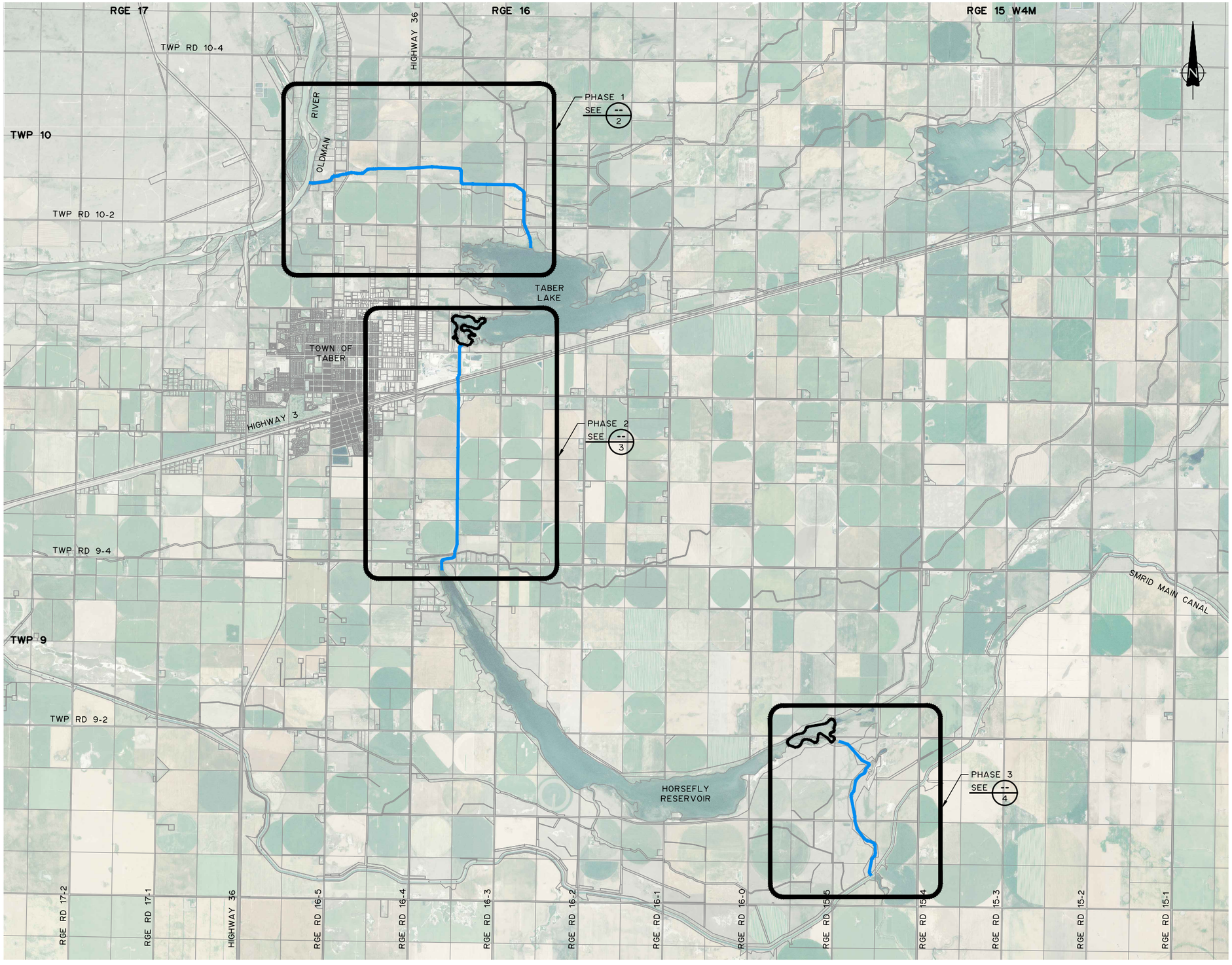
MUNICIPAL DISTRICT OF TABER

HORSEFLY REGIONAL EMERGENCY SPILLWAY

FOR CONSULTATION

1720-054-00

MPE Engineering Ltd.



NOTES:

1. SPILLWAY ALIGNMENT IS BASED ON CURRENT CANAL ALIGNMENTS AND MAY CHANGE DURING DESIGN.
2. HIGHWAY 3 WILL BE RELOCATED IN THE FUTURE. THE EXISTING LOCATION HAS BEEN ASSUMED FOR THIS PROJECT.

THIS DRAWING MAY HAVE BEEN MODIFIED FROM ITS ORIGINAL SIZE. ALL SCALE NOTATIONS INDICATED ARE BASED ON 22"x34" FORMAT DRAWINGS

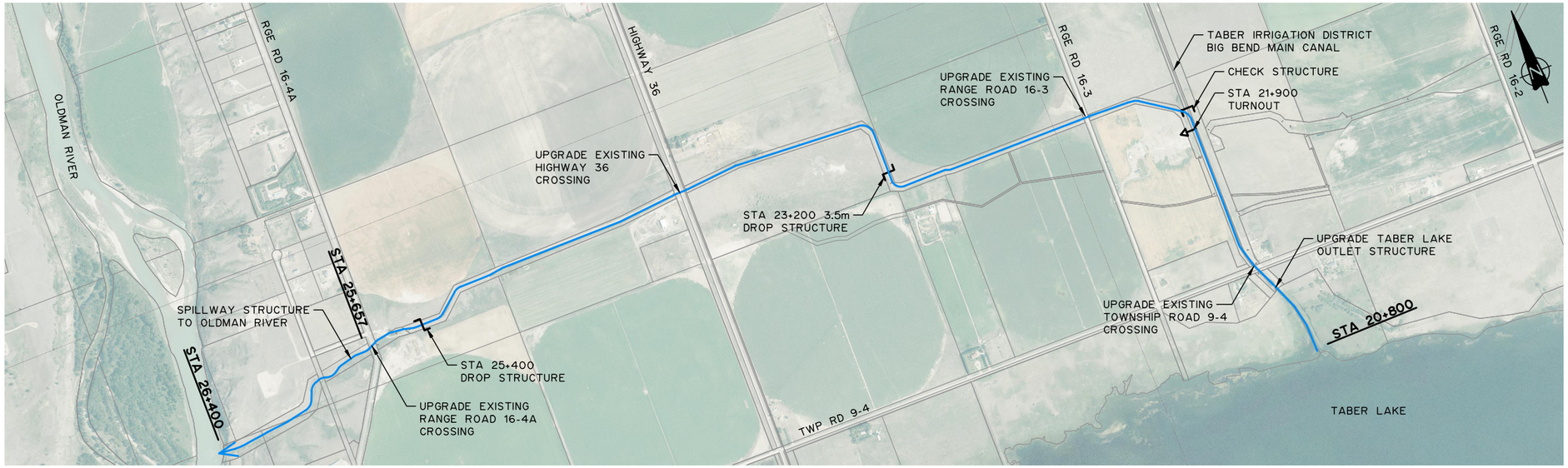
1	21-07-21	FOR CONSULTATION
ISSUE	YY-MM-DD	REVISION

MPE Engineering Ltd.

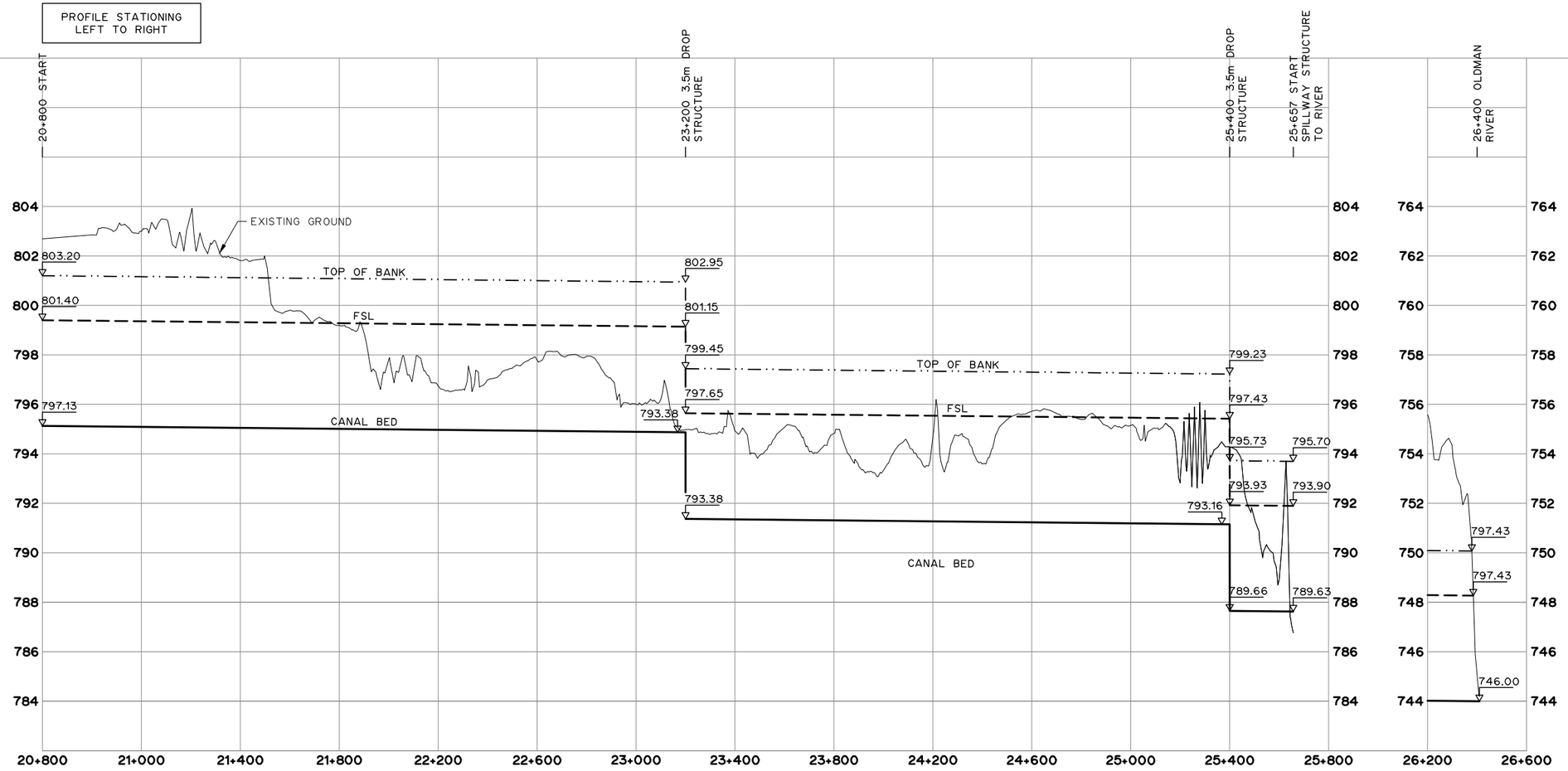
MUNICIPAL DISTRICT OF TABER

HORSEFLY REGIONAL EMERGENCY SPILLWAY
OVERALL SITE PLAN

DESIGNED	J.W.H.	JOB	1720-054-00
DRAWN	R.B.H.	SCALE	1:75 000
DATE	JULY 2021	DRAWING	1



PROFILE STATIONING
LEFT TO RIGHT



NOTES:

1. SPILLWAY ALIGNMENT IS BASED ON CURRENT CANAL ALIGNMENTS AND MAY CHANGE DURING DESIGN.
2. DESIGN FLOW= 40m³/s.

THIS DRAWING MAY HAVE BEEN MODIFIED FROM ITS ORIGINAL SIZE. ALL SCALE NOTATIONS INDICATED ARE BASED ON 11"x17" FORMAT DRAWINGS

ISSUE	YY-MM-DD	REVISION
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MPE Engineering Ltd.

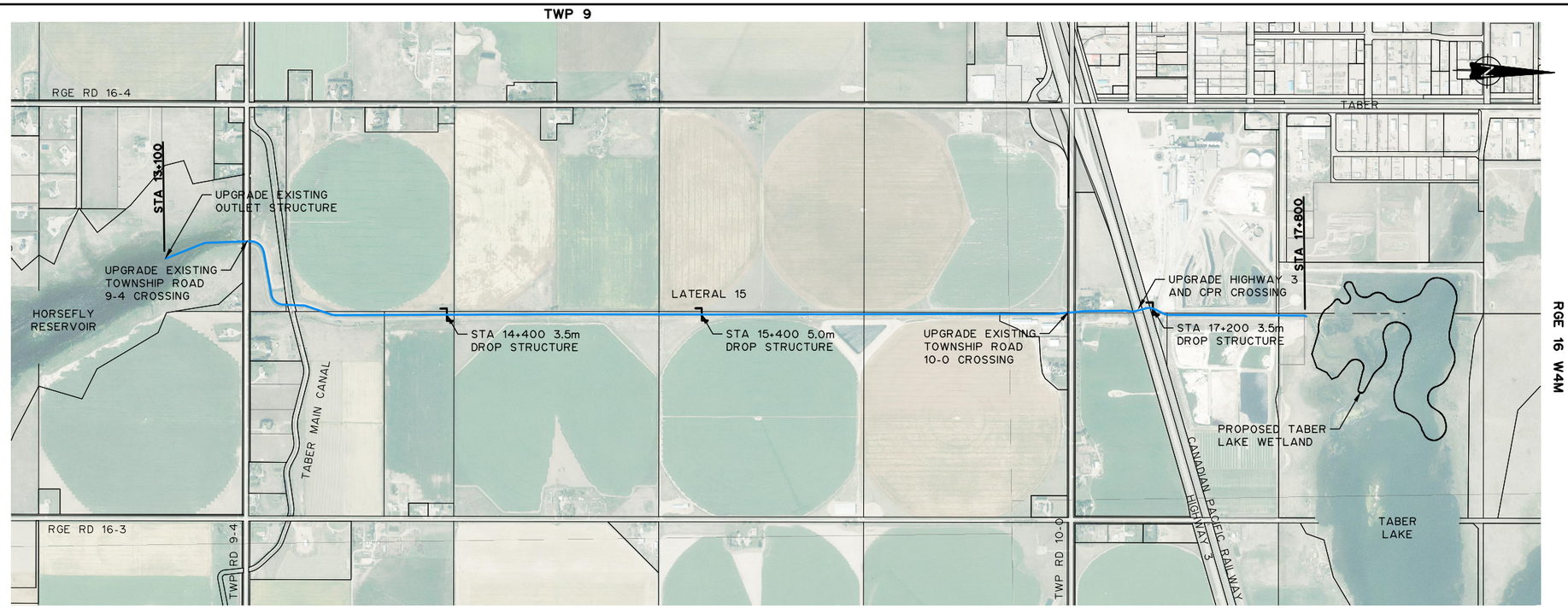
MUNICIPAL DISTRICT OF TABER

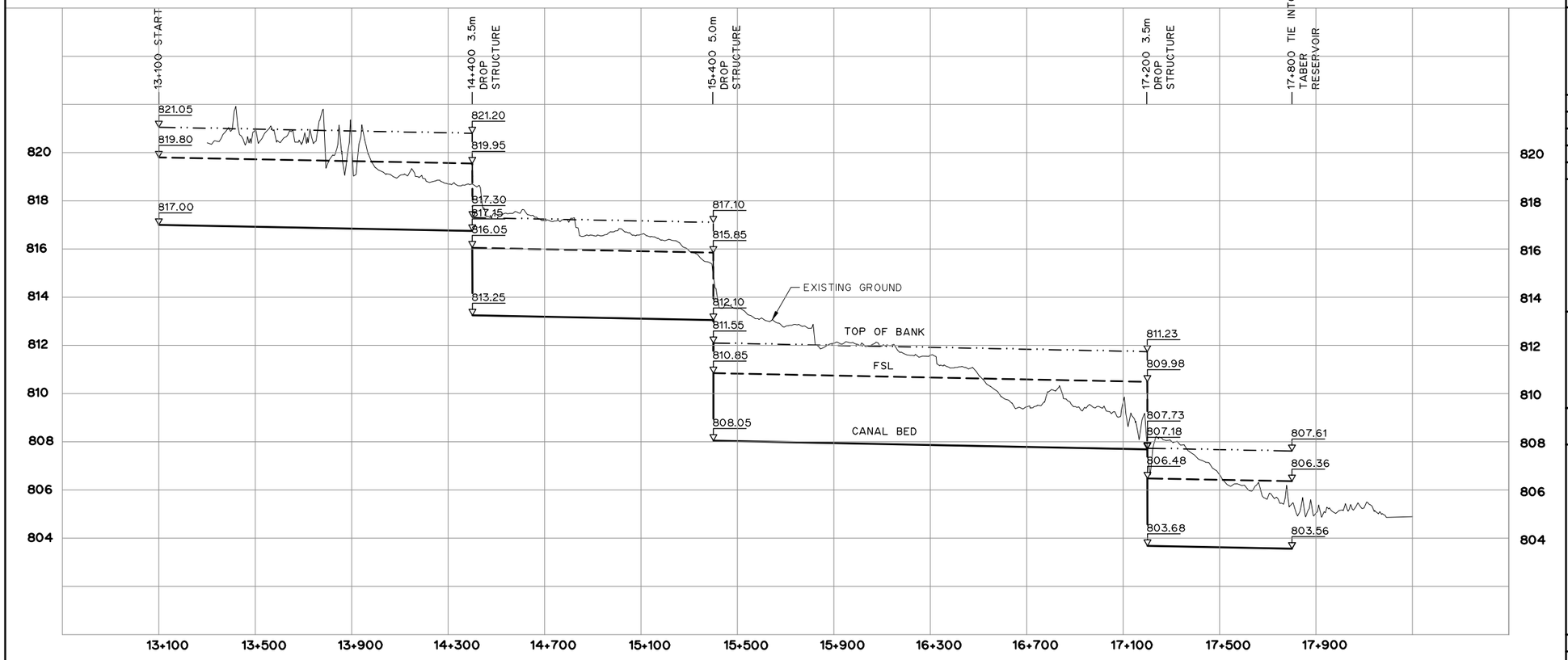
HORSEFLY REGIONAL EMERGENCY SPILLWAY

PHASE 1 PLAN PROFILE

STA 20+800 TO STA 2+657

DESIGNED	J.W.H.	JOB	1720-054-00
DRAWN	R.B.H.	SCALE	H1:20 000 V1:200
DATE	JULY 2021	DRAWING	2





NOTES:

1. SPILLWAY ALIGNMENT IS BASED ON CURRENT CANAL ALIGNMENTS AND MAY CHANGE DURING DESIGN.
2. DESIGN FLOW= 40m^3/s.

THIS DRAWING MAY HAVE BEEN MODIFIED FROM ITS ORIGINAL SIZE. ALL SCALE NOTATIONS INDICATED ARE BASED ON 22"x34" FORMAT DRAWINGS

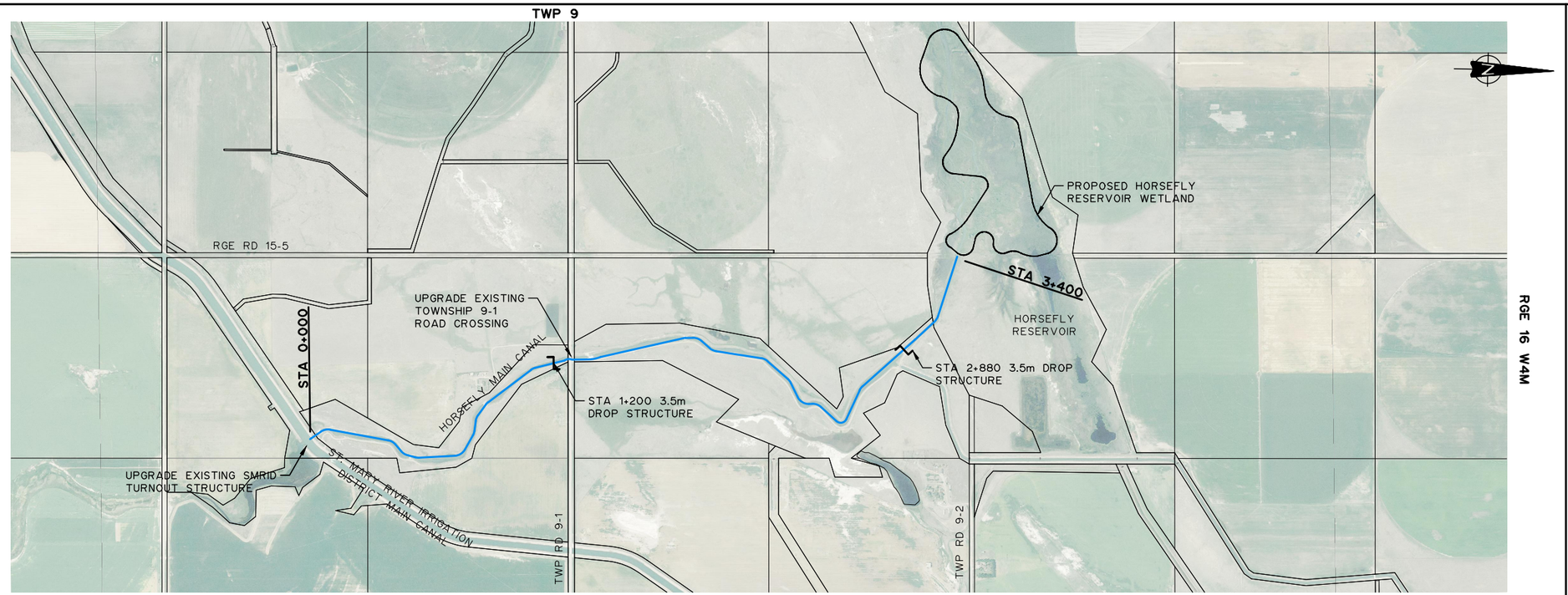
ISSUE	YY-MM-DD	REVISION
1	21-07-21	FOR CONSULTATION

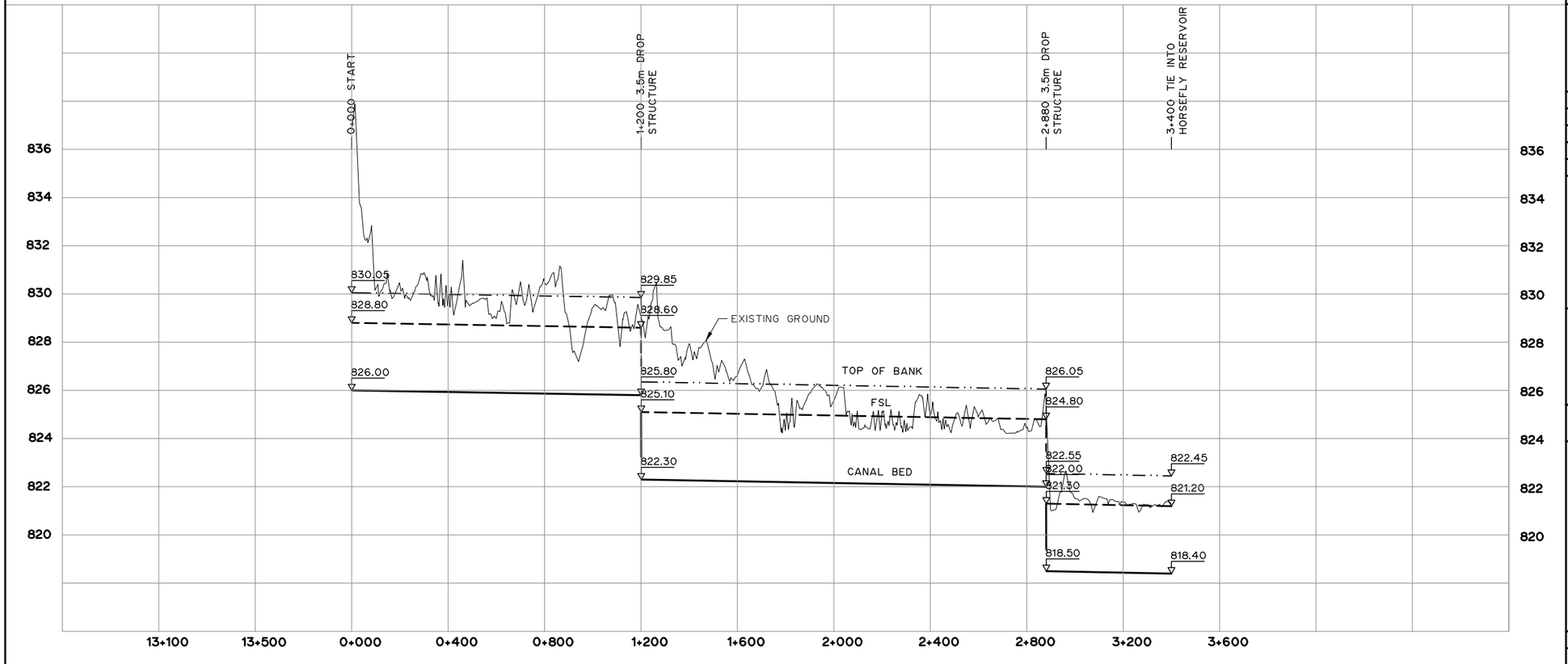
MPE Engineering Ltd.

MUNICIPAL DISTRICT OF TABER

HORSEFLY REGIONAL EMERGENCY SPILLWAY
PHASE 2 PLAN PROFILE
STA 13+100 TO STA 17+800

DESIGNED	J.W.H.	JOB	1720-054-00
DRAWN	J.L.O.	SCALE	H1:20 000 V1:200
DATE	JULY 2021	DRAWING	3





NOTES:

1. SPILLWAY ALIGNMENT IS BASED ON CURRENT CANAL ALIGNMENTS AND MAY CHANGE DURING DESIGN.
2. DESIGN FLOW= 47m^3/s.

THIS DRAWING MAY HAVE BEEN MODIFIED FROM ITS ORIGINAL SIZE. ALL SCALE NOTATIONS INDICATED ARE BASED ON 22"x34" FORMAT DRAWINGS

ISSUE	YY-MM-DD	REVISION
1	21-07-21	FOR CONSULTATION

MPE Engineering Ltd.

MUNICIPAL DISTRICT OF TABER

HORSEFLY REGIONAL EMERGENCY SPILLWAY
PHASE 3 PLAN PROFILE
STA 0+000 TO STA 3+600

DESIGNED	J.W.H.	JOB	1720-054-00
DRAWN	J.L.O.	SCALE	H1:20 000 V1:200
DATE	JULY 2021	DRAWING	4

Letter from Métis Nation of Alberta Region 3

Métis Nation of Alberta
A strong Métis Nation embracing Métis rights
(780) 455-2200 | 1-800-252-7553 | www.albertametis.com
11738 Kingsway NW | 100 Delia Gray Building | Edmonton, AB | T5G 0X5
Métis Rights and Accommodation

JUNE 4, 2021

Municipal District of Taber
ATTN: Jeff Olitch
Project Manager
4900B – 50th Street
Taber, AB T1G 1T2
TEL: (403) 317-3629
Fax: (403) 223-1799
jolitch@mpe.ca

[Sent Via Email]

Re: Municipal District of Taber – Horsefly Regional Spillway Phase 1

Dear Mr. Jeff Olitch,

With respect to the project notification (the "Notification") dated March 15, 2021, for the project known as **Municipal District of Taber – Horsefly Regional Spillway Phase 1 Project** received by the Métis Nation of Alberta ("MNA") Region 3 Consultation Office ("RCO") from your organization, the Regional Consultation Committee ("RCC") has reviewed the project and made the following determination(s):

Based on the final review by the RCC, the proposed project as described in the Notification:

☐ is unlikely to have negative or adverse impacts on the aboriginal rights, claims, and interests, or the historical and contemporary practices related thereto, of the Métis Nation within Alberta and its citizens. Accordingly, the ***RCC HAS NO OUTSTANDING CONCERNS*** with respect to the project proceeding as detailed in the Notification.

☒ may have negative or adverse impacts on the aboriginal rights, claims, and interests, or the historical and contemporary practices related thereto, of the Métis Nation within Alberta and its citizens. Those concerns were communicated to your organization and have been subsequently mitigated or accommodated to the satisfaction of the RCC. Accordingly, the ***RCC HAS NO OUTSTANDING CONCERNS*** with respect to the project proceeding as detailed in the Notification.

.

☐ will have specific and identifiable negative or adverse impacts on the aboriginal rights, claims, and interests, or the historical and contemporary practices related thereto, of the Métis Nation within Alberta and its citizens. Those concerns were detailed in the RCC Notice of Objection with respect to this project and communicated to your organization and the associated regulator. Those concerns have been subsequently mitigated or accommodated to the satisfaction of the RCC. Accordingly, the ***RCC HAS NO OUTSTANDING CONCERNS*** with respect to the project proceeding as detailed in the Notification.

☐ will have specific and identifiable negative or adverse impacts on the aboriginal rights, claims, and interests, or the historical and contemporary practices related thereto, of the Métis Nation within Alberta and its citizens. Those concerns were detailed in the RCC Notice of Objection with respect to this project and communicated to your organization and the associated regulator. Those concerns have still not been mitigated or accommodated to the satisfaction of the RCC. Accordingly, the ***RCC OBJECTS TO THE PROJECT PROCEEDING*** and has directed the RCO to engage legal counsel in order to protect the interests of the Métis Nation with respect to the project.

The above-mentioned possible impacts for the Project identified and associated request is that the MNA Region 3 Consultation Office be notified if including but not limited to any artifacts, grave sites, medicinal plants, etc. are uncovered during this work.

Thank you for engaging with the MNA as part of your engagement and consultation process. We trust that your organization will continue to strive to fulfill best practices in its engagements and consultations with Indigenous peoples, including the Métis Nation within Alberta. The MNA and respective RCOs will be pleased to assist your organization in conducting engagements and consultations regarding any activities and projects undertaken or proposed to be undertaken in Alberta. The staff in the RCO look forward to working with you to achieve mutual success by offering a standardized and streamlined consultation process through the MNA single point of access.

Where additional meetings are required with respect to this project, they may be scheduled by contacting the respective RCO(s). To assist you in that regard, the RCO Contact List is attached to this letter.

Sincerely,

N. Shepherd

Nicole Shepherd
Region 3 Consultation Coordinator
Métis Nation of Alberta

/for

Lawrence Gervais
President
Métis Nation of Alberta Region 3

/encl.

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Letter from Tsuut'ina Nation

Tsuut'ina Nation TUS Consultation
9911 Chiila Blvd. Tsuut'ina, AB. T3T-0E1
Ph. 403.281.4455
Email – vmeguinis@tsuutina.com

November 29th, 2021

MPE Engineering Ltd.
#300, 714 – 5 Avenue S,
Lethbridge, Alberta, T1J-0V1

To: Jeff Hust

Re: Horsefly Regional Emergency Spillway – Phase 1

Dzinisi guja,

We have reviewed your July 21st, 2021 notification letter, due to covid and remote working, we were challenged with trying to complete our field assessments and respond to numerous project notifications. We do know we are late but we would still like to provide our comments.

Water & Fish – Water is of most concern, the quality and what is being released once it is out of the spillway and back into the rivers. Is this specifically for flood protection or a plan for drought conditions? As well, what is the long-term plan for fish and other species caught in the spillway and canals?

Archeological Studies – We know that area is within valleys and coulees used by our Peoples, what is the archeological plan to address chance findings?

Medicinal Plants – The grasslands have medicinal plans that many of our Peoples still use and harvest, is there an inventory of medicinal plants that may be impacted and will harvest opportunities be provided?

Climate Change – The recent flooding in British Columbia is cause for concern and illustrates climate change is a reality, is the proposed upgrading to existing irrigation and drainage infrastructure sufficient to protect the lands and the rivers from a climate calamity?

This project is within our traditional territory and there are potential impacts to lands and water, we would be open to an informational meeting to discuss our concerns further.

Siiyisgaas!

Violet M. Meguinis, Director
Tsuut'ina Consultation

c.c. Chief and Council
Monica Onespot, Executive Director
File

Response to Letter from Tsuut'ina Nation

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MPE Engineering Ltd.

Tsuut'ina Nation TUS Consultation
9911 Chiila Blvd.
Tsuut'ina AB
T3T 0E1

File:1720\054\00\Tsuut'ina\L01
December 3, 2021

Attn: Violet M. Meguinis

Re: MD of Taber Horsefly Regional Emergency Spillway
Response to Comments

Thank you for your comments to our notification letter. We have reviewed your comments and would like to provide the following responses and additional information.

Water and Fish
The spillway is intended for use only during flood conditions. The wetlands proposed in Taber Lake and Horsefly Reservoir will help to control sediment and maintain the quality of water prior to release into the Oldman River. Note that during a 1:100 year flood event the Horsefly Spillway will contribute 40 m^3/s to the estimated river flow of ~3400 m^3/s (1.2%) so it is a very small contributor to the overall volume of water in the river during a flood.

The spillway must be manually activated in order to release water as it is not a passive system. The existing irrigation network is not being changed and as such the portions of the spillway currently used for irrigation will remain.

The irrigation reservoirs in the area (Taber Lake, and Horsefly Reservoir) are man made lakes and provide fish habitat. Any fish that become caught in the system can eventually end up in the Oldman River through existing Taber Irrigation District Canals and tail outs into the river.

Archaeological Studies
As part of the project a clearance from Alberta Culture will be obtained, we have been in contact with their office already and they have indicated a full Historical Resources Impact Assessment (HRIA) is not required. If through the course of construction artifacts are found work will be stopped and an archeologist will be brought in to assess the findings and determine the next steps. If indigenous artifacts are identified the relevant indigenous contacts would be contacted and have the opportunity to assess the site.

Medicinal Plants
No inventory of medicinal plants has been compiled. The only area with natural plants is the coulee area near the end of the project, this land is publicly accessible and would be available for harvest before and after construction of the project.

Climate Change
Climate change is a concern for the future, as seen recently in BC a failure to invest in adequate flood protection can have dire impacts. The project is designed to restore drainage patterns that were disrupted by creating the irrigation system. The system has been designed with the future in mind designing to a

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higher frequency storm event (1:100 year) than the 1:25 year storm even that most stormwater systems are designed to.

Hopefully the responses provided give some more clarity to the project. The MD of Taber and MPE Engineering would be welcome to having an informational meeting to further discuss the project and gather additional concerns and impacts to the Tsuut'ina.

If you wish to schedule an informational meeting or have any questions or concerns, please contact the undersigned at (403) 317-3634 or by e-mail at jhust@mpe.ca.

Yours truly,

MPE Engineering LTD.

Jeffrey Hust, P.Eng.
Water Resources Manager

JH: mw
Cc: Jack Dunsmore, Jim Howell

Enclosure

Response to Comments from Piikani Nation on Initial Project Description

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MPE Engineering Ltd.

Ira Provost
Piikani Nation
PO Box 70
Brocket, Alberta
T0K 0H0

January 24, 2022
File: 1720\054\00\L01

Dear Ira Provost:

Re: Piikani Nation review of the Summary of the Initial Project Description of the Horsefly Emergency Spillway Project

Thank you for Piikani Nation comments on the Initial Project Description Summary. We have reviewed the comments and have provided responses them in the following table.

Hopefully the responses provided give some more clarity to the project. The MD of Taber, MPE Engineering and Stantec would welcome to having an informational meeting to further discuss the project and gather additional concerns and impacts to Piikani Nation.

If you wish to schedule an informational meeting or have any questions or concerns, please contact the undersigned at (403) 317-3634 or by e-mail at jhust@mpe.ca.

Yours truly,

MPE Engineering LTD.

Jeff Hust, P.Eng.
Water Resources Manager

JT: mw

Enclosure

Responses to Comments by the Piikani Nation

Comment #	IPD Section Reference	Issue	Question/Recommendation	Response
1	Section 1.0 Figure 1.1 and Figure 1.2	Figures providing an overview of the proposed project do not provide sufficient resolution of the proposed route for Phases 1, 2, and 3. Figure 1.2 only describes Phase 2 of the project and features found between Horsefly Reservoir and Taber Lake	The Proponent should provide maps identifying proposed routes of Phase 1, 2 and 3, as well as any relevant features described in the IPD (e.g., rail or roadway crossings, turndown structures, Coulee to Oldman River).	Figure 1.2 shows all three phases of the Horsefly Regional Emergency Spillway Project (the Project); the Summary had an incorrect figure. The correct Figure 1.2 is attached. Figures 9.1 – 9.3 in the full Initial Project Description report provides more details and features.
2	Section 1.0 Figure 1.2	Figure 1.2 labelled as figure 12.2	Please revise using consistent figure labelling convention.	The Summary had an incorrect figure. The correct Figure 1.2 is attached.
3	Section 1.0 Figure 1.2	It is difficult to interpret the map depicted in figure 1.2 as a north arrow and scalebar are absent.	Please revise the map to illustrate the appropriate north arrow, scale bar, and projection.	The correct Figure 1.2 is attached.
4	Section 3.0 Engagement with Jurisdictions or Agencies	The Proponent describes members of the Southern Regional Stormwater Drainage Committee. Notable there are no Indigenous representatives, as a result, it implies that no Indigenous representation was engaged directly in the development of the project plan or the evaluation of project alternatives.	Piikani Nation exercises Aboriginal and Treaty rights within the Oldman River watershed. As a result, the Proponent must ensure adequate engagement and consultation of Indigenous rights holders, and where interest is identified, ensure mechanisms exist for engaging Indigenous rights holders in the review and evaluation of project plans moving forward.	The Southern Regional Stormwater Drainage Committee members are comprised of Urban and Rural municipalities that are located within the St. Mary and Taber Irrigation Districts. The Municipal District (MD) of Taber has informed all Treaty 7, some Treaty 6 groups and Métis Nation of Alberta Region 3 of the Project and has solicited their comments on the Project. The Métis Nation of Alberta Region 3 have sent a letter stating they have no outstanding concerns about the Project. The Blood Tribe/Kainai First Nation, Ermineskin Cree Nation and Siksika Nation have visited the Project site. Following the site visit, all three nations stated they have no objections to the Project.
5	Section 3.0 Engagement with Jurisdictions or Agencies	The Proponent notes that three public open houses were held in 2014 and that another public open house to discuss the Horsefly component of the overall stormwater management plan is to be held in Autumn 2021 in Taber.	Please advise Piikani Nation of the proposed date and location for the open house. Additionally, it is recommended that additional site tours be conducted either as part of this open house or in addition to it.	The Autumn 2021 open house has been rescheduled to Q1 or Q2 2022. The Piikani Nation will be notified of the date when it is scheduled. Due to COVID-19 restrictions, this open house will be held virtually. The Blood Tribe/Kainai First Nation, Ermineskin Cree Nation and Siksika Nation have visited the Project site. The Piikani Nation is invited to visit the Project site.
6	Section 4.0 Engagement with Indigenous Groups	The Proponent notes that they will respond to any enquiries from Indigenous groups concerning the proposed project.	This passive approach to engagement with Indigenous rights holders is insufficient. Piikani Nation requires that the proponent follow Piikani's established consultation protocol outlined in Section 2.	The MD of Taber informed the Piikani Nation of the Project in a letter emailed on July 21, 2021, soliciting any concerns they may have and providing a telephone number for more information. This was followed up by email on August 25, 2021, and by telephone in September 25 and October 26, 2021. The Piikani Nation consultation policy is referred to in Section 2.2 of their report and references its location in Appendix B. Appendix B has not been included in the report. The MD of Taber would be happy to review the Piikani Nation consultation policy if they can provide it.
7	5.0 Regional Assessments and Relevant Environmental Studies	The IPD notes that a regional Traditional Knowledge and Land Use study was conducted for the Montana Alberta Tie Ltd transmission line but there is no mention of whether this assessment was considered for the Project.	Given the lack of Indigenous input into the original construction of the Taber Canal and exclusion of knowledge of the Project's potential impacts to Aboriginal and Treaty Rights, Piikani requires that a Traditional Knowledge and Land Use study for the project areas be conducted prior to the Project's approval.	The Piikani Traditional Knowledge and Land Use Study conducted for the Montana Alberta Tie Ltd transmission study found (as reported in an AMEC report) negligible impacts on traditional plant harvesting and hunting and that construction activities occurring along the proposed transmission line right-of-way may have indirect adverse effects to the environmental aesthetics in the area, restricted to the construction seasons. A Traditional Knowledge and Land Use study should not be required for the Project. The Project is located in an existing irrigation system that has been in operation since the early 20th century in an area where the land use is agricultural and residential.

Responses to Comments by the Piikani Nation

Comment #	IPD Section Reference	Issue	Question/Recommendation	Response
8	8.0 Physical Activities Regulation	Piikani Nation agrees with the analysis from the Impact Assessment of Canada, that given this project has the potential to divert nearly 10,000,000 m3 of water during a 1 in 100-year flood event, and more during an even more extreme, yet feasible event, that this project as proposed is subject to Section 61 of the Physical Activities Regulations. Although the proposed project outlines flow capacity for each of the three phases of the canal works as being 40 m3/s it is unclear what the return period for an event that would result in flow rates of 40 m3/s	Piikani Nation recommend that the Proponent provide a synopsis of the return period of the maximum flood event the project as proposed could handle under its expected design constraints.	The Project is designed to address the 1:100-year flood, as stated in Section 8. In such an event, 9,886,882 m^3 of water would be diverted at a rate of 40 m^3/s.
9	Section 9.1 Project Phases	The Proponent reference figure 1.2, which only provides a map for Phase 2 of the proposed project.	The Proponent must provide detailed maps of each phase including all relevant structures used to operate the spillway. These maps should illustrate all features which will be constructed, removed or modified under the scope of the proposed project.	This information is provided in Figures 9.1, 9.2, and 9.3 of the Detailed Project Description (DPD).
10	Section 9.1. Project Phases	It is unclear how proposed channel expansion activities to be carried out under Phase 1- 3 will impact the existing footprint of the canal.	Additional information about the approximate maximum width and depth of the canal must be provided to understand the project scope. .	As stated in Section 9.2.1, the canals will be 4-6 metres (m) wide and 2.7 – 3 m deep.
11	Section 9.1.3 Phase 3	It is unclear what the footprint of the expanded wetland will be at the inlet of Taber Lake. Additionally, it is unclear how this will integrate with the wetland feature which is already under construction.	The Proponent should provide preliminary plans for the proposed wetland footprint at the inlet of Taber Lake.	The proposed wetland has not yet been designed. The design and construction plan will be similar to that for the wetland designed by Stantec Consulting Ltd. (Stantec) for the MD of Taber adjacent to the Horsefly Reservoir. The design and construction of the wetland will require a *Water Act* Application.
12	Section 9.1.3 Phase 3	Insufficient information is projected by the Proponent to assess the physical scope of Phase 3. As the Proponent has not provided adequate maps of the proposed route features identified in the Phase 3 description cannot be adequately located geographically or assessed.	Additional information describing project features that are to be constructed, removed or modified within the scope of this project must be provided. This included location information of described features which can either be cross-referenced with an appropriate site map or coordinates of feature location be provided	This information is provided in Figures 9.1, 9.2, and 9.3 of the DPD.
13	Section 9.1.3 Phase 3	It is unclear what the footprint of the expanded wetland will be at the inlet of Horsefly Reservoir. Additionally, it is unclear how this will integrate with the wetland feature which is already established.	The Proponent should provide preliminary plans for the proposed wetland footprint at the inlet of Horsefly Creek.	The proposed wetland has not yet been designed. The design and construction plan will be similar to that for the wetland designed by Stantec for the MD of Taber adjacent to the Horsefly Reservoir.
14	Section 9.2.l Construction	The Proponent identifies that wetlands will be constructed at the inlet of Horsefly Reservoir and Taber Lake respectively, as a method of improving water quality. Wetlands are to have a footprint of 20-30 ha.	Please provide supporting information and rationale for how a footprint of 30-40 ha was determined to be sufficient to meet water quality objectives.	The wetlands are designed to serve as a filter to water flowing into the Taber Irrigation District (TID) water system. They will decrease the velocity of water flowing into the Horsefly Reservoir and Taber Lake, allow deposition of sediment prior to water entering the waterbodies and provide habitat for wildlife and migratory birds. Their size is determined by the topography and hydrology of the area. As stated above, the design of the wetlands has not commenced and the size stated is an estimate. The size will be refined during the preliminary and final design process.
15	Section 9.2.l Construction	Wetlands are only to be constructed at the inlet of Taber Land and Horsefly Reservoir, however, as identified there is concern regarding the overall impacts of the project on the water quality of the Oldman River.	Provide a summary of water quality management and mitigation features that could be employed to manage the water quality of the spillway before discharge to the Oldman River.	The Project will only be used during 1:100-year flood events or larger. A 1:100-year event will add 40 m^3/s of water to the Oldman River flowing at 3,900 m^3/s, an increase of 1%. Water will be temporarily stored in the Horsefly Reservoir for 3 or 4 days during a 1:100-year or greater flood and will then flow to Taber Lake and the Oldman River. Taber Lake and the Horsefly Reservoir slow down the flow rate in the canal, allowing sediment to drop out before the water reaches the Oldman River, benefitting the water quality.

Responses to Comments by the Piikani Nation

Comment #	IPD Section Reference	Issue	Question/Recommendation	Response
				The TID is presently adopting water quality standards for runoff entering their irrigation system from urban municipalities and agricultural land. Implementation of these standards is an ongoing process and will take a number of years to be fully implemented. The Project temporarily stores water for 3 or 4 days in the Horsefly Reservoir during a flood and then directs it to Taber Lake and the Oldman River. It is not practical to manage the water quality of the flood waters as they flow into the river during a flood.
16	Section 9.2.1 Construction	The Proponent notes: "Control structures will have chain link fencing and the canals will have barbed wire fencing to control access and for safety purposes"	Piikani Nation agrees that there is a need to ensure access to the control structure is limited for public safety reasons. However, the control structure should be designed in a manner that will allow the natural passage of fish and wildlife.	There are existing control structures on the canals. An irrigation system is not designed for or intended to provide fish passage. The Project will not alter passage of wildlife along the canals.
17	9.2.2 Operation	It is unclear from the description of the canals' function under flood conditions what the expected operating limits are. Specifically, the Proponent notes that for events of 1 in 100 years or greater, the turndown structure will allow water passage from the canal into the Oldman River, via the spillway. However, the description also notes that the SMRID Main Canal is designed to handle 1 in 100-year events, with excess water overtopping the canals and flooding the adjacent lands, while water is being diverted via the spillway. Further, the proposed project will allow the flow rates through the spillway canals to handle up to 40m^3/s.	As incongruent measures of flooding scale are provided (e.g. flow rate for the spillway, and event return period for the entire system), the Proponent should provide further analysis and discussion on what scale of flooding event (minimum and maximum event return period) the spillway is expected to operate under.	As stated, the Project is designed for a 1:100 year event. It will not be operated until such an event occurs. In such an event, 9,886,882 m^3 of water would be diverted at a rate of 40 m^3/s. Larger floods will result in overland flooding.
18	12.1.1 Southern Regional Stormwater Management Plan	The Proponent references the Southern Regional Stormwater Management Plan (SRSMP), which examined drainage issues in the south Oldman River drainage basin and considered six options for flood control. This plan provides important context to the driving factors for flooding and the rationale used to examine project alternatives.	Given the importance of the SRSMP, it is requested that the proponent provide the plan either as an appendix to the IPD or as a link, to better understand whether the proposed project indeed represents the most feasible and effective option for flood mitigation.	Section 12 of the IPD full report provides more detail on the SRSMP. A link to the full report can be provided, if necessary or a hard copy can be viewed at the MPE Engineering Ltd. (MPE) office in Lethbridge.
19	12.1.2 Preferred Alternative	The proposed project was selected as he preferred alternative, in part because it provides the shortest route from the SMIRD Main Canal to the Oldman River. What storage capacity do Taber Lake and Horsefly Reservoir provide to the spillway? If storage capacity is negligible, does the location of Taber Lake and Horsefly Reservoir represent a threat to the safety of the town of Taber, as their likelihood of flooding may increase due to the increased inputs?	Taber Lake and Horsefly Reservoir represent hydraulic obstacles in draining the SMIRD Main Canal to the Oldman River, as the flow will be slow-moving through these waterbodies. Where reservoirs have excess storage capacity this can be viewed as a benefit, allowing a buffering capacity between the source and receiving bodies. As it appears Taber Lake and Horsefly Reservoir do not have a meaningful about of excess storage capacity, they may create a bottleneck, resulting in localized flooding, which given their proximity to the Taber townsite, increases the threat to infrastructure and public safety, compared to simply allowing the SMIRD Main Canal to flood. The proponent should provide additional discussion on the implications of Taber Lake and Horsefly Reservoir as hydraulic bottlenecks in the emergency drainage to the SMIRD Main Canal.	Horsefly Reservoir is used to store water for approximately 3 to 4 days during a flood event. The existing reservoir has a design storage capacity of 6,374 dam^3 but is normally operated at a lower water level with a storge capacity of 4,641 dam^3 (a differences of 1,733 dam^3). During a storm event approximately 1,460 dam^3 will be temporarily stored in Horsefly Reservoir which is still below the design capacity of the Horsefly Reservoir. Taber Lake will not be used to store water as flood waters will flow through the lake.
20	13.0 Geographic Location	The proposed project provides two options for Phase 2. One option would route the canal connecting Horsefly Reservoir and Taber Lake in a straight line that traverses the Lantic Inc. industrial complex. A second option would route the canal connecting Horsefly Reservoir and Taber Lake to the immediate east of the Lantic Inc. industrial complex. Of concern is that under Option 1, the canal would	The Proponent should describe additional flood mitigation infrastructure (e.g. berms, dykes) in place to ensure that floodwater overtopping the spillway canal between Horsefly Reservoir and Taber Lake would not be able to infiltrate and mix lagoons at the Lantic Inc. industrial complex. Additional risk assessment should be conducted to examine the chemical constituents stored on the site of the Lantic Inc. industrial	The lagoons at the Lantic Inc. industrial complex are approximately 5 m higher than the existing natural ground and irrigation canals. There is no possibility of mixing this water unless there is a breach in the Lantic lagoon embankments.

Responses to Comments by the Piikani Nation

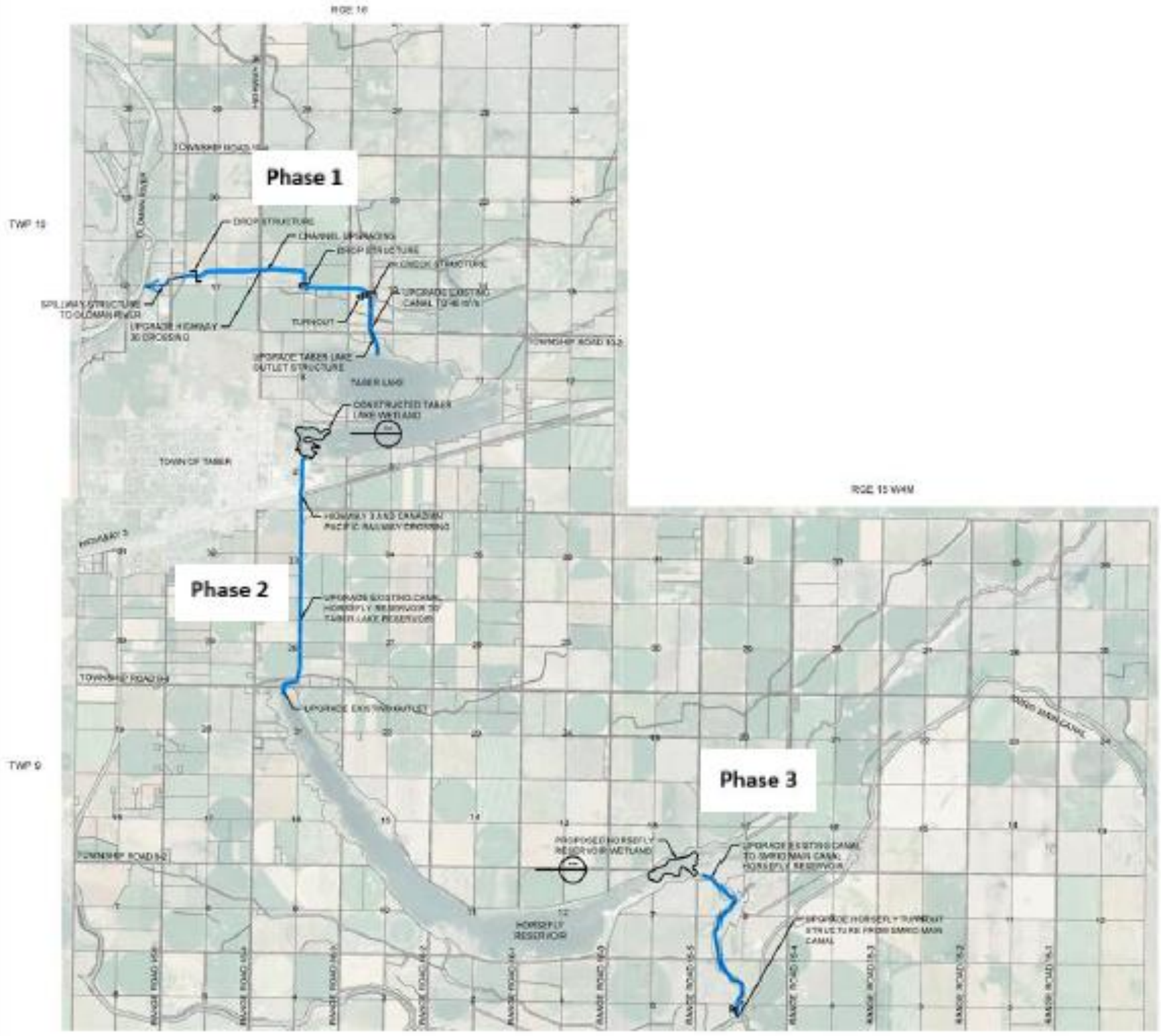
Comment #	IPD Section Reference	Issue	Question/Recommendation	Response
		pass directly beside storage lagoons. Given the nature of the products Lantic Inc. manufactures (sugar), the proximity of the canal represents a significant concern, as these lagoons are assumed to contain process or wastewater with significantly high levels of nutrients and constituents which contribute to Biological Oxygen Demand (BOD). In a flooding event where the spillway is overtopped, the proximity of the canal to these lagoons could allow for floodwaters to easily mix and become contaminated. If released to the environment, this contaminated water could have a significant detriment to the health of aquatic life downstream.	complex, which should inform routing options of the spillway.	
21	14.1 Project Environmental Setting	The fish inventory conducted in support of all three phases of the proposed project notes the presence of significant fish communities and habitats in Taber Lake and Horsefly Reservoir. It is unclear whether the fisheries field program examined the presence of fish or fish habitat in the connecting channels. As there are only limited barriers to migration between the Oldman River and the SMIRD Main Canal, it is expected that fish would be present in the current connecting canals and could exist in the future modified spillway canals.	The proponent should clarify if fishery studies were conducted in the connecting canals between the Oldman River and the SMIRD Main Canal, and if so whether fish are present. The Oldman River contains fish that are of cultural importance to Piikani Nation, as a result, it is of utmost importance that if fish are utilizing the canals which connect the Oldman River and the SMIRD Main Canal, construction is conducted in a manner that avoids, minimizes, and mitigates risks of impacts on fish habitat. Additionally, the Proponent must design the spillway to provide adequate habitat for local fish populations. It is expect that the proposed project will be designed, constructed and operated to meet or exceed all relevant provincial or federal fisheries protection legislation.	The canal system was assessed as part of the fish and fish habitat assessment in 2021 (Section 14.2.5). No fish sampling was completed within the irrigation canals. Given the connectivity of the irrigation canals with fish-bearing waterbodies, it is assumed that resident fish species may migrate through the canals. Irrigation canals are not designed for fish habitat, however the assessment noted habitat conditions in the Horsefly Spillway system. The irrigation canals afford limited habitat to resident fish species; however, more suitable habitat is found within Taber Lake and the Horsefly Reservoir. The assessment found that there are multiple barriers in the system that may impede fish passage. These barriers are a series of stepped spillways positioned throughout the length of the canal system and range in height from 0.6 m to 1.0 m. Construction activities in the irrigation canals, Horsefly Reservoir, Taber Lake, or in the Oldman River will include industry standards and best practices which include, but are not limited to, isolation of the temporary workspace from the waterbody. Following the design flood or greater, a fish rescue operation, performed by a Qualified Aquatic Environment Specialist, will be carried out if needed.
22	15.0 Health, Social and Economics of MD of Taber	The project is expected to generate 30-40 jobs during the construction of each phase.	Provide additional information on Proposed scheduling, and whether each phase will be constructed in parallel or sequentially. Piikani Nation requests that it be notified of any labour or contracting opportunities to be generated through this proposed project.	As stated in Section 11.0, construction of the stages will be sequential. Piikani Nation will be notified of contracting opportunities for the Project.
23	19.1 Overview of Environmental Effects	The IPD references a turndown structure that will be closed when the canal from Taber Lake is at capacity. It is unclear from the information provided the location of this and other turndown structures used in water management.	Please provide revised maps of the project outlining the proposed route(s) and all referenced facilities and infrastructure.	Figures 9.1, 9.2, and 9.3 of the DPD provide this information.
24	19.l Overview of Environmental Effects	The Proponent suggests that the failure of spillway control structures could result in overtopping of the Project canals and flooding of the adjacent lands. The environmental effects would be similar to a flood without the Project. It is unclear whether this analysis is correct, as the spillway routes water towards the Taber townsite and several industrial complexes. While a significant enough flood may result in widespread flooding such as is described by the Proponent, the route of the proposed Project would alter the	More information on various contingency flooding scenarios is required to perform an adequate risk assessment. It is recommended that the Proponent provide the SRSMP which outlines possible project alternatives and conduct a risk assessment on the potential impacts of the various project options.	The SRSMP discusses the flood control options, as provided in the in the full Initial Project Description. The choice of the Project is discussed in Section 12.1.1.2 and provided here: *In February and March 2018, severe flooding was experienced from Taber to Bow Island due to snow melt. During this event, the SMRID Main Canal was at capacity at the Horsefly Spillway location causing the canal to be breached at several locations and the adjacent farmland to be flooded. Fortunately, repairs were completed prior to the system being required to deliver water for irrigation. The event demonstrated that the construction of the Horsefly Spillway would allow diversion of water from the Main Canal, freeing up downstream capacity to accept additional runoff. The Project would therefore benefit not only SMRID and TID, but multiple rural and urban communities. The Regional*

Responses to Comments by the Piikani Nation

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		direction of flow.		*Drainage Committee re-prioritized the flood mitigation projects, placing the Horsefly Regional Emergency Spillway at the top (MPE Engineering Ltd. 2018). Additional rationale for prioritizing the Horsefly Regional Emergency Spillway is it is the shortest route from the SMIRD Main Canal to the Oldman River using existing canals and it is at a significant bottleneck on the SMRID Main Canal, providing a greater amount of flood mitigation than diversions further upstream.*
25	19.1 Overview of Environmental Effects Table 19.I Potential Environmental Effects and Mitigation Measures	The impacts of construction on water quality are expected to be much more severe than described in Table 19.1, as vegetation loss and excavation of the canal itself will allow for soils to be disturbed and mobilized during and after construction.	A robust sediment control strategy aimed at minimizing the movement of sediments must be developed. Additionally, the proponent should outline the framework for a water quality monitoring program examining a range of water quality/chemistry parameters in the proposed spillway, Horsefly Reservoir, Taber Lake and downstream Oldman River. The proponent should also develop an adaptive management protocol for water quality impacts.	Contractors constructing the Horsefly Spillway must submit an Environmental Construction Operations (ECO) Plan which meets the requirements for work on Alberta Transportation projects. The plan includes mitigation for environmental effects and erosion and sediment control. The Project will be used only in the event of a 1:100-year flood or greater. The Project temporarily stores water for 3 or 4 days in the Horsefly Reservoir and then releases it to Taber Lake and the Oldman River.
26	19.I Overview of Environmental Effects Table 19.1 Potential Environmental Effects and Mitigation Measures	The Proponent suggests that if work is required at the outlet to the Oldman River, DFO will be notified and any requirements from them will be adhered to. While our minimum expectation is that DFO is consulted where work is required at the outlet of the Oldman River, from the description of the existing canal and reservoir system, it is anticipated that the entire system may constitute fish habitat.	Piikani Nation requires the Proponent to consult with DFO regarding the entirety of the proposed project and implement environmental protection and mitigation measures to minimize impacts on fish and fish habitat.	A Request for Review is in preparation for submission to DFO. It will include drawings of the outlet to the Oldman River. Work on the outlet is expected to require minimal interaction with the river. The TID has an Authorization from DFO for the operation and maintenance of the irrigation works.
27	19.1 Overview of Environmental Effects Table 19.1 Potential Environmental Effects and Mitigation Measures	Whirling Disease is of great concern in Alberta. While it has not yet been observed in the Oldman River downstream of Taber, it is found within the Oldman River watershed.	The Proponent must develop a decontamination protocol for all equipment to come into contact with the canals or water flowing into them.	One of the components of the ECO Plan is the contractor must comply with Alberta Environment and Parks most current decontamination protocols as found on the Stop the Spread of Whirling Disease website for construction equipment found here: https://www.alberta.ca/stop-whirling-disease.aspx
28	19.2 Summary of Effects	The Proponent suggests that the "Project will provide the benefit of flood control, the environmental effects of developing this benefit are not significant". To date, the full impact of this project on the environment has not been considered. As a result, the Proponent should not consider environmental effects as being insignificant.	The Proponent should remove the statement "the environmental effects of developing this benefit are not significant" until the Proponent can provide evidence to support this assertion.	The Project is a flood mitigation project, upgrading an existing irrigation infrastructure in operation for nearly a century. Based on the assessment of the Project, residual effects after mitigation will not result in significant changes to the environment, as discussed in the DPD.
29	19.3 Fish and Fish Habitat	The Proponent suggests that "effects on fish and fish habitat are expected to be minor to negligible". The full impacts of this project including direct impacts to fish, fish habitat and water quality, have not been fully considered or qualified.	The proponent must conduct a fish habitat assessment on the full scope of the project and consider the impacts of habitat loss and water quality during both construction and operation, on fish health within the spillway as well as the downstream Oldman River. Water quality modelling must be performed to understand the potential contributions of this project to the Oldman River.	The fish and fish habitat assessment included the Oldman River, the coulee leading down to the Oldman River, the inlet and outlet of Taber Lake, the inlet and outlet of the Horsefly Reservoir, and canal infrastructure. The effects of the Project on fish and fish habitat are discussed in the DPD and will be reviewed by DFO as part of the regulatory approvals process. Water quality modelling is not required. The Project will be used only the event of a 1:100-year flood or greater. The Project temporarily stores water for 3 or 4 days in the Horsefly Reservoir and then releases it to Taber Lake and the Oldman River.
30	19.3 Fish and Fish Habitat	The Proponent suggests that upgrades to Horsefly Reservoir will. be carried out in the canal and therefore no work will be carried out in the reservoir. However, they previously described in Section 9.1.3 that the existing wetland at Horsefly Reservoir will be expanded and enhanced to improve water quality. The wetland and reservoir should not be considered	A fish habitat assessment must be conducted on the entirety of the spillway, including for Horsefly Reservoir. A protection plan including impact avoidance, minimization and mitigation must be developed for the Horsefly Reservoir.	Preliminary engineering for the wetlands in the Horsefly Reservoir and Taber Lake has not occurred. Construction of these wetlands will be similar to that followed for the construction of the wetland south of the Horsefly Reservoir designed by Stantec in 2020. The effects, mitigation, and residual effects of these activities are discussed in the DPD. . Industry standards and best practices will be applied and additional mitigation measures developed to reduce potential effects on fish and

Responses to Comments by the Piikani Nation

Comment #	IPD Section Reference	Issue	Question/Recommendation	Response
		as separate features. As a result, the Proponent must consider the impacts of wetland expansion on the fish habitat provided both by the existing wetland and reservoir.		fish habitat during construction. Standard best practices include water quality monitoring during construction, temporary isolation of in-water works, and fish rescues performed by a Qualified Aquatic Environment Specialist within isolated workspaces. Mitigation measures will be reviewed by DFO as part of the regulatory approvals process.
31	20.0 Potential Extra- Provincial and Federal Impacts	The Proponent suggests that the effects of this project will be confined to Alberta. The Oldman River is a tributary of the South Saskatchewan River which has headwaters in British Columbia and flows through Alberta, Saskatchewan and Manitoba. The South Saskatchewan River is heavily impacted by agriculture, oil and gas, and municipal takings and effluent discharge. These impacts are compounded through the South Saskatchewan River watershed.	Given the already significant and cumulative nature of effects in the South Saskatchewan River watershed, this project cannot be viewed as not having any impact beyond the borders of Alberta. An analysis must be conducted on the impacts to water quality and quantity on the downstream environment as a result of the construction and operation of this project.	The Project is a flood mitigation project that will be used only in the event of a 1:100-year flood or greater. The Project temporarily stores water for 3 or 4 days in the Horsefly Reservoir and then releases it to Taber Lake and the Oldman River. A 1:100-year event will add 40 m^3/s of water to the Oldman River flowing at 3,900 m^3/s, an increase of 1%. The water quality of the spillway will be similar to what is currently discharged into the Oldman River during a flood.
32	21.0 Impacts to Indigenous Groups Including Traditional Land Use, Physical and Cultural Heritage, and Historical, Archaeological and Palaeontological Resources	The Proponent notes that "Communication with Indigenous groups has not identified any Project effects on physical or cultural heritage, or structures or sites of historical, archaeological, paleontological or architectural significance to Indigenous peoples." While this statement may characterize a snapshot of what the Proponent has heard to date, Piikani Nation has not been meaningfully engaged by the Proponent to date. As a result, the Proponent's characterization of impacts to Piikani Nation are accurate [sic?].	The Proponent must engage directly with Piikani Nation and support it in the identification and determination of all impacts of this project on the rights and interests of Piikani Nation.	The MD of Taber informed the Piikani Nation of the Project in a letter emailed on July 21, 2021, soliciting any concerns they may have and providing a telephone number for more information. This was followed up by email on August 25, 2021 and by telephone in September 25 and October 26, 2021. The MD of Taber received no request to engage with the Piikani Nation nor questions or concerns about the Project until it found the Piikani Nation's November 26, 2021, submission to the Impact Assessment Agency of Canada on the Summary of the Initial Project description.
33	23.0 Greenhouse Gas Emissions Associated with the Project	The Proponent considers the greenhouse gas emissions directly associated with the construction and operation of the proposed project, however, does not provide adequate consideration for potential emissions or storage capacity which will be provided by the limnological and wetland processes (e.g. expansion of wetlands).	It is recommended that the Proponent consider the full impacts of the project including those both positive and negative derived from modifications to natural ecosystem processes.	The DPD will address both the impacts and benefits of the Project.





Notes
1. Original figure content provided by MPE Engineering Ltd.

Project Location
TWP10N, R15&16W
Town of Taber

Prepared by SL on 2021-06-01
TR by TQ on 2021-06-06
IR Review by JH on 2021-06-01

Client/Project
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway

10773006-9000 RDVA

Figure No.
1.2

Title
Horsefly Regional Emergency Spillway Project – Project Phases

Stantec

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

APPENDIX E

Regulatory Correspondence

E1

Letter from Infrastructure Canada

Infrastructure Canada
Ottawa, Canada
K1P 0B6

Our file Notre référence

Project 56626

October 30, 2020

Craig Pittman
Director of Infrastructure, Municipal District of Taber
4900B 50 Street
Taber, AB T1G 1T2
403-223-2541

[Sent via Email]
CPittman@mdtaber.ab.ca

Subject: Horsefly Regional Emergency Spillway (Phase 1) – Federal Environmental and/or Impact Assessment Requirements and Consultation Obligations with Canada's Indigenous Peoples

Dear Craig Pittman,

Following the federal Ministerial approval (July 22nd, 2020) of funding for the Horsefly Regional Emergency Spillway (Phase 1; the Project) under the Investing in Canada Infrastructure Project, Infrastructure Canada (INFC) has reviewed all information provided to date on the proposed Project to assess if there are any federal requirements under the *Impact Assessment Act* (IAA). INFC has also reviewed the information provided to determine INFC's obligation to consult with Canada's Indigenous Peoples, including the identification of next steps.

***Impact Assessment Act* Requirements**

Based on the information provided by the Municipal District of Taber for this Project, INFC is of the opinion that this project has no requirements under Section 82 of the IAA.

Note: INFC's understanding is that the Project is not located in whole or in part on federal lands. Should this information change or be incorrect, please inform INFC as soon as possible.

Consultation Obligations with Canada's Indigenous Peoples

Following INFC's review of the information provided to date, INFC has concluded that there is an obligation to consult with Canada's Indigenous Peoples. INFC's intent is to work with project proponents to engage and consult with Indigenous groups that may have a potential interest in the proposed project. At this time, INFC is not aware of any ongoing consultation with Indigenous groups initiated by the Municipal District of Taber. We understand that further discussion will be required with the Municipal District of Taber to better understand what, if any, consultation activities are planned to be undertaken for this Project and to determine if additional consultation activities and accommodation measures should be included in the consultation process to allow INFC to meet its requirements.

INFC therefore requests that the Municipal District of Taber notify the following Indigenous Groups and inform them that INFC will be contributing financial support for this project:

- The Blood Tribe
- Métis Nation of Alberta (Region 3)

For your reference, INFC has provided the contact information for the Blood Tribe, and Métis Nation of Alberta (Region 3), found in Annex 1 and an example template notification letter to Indigenous Groups, found in Annex 2. Please ensure that INFC is copied on the notification letter and confirm if any feedback is received.

INFC will require a summary of communications, including any issues or concerns raised by respective Indigenous groups and an indication of how the Municipal District of Taber has addressed or proposes to address those issues or concerns. An example of a template consultation log and an example of a concerns tracking chart can be found as Annexes 3 and 4, respectively.

Note: All Annexes were provided as attachments in the original email correspondence from INFC dated October 30th, 2020.

Once consultation has started, INFC kindly requests the Municipal District of Taber to provide an update on the status of the project and consultation process to INFC. The update provided should focus on the following information:

- Project schedule, including a confirmation of when site preparation works and construction of the Project are expected to start;
- A summary of any consultation activities conducted or planned by the Municipal District of Taber as part of the Project, including any issues or concerns expressed by the Indigenous groups consulted;
- Any accommodation's being negotiated with Indigenous groups; and
- Implementation of any mitigation measures or compensation measures identified during the consultation process.

Once we have received this information, we will confirm when our consultation obligations have been met.

We would also like to take this opportunity to remind you that the Project may not proceed with site preparation works and construction until INFC can confirm that INFC's obligation to consult with Canada's Indigenous Peoples, have been met.

Note: During these unprecedented times regarding the current COVID-19 pandemic, many consultation officers are operating at minimal capacity or have been closed, which may result in extended timelines with respect to the engagement process.

Should the Municipal District of Taber consider future changes to the nature, scope, design, location or start and completion date of the Horsefly Regional Emergency Spillway (Phase 1) that differ from that which has been provided to date, it is the responsibility of the Municipal District of Taber to immediately notify INFC. The department may then reassess the Project in accordance with the requirements under

the IAA and determine whether an obligation to notify or consult with Canada's Indigenous Peoples arises.

Should you have any comments or questions, please contact Mark Libby by email at mark.libby2@canada.ca with cc to infc.aboriginalconsultenv-consultautochtonesenv.infc@canada.ca or by phone at 343-551-0406.

Sincerely,

Jared Bone

Jared Bone, R.P.F.
Acting - Sr. Environmental Review and Approval Officer
Aboriginal Consultation and Environmental Services

cc:
Jared Bone, INFC (jared.bone@canada.ca)
Tonya Youngberg, INFC (tonya.youngberg@canada.ca)
Francesca Addante, INFC (francesca.addante2@canada.ca)
INFRAS Alberta ICIP (alberta.icip@gov.ab.ca)

Attachments: Annex 1 – Contact Information for Indigenous Groups – DTC (ICIP)
Annex 2 – Template Letter to Notify Indigenous Groups of Project - DTC (ICIP)
Annex 3 – Indigenous Consultation Communications List Template
Annex 4 – Indigenous Concerns Tracking Chart Template

E2

Letter from IAAC

Impact Assessment Agency of Canada | Agence d'évaluation d'impact du Canada

Prairie and Northern Region
Canada Place
Suite 1145, 9700 Jasper Avenue
Edmonton, Alberta T5J 4C3

Région des Prairies et du Nord
Place Canada
Pièce 1145, 9700 rue Jasper
Edmonton (Alberta) T5J 4C3

June 25, 2021

Jim Howell
Senior Principal
Stantec
200-325 25 Street SE
Calgary, AB, T2A 7H8
jim.howell@stantec.com

Dear Jim Howell,

Thank you for the information regarding the Horsefly Regional Emergency Spillway (the Project) proposed by the Municipal District of Taber provided on November 18, 2020.

As indicated in the Impact Assessment Agency (the Agency) correspondence of June 8, 2021, the proposed Project appears to meet the thresholds in item 61 *Physical Activities Regulations* of the *Impact Assessment Act* for the expansion of an existing structure for the diversion of water from a natural waterbody into another natural water body. As such, the Project is a physical activity designated under the Regulations.

The Agency regards Taber Lake and the Horsefly Reservoir as natural waterbodies since they were naturally occurring waterbodies that were then modified. The Agency understands the diversion capacity will increase from 7 m^3/s to 40 m^3/s which is an increase of the diversion capacity by 50% or more and the subsequent maximum diversion capacity is greater than 10,000,000 cubic metres of water per year.

The first step of the impact assessment process is submitting an Initial Project Description (IPD) to the Agency. The Agency encourages you to submit a draft IPD prior to formal submission. The Agency is available to review the draft IPD alongside the information requirements of the *Information and Management of Time Limits Regulations* and provide feedback to help ensure all the required information is provided. Upon receipt of the formal submission, the Agency conducts a 10 day review to determine if the document meets the requirements of the regulations. Acceptance of the IPD will initiate the 180 calendar day Planning Phase of the impact assessment process.

The Planning Phase is the first of five phases of the impact assessment process. During the first 80 days of this phase, the Agency holds a 20 day public comment period to engage with public, Indigenous groups, provincial jurisdictions, and federal authorities on their views and expertise regarding the Project and if an Impact Assessment is required. Next, the Agency issues a Summary of Issues and the proponent will be required to submit a Detailed Project Description (DPD) that meets the requirement of the Regulations and that addresses the

issues raised. At the end of the 80 days, The Agency makes a determination on whether an Impact Assessment is required. If an IA is required, the next 100 days will consist of the Agency drafting the Tailored Impact Statement Guidelines (TISG) and other plans and hosting a public comment period on these documents.

Additional information regarding the impact assessment process, including IPD requirements, is available here

- * Impact Assessment Process Overview
- * Practitioner's Guide to Impact Assessment
- * Preparing an Initial Project Description

The Agency is available to discuss the Project further. Should the Project or any of the planned activities change, or if you have any further questions, please contact me at iaac.pnr-rpn.aeic@canada.ca AND 780-495-2037.

Sincerely,

Mathieu Dumais
Project Analyst
Impact Assessment Agency of Canada

E3

Letter from Alberta Environment and Parks

Environment and Parks

Regulatory Assurance Division
Approvals Unit
2nd Floor, Petroleum Plaza, South Tower
9915 – 108 Street
Edmonton, Alberta T5K 2G8
Canada
Telephone: 780-427-5828
http://www.ea.alberta.ca

July 13, 2021

Mr. Arlos Crofts
Municipal District of Taber
c/o Jim Howell
Stantec Consulting
jim.howell@stantec.com

Dear Mr. Howell:

Further to the letter from Mr. Crofts of July 7, 2021, I wish to advise you that pursuant to Section 44 of the *Environmental Protection and Enhancement Act* (EPEA), I have considered the application of the environmental assessment process to your proposed Horsefly Emergency Spillway Project. This activity is an exempted activity for the purposes of environmental assessment. Therefore, a screening report will not be prepared and an environmental impact assessment report is not required.

Please note that this decision is based on the current information about the project and that I reserve the ability to review this decision should different and/or new information come to light. The Municipal District of Taber should also note that Section 47 of EPEA gives the Minister of Environment and Parks the authority to order the preparation of an environmental impact assessment report under appropriate circumstances, notwithstanding a director's decision to not require an environmental impact assessment report.

I understand you have already submitted the project description to the Impact Assessment Agency of Canada (IAAC) to determine any federal environmental assessment requirements under the *Impact Assessment Act*.

If you have any questions or need further information please contact me at 780-427-9116.

Sincerely,

Corinne Kristensen
Director, Regulatory Assurance Section
Environment and Parks
(Designated Director, *Environmental Protection and Enhancement Act*)

cc: Dorothy Lok (AEP)
Melanie Daneluk (AEP)

E4

Letter from Alberta Culture, Multiculturism and the Status of Women

Alberta

HRA Number: 4825-21-0013-001
May 21, 2021

Historical Resources Act Approval with Conditions

Proponent: Municipal District of Taber
4900B - 50 Street, Taber, AB T1G 1T2
Contact: Arlos Crofts

Agent: Stantec
Contact: Erin Greenwood

Project Name: **Horsefly Regional Emergency Spillway - Phase 1**

Project Components: Storm Water Management

Application Purpose: Requesting HRA Approval / Requirements

Historical Resources Act approval is granted for the activities described in this application and its attached plan(s)/sketch(es) subject to the following conditions.

David Link
Assistant Deputy Minister
Heritage Division
Alberta Culture, Multiculturalism
and Status of Women

SCHEDULE OF CONDITIONS

ARCHAEOLOGICAL RESOURCES

There are no *Historical Resources Act* requirements associated with archaeological resources; however, the proponent must comply with Standard Requirements under the *Historical Resources Act*: Reporting the Discovery of Historic Resources, which are applicable to all land surface disturbance activities in the Province.

PALAEONTOLOGICAL RESOURCES

Conditional *Historical Resources Act* approval is granted relative to palaeontological resources on the understanding that a targeted Historic Resources Impact Assessment will be conducted, as outlined below.

SCHEDULE OF CONDITIONS (continued)

1. The Historic Resources Impact Assessment must target the following locations:

   a) The Oldman River valley walls in 18-10-16-W4M and;

   b) the coulee/spillway between the Oldman River and Range Road 164A (17&18-10-16-W4M).

   Development activities outside of the specified target areas may proceed as planned without further concern for palaeontological resources.

2. The Historic Resources Impact Assessment is to be carried out prior to the initiation of any land surface disturbance activities in the areas listed above, under snow free, unfrozen ground conditions. Should the project require survey under winter conditions, assessment procedures must be discussed in advance with the Royal Tyrrell Museum of Palaeontology.

3. The Historic Resources Impact Assessment for palaeontological resources is to be conducted on behalf of the proponent by a palaeontologist qualified to hold a palaeontological research permit within the Province of Alberta. A permit must be issued by Alberta Culture, Multiculturalism and Status of Women prior to the initiation of any palaeontological field investigations. Please allow ten working days for the permit application to be processed. To obtain contact information for consultants qualified to undertake this work, please consult the list of Alberta Historic Resource Consultants.

4. Results of the Historic Resources Impact Assessment must be reported to Alberta Culture, Multiculturalism and Status of Women and subsequent *Historical Resources Act* approval must be granted before development proceeds in the target areas.

ABORIGINAL TRADITIONAL USE SITES

There are no *Historical Resources Act* requirements associated with Aboriginal traditional use sites of a historic resource nature; however, the proponent must comply with Standard Requirements under the Historical Resources Act: Reporting the Discovery of Historic Resources, which are applicable to all land surface disturbance activities in the Province.

HISTORIC STRUCTURES

There are no *Historical Resources Act* requirements associated with historic structures; however, the proponent must comply with Standard Requirements under the *Historical Resources Act*: Reporting the Discovery of Historic Resources, which are applicable to all land surface disturbance activities in the Province.

PROVINCIALLY DESIGNATED HISTORIC RESOURCES

There are no *Historical Resources Act* requirements associated with Provincially Designated Historic Resources; however, the proponent must comply with Standard Requirements under the *Historical Resources Act*: Reporting the Discovery of Historic Resources, which are applicable to all land surface disturbance activities in the Province.

ADDITIONAL COMMENTS

1. In addition to any specific conditions detailed above, the proponent must abide by all Standard Conditions under the *Historical Resources Act*.

SCHEDULE OF CONDITIONS (continued)

Lands Affected: All New Lands

Proposed Development Area:

MER	RGE	TWP	SEC	LSD List
4	16	10	16	6-12
4	16	10	15	3-6,12
4	16	10	17	9-13
4	16	10	18	7-10
4	16	10	10	11,13-14

Documents Attached:

Document Name	Document Type
Project Plans	Illustrative Material

E5

Letter from Alberta Culture and the Status of Women

Alberta

HRA Number: 4825-21-0013-002
October 22, 2021

Historical Resources Act Approval

Proponent: Municipal District of Taber
4900B 50 Street, Taber, AB T1G 1T2
Contact: Arlos Crofts

Agent: Stantec
Contact: Erin Greenwood

Project Name: **Horsefly Spillway Phase 2 and Phase 3**

Project Components: Storm Water Management

Application Purpose: Requesting HRA Approval / Requirements
Amendment or Update to Project Submitted Previously

Historical Resources Act approval is granted for the activities described in this application and its attached plan(s)/sketch(es) subject to Section 31, "a person who discovers an historic resource in the course of making an excavation for a purpose other than for the purpose of seeking historic resources shall forthwith notify the Minister of the discovery." The chance discovery of historical resources is to be reported to the contacts identified within Standard Requirements under the *Historical Resources Act*: Reporting the Discovery of Historic Resources.

Martina Purdon
Manager, Regulatory Approvals
and Information Management
Alberta Culture and Status of
Women

Lands Affected: Additional Lands

Proposed Development Area:

MER	RGE	TWP	SEC	LSD List
4	16	9	28	2-3,6-11,14-15
4	16	9	21	14
4	16	10	4	2-3,6-7,9-11,14-16
4	16	9	27	5-6,10-12,14-15
4	16	9	33-34	2-3,6-7,10-11,14-15
4	16	10	3	2-3,6-7,10-11
4	15	9	5	6-7,10-11,13-15

(continued)

4	15	9	8	3-6,10-14
4	15	9	18	1-2
4	15	9	17	4
4	15	9	7	15-16

Documents Attached:

Document Name	Document Type
Phase 2 Project Plans	Illustrative Material
Phase 3 Project Plans	Illustrative Material

E6

Letter from Alberta Culture and the Status of Women

Alberta

HRA Number: 4825-21-0013-003
December 20, 2021

Historical Resources Act Approval with Conditions

Proponent: Municipal District of Taber
4900B - 50th Street, Taber, AB T1G 1T2
Contact: Mr. Arlos Crofts

Agent: Stantec Consulting Ltd.
Contact: Christopher Capobianco

Project Name: **Horsefly Regional Emergency Spillway - Phase 1**

Project Components: Storm Water Management
Other - Temporary workspace

Application Purpose: Requesting HRA Approval / Requirements

Historical Resources Act approval is granted for the activities described in this application and its attached plan(s)/sketch(es) subject to the following conditions.

David Link
Assistant Deputy Minister
Heritage Division
Alberta Culture and Status of Women

SCHEDULE OF CONDITIONS

ARCHAEOLOGICAL RESOURCES

There are no *Historical Resources Act* requirements associated with archaeological resources; however, the proponent must comply with Standard Requirements under the *Historical Resources Act*: Reporting the Discovery of Historic Resources, which are applicable to all land surface disturbance activities in the Province.

PALAEONTOLOGICAL RESOURCES

Conditional *Historical Resources Act* approval is granted on the understanding that a Historic Resources Impact Assessment for palaeontological resources in the form of a monitoring program will be conducted, as outlined below.

1. The following *Historical Resources Act* conditions are based on the results of Historic Resources Impact Assessment studies carried out by Stantec Consulting Ltd. under Palaeontological Research Permit No. 21-060.

SCHEDULE OF CONDITIONS (continued)

2. A monitoring program is required for excavation activities associated with the upgraded spillway from Range Road 164A to the Oldman River.

3. No excavation activities, as described above, are to take place on the project until a professional consulting palaeontologist is on site to monitor construction activities. Should significant palaeontological resources be encountered during the conduct of the monitoring program, the Royal Tyrrell Museum of Palaeontology must be contacted. It may then be necessary for Alberta Culture and Status of Women to issue further instructions regarding these resources.

4. The Historic Resources Impact Assessment for palaeontological resources is to be conducted on behalf of the proponent by a palaeontologist qualified to hold a palaeontological research permit within the Province of Alberta. A permit must be issued by Alberta Culture and Status of Women prior to the initiation of any palaeontological field investigations. Please allow ten working days for the permit application to be processed. To obtain contact information for consultants qualified to undertake this work, please consult the list of Alberta Historic Resource Consultants.

ABORIGINAL TRADITIONAL USE SITES

There are no *Historical Resources Act* requirements associated with Aboriginal traditional use sites of a historic resource nature; however, the proponent must comply with Standard Requirements under the Historical Resources Act: Reporting the Discovery of Historic Resources, which are applicable to all land surface disturbance activities in the Province.

HISTORIC STRUCTURES

There are no *Historical Resources Act* requirements associated with historic structures; however, the proponent must comply with Standard Requirements under the *Historical Resources Act*: Reporting the Discovery of Historic Resources, which are applicable to all land surface disturbance activities in the Province.

PROVINCIALLY DESIGNATED HISTORIC RESOURCES

There are no *Historical Resources Act* requirements associated with Provincially Designated Historic Resources; however, the proponent must comply with Standard Requirements under the *Historical Resources Act*: Reporting the Discovery of Historic Resources, which are applicable to all land surface disturbance activities in the Province.

ADDITIONAL COMMENTS

1. In addition to any specific conditions detailed above, the proponent must abide by all Standard Conditions under the *Historical Resources Act*.

Lands Affected: All New Lands

Proposed Development Area:

MER	RGE	TWP	SEC	LSD List
4	16	10	16	6-12
4	16	10	17	9-13

SCHEDULE OF CONDITIONS (continued)

4	16	10	15	3-6,11-12
4	16	10	18	7-9
4	16	10	10	11,13-14

Documents Attached:

Document Name	Document Type
110773806 Development Plans	Illustrative Material

APPENDIX F

Environmental Construction Operations (ECO) Plan Framework

F1

ECO Plan Framework

Environmental Construction Operations (ECO) Plan Framework

Instructions for Preparing ECO Plans for Alberta Transportation, City of Calgary and City of Edmonton Construction Projects



In partnership with:

Alberta

Calgary

Edmonton

TITLE: Environmental Construction Operations (ECO) Plan Framework
Instructions for Preparing ECO Plans for Alberta Transportation, City of Calgary and City of Edmonton Construction Projects

PREPARED BY: Alberta Transportation
The City of Calgary
The City of Edmonton

DOCUMENT HOLDER: Alberta Transportation, Environmental Regulation, Technical Standards Branch

DOCUMENT CONTROL: The City of Calgary, Environmental & Safety Management, under the terms of the ECO Plan Framework Memorandum of Understanding (EXT 03 – ECO MOU).

EDITION: 2020 edition. This document replaces the 2017 edition released 30 January 2017.

RELEASE DATE: 6 July 2020

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FOR FURTHER INFO: Alberta Transportation, Environmental Regulation Technical Standards Branch.

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www.alberta.ca/transportation.aspx	www.calgary.ca	www.edmonton.ca

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Environmental Construction Operations (ECO) Plan Checklist

Project Name: _____

Contractor's On- Site Representative(s) (Name, Company, Email and Phone Number): _____

_____

ECO Plan submitted to (Name and Jurisdiction): _____

Note: All checklist items are required in the ECO Plan. Explain any deficiencies in the comments section.
Ensure that this three-page checklist is signed and submitted with the ECO Plan.

ECO Plan Framework Step		YES	NO	N/A
Step 1 – Description of Site Activities				
1.1	Site Activities	☐	☐	☐
1.2	Site Drawings	☐	☐	☐
1.3	Project Schedule	☐	☐	☐
Step 2 – Potential Environmental Impacts and Controls				
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2.2	Impacts and Mitigations	☐	☐	☐
2.3	Erosion and Sediment Control	☐	☐	☐
Step 3 – Hazardous Materials and Waste Management				
3.1	Hazardous Materials	☐	☐	☐
Step 4 – Environmental Emergency Procedures				
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Step 5 – ECO Plan Implementation				
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5.2	Communication	☐	☐	☐
5.3	Documentation	☐	☐	☐
5.4	ECO Plan Update	☐	☐	☐

Explain any deficiencies in the ECO Plan:

_____

_____

_____

_____

ECO Plan Checklist for City of Calgary and City of Edmonton can be found in Environmental Construction Operations (ECO) Plan Framework Municipal Version.

Contractor Responsibilities

All Contractors must be aware of how environmental policy, regulation and law govern their work. The Contractor is responsible, either by its own actions or through its sub contractors, for providing the resources needed to develop and implement the ECO Plan. The Contractor is responsible for ensuring sub contractors understand their roles and responsibilities and operate in compliance with the ECO Plan.

Contractors must refer to the terms and conditions contained in applicable contractual and regulatory documents to be fully aware of their responsibilities. In general, Contractors must:

a) Identify the potential environmental issues and develop mitigation measures to prevent or minimize environmental impacts.

b) Identify and acknowledge permits, approvals, authorizations, notifications, guidelines, standards, policies and programs applicable to the project.

c) Prepare and update the ECO Plan in accordance with the latest version of the ECO Plan Framework.

d) Submit copies of the ECO Plan and all other required documentation to the consultant for Alberta Transportation projects or The City Project Manager for municipal projects.

e) Revise the ECO Plan as required based on reviewer (i.e., The City of Calgary, The City of Edmonton or the consultant for Alberta Transportation projects) comments.

f) Identify an on site individual to be the Contractor's On-Site Representative to maintain environmental controls and address any environmental issues or questions that arise. The Contractor must identify this individual within the ECO Plan and at the pre-construction meeting.

g) Train staff and sub contractors to identify, address and report potential environmental problems.

h) Review the ECO Plan requirements at orientation meetings, the pre-construction meeting, tailgate meetings etc.

i) Implement and maintain environmental mitigation measures in accordance with the ECO Plan.

j) Correct and record deficiencies in a timely and appropriate manner.

k) Take corrective action (e.g., shut down work) upon recognition that an impact to the environment may occur or has occurred.

l) Ensure that all sub contractors comply with the ECO Plan.

m) Monitor the work site to ensure that the ECO Plan is effective for all conditions, including inclement weather and shut-down periods. Document all monitoring efforts.

This ECO Plan is complete to the best of our abilities. The undersigned acknowledges and accepts the responsibilities detailed herein.

Contractor Principal-in-Charge Signature	Name (please print)	Date

Introduction

The Environmental Construction Operations (ECO) Plan Framework guides the development of ECO Plans for Alberta Transportation, The City of Calgary, and the City of Edmonton. ECO Plans ensure the following:

- The project is compliant with applicable regulations, bylaws and guidelines
- Environmental considerations are integrated into project decision-making

ECO Plan Process

The Contractor must prepare and implement an ECO Plan in accordance with the current version of the Department's manual entitled "Environmental Construction Operations (ECO) Plan Framework." The ECO Plan must be site specific and address all environmental regulations, conditions and sensitivities.

The ECO Plan Checklist must be completed and be signed by the Contractor Principal-in-Charge as part of the ECO Plan submission.

No work may begin until the Contractor has an accepted ECO Plan. Contractors must submit their ECO Plans to the appropriate jurisdiction at least 14 days prior to the scheduled start of construction. The reviewer will evaluate the ECO Plan and one of the following will result:

1. **Acceptance** – If the ECO Plan is accepted to the mutual satisfaction of the Contractor and the reviewer (reviewers may include the consultant for Alberta Transportation, The City of Calgary or The City of Edmonton), the Contractor will be advised that the ECO Plan is complete.

2. **Follow-up or Revision** – The reviewer will follow up with the Contractor if deficiencies are identified or questions are raised. Incomplete ECO Plans will be returned to the Contractor for revision. ECO Plans must be completed to the mutual satisfaction of all parties. Changes to accepted ECO Plans must be documented (see Table 5-3) and copies of the updated ECO Plan forwarded to the reviewer and other parties, as applicable.

This Framework provides instructions for developing ECO Plans for Alberta Transportation, The City of Calgary and The City of Edmonton. **Additional requirements** for City of Calgary and City of Edmonton can be found in *Environmental Construction Operations (ECO) Plan Framework Municipal Version*. All ECO Plans must follow the jurisdictional appropriate Framework and adopt the headings and structure provided.

Step 1
Description of Site Activities

1.1 Site Activities

Briefly describe the location and general construction activities that will occur as a result of the Contractor's activities, including any permanent and temporary structures. It is particularly important for the Contractor to describe specific on-site construction activities that could result in environmental impacts (e.g. working in/near a watercourse or wetland).

1.2 Site Drawing(s)

Provide site drawing(s) that contain standard map features (e.g., north arrow, scale, legend) and be at an appropriate scale to accurately show the location of the project components and activities relative to existing features. Annotated photographs can be included in this section. Table 1-1 summarizes some additional details that may be relevant to include on the site drawing(s).

Table 1-1 Example: Potential Details to include on the Site Drawing(s)

Site Location	Site Set-up and Layout	Erosion and Sediment Controls	Environmental Sensitivities
• Site location (e.g., municipal address; legal land description) • Project boundaries • Municipal boundaries, historic sites, protected areas (e.g., parks), federal land • Linear and other transportation components (e.g., railways, roads)	• Staging areas/ laydown • Borrow areas • Stockpile locations • Refuelling areas • Detour placement • Spill kits • Hazardous materials storage • Hazardous waste storage • Waste and recycling areas* • Office and parking* • Access/egress*	• Project-specific erosion and sediment controls as appropriate for the jurisdiction (see Step 2.3 and Table 2-3 for more details) including both temporary and permanent measures. • Storm water infrastructure	• Environmentally sensitive areas (e.g., wildlife habitat; waterbodies such as wetlands, and watercourses ; vegetation such as tree stands and rare plants) • Buffers around sensitive areas • Monitoring wells • Known Contamination

*Only apply to City of Calgary ECO Plans

1.3 Project Schedule

The ECO Plan will include a project schedule that presents the sequence and timing of construction activities. It will identify any time-sensitive environmental considerations including scheduled shut-downs and restricted work periods. For example, Restricted Activity Periods (RAP) may restrict the activities of the Contractor unless additional mitigation is completed (e.g. conducting bird nesting surveys prior to clearing within the RAP).

Step 2
Potential Environmental Impacts and Controls

2.1 Permits, Approvals, Authorizations and Notifications

The Contractor must provide instruction to their staff and sub-contractors how environmental conditions and/or restrictions prescribed within permit conditions, approvals, authorizations and the contract govern their work.

List the name and permit number of all required project permits, approvals, authorizations and notifications in this section. Compile all of the environmental conditions and restrictions prescribed by the regulatory agencies, which pertain to the Contractor, in a summary table (e.g., Table 2-1). Tender packages and Environmental Risk Assessments (Alberta Transportation) outline the regulatory requirements that the Contractor must address.

Retain copies of projects permits, approvals, authorizations and notifications (as well as the permit applications when relevant) on site during all activities. These documents, upon request, will be provided to the regulators during site visits and inspections.

Table 2-1 Example: Project Permits, Approvals, Authorizations and Notifications

Legislation	Environmental Conditions That Apply to the Contractor's Activities
Fisheries and Oceans Canada Fisheries Act Authorization	No in-stream work will occur between May 1 and July 15
	Operate machinery on land in a manner that minimizes disturbance to the bed and banks of the watercourse
	A fish rescue shall be undertaken in the isolated area and shall be released unharmed to an area containing sufficient flow and cover outside of the construction area
	etc.
Alberta Environment and Parks Water Act Approval	The Contractor shall not release sediment into any wetland or watercourse
	Develop a temporary erosion and sediment control plan prior to construction
	etc.
Notification under the Code of Practice for Watercourse Crossings	Where isolating the location of a works, the isolation must be carried out in a manner that isolates the location of the works from the flowing water in the water body, and eliminates the flow of surface water through the construction site.
	During a restricted activity period, when fish are spawning or migrating, an isolation method that blocks the entire width of a water body must not be in place for longer than 3 consecutive days, unless upstream and downstream fish migration is accommodated
	etc.

2.2 Impacts and Mitigations

The Contractor must identify environmental sensitive features and mitigate all project-related impacts. The Contractor and all sub-contractors must understand how to comply with all regulatory requirements and identify, mitigate, and monitor project related impacts. The Contractor must ensure that all project regulatory requirements and environmental impacts are complied with and mitigated.

The Contactor must identify specific regulatory requirements (other than permits, approvals, authorizations and notifications) and project impacts over which they have reasonable control. Identify project related impacts and mitigation measures that the Contractor must implement to remain compliant In Table 2-2.

The Contractor must refer to the Environmental Risk Assessment and the Tender Package to guide the development of Table 2-2 for Alberta Transportation projects. Municipal projects should refer to Contractor Environmental Responsibilities Package, Standard General Conditions, Special Conditions and Standard Specifications identified in the tender.

Table 2-2 Example: Project Regulatory Requirements and Environmental Sensitivities (other than permits, approvals, authorizations and notifications)

Legislation / Environmental Sensitivity	Regulatory Requirement / Environmental Sensitivity	Contractor's Mitigation
Migratory Birds Convention Act and its regulations	Avoid engaging in potentially destructive or disruptive activities during the Restricted Activity Period in order to reduce the risk of affecting migratory birds, their nests or eggs.	If vegetation removal is required during the Restricted Activity Period, the Contractor will have pre clearing surveys conducted by a qualified professional biologist to confirm that birds are not impacted by vegetation clearing and wetland disturbance activities. If active bird nests are found, a buffer will be established and no work shall be completed in that area until further surveys clear the area.
	etc.	
Dust Management	The Contractor shall manage dust during the construction period to reduce the impacts to neighbouring communities.	Throughout construction, haul roads will be regularly watered during dry conditions. Tackifiers and interim cover crops will be applied to soil stockpiles and completed.
	etc.	
City of Calgary Community Standards Bylaw 5M2004	A Person shall not engage in any activity that is likely to allow smoke, dust or other airborne matter to escape the Premises without taking reasonable precautions to ensure that the smoke, dust or other airborne matter does not escape the Premises.	Ensure equipment on site is in good working order. Remove equipment from site that is blowing black smoke. Do not haul or strip soil during windy conditions. Use water truck to supress dust.
	etc.	

2.2.1 Care of Water

2.2.1.1 Turbidity Monitoring

Turbidity monitoring is required if the Contractor has planned instream construction activities below the ordinary high water mark of the waterbody, or if it was identified in the tender package. The Contractor shall follow the latest version of Alberta Transportation's Turbidity Special Provision. The Turbidity Monitoring Plan shall form a part of the ECO Plan.

The Contractor will provide the following information in the ECO Plan:

- Type of watercourse, as per the special provisions definitions;
- Locations of transects, sampling points and frequency of monitoring; and
- Relationship between Total Suspended Solids (TSS) and turbidity in the watercourse.

Records of monitoring activity shall be provided to the Consultant weekly. The Contractor must immediately call the Environmental Response line at 1-800-222-6514 and must notify the applicable jurisdiction within 24 hours in the event of a reportable release.

2.2.1.2 Fish Capture and Release

The Contractor shall follow the latest version of Alberta Transportation's Fish Capture and Release Supplemental Specification found in the Standard Specifications for Highway Construction if fish capture and release is required. A Fish Capture and Release Management Plan must be developed and shall form part of the Contractors ECO Plan.

The Contractor will provide the following information in the ECO Plan:

- Fish Research Licence Number
- Locations for fish capture;
- Locations for cofferdams, nets and other isolation structures; and
- Fish release location.

2.2.1.3 Decontamination Protocol

If the decontamination protocol is required for the project the Contractor must describe how they will comply with:

- Alberta Environment and Park's (AEP) most current decontamination protocols as found on the Stop the Spread of Whirling Disease website for construction equipment.
- AEP's Decontamination Protocol for all other non-construction related equipment (i.e., personal gear, turbidity monitoring equipment, etc.).

2.2.1.4 Planned Dewatering

A Dewatering Plan shall be developed and form part of the Contractors ECO Plan if dewatering and/or isolation of the work is planned. This plan must include, but is not limited to:

- Location and size of pumps;
- Screen or mesh size if required due to fish presence (e.g. DFO End of Pipe Screen Guidelines);
- Discharge location(s); and
- Monitoring method to ensure sediment laden water is not released into a receptor.

2.3 Erosion and Sediment Control

Alberta Transportation and the Cities of Calgary and Edmonton require Erosion and Sediment Control Plans, including drawings on construction projects; however, each jurisdiction has its own specific requirements. Alberta Transportation projects refer to the latest version of the Alberta Transportation Erosion and Sediment Control Manual.

The Contractor must implement, inspect and maintain appropriate and site specific erosion and sediment control measures for the contract term. If project shut-downs are expected the Contractor must explain how they plan to monitor/maintain ESC during that period. The erosion and sediment control plan shall form a part of the ECO Plan.

Step 3
Hazardous Materials and Waste Management

3.1 Hazardous Materials

In Table 3-1, the Contractor must identify and describe in their ECO Plan material-specific handling, storage, containment and disposal procedures; these procedures must comply with all regulatory requirements (e.g. setback distance from a waterbody). The Contractor must keep all hazardous waste disposal receipts and manifests. All waste storage locations must be shown on the site drawing (Step 1.2).

Table 3-1 Example: Hazardous Materials and Associated Handling Procedures

Hazardous Material	Handling Procedure	Storage Location	Containment	Disposal
Diesel	On-site fuelling will follow best management practices.	Refuelling station (see Site Drawing, Step 2.3)	Double-walled fuel tank located on impervious tray with capacity to hold 110% of stored liquid volume. Concrete barriers, fire extinguisher and no smoking sign erected.	Empty storage container will be re-filled. If fuel is no longer needed it will be transported off site for use else ware.
Lubricating Oil	Contractor will provide secondary containment with capacity to hold 110% of stored liquid volume when lubricating oil is used.	Storage locker in laydown area (see Site Drawing, Step 2.3)	Fire-proof containment locker.	Used lubricating oils will be stored and removed from site, to an appropriate eco station, on a regular basis (e.g. weekly)

Step 4
Environmental Emergency Procedures

4.1 Environmental Emergency Prevention and Response

The ECO Plan must identify potential project-related incidents that may impact the environment. These incidents could be the result of natural events, accidents, human error or improper work practices.

The Contractor will develop a Spill Response and Disposal Plan as a part of their ECO Plan. The immediate reporting of environmental releases and spills is a requirement of provincial and federal environmental legislation.

Examples of potential incidents include:

- Contaminant spills and releases to land, water and air from fuels, oils, lubricants and chemicals
- Discovery of historic contamination
- Erosion and scour events of land (e.g., water, wind) and watercourses (e.g., bank erosion, flooding, berms and coffer dam failures)

The ECO Plan must provide emergency procedures to prevent and respond to potential incidents that may impact the environment. The emergency response procedures must include:

- Training provisions to make Contractor staff and sub contractors aware of their responsibilities during emergency situations
- A list of hazardous materials available on site including their location
- Initial response to an emergency, describing the steps to be taken to address a situation
- Immediate reporting of environmental incidents to appropriate authorities
- Post-emergency review, proper disposal, follow-up and improvement of procedures as needed

The Contractor is responsible to ensure that each emergency response procedure reflects current, regulatory requirements and any jurisdiction specific conditions.

The ECO Plan must include a current emergency contact list and describe where it will be posted on site; this list must include names and contact details for key personnel and applicable regulatory agencies.

Step 5
ECO Plan Implementation

5.1 Training

The Contractor must describe how they will train staff, including sub-contractors, to comply with the ECO Plan.

ECO Plans must be included as a topic in site orientations, pre-construction meetings and regular site meetings. Minutes of these meetings must be retained and available upon request. Topics for training and awareness sessions may include (but are not limited to) those listed in Table 5-1.

Table 5-1 Potential Topics for ECO Plan Training and Awareness Sessions

ECO Plan Training and Awareness — Potential Topics
ECO Plan Content and On-site Location
ECO Plan Team Roles and Responsibilities
Locations of Environmental Restrictions (e.g., wetlands, rare plants, bird nests, riparian areas)
Requirements of Project Permits, Approvals, Authorizations and Notifications
Potential Environmental Impacts, Mitigation Measures and Best Management Practices
Erosion and Sediment Control
Hazardous Materials and Waste Management
Monitoring and Reporting Procedures
Environmental Emergency Response Procedures (including locations of spill kits, contact information, etc.)

5.2 Monitoring

The Contractor will develop methods to monitor and inspect compliance with their ECO Plan.

The monitoring and inspection procedures must satisfy regulatory and contractual requirements and must also be appropriate for the nature and scale of the project and must consider the site characteristics, work activities and potential site specific environmental risks.

The Contractor is responsible for understanding and complying with reporting requirements and ensuring that all of the environmental controls are working and effective.

The Contractor must include the following project specific information in this section:

- Locations and items to be inspected
- Monitoring frequency
- Monitoring during scheduled shut downs
- Reporting requirements related to permits, approvals, authorizations and notifications

Deficiencies identified during monitoring activities must be immediately addressed.

5.3 Documentation

A copy of the most up-to-date ECO Plan and related documents (e.g. permits and regulatory documentation) must be retained at the construction site and available for inspection at all times. These documents must be kept current and be available to all personnel. Table 5-2 provides a non-comprehensive list of the types of documents that should be maintained as up-to-date copies on the project site.

Table 5-2 Example Types of Documentation to be Retained on the Project Site

Example — Documentation to be Retained on the Project Site
Current ECO Plan
Current Erosion and Sediment Control Report and/or Drawing(s)
Regulatory Permits, Approvals, Authorizations and/or Notifications, as well as their applications when relevant (often the application forms part of the approval)
Record of Environmental Incidents (e.g., spill and release records)
Hazardous Materials Inventory
Hazardous Waste Materials Inventory
Completed Environmental Monitoring Records
Site Orientation, Tailgate Meeting and Project Progress Minutes
Fuelling Logs
Relevant Memos Relating to Environmental Matters

5.4 ECO Plan Update

Provide ECO Plan update procedures in this section and include a circulation list for updated ECO Plans.

ECO Plans must be updated when the project, its site conditions and/or its activities change in a way not anticipated in the original document. For example, in the case of an unplanned winter shut-down, the ECO Plan must be revised to include the procedures and environmental protection measures required for the shut-down period. At a minimum the ECO Plan must also be reviewed for multi-year projects in advance of freeze-up in the fall and melt in the spring.

The Contractor is responsible for notifying (as appropriate) Alberta Transportation, The City of Calgary and/or The City of Edmonton of the changes once the ECO Plan is updated and prior to implementation. Modifications to the ECO Plan must provide an equal or better level of avoidance or mitigation. The Contractor shall communicate the changes to employees and relevant sub-contractors, and provide the necessary training before implementing the changes.

All subsequent changes must be documented once the initial version of the ECO Plan is approved (include a revision summary table such as Table 5-3). Clearly summarize what the changes are and where they are located in the document, referencing applicable sections, pages, drawings and/or table numbers. This revision summary table should be located at the front of the revised ECO Plan (just after the cover page). Forward the revised ECO Plan to the reviewer (i.e., The City of Calgary, The City of Edmonton or the consultant for Alberta Transportation projects) and other applicable parties.

Table 5-3 Example: ECO Plan Revision Summary Table

Date	ECO Plan Section	Specific Document Reference (Page #, Drawing # or Table #)	Description of Change
25 Jun. 2020	2.2	Page 4	Modify erosion and sediment control plan to further protect an environmental sensitive feature. See the updated site drawing.
	1.2	Site Drawing	Add Spill Kit location updated Site Drawing.
28 Aug. 2020	Table 3-2	Page 32	Updated to include solvent that is now required for the bridge work.

F2

Greenfield Construction Ltd.'s ECO Plan for Emergency Spillway and Related Work on the Jensen Dam Flood Handling Upgrades near Magrath, Alberta

Emergency Spillway and Related Work – Jensen Dam Flood Handling Upgrades

Located 13 km South of Magrath, Alberta

ENVIRONMENTAL CONSTRUCTION OPERATIONS PLAN
Vol: 1.5

Prepared for:

Greenfield Construction Ltd.

Prepared By:

RIDGE Environmental Planning Ltd.

OCTOBER 2020

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1.0 DESCRIPTION OF SITE ACTVITIES

1.1 Site Activities

The Alberta Ministry of Transportation (the Minister) awarded the Jensen Dam Flood Handling Upgrades (the Project) to Greenfield Construction Ltd. (The Contractor) for the construction of a new emergency spillway and related work which is located in Section 34, SW 27 and N½ 22 of Township 4, Range 22, West of the 4th Meridian, at Jensen Dam approximately 13km south of Magrath, Alberta in the County of Cardston. (**Figure 1**). The purpose of the Project is to construct an access road, construction of 2 fuse plugs, erosion protection for Bridge 70408 and install a fibre optic cable from Taylor coulee Chute to Taylor Wasteway and to supply and install of domestic turnout and water level transmitter LT101 at Bridge 70408. This Environmental Construction Operations Plan (ECO Plan) has been prepared on behalf of the Contractor to provide site specific requirements for environmental protection preparation and planning.

This ECO Plan is based on the Environmental Construction Operations (ECO) Plan Framework, 2020 Edition, prepared by Alberta Transportation, the City of Calgary and the City of Edmonton. A completed ECO Plan checklist is included in **Appendix A.**

The Project is located in the Grassland Natural Region located specifically within the Mixedgrass Subregion which features gently undulating semi-arid prairie, broken by coulees and valleys. These areas are dominated by drought-tolerant grasses, shrubs and herbs and trees are absent except along rivers or deep coulees. Hot summers and long cold winters are typical of this subregion.

The following describes the Project understanding provided by Greenfield Construction:

- Construction of Access Road: including
  - excavation
  - placement Impervious Fill (Zone 1A)
  - removal and disposal of culverts
  - supply and installation of culvert
  - supply and placement of granular fill materials and riprap
  - removal and disposal of barbed wire fence, and
  - supply and installation of barbed wire fence.
- Construction of Fuse Plug No.1 (FP1): including
  - excavation, placement Impervious Fill (Zone 1A) and Random Fill (Zone 2A)
  - supply and installation of articulated concrete block (ACB);
  - supply and placement of granular materials and riprap
  - removal and disposal of barbed wire fence, and
  - supply and installation of barbed wire fence.
- Construction of Fuse Plug No.2 (FP2): including
  - excavation, placement Impervious Fill (Zone 1A) and Random Fill (Zone 2A)
  - supply and installation of articulated concrete block (ACB)
  - supply and placement of granular materials and riprap
  - removal and disposal of barbed wire fence, and
  - supply and installation of barbed wire fence.
- Erosion Protection for Bridge 70408: including

  - excavation, supply and placement of Random Fill (Zone 2A), and
  - supply and placement of granular materials and riprap.
- Supply and Installation of Domestic Turnout.
- Supply and Installation of Water Level Transmitter LT101.
- Supply and Installation of Fibre Optic Cable form Taylor Coulee Chute to Taylor Wasteway.



Figure 1: Project Location

1.2 Site Drawings

Drawings of proposed works are in **Appendix C**

1.3 Project Schedule

The preliminary construction schedule is shown in **Appendix B** is anticipated to commence at the approximately October 15, 2020 and be completed by May 31, 2021. Working hours will be

during daylight hours five days per week with the possibility of weekend work, weather permitting.

The reservoir outlet canal and main canal is used from April 01 to November 01 of any year. The Full Supply Level (FSL) of Jensen Reservoir is 1072.64. The reservoir level will be near or at full supply level (FSL) from April 01, 2020 to November 07, 2020. Alberta Environment and Parks (AEP) Water Infrastructure Operation Branch (WIOB) will lower the reservoir water level to the Winter Operating Level (WOL) of 1066.80 m on November 09, 2020. AEP WIOB will start filling the reservoir on April 01, 2021.

All environmental considerations will be implemented throughout construction and BMPs will be followed to prevent or minimize environmental impact. There are no scheduled or anticipated shutdowns of any significant length, either for climatic or environmental reasons. Alterations to the construction schedule may result from inclement weather, delays in material availability, or for unforeseen circumstances.

2.0 POTENTIAL ENVIRONMENTAL IMPACTS AND CONTROLS

2.1 Permits, Approvals, Authorizations and Notifications

Details of regulatory compliance are set out in Table 2-1.

2.1.1 Canadian Navigation Water Act

The Federal *Canadian Navigation Water Act* (NPA) includes a *List of Scheduled Waters* under which Transport Canada Regulates works and activities that have the potential to affect navigation. Non-scheduled waterways also may be covered under the *Act if* the works pose a risk to public navigation. Jensen Reservoir canal is not a scheduled navigable waterway; however, the canal is classified as navigable water. As per the Transport Canada "*A Guide to the Navigation Protection Program's Notification, Applicant and Review Requirements"* for works in navigable waters not listed in the schedule, a voluntary application for an approval may be submitted to the Minister and a notice may be published to advise interested parties that information is posted for review. The erosion protection work (including the installation of the cofferdams) meets the Minor Works Order for Erosion-Protection Works under the CNWA and therefore can proceed without an application for approval.

2.1.2 Fisheries Act

The Project has been reviewed by Fisheries and Oceans Canada (DFO) and a Letter of Advice for the Project (20-HCAA-01094) was issued on 28 September 2020. The Contractor is responsible for understanding and implementing the Letter of Advice.

2.1.3 Water Act

The *Water Act (WA)* regulates Alberta's water resources. Through Alberta Environment and Parks (AEP) the *Act* governs activities affecting waterbodies in Alberta, including construction activities, water diversions and permanent alterations of waterbodies including wetlands. *Water Act* approval is required to alter flow or level of water; change the location of water; change the direction of water flow; cause the siltation of water; cause erosion of bed or shore of any waterbody or any effect on the aquatic environment.

A *Water Act* approval has been issued for this project (Approval No. 5048049).

2.1.4 Historical Resources Act

In Alberta, several project types that may encounter or impact historical resources may require approval under the HRA prior to the commencement of the construction activities. *Historical Resources Act* Approval (HRA No.: 4825-19-0023-002) was issued for the Project with condition for the Project. Greenfield will notify the Consultant immediately in the event that palaeontological or historical resources are discovered during construction. A palaeontologist will be on site if excavation in bedrock is required. Further instructions may be issued by Alberta Culture, Multiculturism and Status of Women regarding the documentation of these resources.

2.1.5 Public Lands Act

All work is anticipated to occur within the limits and extent of the existing infrastructure therefore authorization under the *Public Lands Act* will not be required.

Table 2-1 Project Permits, Approvals, Authorizations and Notifications

Permit, Approval, Authorization or Notification File Number and Title	Environmental Conditions and/or Mitigation Measure(s)

Fisheries and Oceans
DFO *Letter of Advice 20-HCAA-01094* (**Appendix E**)
	• Capture, relocate and monitor for fish trapped within isolated, enclosed, or dewatered areas
	  o Dewater gradually to reduce the potential for stranding fish
	• Screen intake pipes to prevent entrainment or impingement of fish
	  o Use the DFO code of practice for water intake screens
	• Apply the interim code of practice for temporary cofferdams and diversion channels
	• Limit impacts on riparian vegetation to those approved for the work, undertaking or activity
	• Replace/restore any other disturbed habitat features and remediate any areas impacted by the work, undertaking or activity
	• If equipment is working in water or below the high-water mark, equipment will be decontaminated prior to and after work is completed as per the Alberta Decontamination Protocol for work in or near water (AEP 2020).
	• Develop and implement a Sediment Control Plan to minimize sedimentation of the waterbody during all phases of the work, undertaking or activity
	  o Conduct all in-water works, undertakings or activities in isolation of open or flowing water to reduce the introduction of sediment into the watercourse
	  o Inspect and regularly maintain the erosion and sediment control measures and structures during all phases of the project
	  o Remove all exposed non-biodegradable sediment control materials once site has been stabilized
	  o Use methods to prevent substrate compaction (e.g., swamp mats, pads)
	  o Dispose and stabilize all dredged material above the high-water mark of nearby waterbodies to prevent entry in the water
	• Do not deposit any deleterious substances in the water course
	• Develop and implement a response plan to avoid a spill of deleterious substances

Permit, Approval, Authorization or Notification File Number and Title	**Environmental Conditions and/or Mitigation Measure(s)**
Water Act Approval 5048049 ***(Appendix E)***	• Greenfield shall not cause or permit any water to enter an intake pipe leading to pumps unless the water has passed through a screen with openings no larger than 2.54 millimetres • Greenfield shall not deposit or inadvertently deposit any substance in, on or around the waterbody that has, or may have, the potential to adversely affect the waterbody • Greenfield shall always retain a copy of the WA approval onsite during construction. • Greenfield will only remove or disturb bank vegetation as described in the WA approval • No construction activity will be permitted to cause erosion or siltation as a result of the activity • Greenfield will comply with the Section 3.4 Erosion and Sediment Control of this ECO Plan developed for the Project.

	• The Erosion and Sediment Control measures outlined in Section 3.4 includes the following information: o Measures to minimize and avoid erosion and siltation of a waterbody o Protocols to ensure no removal or disturbance or bank vegetation occurs outside of the Project limits o Site preparation practices to be used on erodible soils o Measures for the management of water flow to minimize erosion and siltation of any waterbody o Measures for stabilization of all disturbed areas until vegetation or other long-term erosion control methods are fully established and functioning. o Measures for the management of excavated material
Historical Resources Act *Approval No.: 4825-19-0023-002* ***(Appendix E)***	• No excavation activities impacting bedrock, as described above, are to take place on the project until a professional consulting palaeontologist is on-site to monitor construction activities. Should significant palaeontological resources be encountered during the conduct of the monitoring program, the Royal Tyrrell Museum of Palaeontology must be contacted. It may then be necessary for Alberta Culture, Multiculturalism and Status of Women to issue further instructions regarding these resources. • There are no *Historical Resources Act* requirements associated with Aboriginal traditional uses, historic structures, or Provincially Designated Historic Resources however Greenfield shall remain compliant with the Standard Requirements under the *Historical Resources Act*: Reporting the Discovery of Historic Resources. • If historical resources are encountered during construction, all work shall cease immediately, the known heritage resources will be protected, and the findings will be reported. Work shall not resume until approval is given. • If a chance discovery is made during construction operations, an area of 15m will be flagged beyond the edge, and surrounding, a newfound heritage resource. The findings will be reported immediately to the Minister, Mike Oka at mike.oka@bloodtribe.org and to The Metis Nation of Alberta Region 3 at mnar3notifications@metis.org

2.2 Impacts and Mitigations

Potential environmental impacts and mitigation measures to reduce potential negative environmental impacts of the Project are listed in **Table 2-2**. Environmental controls and Best Management Practices (BMPs) to be followed by the contractor that will reduce or eliminate these environmental impacts are also listed.

Table 2-2 Project Regulatory Requirements and Environmental Sensitivities (other than permits, approvals, authorizations and notifications)

Legislation/ Environmental Sensitivity	Environmental Mitigation Measure(s)
Surface Water and Ground Water	• Temporary erosion control measures will be implemented as required to reduce erosion and sediment laden water into existing watercourses. • Hazardous materials, fuelling and equipment maintenance will occur a minimum of 100m from the watercourse.
Historical and Archaeological Resources	• If possible historical resources (fossils, artifacts, bones) are uncovered or discovered in the active working area, cease work, and prevent further access to the site, contact the appropriate government regulator. Do not resume works until instructed to do so by the regulator.

Legislation/ Environmental Sensitivity	Environmental Mitigation Measure(s)
	• Campsites are not permitted on the Project. • Greenfield shall control all equipment and work operations to ensure operations do not extend beyond designated working limits (unless authorized by the Consultant).
Fish and Fish Habitat	• Debris (e.g. bark, slash, wood chips, sawdust, organic debris, topsoil, fuel, lubricants) shall not enter a river, stream or waterbody • Construction operations shall not occur within the wetted perimeter of a waterbody unless required • Equipment operating within the wetted perimeter of a waterbody will use bio-friendly hydraulic fluids and will be free from external oil and grease • Use clean granular fill with less than 10% fines passing the 80 µm sieve size when exposed to a reservoir or canal for cofferdams, causeways and access ramps. Fine grained soils and any material that can cause sedimentation cannot be exposed to a waterbody. • Temporary work (e.g. cofferdam) will be removed and any disturbed areas will be reclaimed • Greenfield shall complete any instream activities in accordance with the Environmental Risk Assessment – Golder Report 2020 (**Appendix F**) – as well the Environmental Evaluation – Golder Report 2020 as background reference information. • All required erosion and sediment controls and spill containment measures will be installed prior to commencing construction activities. • Accumulated silt materials shall be removed and disposed of on-site at locations acceptable to the Minster of Alberta Transportation. • If fish capture and release is required, it shall be done in accordance with section 6.15 “Fish Capture and Release” of the Standard Specifications for Highway Construction. • Care of Water Plan developed as per Contract requirements. **(Appendix D)** • Ensure all construction debris is collected and disposed of properly. Utilize containment systems such as tarps or poly sheeting to manage such materials and facilitate cleanup and removal. • All hazardous materials, including fuels, oils, lubricants and other hazardous chemicals are prohibited from being stored within 100 m of watercourses • Refuelling and maintenance of vehicles and equipment will not occur within a minimum of 100 m of watercourses. • Where immobile equipment is required to operate within 100m of the watercourse, the following will be applied: o Equipment is to be stationed in an impervious containment area o All containers, hoses and nozzles will be free of leaks o Operators are to be stationed at both ends of the hose during fueling unless the nozzle ends are visible and readily accessible by one operator. • Spill response materials and equipment will be readily available, and location will be known to all personnel on site.
Wildlife and Wildlife Habitat	• A QEP (Qualified Environmental Professional) will monitor and protect the area within the construction work limits against swallow nesting during the appropriate season when swallows maybe present. • Maintain setback distances between construction operations and the habitat of the following designated species and during the dates listed:

Legislation/ Environmental Sensitivity	Environmental Mitigation Measure(s)
	o Mule deer winter period (Jan 1 – Feb 28) – 100m o Mule deer natal period (May 15 – Jun 30) – 100m o Prairie falcon nesting period (Feb 1 – Jun 30) – 400m o Migratory Bird Act (Apr 1 – Jun 30) – Species dependant o Snake and snake hibernaculum (year-round) – 500m • If snakes are required to be relocated, the AEP Area Wildlife Biologist will be notified to determine the best course of action • Wildlife encounters should be reported to the appropriate agencies and the Consultant. • Do not approach wildlife in any case. • Waste shall be contained in waste receptacles and regularly disposed of offsite at an approved waste disposal facility. • The federal *Migratory Birds Convention Act (MBCA;* Section 5[9]) provides legislation that prohibits the disturbance or destruction of a bird, its nest, or eggs. The federal *Species at Risk Act (SARA)* provides similar protection for avian species listed under *SARA,* regardless of whether they are also protected provincially. Environment Canada continues to develop avoidance guidelines to support compliance with existing prohibitions. o The purpose of conducting pre-clearing bird surveys is to reduce the likelihood of non-compliance with MBCA and SARA. The potential nesting zone timing for the area is **April 15 to August 31**. Construction is occurring outside of the RAP. • Nest survey to-be completed no greater than 7 days prior to construction. • The Contractor is required to conduct monitoring procedures and provide suitable mitigations to prevent migratory bird nesting within the construction site limits. The Contractor's wildlife biologist will determine the date when the mitigations can be removed. • Pets are not allowed within construction site limits • Firearms, hunting or shooting are not permitted within the construction site limits • Fencing will be installed to prevent livestock from entering the construction site limits as necessary. Temporary fences shall be removed at Project completion. • It is prohibited to harass wildlife
Vegetation	• Vegetation and weed control procedures will be developed and in place for the duration of the project. The site will be monitored to detect early weed growth and a herbicide approved by AEP will be applied if required. 100 m setback distance for spraying around the canal and reservoir will be adhered to. Records of the types and amounts of herbicides purchased, delivered, stored and used will be maintained and available for review. • Greenfield will maintain compliance with the Industrial Vegetation Management Association standards and practices • All weeds to be controlled in accordance with the Weed Control Act and Alberta Clubroot Management Plan. • To prevent the spread of Clubroot: o All equipment will arrive onsite clean and free of soil or vegetative debris. o Soil disturbance shall not commence until ECO Plan has been reviewed and approved by the Consultant. o Clean equipment and vehicles prior to leaving known Clubroot infect sites

Legislation/ Environmental Sensitivity	Environmental Mitigation Measure(s)
	○ Avoid equipment traffic during wet conditions in locations with Clubroot infected sites. ○ Removal of soil and vegetation debris from footwear, PPE or tools in contact with soil ○ The Contractor shall carry out the operations in accordance with the Best Management Practices outlined in the Alberta Clubroot Management Plan. • Clearing of vegetation should be kept to a minimum: use existing trails, roads, or corridors wherever possible to avoid disturbance to the vegetation and prevent soil compaction. • Immediately stabilize slopes and exposed areas by any activity associated with the Project to prevent erosion and/or sedimentation and/or instability. • Conduct clearing outside of the bird nesting window or following engagement with a wildlife specialist. • Burning is not permitted on the Project. • All equipment, vehicles, supplies, materials, imported materials, and all activities will be confined to within the working easements and staging area. • Traffic will travel along pre-defined routes and within the confines of the working easements. • Vehicles and equipment will be parked only in designated staging areas. • New adverse vegetation that affects adjacent landowners and their croplands or construction operations will be removed or controlled • Materials imported to site or exported from site will not be contaminated with weed seeds. Construction and reclamation equipment will be cleaned to prevent importing or exporting weed seeds.
Soil	• Greenfield will reclaim and revegetate disturbed areas (if required) with the appropriate native seed mix specified as per the tender package documents. • Install, monitor, and maintain erosion and sediment control measures as required. ESC measures will be monitored every 7 days (Refer to Section 3.4 Erosion and Sediment Control) or after a significant precipitation event (i.e. 11 mm or greater). • Sand, gravel and rock that have been processed by washing methods shall be temporarily stockpiled for a minimum of 48 hours to permit drainage of excess water. • Stockpiles shall be kept neat, regular and will not be more than 6m in height. Stockpiles will be kept 5m apart. • Employ appropriate dust control measures for different project activities including vacuum, shrouding, wetting, or other systems. • Reduce sediment introduction by completing works where possible from outside the watercourse. Utilize clean riprap and use appropriate erosion and sediment control measures. • Inspect equipment prior to the start of construction and routinely during construction for leaks or damage to reduce the potential for spills. • All workers on-site to ensure spill kits are in all equipment and vehicles and workers are trained in their use. • Ensure all machinery is well maintained and leak-free prior to entering site. • Fuel, service, and clean equipment and vehicles in a designated location, a minimum of 100 m from any waterbody. Refueling must be performed over a spill tray. Have emergency spill response materials readily available.

Legislation/ Environmental Sensitivity	Environmental Mitigation Measure(s)
	• Fuel storage will be located at an approved offsite location a minimum of 100m from any watercourse. • Place drip trays under parked vehicles and equipment.
Waste Management	• All opportunities to re-use, recycle or compost wastes will be explored and implemented. Salvage and separate metal, plastic, paper, cardboard, and glass and transfer them to the nearest appropriate collection facility. • For contamination resulting from Greenfield's actions, all contaminated material will be removed from the site and disposed of at a, approved licensed landfill, as required. • For contamination resulting from Greenfield's actions, the Consultant and Alberta Transportation will be contacted. • For contamination resulting from Greenfield's actions, tipping fee receipts and manifests will be retained to verify legal disposal of contaminated material. • Inert solid waste materials resulting from the work shall be removed and disposed of in accordance with Alberta Environment's Construction, Renovation and Demolition Waste Reduction Guidelines. Inert solid waste may be temporarily stockpiled on the disturbed land. • The site will undergo a daily clean-up including removal of general litter and construction wastes. • No waste and other materials will be stockpiled outside the working areas. • Construction debris and waste will be disposed of at an appropriate off-site disposal or recycling facility. • Existing and temporary barbed wire fencing will be removed and disposed of at an approved off-site waste facility. • Existing corrugated steel pipe will be removed, and debris will be disposed at an appropriate off-site disposal or recycling facility. • The sanitary system will be regularly maintained and serviced, treatment porta-potty will be located on-site, within the work staging area. • All opportunities to re-use, recycle or compost wastes will be explored and implemented. • Construction or demolition waste will not be burned or buried.
Canadian Navigable Waters Act (CNWA)	• The proposed work meets the Minor Works Order for Erosion-Protection Works and no approval is required. The reservoir and canal are also not considered navigable during the time of construction due to the lower water levels.
Migratory Birds Convention Act	• Under the Act and its regulation, no disturbance to nests or nesting birds is allowed during breeding and nesting periods (April 15 – August 31) for protection of migratory birds, their eggs and their nests. The Project is set to commence after September 1, 2020 to avoid working within this period. • The Project site shall be monitored for sings of nesting activity during the migratory nesting period. • The Contractor will monitor the site for signs of nesting activity. If nesting occurs, a wildlife specialist will be engaged for removal of inactive partially completed nests. • Anti nesting measures will be installed prior to the nesting period, if required, with the approval of the Consultant prior to use. • Substantially completed nests will be considered active and disturbance of these nests is not permitted until the wildlife specialist determines the nests are inactive or the migratory nesting period has ended.

Legislation/ Environmental Sensitivity	Environmental Mitigation Measure(s)
Canadian Environmental Protection Act	• Contribute to sustainable development through pollution prevention and protect the environment, human life and health from the risks associated with toxic substances.
Hazardous Products Act	• Provide material safety data sheet (MSDS) for any controlled product and ensure the product or its container is labelled with all required information and hazard symbols.
Environmental Protection and Enhancement Act	• Report releases which exceed thresholds of an approval or regulation to the EPEA.
Release Reporting Regulation	• Contact list contains contacts and spill reporting requirements as listed in the legislation and must be adhered to.
Alberta Wildlife Act	• Report wildlife issues to the appropriate agencies.
Waste Control Regulation	• All waste will be transported offsite to a provincially designated landfill appropriate for the material being disposed of.
Weed Control Act	• All weeds to be controlled in accordance with the *Weed Control Act.*
Historical Resources Act	• If archaeological sites are encountered, consultant will be notified, and work will cease until permission is granted. • A paleontological monitor will be onsite if there is potential to impact bedrock
Alberta Soil Conservation Act	• Prevent permanent soil loss or deterioration from construction.
Species at Risk Act	• Prohibition against killing, harming, or capture of species listed under the Act.
Agricultural Pests	• Owner of the land has responsibility of taking measures to prevent any pests (Clubroot, beavers).

2.2.1 Care of Water

The Project will require works to be completed adjacent to the Jensen reservoir, and within the reservoir outlet canal and main canal. The main canal is separated from the Jensen reservoir and reservoir outlet canal by the Taylor Coulee Chute. The Taylor Coulee Chute allows the downstream movement of fish, except during times when water levels are low enough that water fails to flow over the chute. As of November 12, 2020, water is not flowing through Taylor Coulee Chute due to low water levels and winter weather conditions.

The design of temporary care of water measures includes, cofferdams, temporary erosion and sedimentation controls, pumping, fish salvage, turbidity monitoring and other protective measures to help maintain dry conditions during construction and protect the aquatic environment. All physical measures listed below will be removed and reclaimed once construction is complete. A copy of the Care of Water (CoW) is located in **Appendix D**.

2.2.1.1 Turbidity Monitoring

Instream construction works have the potential to disturb and re-suspend bed or bank sediments which are transported downstream, increasing turbidity above background conditions.
A water quality monitoring program has been developed for this project and is described below. Water quality monitoring is intended to be completed during instream activities such as cofferdam construction or activities where flowing water is presents. The intent is to ensure construction activities are completed in isolation and/or away from flowing water to minimize potential downstream impacts or negative impacts on the aquatic environment. A copy of the Projects Turbidity Monitoring Plan is located with the CoW found in **Appendix D**.

2.2.1.2 Fish Capture and Release

A fish salvage will be completed as outlined within the November 11, 2020 Fish Rescue and QAES Memos attached in **Appendix F**.

The fish salvage is being completed under RL-Pass #20-5020. A copy of RL Pass is found in **Appendix E**.

Fish capture and release will follow Alberta Transportation's supplemental specification 6.15 Fish Capture and Release best management practices (Alberta Transportation, 2008).

2.2.1.3 Decontamination Protocol

The Project falls within the Whirling Disease Decontamination Risk Yellow Zone, which is rated as high to moderate risk. (**Figure 2.**)

Whirling disease is caused by a microscopic parasite which affects salmonid fish such as trout and whitefish. Young fish are the most vulnerable to the parasite, with mortality rates of up to 90%. Fish infected with whirling disease may show signs of 'whirling' swimming, skeletal deformities, and colour changes due to nerve compression.

Best practices for stopping the spread. These practices should be completed before leaving any waterbody, not just in the infected areas of Alberta.

- Never move live or dead fish, or fish parts from one water body to another (this is illegal in Alberta).
- Clean, drain and dry your watercraft and equipment before moving a boat or any equipment (such as hip waders, life jackets, kayaks, etc.) between water bodies, be sure to:
    - **clean** any equipment that has been in contact with water
    - **drain** water from the equipment onto dry land before leaving the shore
    - **dry** your equipment completely between trips
    - disinfecting equipment and gear with Quat Plus is also recommended

Greenfield shall follow AEP's whirling disease decontamination protocol for watercraft, equipment, material and personal used with in the bed or banks of waterbodies as outlined in the AEP Decontaminating Protocol for Work In or Near Water.

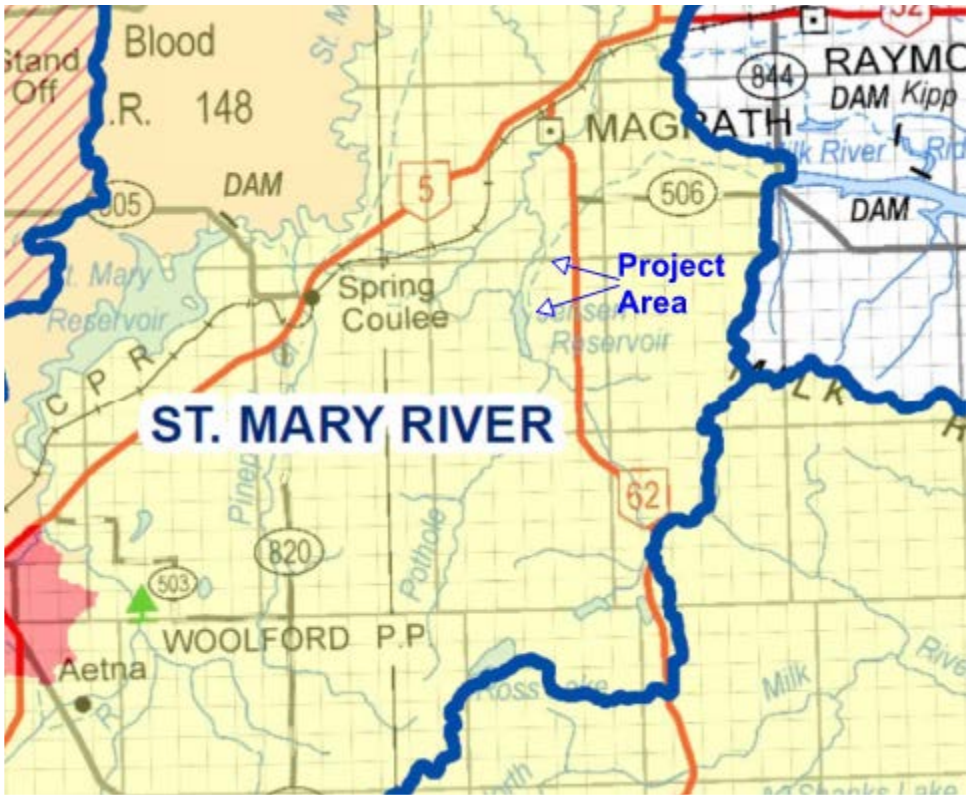


Figure 2: AEP Whirling Decontamination Risk Zone Map

2.2.1.4 Planned Dewatering

Any water that will be directly impacted by construction activities shall be dewatered to create dry working conditions for construction when feasible.
Water quality shall be tested prior to dewatering. Only water that is of similar or better quality as background samples shall be pumped directly into the canal channel. Any water that is found to be silt-laden shall be pumped into a vegetated area / silt bags a minimum of 30m from the canal channel to manage turbidity.
See Care of Water Drawings in **Appendix D** for Greenfield's plans to dewater and lower water levels to accommodate construction operations.

2.3 Erosion and Sediment Control

The focus of erosion and sediment control (ESC) measures is to reduce the potential for sediment mobilization and transport from the site, and to prevent sediment-laden water from migrating off site and potentially impacting the aquatic environment. Erosion and sediment details can be found in **Appendix C** (drawing #51024-P).

2.3.1 Temporary Erosion and Sediment Controls

The approach to ESC must be proactive rather than reactive, and when possible, mitigation measures will be installed prior to initiating construction activity. It should be noted that if site conditions or proposed works change, ESC mitigation measures may need to be modified. Temporary ESC measures must be implemented continuously as construction proceeds and removed when the Project is complete. All ESC measures must be inspected every seven (7) days and following heavy rainstorms or snowmelt events and will be maintained as required.

Accumulated sediment will be removed and disposed should any deficiencies in ESC measures directly or indirectly create adverse environmental impacts, Greenfield will initiate necessary actions to mitigate the effects.
ESC measures will be implemented and monitored, where required, to ensure that no deleterious substances enter the canal or waterbody.

2.3.1.1 Installation of and use of Silt Fence, Erosion Control Blankets and Straw Wattle

Greenfield shall supply and install Silt Fence, Erosion Control Blankets and Straw Wattle throughout the duration of the Project to be implemented at temporary ESC measures. Supplies will be kept onsite for the duration of the Project.

2.3.1.2 Exposed Surfaces

Exposed surfaces have a high potential for sediment mobilization depending on slope, weather (wind, rain, snow melt), and sediment type. As required, exposed surfaces will be seeded to promote re-vegetation. Seeding exposed areas can occur immediately after working the area, leaving the seeds dormant until the spring. Seeding can also be completed post-construction during the regular growing season. Both options would require the installation of temporary ESC measures until vegetation occurs to prevent erosion and sedimentation into nearby waterbodies.

2.3.1.3 Water Management

A Project specific Care of Water plan is in **Appendix D.**

2.3.1.4 Non-woven Geotextile

Non-woven geotextile will be placed prior to placing geosynthetic clay liner, bedding, gravel armour and riprap to protect the surface. Details are provided in **Appendix H.**

2.3.2 Contingency Materials

Additional ESC materials will available on-site throughout the duration of the Project that could be deployed quickly if inclement weather conditions necessitate their use. These materials may include:

- Heavy-duty poly sheeting (1 roll minimum)
- Geotextile fabric (1/2 roll minimum)
- Pumps with 2” and 3” pipes (or appropriate for the conditions)
- Erosion control blanket and appropriate pins/anchors (Type C)
- Sediment fencing and stakes
- Fibre matting and rolls
- Sandbags
- Shovels

2.3.3 Best Management Practices

Many of the recommended BMPs in this section are based on the Transportation Association of Canada document National Guide to Erosion and Sediment Control on Roadway Projects (TAC

2005), Erosion and Sediment Control Manual (Alberta Transportation 2011), Alberta Clubroot Management Plan (Alberta Government 2014), Alberta Environment Decontamination Protocol for Work in or Near Water (AEP 2020), and Land Development Guidelines for the Protection of Aquatic Habitat (Chilibeck et al. 1992). These BMPs are intended to be used throughout the project site. **Table 2-3** identifies common erosion and sediment control BMPs for this Project.

Table 2-3 Erosion and Sediment Control BMP's

BMP	Description
Minimize exposed soils	Only clear areas required to complete work within the approved construction limits.
Observe environmental timing restrictions	Follow bird nesting windows for nesting zone B3 - Mid-April to Late-August *(GoC General Nesting Periods for Migratory Birds)*
Install BMPs early	Install runoff, erosion and sediment control measures as soon as soil has been exposed or disturbed. ESC measures may be phased in depending on onsite activities.
Weather – Heavy Precipitation Events	Monitor the weather regularly and implement ESC measures accordingly. Increase monitoring frequency if heavy precipitation events are forecasted.
Prepare for shutdowns	Be prepared for scheduled or unscheduled work stoppages by ensuring contingency supplies are available. Should an extended temporary shutdown become required, a shutdown plan should be developed that will outline potential environmental effects/risks and measures required to minimize them.
Topsoil and seed early	Covering exposed soils as soon as possible will reduce erosion potential.
Clubroot Management	Ensure that all machinery is cleaned prior to being transported to site, to avoid transportation of soils or other possible contaminants to site.
Whirling Disease Management	Follow decontamination protocol for Whirling Disease.
Runoff Control	
Keep clean water clean	Prevent clean offsite water from mixing with runoff from disturbed areas.
Reduce runoff volume	Direct runoff water moving through site to adjacent well vegetated areas outside of the watercourse.
Management of sediment laden water	Sediment laden water generated because of onsite activities should be directed into stable well vegetated areas for sediment removal.
Erosion and Sediment Control	
Sediment fencing	Slow runoff to allow suspended sediments to settle out. Applicable for overland sheet flow only. Must be regularly inspected.
Surface tracking	Exposed areas should be tracked whenever possible. Ensure the position of the “track” is perpendicular to the direction of the slope.
Rolled erosion control products	Slows runoff and reduces the potential for surface erosion. Applicable for cut and fill slopes.

2.3.4 Revegetation Guide

Vegetation acts to prevent erosion by slowing runoff and encouraging infiltration. All exposed soil will be seeded with the appropriate seed mix prescribed in the Contract, as soon as possible after construction has been completed as required. **Table 2-4** contains considerations and BMPs for the re-vegetation of the Project Site.

Table 2-4 Revegetation Planting Guide Considerations

Re-vegetation Component	Considerations	
Topsoil	Product Specifications	• Imported topsoil – if required, imported topsoil will be inspected and tested prior to placement on site. • Topsoil is to be tested for texture, nutrient content, soluble salt content, pH value, organic matter, weed seed content, growth inhibitors and soil sterility. • Topsoil shall be a fine friable medium loam, neither heavy clay nor of a very light sandy nature, capable of sustaining good agricultural growth. • Topsoil will be stockpiled temporarily on-site on a liner or
	Installation	• Verify grades are correct, ensuring positive drainage. • Area requiring topsoil will be cultivated to a depth of 100 mm. • Remove all surface debris (i.e. roots, vegetation branches, stones) in excess of 50 mm diameter. • Spread topsoil in accordance with the contract specifications. • Keep topsoil and subsoil separated during loading, hauling and spreading. • Follow final grading procedures as per drawings
	Maintenance and Protection	• Prime Consultant responsible for confirming acceptance of material, depth of growing medium and finish grading.
Seeding	Product Specifications	• The approved grass seed mixture for the Project will be used which is as follows: o Slender wheat grass (Agropyron trachycaulum) – 30% o Canada wildrye (Elymus canadensis) – 15% o Mountain brome (Bromus carinatus) – 15% o Northern wheat grass (Agropyron dasystachyum) – 10% o Western wheat grass (Agropyron smithii) – 5% o Indian rice grass (Orzyopsis hymenoides) – 5% o Alkali grass (Puccinellia distans) – 10% o Needle and thread grass (Stipa comate) – 10% • Seeding must be packaged in original containers with labels. • Fertilizer will be compatible with the seed mix and soil conditions (Nitrogen 16, Phosphates 20, Potash 0)
	Installation	• Soil will be loosened in areas which require seeding to a cultivated depth of 150 mm. • Prepared surfaces will be free of frost and standing water.

		• Seeding will not occur in unsuitable weather conditions to prevent spread outside of construction limits or uneven application of seeds. • Fine grade surface free of humps, hollows, deleterious and refuse material. • Drill seeding will have an application rate of 30kg/Ha, fertilizer at a rate of 150kg/Ha and cover crop seed at a rate of 5kg/Ha. • The seed drill will be used to uniformly distribute seeds at the specified rate and ensure they are properly placed in the soil and covered to a depth of between 20mm and 40mm. • Apply the seeds in rows orientated crosswise to the slope. Seeds will not be applied using rows that follow the slope unless surface tracking is immediately provided to prevent all paths for surface runoff. • Fertilizer will not be applied at the same time as the seeds unless the seed drill is equipped to sideband and uniformly distribute the fertilizer • Where seeding adjoins existing vegetation, seeding application will overlap at least 300mm into adjacent vegetated areas. • In areas that area inaccessible to drill seeding equipment, broadcast seeding will be completed as follows: o A cyclone seeder or hand methods will be used as authorized by the Minister o Apply broad-cast seed mix at a rate of 30kg/Ha o Immediately following broad-cast seeding, the seeded area will be harrowed to provide a soil cover between 20mm and 40mm over the seeds and surface track the seeded area. • Greenfield will seed all disturbed areas in accordance with the Standard Specifications for Highway Construction.
	Maintenance and Protection	• Seeded areas will be watered after seeding. The Minister will determine frequency of watering and will give 24 hours' notice to commence watering activities • Protect sod against pedestrian and vehicular traffic. • Reseeding may be required, which will be determined by the Minister. • The Minister will inspect the seeded areas during May of the calendar year following initial seeding. Reseeding work shall be completed prior to June 15 of that year, which may be extended depending on weather conditions, and as authorized by the Minister.
Site Clean Up and Restoration of Disturbed Areas	Installation, Maintenance and Protection	• Work shall be completed in accordance with the Drawings and as directed by the Consultant • Upon Project completion, Greenfield shall restore all disturbed areas to a condition comparable to pre-construction conditions. • Restoration shall include grading and contouring disturbed areas to lines matching the surrounding ground, followed by topsoiling, seeding, fertilizing and harrowing. The work shall be carried out to the satisfaction of the Consultant.

3.0 HAZARDOUS MATERIALS AND WASTE MANAGEMENT

3.1 Hazardous Materials

The types and handling procedures for hazardous materials are listed in **Table 3-1**. Any hazardous materials waste and/or spills will be immediately and appropriately cleaned up and disposed of and the affected land will be reclaimed. Major spills will be cleaned up as directed by Alberta Environment and Parks, while minor spills will be cleaned up appropriately by the crew, depending on the material and on-site conditions. Small spills will be temporarily stored in lined drums and then disposed of appropriately at permitted facilities. Permits are required to dispose of hazardous waste. The Consultant and Owner will be informed of all spills. Equipment will be refuelled at a minimum of a 100 m away from waterbodies. Greenfield will be responsible for notifying AEP at 1-800-222-6514.

The following measures shall be implemented:

- Hazardous materials shall be transported, used and stored in accordance with regulatory requirements
- All fuel and service vehicles shall be equipped with 10kg of suitable sorbent material, 30 m² of 6 mil polyethylene, a shovel and an empty fuel barrel with the lid removed
- Handling and fuelling operations will be completed in a manner to prevent contaminating the ground, surface water and ground water. Containment berms and an impermeable base course will be used to contain spilled fuel.
- Fuel storage areas and non-portable transfer lines will be clearly marked and barricaded
- Waste construction equipment lubricants will be stored in a tank or closed container and will be disposed of off-site at an approved disposal facility.

3.2 Waste Management

Table 3-2 lists the types, handling procedure and disposal methods of waste materials that may be generated on site. Waste will be stored in appropriate containment at the Greenfield yard and will be disposed of at a registered waste facility or transfer station. Greenfield's Superintendent will be the on-site person responsible for instructing workers and overseeing and documenting materials and waste management.

Table 3-1 Hazardous Material Handling and Disposal Procedures

Hazardous Materials	Storage/Handling/ Transportation Procedures	Reuse/Recycling/Disposal Method
Fuel, Oil, and Grease	• Fuel will be stored offsite (> 100m from watercourse) and all refueling will occur with fire extinguisher and spill kit nearby. This will prevent the risk of contaminating the ground and potentially the water table. • All fuel and service vehicles will have a shovel, empty fuel barrel with the lid removed, 10kg of suitable sorbent material and 30 m² of 6 mil polyethylene • Fuel storage areas will be clearly marked and barricaded	• Recycle at an appropriate facility.

	with markers visible in all weather conditions • All maintenance will occur offsite at dedicated facilities. • Store a minimum of 100 m from any watercourse. Contain product by lined pit-tray, berms or in seacan. Small containers to have appropriate lids/caps in place. • Waste materials properly collected and stores in a clearly marked closed container and removed from site. Storage must exclude water to reduce risk of over-topping.	
Sewage	• Separate sanitation facilities (Port-a-Potty) for male and female workers will be provided. Toiletry items will be provided, and facilities will be kept in a clean condition	• Exported off-site for disposal by authorized dealers.
Spill containment and clean up materials	• Removed immediately	• Exported off-site to appropriate licensed landfill.

Table 3-2 Waste Material Handling and Disposal Procedures

Wastes	Storage/Handling/ Transportation Procedures	Reuse/Recycling/Disposal Method
Concrete	• Concrete is to be broken down into pieces with a maximum size of approximately 1 m³ and moved off site for disposal.	• Recycle or dispose of concrete at an appropriate facility.
Metal	• Store in clearly marked container/bin. Remove from site for disposal.	• Recycle at an appropriate facility.
Personal Garbage	• Store in a clearly marked container/bin that will not be a wildlife attractant. Remove from site for disposal.	• Reuse/recycle as appropriate or dispose at a designated facility.
Cardboard	• Store in clearly marked container/bin. Remove from site for disposal.	• Recycle at an appropriate facility.

4.0 ENVIRONMENTAL EMERGENCY PROCEDURES

4.1 Environmental Emergency Prevention and Response

Incidents or emergencies are those situations that could potentially cause an adverse effect to the workers, public, environment or property associated with or adjacent to the construction project. These incidents or emergencies may require reporting to provincial and/or federal regulators and include releases to the environment of any of the hazardous and non-hazardous materials or wastes listed in **Table 4-1**. Proper work procedures and adherence to Emergency Response Procedures will minimize the potential for inappropriate handling of materials and wastes that may possibly lead to emergency releases.

Appropriate Emergency Response Procedures require that Greenfield has completed the following:

- Pre-planning
  - Complete an ECO Plan Report.
  - Identify any environmentally sensitive sites.
  - Identify and assess known or potentially contaminated soil and groundwater locations, based on information from Consultant and Owner.
  - Identify and clearly mark the locations of all underground and above ground utilities, including power, gas, phone, cable, water, stormwater and sewer lines.
  - Compile list of emergency contact numbers. (**Table 4-2**)
  - Compile appropriate MSDS sheets, spill kits, fire extinguishers and first aid kits for materials and wastes expected on the construction site.
  - Ensure appropriate training regarding emergency responses, environmental controls, site safety and personal safety has been received by the crew.
- Operations
  - Provide emergency contact information, MSDS sheets, spill kits, fire extinguishers and first aid kits on-site.
  - Provide relevant information to the construction crew prior to activities with environmentally sensitive sites, hazardous or contaminated sites and/or materials.
  - Ensure that vehicles and equipment are maintained and operated correctly and are in good working order.
  - Ensure that materials and wastes are handled, disposed of and recycled as outlined in **Table 4-1.**
- Release reporting
  - All spills, leaks and releases of hazardous materials and wastes as defined by Alberta Environment and Parks laws and regulations will be reported as

soon as reasonably possible to the Consultant's Project Manager via phone and through email.

- Greenfield will notify the Consultant, Alberta Transportation and Alberta Environment and Parks of any spill, leak or release that has caused, is causing, or may cause an adverse effect on the environment. An adverse effect is defined as impairment of or damage to the environment, human health or safety or property. Sediment is considered a deleterious substance.
- Information to be provided immediately following a release or spill will include:
  - The location and time of the release.
  - Description of the circumstances leading up to the release.
  - Type and quantity of the substance released.
  - Details of any action taken, and proposed action be taken at the release site.
  - Description of the location of the release and the immediate surrounding area.

- Emergency Situations:
  - Greenfield will call 911 under all emergency situations.
  - Emergency situations are those that require an immediate response from police, fire or medical crews, including:
    - Environmental disasters (uncontrollable chemical spills, releases, fires, explosions etc.).
    - Serious injury.
- Contamination Discovery
  - Immediately report all contamination to the Greenfield supervisor and the Consultant and Alberta Transportation.
  - Information to be provided immediately following discovery of historical contamination include:
    - The location of the contamination.
    - Description of the circumstances leading up to discovery of the contamination.
    - Type and quantity of the contamination, if known.
    - Details of any action taken and proposed to be taken at the contaminated site.

Table 4-1 lists the potential emergencies that may result during the construction of the project and the incident response procedures that are appropriate to each emergency. Any impacted sites will be remediated immediately and fully, as required. Remediation work will be documented through reporting, photographs, follow-up sampling, etc. Contact information is listed for each type of emergency, while other emergency contacts and phone numbers are listed in **Table 4-2.**

Table 4-1 Incident Response Procedures

Potential Incidents	Response Procedure
Hazardous Spills and Releases (fuels, oils, solvents, etc.)	
Initial response and containment	**Crew**: • Immediately stop work, shut down equipment, close valves and plug hoses. • Remove sources of ignition, no smoking, keep fire extinguisher nearby. • Secure the source of the release, if safe to do so, to ensure safety of workers, the environment, and the public. • Immediately report any environmental incidents to the Site Supervisor. • If directed to do so, contain the release through the use of spill kits, berms, booms or dikes, preventing or minimizing discharge to the surface water drainage system and receiving waterbody. **Site Supervisor**: • In collaboration with Environmental consultant, assess the incident and contact the Consultant and the Owner. • If the spill is significant or assistance is required, contact Environmental consultant, who will assist in managing the spill or release. • The spill may be considered significant if: - The substance cannot be contained or is entering the surface drainage system or receiving waterbody. - The substance is dangerous or potentially hazardous to the environment. - The substance cannot be identified. • If appropriate, direct employees to clean up the release using spill kits. • If appropriate, excavate any contaminated materials and dispose of in accordance with all applicable procedures and regulations. • If clean-up assistance is required, work with Alberta Environment and Parks and others on scene.
Release reporting	**Site Supervisor:** • If release is not causing, may not cause or has not caused an “adverse effect” to the environment, report to Corporate office, the Consultant and the Owner. • If release is causing or has caused or may cause an “adverse effect” to the environment, report to Greenfield supervisor, the consultant, the QEP and Alberta Environment and Parks. • If release is into the water or below the high-water mark, Greenfield supervisor, the consultant, the QEP and Alberta Environment and Parks. • Alberta Environment and Parks (1-800-222-6514) and DFO (1-855-852-8320). • In collaboration with Environmental consultant, complete any forms or written notifications that might be required. • Ensure spill kits are replenished.
Incident assessment and review	**Greenfield:** • Review procedures and responses with the Consultant and Owner to determine if changes are required. • Assess and implement corrective action to prevent recurrence of spill or incident. • Revise the ECO Plan if required.
Discovery of Unknown Historic Contamination (buried refuse, underground storage tanks, hydrocarbons, metals, etc.)	
Initial response and containment	**Crew:** • Immediately stop work if contamination is suspected. • Secure the area. • Report contamination discovery to the Site Supervisor.

Potential Incidents	Response Procedure
	• If directed to do so, contain the contamination through the use of spill kits, berms, booms or dikes, preventing or minimizing discharge to the surface drainage water system and receiving waterbody. **Site Supervisor:** • In collaboration with Corporate office, immediately contact the Consultant and Owner in any situation. • Follow the directions of the Consultant and Owner to assist in clean-up efforts.
Release reporting	**Site Supervisor:** • In collaboration with Corporate office, immediately notify the Consultant and Owner in any situation. • Greenfield will report the spill to the appropriate authorities. • Ensure spill kits are replenished.
Incident assessment and review	**Greenfield:** • Review procedures and responses with the Consultant and Owner to determine if changes are required. • Assess and implement corrective action to prevent recurrence of incident. • Revise the ECO Plan if required.
Erosion Events (bank erosion, sediment release, flooding, extreme storm events)	
Initial response and containment	Implementation of Emergency Response Plan for Flood Events – **Appendix G** **Crew:** • Stop work immediately. • Contain sediment release using berms, ditches, booms, silt fence or other measures. • Notify Site Supervisor immediately. • If directed to do so, mitigate flooding/erosion event, and prevent or minimize further sediment release. **Site Supervisor:** • In collaboration with Corporate office and Environmental consultant, immediately notify the Consultant and Owner. • Continue construction and operations only if safe to do so.
Release reporting	**Site Supervisor:** • In collaboration with Corporate office and Environmental consultant, immediately notify the Consultant and Owner. • In collaboration with Corporate office, complete the necessary paper reporting. • If release is not causing, may not cause or has not caused an" adverse effect" to the environment, report to Greenfield, consultant, and Alberta Transportation. • If release is causing or has caused or may cause an "adverse effect" to the environment, report to Greenfield supervisor, the Consultant, Environmental consultant, and Alberta Environment and Parks. • If release is into the water or below the high-water mark, report to Greenfield Supervisor, the Consultant, the QEP and Alberta Environment and Parks (1-800-222-6514) and DFO (1-855-852-8320).
Incident assessment and review	**Greenfield:** • Review procedures and responses with the Consultant and Owner to determine if changes are required. • Assess and implement corrective action to prevent recurrence of incident. • Revise the ECO Plan and implement new ESC strategies if required.
Fire	
Initial response and containment	**Crew:** • Ensure fire extinguishers are visible and easy to reach. • Immediately stop work, shut down equipment, close valves and plug hoses.

Potential Incidents	Response Procedure
	• Remove sources of ignition, no smoking, keep fire extinguisher nearby. • Secure the area. • Immediately report fire to Site Supervisor. • If safe to do so and directed by the Site Supervisor, contain the fire using the appropriate extinguisher. • For Class A fires (wood, paper, rags, rubbish), use the pressurized extinguisher and soak the fire completely. • For Class B fires (flammable liquids, oil and grease), use ABC units, dry chemical, foam and carbon dioxide extinguishers. • Start at the base of the fire and use a swinging motion from left to right, keeping the fire in front. **Site Supervisor:** • If the fire that has the potential to become uncontrollable, call 911. • In collaboration with Corporate office, contact the Consultant and Owner. • If safe to do so, direct employees to put out fire using appropriate methods.
Reporting	**Site Supervisor:** • In collaboration with Corporate office, notify the Consultant and Owner.
Incident assessment and review	**Greenfield:** • Ensure fire extinguishing materials are replenished. • Review procedures and responses with the Consultant and Owner to determine if changes are required. • Assess and implement corrective action to prevent recurrence of incident. • Revise the ECO Plan if required.
Utility Line Strike	
Initial response and containment	**Crew:** • If a utility line is hit, stop work immediately and notify the Site Supervisor. • If safe to do so, secure the source area. **Site Supervisor:** • In collaboration with Corporate office, contact the Consultant and Owner. • Call 911 if the utility strike is an emergency. • Notify the utility company to report the incident. The utility company will advise of preferred action. • Direct crew to resume work only when it is safe to do so.
Reporting	**Site Supervisor:** • In collaboration with Corporate office, notify the Consultant and Owner.
Incident assessment and review	**Greenfield:** • Review procedures and responses with the Consultant and Owner to determine if changes are required. • Assess and implement corrective action to prevent recurrence of incident. • Revise the ECO Plan if required.

On site equipment and material will include (but not limited to): fiber rolls, absorbent pads, fire extinguishers and spill kits. The equipment will be located in the appropriate equipment or truck and stored/located in onsite storage at night.

The table below lists the key contacts and phone numbers for reporting potential incidents and emergencies. This list will be revised as required to ensure it is up-to-date and posted in the Contractor's site trailer.

Table 4-2 Emergency Contact Information

Emergency Contact	Phone Number
Greenfield – Mike Allain	506-625-0975
Greenfield – Chris Sippley	506-625-4023
MPE – Jeff Olitch	403-329-3442
Alberta Transportation - Carl Wirzba	403-382-4084
Eric Beveridge, RIDGE Environmental Planning, Environmental Consultant (QEP)	403-850-0895
Ambulance	911
Police	911
Fire Department	911
Emergency Spill Containment	911
STARS Helicopter	1-403-295-1811
Alberta Environment and Parks	1-800-222-6514
DFO's "Fisheries Protection Program"	1-855-852-8320
Poison Centre	1-800-332-1414
Alberta One Call	1-800-242-3447
Occupational Health and Safety	1-403-297-2222
Dangerous Goods/Disaster Services	1-800-242-3447

5.0 ECO PLAN IMPLEMENTATION

5.1 On-Site Representative

The on-site representative for Greenfield will be – Chris Sippley. They will be responsible for maintaining the environmental controls, addressing environmental issues and questions that arise, as well as ensuring that all personnel working onsite will be aware of and adhere to the ECO Plan.

These Greenfield staff will be Site Representative Contacts with primary contact being Permit Holders.

Name	Contact #	Role
Carolyn Tozer	506-622-7922	Owner / Permit Holder
Mike Allain	506-625-0975	Supervisor / Permit Holder
Garth Creamer	902-430-7397	H&S Coordinator / Admin Support ECO Plan Management and Maintenance
Chris Sippley	506-625-4023	Supervisor
Johnny Taylor	506-625-0609	Supervisor/Quality Control

5.2 Training and Communication

Through the implementation of this ECO Plan, Greenfield will ensure that all construction and management personnel, including subcontractors, are aware of the environmental obligations and commitments that must be met throughout the construction project. Greenfield will develop and deliver training schedules and content to their staff prior to each project, and will:

- Ensure all key site personnel are properly trained in the relevant content and requirements of this ECO Plan.
- Communicate the relevant elements of this ECO Plan and any changes in it to crews as required.
- Ensure that all staff and crews understand the importance of their personal performance and compliance with all environmental regulations.
- Assess and document the effectiveness of training received by employees. The assessment results will be used to develop and improve future training requirements.

The ECO Plan will be discussed, as necessary, during site orientations, pre-construction meetings, regular site meetings and weekly construction progress meetings. Minutes from these meetings will be retained. Any concerns identified regarding the implementation of the ECO Plan will be discussed and resolved with the Consultant in a timely manner. Greenfield will ensure that the crew and sub-contractors have a clear understanding of the appropriate procedures for handling all materials and waste, with an emphasis on hazardous

materials/waste management. Information provided to the crew in the form of information and/or training session will be site-specific and outlined in **Table 5-1.**

Table 5-1 ECO Plan Training and Awareness Sessions

ECO Plan Training and Awareness Sessions Project Topics
ECO Plan content, team roles and responsibilities
Emergency Response Procedures, including spill reporting procedures, locations of MSDS information, spill kits, emergency contact numbers, etc.
Environmentally sensitive areas or timing restrictions
Use or generation of hazardous chemicals and substances
Monitoring and reporting procedures
Refuelling protocol
Potential environmental impacts, mitigation measures and best management practices
Erosion and sediment control
Hazardous materials and waste management
Environmental controls that will be implemented to minimize or reduce environmental impacts
Individual roles and responsibilities to the ECO Plan
Potential consequences of non-conformance with environmental responsibilities for both individuals and Greenfield
All environmental Approvals and/or Authorization issued for the Project

5.3 Monitoring and Reporting

Environmental monitoring will be conducted prior to, during and after the construction project, as outlined below. Greenfield will be responsible for determining the success of the environmental controls on preventing environmental impacts throughout construction and taking appropriate actions to halt construction activities or recommend additional environmental controls if unacceptable environmental impacts occur. Environmental monitoring will include the following responsibilities:

- Ensure that construction operations are in accordance with the environmental specifications of the Project, this ECO Plan, and all other environmental legislation, approvals, authorizations and regulations and guidelines.
- Inspect ESC measures every seven (7) days and after significant precipitation events (>12.5 mm in 24 hours or rapid melt of snow accumulation). Retain inspection documentation and make it available upon request.
- Implementation of the Care of the Water Plan and the turbidity monitoring plan during all construction phases impacting the channel.

- Inspect construction site daily for garbage and general status.
- Inspect stockpiles daily for general status. Approximately 5000 m3 of material will be removed from the canal slopes and replaced rip rap. Waste Removed Plan – **Appendix C**.
- Inspect waste management and hazardous materials storage daily for general status.
- Inspect emergency preparedness, determine the significance of spills and report to authorities and regulators when necessary.

Environmental monitoring will be conducted and documented weekly or as required for the duration of the Project. Deficiencies identified through monitoring will be addressed immediately and may require that construction activities be halted. Any non-compliance issues with the ECO Plan requirements will be addressed immediately and recorded. Any crew member observing a possible infraction or non-compliance action will notify the Site Supervisor. The Consultant's has the authority to shut down construction activities if significant environmental impacts, incidents or non-compliance, such as:

- Failure to follow environmental controls or best management practices.
- Failure to follow Emergency Response Procedures.
- Failure to follow or non-compliance with environmental regulations, approvals or guidelines.

In the event that a harmful substance is released into the environment, which exceeds the threshold of an approval or regulation, the AEP Environmental Response Centre will be verbally notified at (780)422-4505 or 1-800-222-6514 (24 hours). A written report must be submitted to the Environmental Response Centre within 7 days of the verbal notification. The written report must include the following:

a) Date and time of release

b) Location of the point of release

c) Duration of the release and the release rate

d) Composition of the release including concentration, total weight, quantity or amount released

e) Detailed description of the events leading up to the release

f) Steps or procedures taken to minimize or stop the release

g) Steps or procedures taken to prevent further releases

h) Any other information deemed relevant

5.4 Documentation

Greenfield will complete and maintain documents (see **Table 5-2**) that are legible and accessible. Copies of the ECO Plan and all regulatory approvals will be available at all times on

the construction site and at the Greenfield office to ensure it is readily accessible and updated as necessary.

Table 5-2 Project Site Documentation

Documentation to be Retained on the Project Site
ECO Plan (Current version)
Erosion and Sedimentation Control Report and/or Plan(s)
Environmental Regulatory Documents (Approval, Authorizations, Permits, Notifications, etc.)
Records of Environmental Incidents (e.g., spill and release records)
Hazardous Material Inventory
Waste - Hazardous Material Inventory
Environmental Monitoring Records
Construction Equipment Inspection Logs
Fueling Logs
Tailgate Meeting, Site Orientation and Project Progress Minutes
Memos Relating to Environmental Matters

5.5 ECO Plan Update

Greenfield will evaluate the appropriateness and effectiveness of the ECO Plan following any significant environmental impacts, regulatory requirements and emergency preparedness needs. Greenfield will review all Environmental Inspection Reports, Spill Reports, hazard assessments, spills and releases, monitoring information, non-compliance events, and environmental suggestion forms. This review will identify any requirements for changes to the site-specific ECO Plan, and for continual improvement in future ECO Plans. Modifications to the ECO Plan must provide an equal or better level of mitigation or a schedule update. Greenfield will revise the ECO Plan in the form of a clear memo, which will be kept on-site with the original ECO Plan. The revisions will be communicated to all employees/sub-contractors, the Consultant and Owner. These changes will then be implemented as required to ensure regulatory compliance.

The effectiveness of the ECO Plan will be reviewed at all site and progress meetings. ECO Plan changes will be introduced as required, subject to the following conditions:

- ECO Plan changes will maintain or improve the level of impact mitigation.
- ECO Plan changes will be initiated promptly.
- Changes must be reviewed and accepted by the on-site Consultant.
- Changes will be communicated to staff and subcontractors onsite.
- Changes will be incorporated in the ECO Plan document and summarized in the ECO Plan Revision Summary **Table 5-3,** provided below; and
- The updated ECO Plan will be circulated for filing at the Project site.

Table 5-3 ECO Plan Revision Table

Date	ECO Plan Section	Specific Document Reference (Page #, Drawing # or Note #)	Description of Change

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APPENDIX A

ECO Plan Checklist

Environmental Construction Operations (ECO) Plan Checklist

Project Name: Jensen Dam Flood Handling Upgrades

Contractor's On- Site Representative(s) (Name, Company, Email and Phone Number):
MIKE ALAIN / GREENFIELD CONSTRUCTION / mallain@greenfield-construction.com
PHONE (506-625-0975)

ECO Plan submitted to (Name and Jurisdiction): JESSE OLITAU / MPE / CONSULTANT

Note: All checklist items are required in the ECO Plan. Explain any deficiencies in the comments section.
Ensure that this three-page checklist is signed and submitted with the ECO Plan.

ECO Plan Framework Step		YES	NO	N/A
Step 1 – Description of Site Activities				
1.1	Site Activities	☒	☐	☐
1.2	Site Drawings	☒	☐	☐
1.3	Project Schedule	☒	☐	☐
Step 2 – Potential Environmental Impacts and Controls				
2.1	Permits, Approvals, Authorizations and Notifications	☒	☐	☐
2.2	Impacts and Mitigations	☒	☐	☐
2.3	Erosion and Sediment Control	☒	☐	☐
Step 3 – Hazardous Materials and Waste Management				
3.1	Hazardous Materials	☒	☐	☐
Step 4 – Environmental Emergency Procedures				
4.1	Environmental Emergency Prevention and Response	☒	☐	☐
Step 5 – ECO Plan Implementation				
5.1	Training and Monitoring	☒	☐	☐
5.2	Communication	☒	☐	☐
5.3	Documentation	☒	☐	☐
5.4	ECO Plan Update	☒	☐	☐

Explain any deficiencies in the ECO Plan:

ECO Plan Checklist for City of Calgary and City of Edmonton can be found in Environmental Construction Operations (ECO) Plan Framework Municipal Version.

Contractor Responsibilities

All Contractors must be aware of how environmental policy, regulation and law govern their work. The Contractor is responsible, either by its own actions or through its sub contractors, for providing the resources needed to develop and implement the ECO Plan. The Contractor is responsible for ensuring sub contractors understand their roles and responsibilities and operate in compliance with the ECO Plan.

Contractors must refer to the terms and conditions contained in applicable contractual and regulatory documents to be fully aware of their responsibilities. In general, Contractors must:

a) Identify the potential environmental issues and develop mitigation measures to prevent or minimize environmental impacts.

b) Identify and acknowledge permits, approvals, authorizations, notifications, guidelines, standards, policies and programs applicable to the project.

c) Prepare and update the ECO Plan in accordance with the latest version of the ECO Plan Framework.

d) Submit copies of the ECO Plan and all other required documentation to the consultant for Alberta Transportation projects or The City Project Manager for municipal projects.

e) Revise the ECO Plan as required based on reviewer (i.e., The City of Calgary, The City of Edmonton or the consultant for Alberta Transportation projects) comments.

f) Identify an on site individual to be the Contractor's On-Site Representative to maintain environmental controls and address any environmental issues or questions that arise. The Contractor must identify this individual within the ECO Plan and at the pre-construction meeting.

g) Train staff and sub contractors to identify, address and report potential environmental problems.

h) Review the ECO Plan requirements at orientation meetings, the pre-construction meeting, tailgate meetings etc.

i) Implement and maintain environmental mitigation measures in accordance with the ECO Plan.

j) Correct and record deficiencies in a timely and appropriate manner.

k) Take corrective action (e.g., shut down work) upon recognition that an impact to the environment may occur or has occurred.

l) Ensure that all sub contractors comply with the ECO Plan.

m) Monitor the work site to ensure that the ECO Plan is effective for all conditions, including inclement weather and shut-down periods. Document all monitoring efforts.

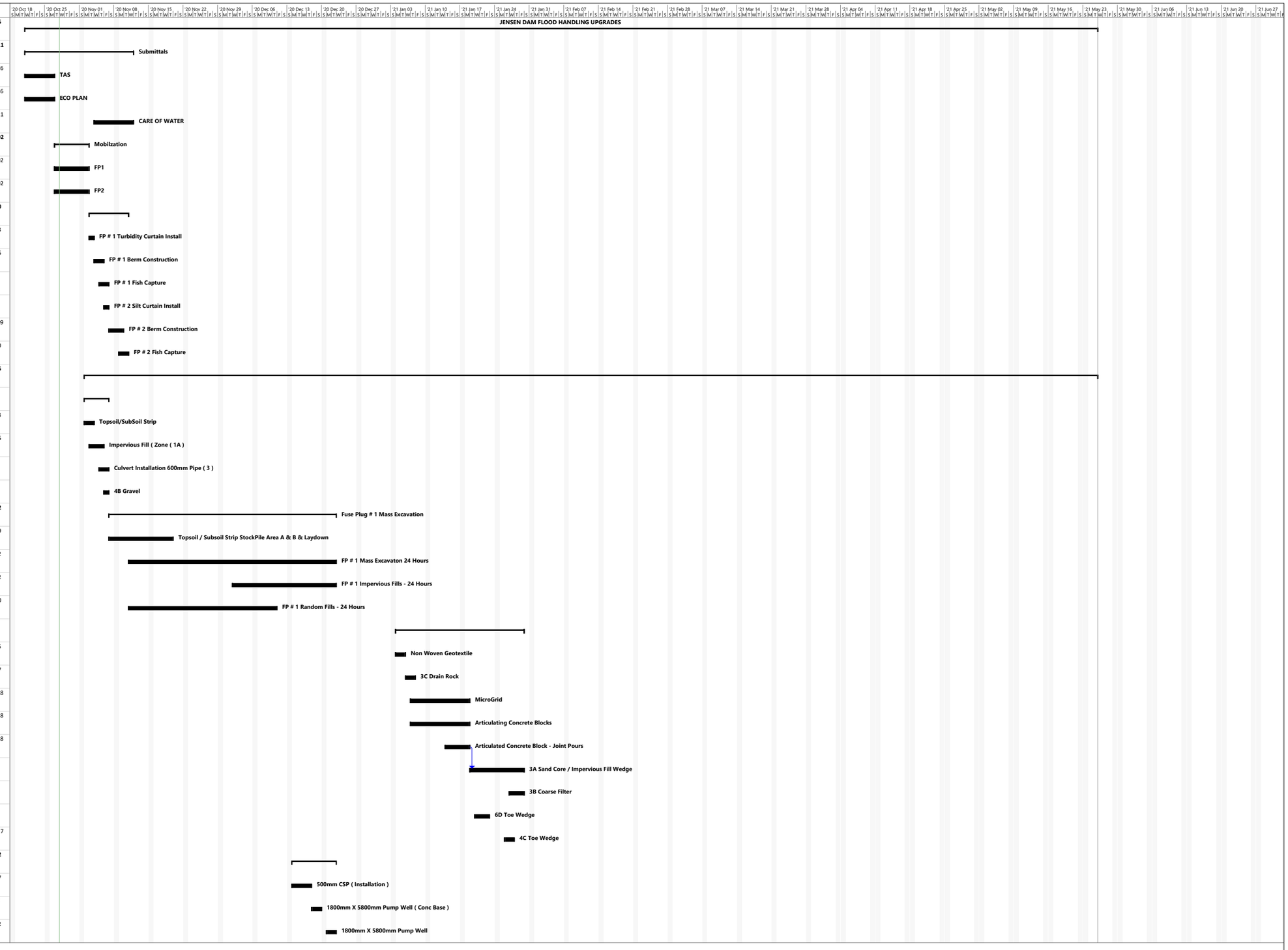
This ECO Plan is complete to the best of our abilities. The undersigned acknowledges and accepts the responsibilities detailed herein.

Michael Allain	MICHAEL ALLAIN	October 19/20
Contractor Principal-in-Charge Signature	Name (please print)	Date

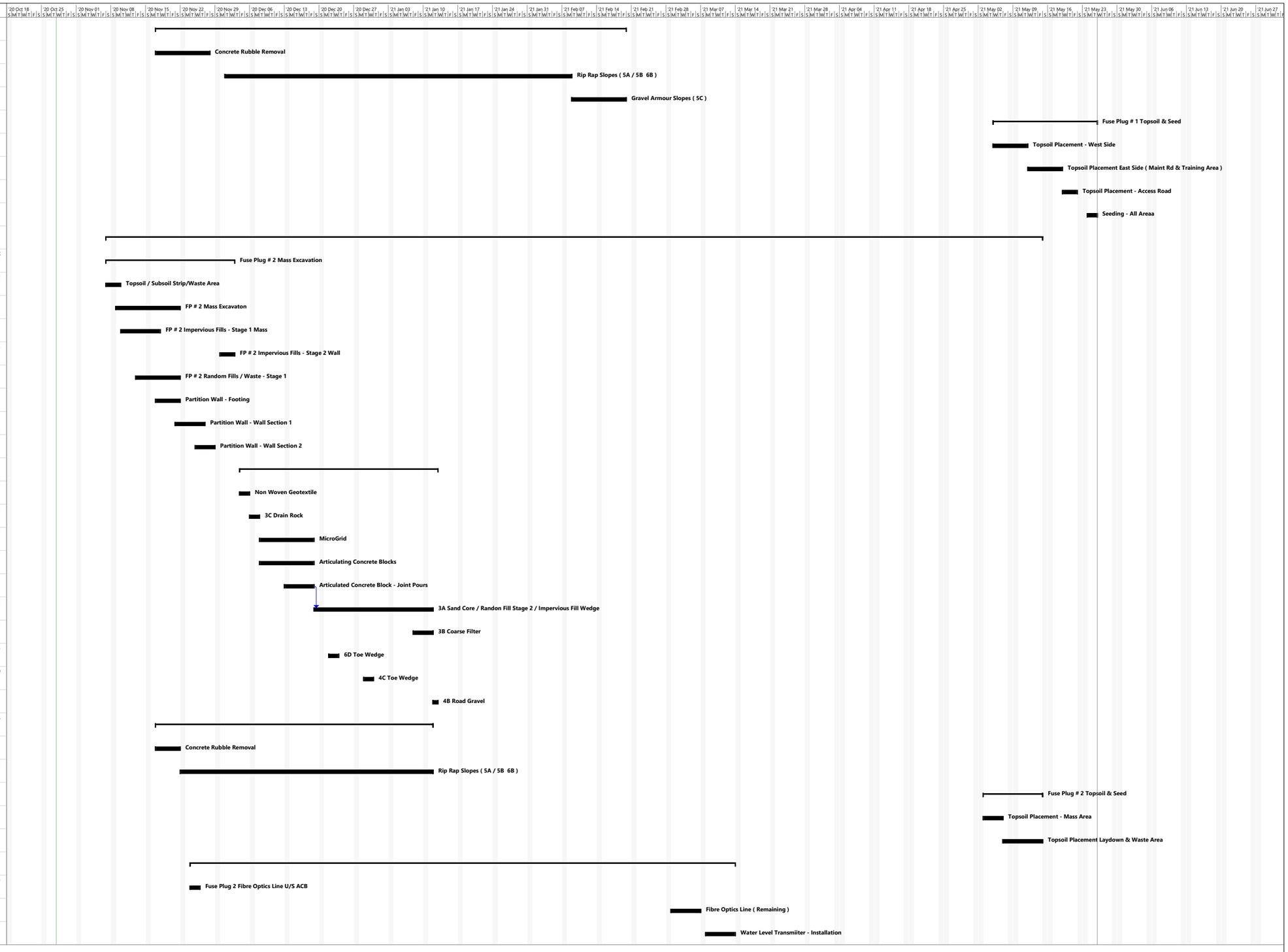
APPENDIX B

Project Construction Schedule

ID	Task Name	Duration	Start	Finish
1	**JENSEN DAM FLOOD HANDLING UPGRADES**	**178 days**	**Wed 20-10-21**	**Tue 21-05-25**
2	**Submittals**	**19 days**	**Wed 20-10-21**	**Wed 20-11-11**
3	TAS	5 days	Wed 20-10-21	Mon 20-10-26
4	ECO PLAN	5 days	Wed 20-10-21	Mon 20-10-26
5	CARE OF WATER	7 days	Wed 20-11-04	Wed 20-11-11
6	**Mobilzation**	**6 days**	**Tue 20-10-27**	**Mon 20-11-02**
7	FP1	6 days	Tue 20-10-27	Mon 20-11-02
8	FP2	6 days	Tue 20-10-27	Mon 20-11-02
9	**CARE OF WATER**	**7 days**	**Tue 20-11-03**	**Tue 20-11-10**
10	FP # 1 Turbidity Curtain Install	1 day	Tue 20-11-03	Tue 20-11-03
11	FP # 1 Berm Construction	2 days	Wed 20-11-04	Thu 20-11-05
12	FP # 1 Fish Capture	2 days	Thu 20-11-05	Fri 20-11-06
13	FP # 2 Silt Curtain Install	1 day	Fri 20-11-06	Fri 20-11-06
14	FP # 2 Berm Construction	2 days	Sat 20-11-07	Mon 20-11-09
15	FP # 2 Fish Capture	2 days	Mon 20-11-09	Tue 20-11-10
16	**FUSE PLUG 1**	**168 days**	**Mon 20-11-02**	**Tue 21-05-25**
17	**Fuse Plug # 1 Const. Access Road**	**5 days**	**Mon 20-11-02**	**Fri 20-11-06**
18	Topsoil/SubSoil Strip	2 days	Mon 20-11-02	Tue 20-11-03
19	Impervious Fill (Zone (1A)	3 days	Tue 20-11-03	Thu 20-11-05
20	Culvert Installation 600mm Pipe (3)	2 days	Thu 20-11-05	Fri 20-11-06
21	4B Gravel	1 day	Fri 20-11-06	Fri 20-11-06
22	**Fuse Plug # 1 Mass Excavation**	**39 days**	**Sat 20-11-07**	**Tue 20-12-22**
23	Topsoil / Subsoil Strip StockPile Area A & B & Laydown	11 days	Sat 20-11-07	Thu 20-11-19
24	FP # 1 Mass Excavaton 24 Hours	36 days	Wed 20-11-11	Tue 20-12-22
25	FP # 1 Impervious Fills - 24 Hours	18 days	Wed 20-12-02	Tue 20-12-22
26	FP # 1 Random Fills - 24 Hours	26 days	Wed 20-11-11	Thu 20-12-10
27	**Fuse Plug # 1 Core**	**23 days**	**Mon 21-01-04**	**Fri 21-01-29**
28	Non Woven Geotextile	2 days	Mon 21-01-04	Tue 21-01-05
29	3C Drain Rock	2 days	Wed 21-01-06	Thu 21-01-07
30	MicroGrid	10 days	Thu 21-01-07	Mon 21-01-18
31	Articulating Concrete Blocks	10 days	Thu 21-01-07	Mon 21-01-18
32	Articulated Concrete Block - Joint Pours	4 days	Thu 21-01-14	Mon 21-01-18
33	3A Sand Core / Impervious Fill Wedge	10 days	Tue 21-01-19	Fri 21-01-29
34	3B Coarse Filter	3 days	Wed 21-01-27	Fri 21-01-29
35	6D Toe Wedge	3 days	Wed 21-01-20	Fri 21-01-22
36	4C Toe Wedge	2 days	Tue 21-01-26	Wed 21-01-27
37	**Domestic Turnout**	**8 days**	**Mon 20-12-14**	**Tue 20-12-22**
38	500mm CSP (Installation)	4 days	Mon 20-12-14	Thu 20-12-17
39	1800mm X 5800mm Pump Well (Conc Base)	2 days	Fri 20-12-18	Sat 20-12-19
40	1800mm X 5800mm Pump Well	2 days	Mon 20-12-21	Tue 20-12-22

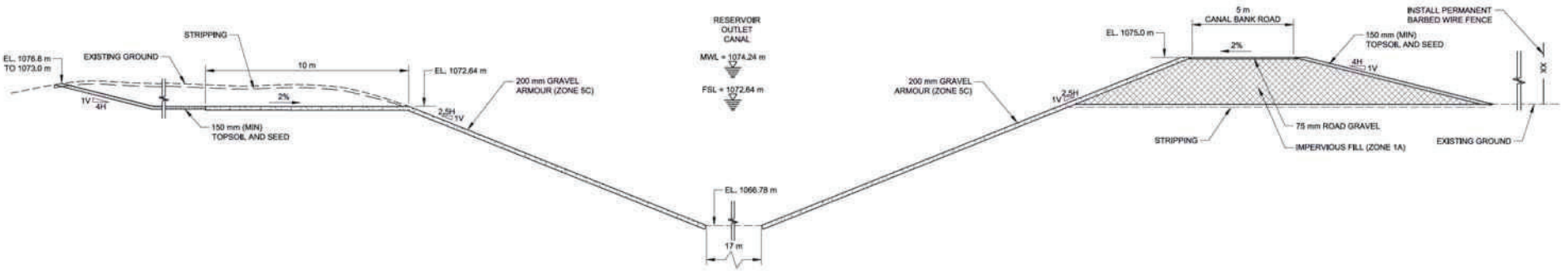


ID	Task Name	Duration	Start	Finish
41	**Fuse Plug # 1 Canal Slopes**	**82 days**	**Tue 20-11-17**	**Fri 21-02-19**
42	Concrete Rubble Removal	10 days	Tue 20-11-17	Fri 20-11-27
43	Rip Rap Slopes (5A / 5B 6B)	60 days	Tue 20-12-01	Mon 21-02-08
44	Gravel Armour Slopes (5C)	10 days	Tue 21-02-09	Fri 21-02-19
45	**Fuse Plug # 1 Topsoil & Seed**	**15 days**	**Wed 21-05-05**	**Tue 21-05-25**
46	Topsoil Placement - West Side	5 days	Wed 21-05-05	Tue 21-05-11
47	Topsoil Placement East Side (Maint Rd & Training Area)	5 days	Wed 21-05-12	Tue 21-05-18
48	Topsoil Placement - Access Road	3 days	Wed 21-05-19	Fri 21-05-21
49	Seeding - All Areaa	2 days	Mon 21-05-24	Tue 21-05-25
50	**FUSE PLUG 2**	**156 days**	**Sat 20-11-07**	**Fri 21-05-14**
51	**Fuse Plug # 2 Mass Excavation**	**22 days**	**Sat 20-11-07**	**Wed 20-12-02**
52	Topsoil / Subsoil Strip/Waste Area	2 days	Sat 20-11-07	Mon 20-11-09
53	FP # 2 Mass Excavaton	12 days	Mon 20-11-09	Sat 20-11-21
54	FP # 2 Impervious Fills - Stage 1 Mass	7 days	Tue 20-11-10	Tue 20-11-17
55	FP # 2 Impervious Fills - Stage 2 Wall	3 days	Mon 20-11-30	Wed 20-12-02
56	FP # 2 Random Fills / Waste - Stage 1	8 days	Fri 20-11-13	Sat 20-11-21
57	Partition Wall - Footing	5 days	Tue 20-11-17	Sat 20-11-21
58	Partition Wall - Wall Section 1	5 days	Sat 20-11-21	Thu 20-11-26
59	Partition Wall - Wall Section 2	4 days	Wed 20-11-25	Sat 20-11-28
60	**Fuse Plug # 2 Core**	**34 days**	**Fri 20-12-04**	**Tue 21-01-12**
61	Non Woven Geotextile	2 days	Fri 20-12-04	Sat 20-12-05
62	3C Drain Rock	2 days	Sun 20-12-06	Mon 20-12-07
63	MicroGrid	10 days	Tue 20-12-08	Fri 20-12-18
64	Articulating Concrete Blocks	10 days	Tue 20-12-08	Fri 20-12-18
65	Articulated Concrete Block - Joint Pours	6 days	Sun 20-12-13	Fri 20-12-18
66	3A Sand Core / Randon Fill Stage 2 / Impervious Fill Wedge	20 days	Sat 20-12-19	Mon 21-01-11
67	3B Coarse Filter	3 days	Fri 21-01-08	Mon 21-01-11
68	6D Toe Wedge	2 days	Tue 20-12-22	Wed 20-12-23
69	4C Toe Wedge	2 days	Tue 20-12-29	Wed 20-12-30
70	4B Road Gravel	1 day	Tue 21-01-12	Tue 21-01-12
71	**Fuse Plug # 2 Canal Slopes**	**48 days**	**Tue 20-11-17**	**Mon 21-01-11**
72	Concrete Rubble Removal	5 days	Tue 20-11-17	Sat 20-11-21
73	Rip Rap Slopes (5A / 5B 6B)	44 days	Sun 20-11-22	Mon 21-01-11
74	**Fuse Plug # 2 Topsoil & Seed**	**10 days**	**Mon 21-05-03**	**Fri 21-05-14**
75	Topsoil Placement - Mass Area	4 days	Mon 21-05-03	Thu 21-05-06
76	Topsoil Placement Laydown & Waste Area	6 days	Fri 21-05-07	Fri 21-05-14
77	**ELECTRICAL AND CONTROLS**	**95 days**	**Tue 20-11-24**	**Sat 21-03-13**
78	Fuse Plug 2 Fibre Optics Line U/S ACB	2 days	Tue 20-11-24	Wed 20-11-25
79	Fibre Optics Line (Remaining)	6 days	Mon 21-03-01	Sat 21-03-06
80	Water Level Transmiiter - Installation	6 days	Mon 21-03-08	Sat 21-03-13

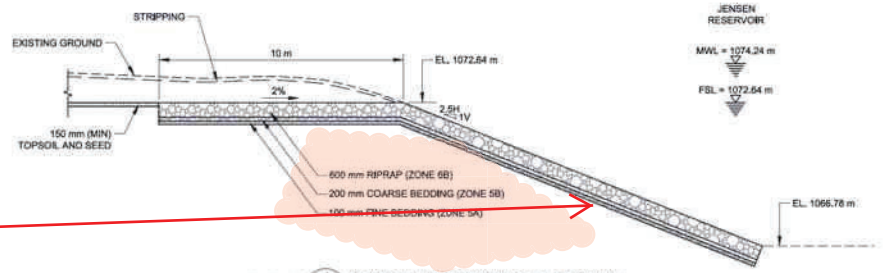


APPENDIX C

Contract Drawings and Site Plans

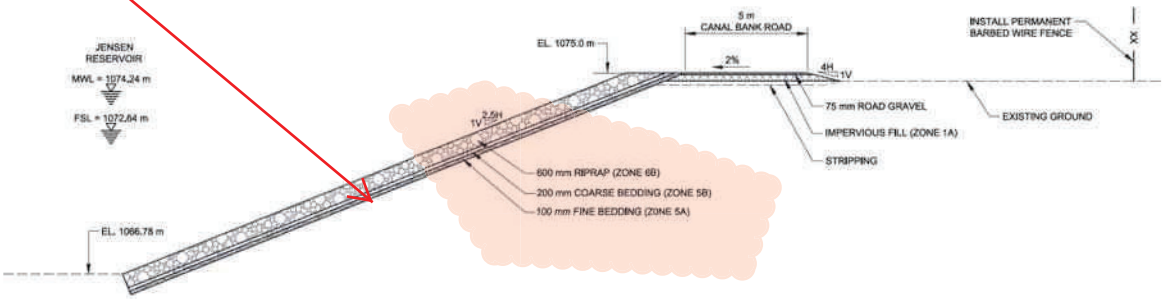


SCALE 1:100 H 11 SECTION - RESERVOIR OUTLET CANAL



SCALE 1:100 J 11 SECTION - RESERVOIR OUTLET CANAL

Waste Removed



SCALE 1:100 K 11 SECTION - RESERVOIR OUTLET CANAL

LEGEND

- XX — PERMANENT BARBED WIRE FENCE
- TOPSOIL AND SEED
- IMPERVIOUS FILL (ZONE 1A)
- ROAD GRAVEL (ZONE 4B)
- FINE BEDDING (ZONE 5A)
- COARSE BEDDING (ZONE 5B)
- GRAVEL ARMOUR (ZONE 5C)
- RIPRAP (ZONE 6B)

NOTE(S)

1. ELEVATIONS, STATIONS AND DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.

ISSUED FOR
CONSTRUCTION

0 5 10
1:100 METRES

THINK SAFETY FIRST

DEPARTMENT BAR CODE

THIS DRAWING MAY HAVE BEEN REDUCED. ALL SCALE NOTATIONS INDICATED (i.e. 1:1000 etc) ARE BASED ON 22" X 34" FORMAT DRAWINGS

MPE Engineering Ltd.
GOLDER
MPE JOB NO. 1716.063.00

PERMIT TO PRACTICE
Golder Associates Ltd.
PERMIT NUMBER: P5122
The Association of Professional Engineers and Geoscientists of Alberta

DESIGNER

CHECKER

REV	DATE	REVISIONS	BY
2			
1			
1	2020-10-16	ISSUED FOR CONSTRUCTION	AS
0	2020-09-04	ISSUED FOR TENDER	AS

DATE 2020-09-04
AEP CAPITAL PROJECT NUMBER CP 2003 - 00007
SITE 50052

Alberta Transportation

EMERGENCY SPILLWAY AND RELATED WORK
JENSEN DAM FLOOD HANDLING UPGRADES

FUSE PLUG (FP1)
SECTIONS (3 OF 3)

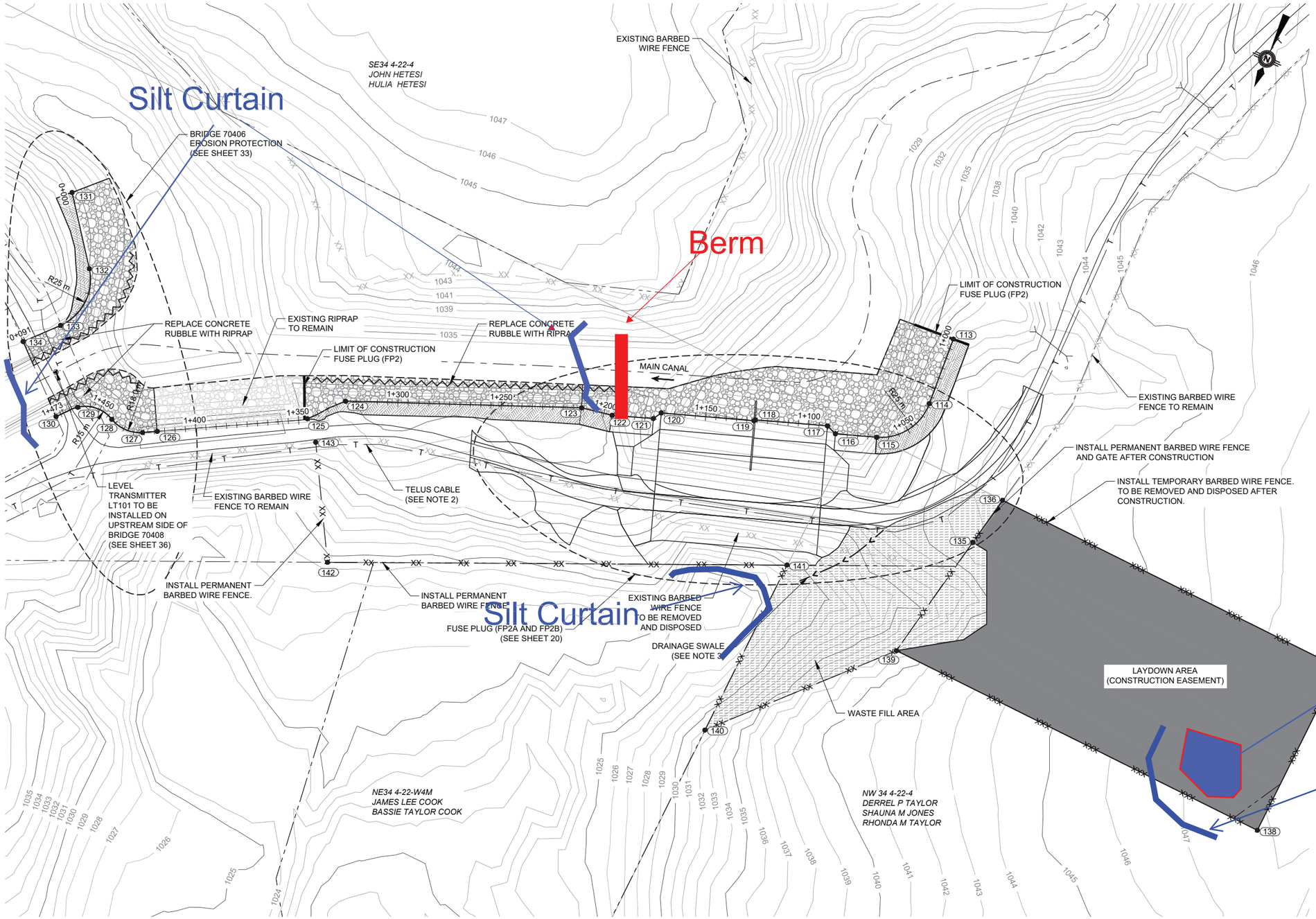
CONTRACT 0021462
SHEET 14 OF 45
CONSULTANT DRAWING 1895260DW014
TRANSPORTATION DRAWING 51019-P

AUTOCAD FILE No. 1895260DW021.dwg TENDER No. TND 0021462

Jensen Dam Flood Handling Upgrades – Erosion and Sediment Control Measures

As required for the duration of the Project, ESC measures will be used and maintained during construction activities as required. All ESC works to be used will be temporary – no permanent works to be used.

The following is a list of typical ESC works that maybe used for the Project.



LEGEND

- EXISTING GROUND CONTOURS (2 m INTERVALS)
- EXISTING MINOR TRIBUTARY
- PROPERTY LINES
- T — TELUS CABLE
- EXISTING ROADS
- EXISTING CONCRETE RUBBLE (SEE NOTE 3)
- FLOW DIRECTION
- XX — EXISTING BARBED WIRE FENCE
- XX — PERMANENT BARBED WIRE FENCE
- XXX — TEMPORARY BARBED WIRE FENCE
- LAYDOWN AREA
- TOPSOIL AND SEED
- WASTE FILL
- RIPRAP (ZONE 6B)

NOTE(S)

1. ELEVATIONS, STATIONS AND DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. CONTRACTOR TO COORDINATE THE RELOCATION OF TELUS CABLE.
3. DRAINAGE SWALE TO BE 500 mm DEEP, 1000 mm WIDE BED WIDTH, 1V:2H SIDE SLOPES. SWALE TO BE LINED WITH 400 mm THICK SALVAGED RIPRAP OVER 200 mm THICK FINE BEDDING (ZONE 5A). LOCATION TO BE DETERMINED IN THE FIELD.

REFERENCE(S)

1. COORDINATES IN NAD83 UTM ZONE 12.
2. EXISTING GROUND DEVELOPED FROM 2018 LIDAR PROVIDED BY MPE, FILENAME 'BE_Z12_0260E_05464N.DWG'.

ISSUED FOR
TENDER

0 50 100
1:1,000 METRES

AUTOCAD FILE No. 1895260DW024.dwg TENDER No. TND 0021462

THINK SAFETY FIRST

DEPARTMENT BAR CODE

THIS DRAWING MAY HAVE BEEN REDUCED.
ALL SCALE NOTATIONS INDICATED (i.e. 1:1000 etc)
ARE BASED ON 22" X 34" FORMAT DRAWINGS

MPE Engineering Ltd. / GOLDER

MPE JOB NO. 1716-063-00

PERMIT TO PRACTICE
Golder Associates Ltd.
PERMIT NUMBER: P5122
The Association of Professional Engineers and Geoscientists of Alberta

DESIGNER: ORIGINAL SIGNED AND SEALED BY RONALD KITAGAWA 2020-09-04

CHECKER: ORIGINAL SIGNED AND SEALED BY DENNIS BECKER 2020-09-04

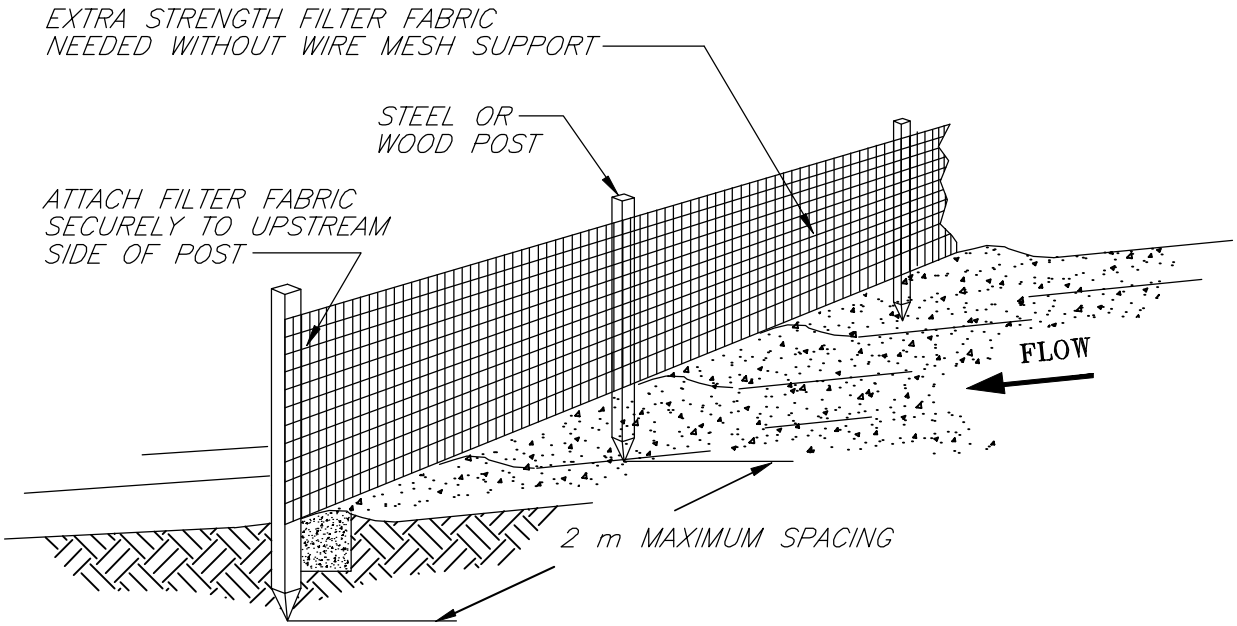
REV	DATE	REVISIONS	BY
0	2020-09-04	ISSUED FOR TENDER	AS

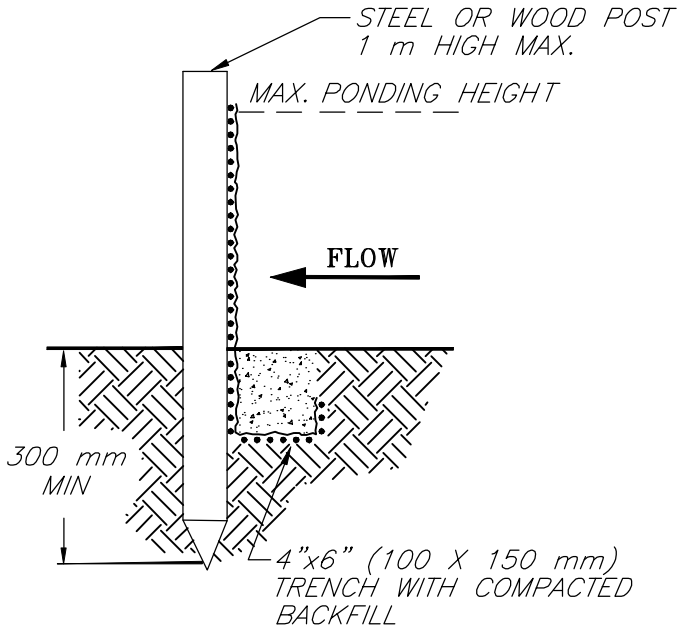
Alberta Transportation

EMERGENCY SPILLWAY AND RELATED WORK
JENSEN DAM FLOOD HANDLING UPGRADES

FUSE PLUG (FP2)
GENERAL ARRANGEMENT

DATE	AEP CAPITAL PROJECT NUMBER	SITE	CONTRACT	SHEET	CONSULTANT DRAWING	TRANSPORTATION DRAWING
2020-09-04	CP 2003 - 00007	50053/70408	0021462	19 OF 39	1895260DW019	51024-P





TRENCH METHOD DETAIL

NOTES:

1. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.
2. INSPECT AND REPAIR FENCE DAILY AND AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN ACCUMULATED SILT REACHES 200 mm.
3. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA WILL NOT CONTRIBUTE SEDIMENT OFF-SITE.
4. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

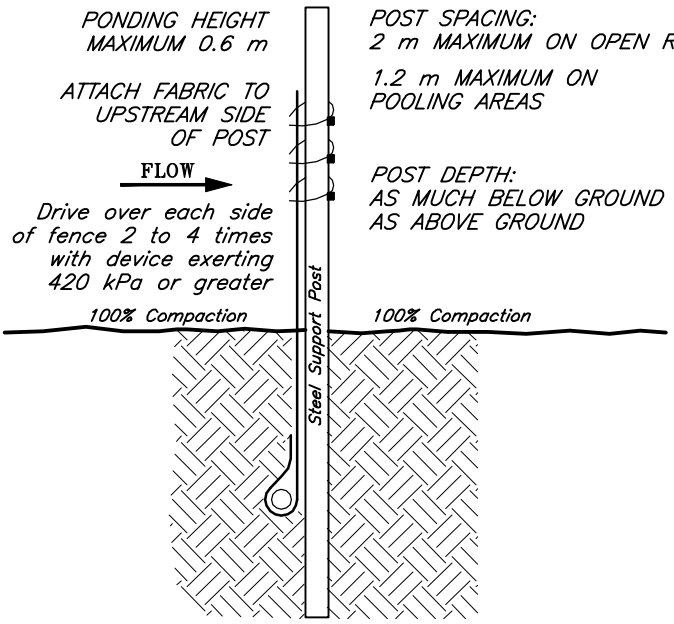
NOT TO SCALE

SILT FENCE

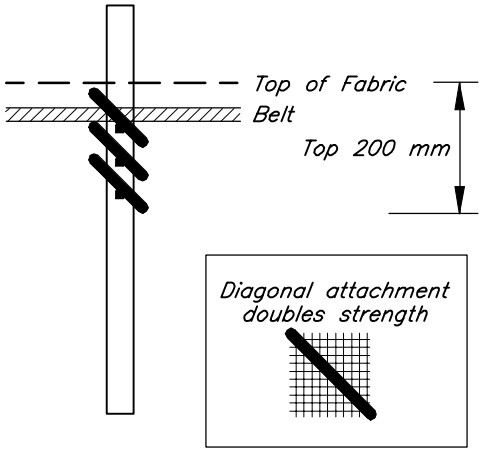
(TRENCH METHOD)

FILE: SILTFENC

© 1994 JOHN McCULLAH
From: Salix-Applied Earthcare - EROSION DRAW 3.0



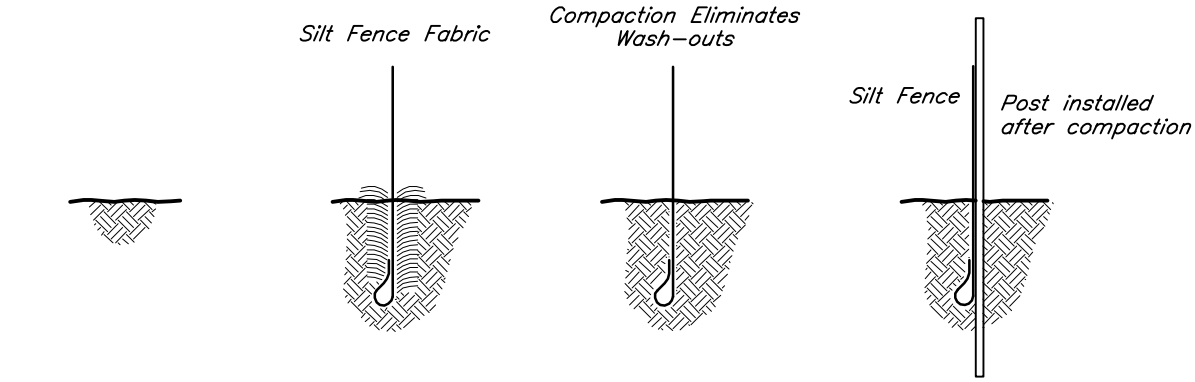
NO MORE THAN 0.6 m OF A 0.9 m FABRIC
IS ALLOWED ABOVE GROUND



ATTACHMENT DETAILS:

- Gather fabric at posts, if needed.
- Utilize three ties per post, all within top 200 mm of fabric.
- Position each tie diagonally, puncturing holes vertically a minimum of 25 mm apart.
- Hang each tie on a post nipple and tighten securely.
- Use cable ties (50 lbs) or soft wire.

MECHANICAL (SLICING) METHOD



a) Before Installation

b) During fabric insertion. Disrupted soil.

c) After Compaction. Greater stability.

d) Completed Installation

MECHANICAL (SLICING) METHOD INSTALLATION SEQUENCE

NOTES:

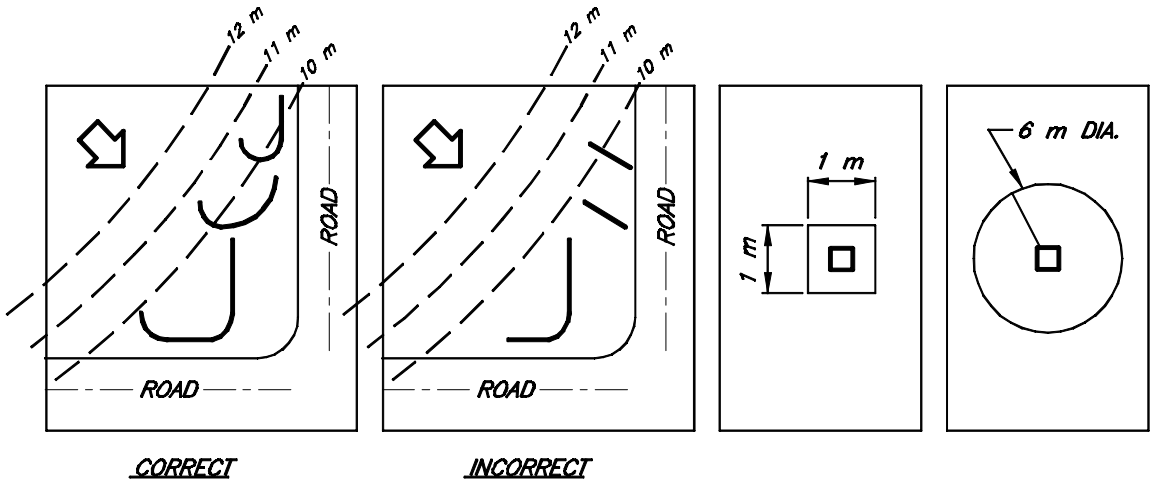
1. INSTALLATION MACHINE MUST ALLOW CONTINUOUS SLICING AND EMBEDMENT OF GEOTEXTILE INTO GROUND WITH MINOR GROUND DISTURBANCE.
2. INSTALLATION MACHINE TYPES WILL VARY WITH MANUFACTURER.
3. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT TO SCALE

SILT FENCE

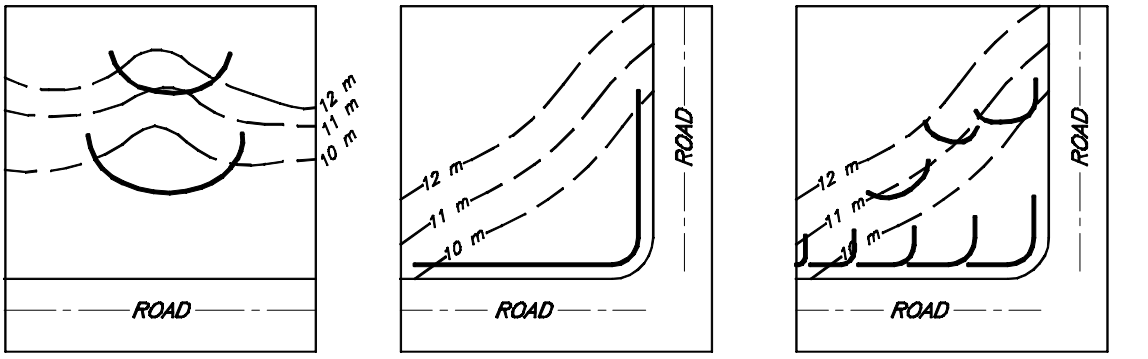
(MECHANICAL METHOD)

SOURCE: CARPENTER T. 2000



"J" CONFIGURATION

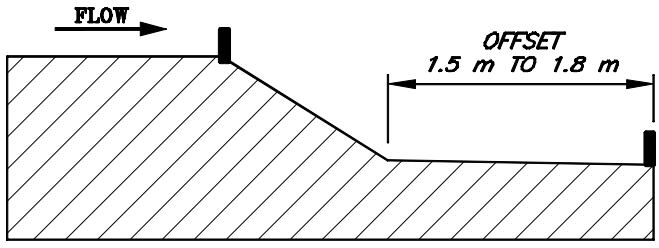
SILT FENCE BARRIER AT STORM INLET



"SMILE" CONFIGURATION

AVOID LONG INSTALLATION

COMBINATION OF "SMILE" AND "J" CONFIGURATIONS



LOCATION AT TOP AND BOTTOM OF SLOPE

NOT TO SCALE

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

SOURCE: CARPENTER T. 2000

SILT FENCE
(CONFIGURATION PLAN)



Straw Roll – examples
(will follow BMP 28a)

Fibre Rolls and Wattles

a) Straw Roll
b) Wattles (Live Fascine)

Sediment Control and Erosion Control

B.M.P. #28
(a & b)

Description and Purpose

- Straw roll consists of bundled straw (or natural fibre) wrapped in photo-degradable open-weave plastic netting staked into the soil along slope contours as a grade break to reduce erosion potential
- Wattles consist of bundled live fascine to stake into the soil along slope contours
- Fibre rolls are installed across slope contours as a grade break to reduce erosion potential by reducing overland flow velocities
- Normally life stake can be installed to anchor the Fibre Rolls and Wattles to provide deep root vegetation with potential favourable moisture retention provided by Fibre Roll
- Fibre rolls and wattles also capture sediment, organic matter, and seeds carried by runoff

Applications

- Temporary measure
- May be used on slopes stable enough to support vegetation (steep, confined, slopes and channel banks with gradients greater than 1H:1V may have low success potential)
- May be used on slopes and channel banks with adequate sunlight, moisture, and wind protection to support vegetation
- May be used along long slopes as a grade break to shorten slope length between line of fibre rolls at different contour elevations
- May be used as grade breaks, where slopes transition from flatter to steep gradients
- May be used on lake shores as wave break to assist in revegetation and stabilization of banks
- Can be used in conjunction with live staking as bioengineering measure

Advantages

- Grade break measure to lower sheet and rill erosion potential
- Can be used on slopes too steep for silt fences or straw bales sediment barriers
- In time, plastic netting will degrade due to the sunlight and straw will degrade and be incorporated into the soil
- Primary purpose is erosion control, however fibre rolls due provide some sediment control

Fibre Rolls and Wattles

a) Straw Roll
b) Wattles (Live Fascine)

Sediment Control and Erosion Control

B.M.P. #28 (a & b)

Limitations

- Designed for low sheet flow velocities
- Designed for short slopes with a maximum gradient of 1H:1V
- May be labour intensive to install
- Few precedents as this measure is generally not used on AT construction projects
- Straw rolls have short life span due to natural degradation
  - Usually only functional for two seasons
- Susceptible to undermining and failure if not properly keyed into the soil
- Labour intensive maintenance may be required to ensure rolls are in continuous contact with the soil, especially when used on steep slopes or sandy soils

Construction

(Waiver: For guidance only. A site specific design is required from the designer/engineer)

- Prepare slope face and remove large rocks or other deleterious materials
- Excavate small trenches a minimum of 0.15 m deep and 0.15 m wide across the width of the slope, perpendicular to slope direction, starting at the toe of the slope and working upwards towards crest of slope
- Space trenches a maximum of 3 to 8 m apart along the slope incline, with steeper slopes having trenches spaced closer together
- Place fibre rolls into trench ensuring continuous contact between fibre roll and soil surface
- Butt-joint adjacent fibre roll segments tightly against one another
- Use a metal bar to make pilot hole through middle of the fibre roll a minimum depth of 0.3 m into underlying soil
- Pilot holes should be spaced a maximum of 1 m apart
- Secure fibre roll to soil using wooden stake or other appropriate anchor; live stake may be used as alternate anchor
- Place soil excavated from trench on upslope side of fibre roll and compact to minimize undermining of fibre roll by runoff
- Seed the soil along the upslope and downslope sides of the fibre roll to promote vegetation growth

Construction Considerations

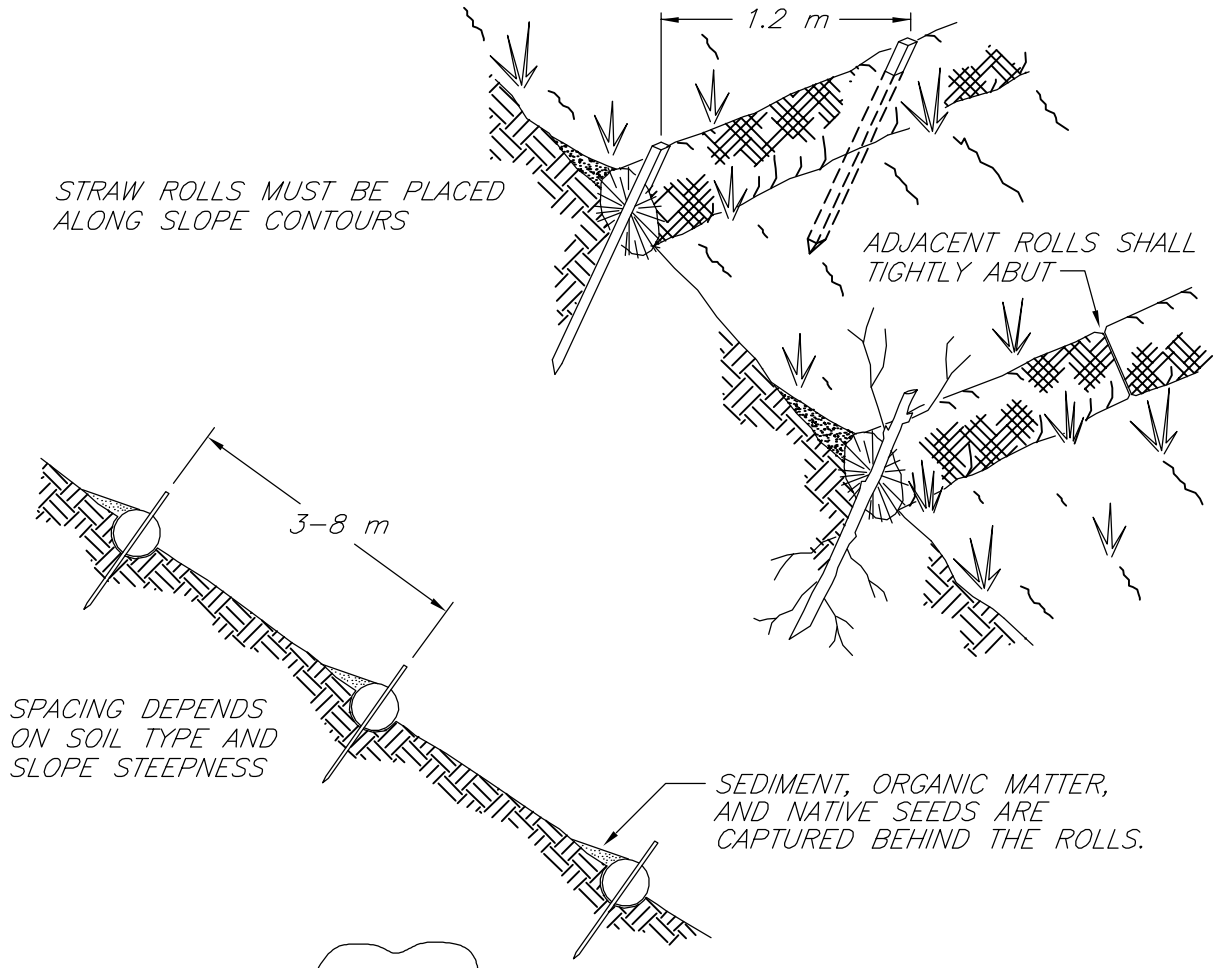
- Use live stakes in place of wooden stakes
- If the slope soil is loose and uncompacted, excavate trench to a minimum depth of 2/3 of the diameter of the fibre roll
- For steep slopes, additional anchors placed on the downslope side of the fibre roll may be required

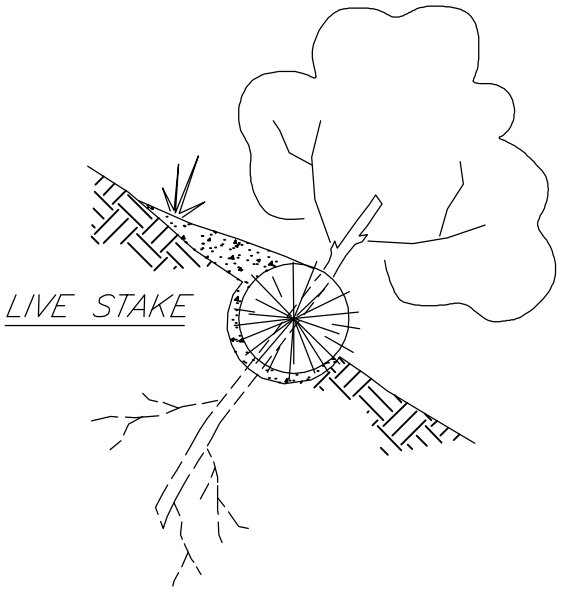
Inspection and Maintenance

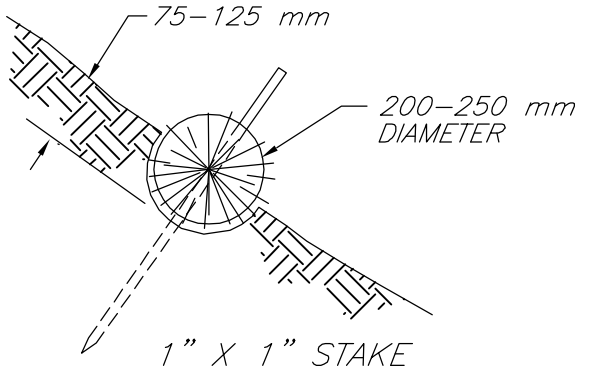
- Inspect structures at biweekly intervals or after significant storm events (1:2 year storm and/or 40 mm rainfall in 24 hours)
- Areas damaged by washout or rutting should be repaired immediately
- Additional stormwater control measures should be considered for rilling areas damaged by runoff

Similar Measures

- Synthetic permeable barriers







NOT TO SCALE

NOTE:

1. STRAW ROLL INSTALLATION REQUIRES THE PLACEMENT AND SECURE STAKING OF THE ROLL IN A TRENCH, 75–125 mm DEEP, DUG ON CONTOUR. RUNOFF MUST NOT BE ALLOWED TO RUN UNDER OR AROUND ROLL.
2. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

STRAW ROLLS

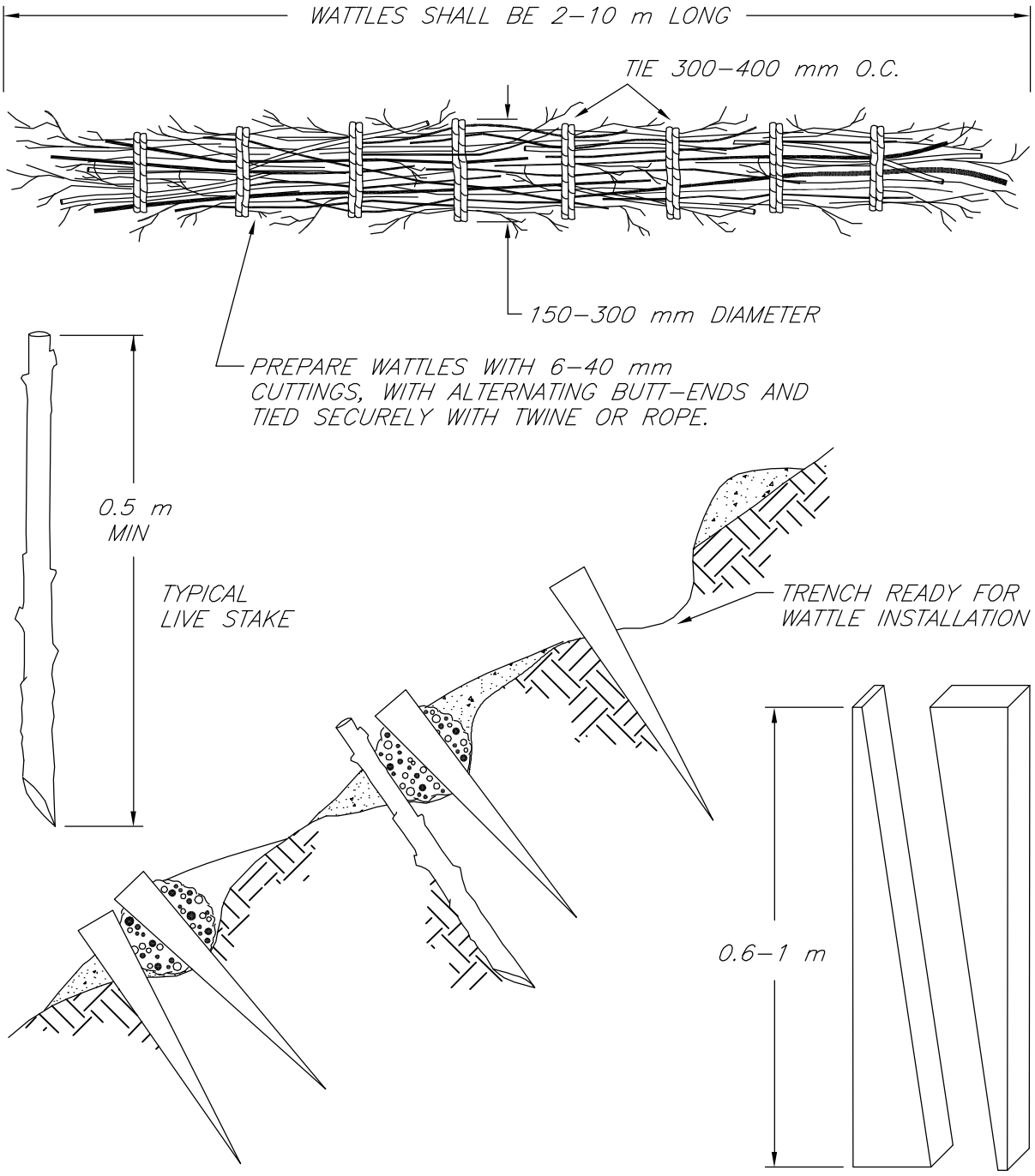
FILE: STRWROLL

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Alberta TRANSPORTATION

B.M.P. #28a
Typical Section

0104–01–23211/BMP28A–A.dwg



NOTES:

1. HARVEST AND INSTALL WATTLES DURING DORMANT SEASON.
2. INSTALL WATTLES ON SLOPE CONTOURS.
3. ALL WORK PROCEEDS FROM THE BOTTOM OF THE SLOPE TO THE TOP.
4. FILL OR PARTIALLY COVER WATTLE WITH SOIL FROM SLOPE OR TRENCH ABOVE.
5. COMPACT AND WORK SOIL INTO COMPLETED WATTLES.
6. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

TYPICAL CONSTRUCTION STAKE
SAW 2X4 (100X50 mm) LUMBER
ON DIAGONAL

NOT TO SCALE

WATTLE
(LIVE FASCINE)

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FILE: WATTLE

Alberta TRANSPORTATION

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APPENDIX D

Care of Water Plan

TND0021462 - EMERGENCY SPILLWAY AND RELATED WORK JENSEN DAM FLOOD HANDLING UPGRADES

November 17, 2020

Revision 2

Prepared for: Greenfield Construction Ltd.

Prepared by CORE Environmental

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Revision Summary

Description	Page	Revision Date	Revision By
Original Issue		October 19, 2020	CORE / Greenfield
Update per Consultant Comments and Changed Environmental Site Conditions		November 12, 2020	CORE / Greenfield
Add Decontamination Protocol as Appendix		November 17, 2020	CORE / Greenfield

1.0 Project Overview

The Alberta Ministry of Transportation awarded the Jensen Dam Flood Handling Upgrades (the Project) to Greenfield Construction Ltd. (The Contractor) for construction of a new Emergency Spillway and Related Work which is at Section 34, SW 27 and N1/2 22 of Township 4, Range 22, West of the 4th Meridian, at Jensen Dam approximately 13km south of Magrath, Alberta in the County of Cardston.

The main items of work of this Contract include the following:

- **Construction of an Access Road**: including excavation; placement of Impervious Fill (Zone1A); removal and disposal of culverts; supply and installation of culverts, supply and placement of granular fill materials and riprap; removal and disposal of barbed wire fence; and supply and installation of barbed wire fence.
- **Construction of Fuse Plug No.1 (FP1)**: including excavation, placement of Impervious Fill (Zone 1A) and Random Fill (Zone 2A); supply and installation of articulated concrete block (ACB); supply and placement of granular materials and riprap; removal and disposal of barbed wire fence; and supply and installation of barbed wire fence.
- **Construction of Fuse Plug No.2 (FP2)**: including excavation, placement Impervious Fill (Zone 1A) and Random Fill (Zone 2A); supply and installation of articulated concrete block (ACB); supply and placement of granular materials and riprap; removal and disposal of barbed wire fence; and supply and installation of barbed wire fence.
- **Main Canal Erosion Protection**: including excavation, supply and placement of Random Fill (Zone 2A); and supply and placement of granular materials and riprap
- **Supply and Installation of Domestic Turnout**
- **Supply and Installation of Water Level Transmitter LT101.**

1.1 Project Schedule

The preliminary construction schedule is shown in Appendix F. The Project is anticipated to commence on approximately October 21, 2020 and be completed by May 30, 2021. Working hours will be during daylight hours five days per week with the possibility of weekend work, weather permitting.

The reservoir outlet canal and main canal are used from April 01 to November 01 of any year. The Full Supply Level (FSL) of Jensen Reservoir is 1072.64. The reservoir level will be near or at full supply level (FSL) from April 01, 2020 to November 07, 2020. Alberta Environment and Parks (AEP) Water Infrastructure Operation Branch (WIOB) will lower the reservoir water level to the Winter Operating Level (WOL) of 1066.80 m on November 09, 2020. AEP WIOB will start filling the reservoir on April 01, 2021.

2.0 Care of Water Environmental Sensitivities

The Project will require works to be completed adjacent to the Jensen reservoir, and within the reservoir outlet canal and main canal. The main canal is separated from the Jensen reservoir and reservoir outlet canal by the Taylor Coulee Chute. The Taylor Coulee Chute allows the downstream movement of fish, except during times when water levels are low enough that water fails to flow over the chute. As of November 12, 2020, water is not flowing through Taylor Coulee Chute due to low water levels and winter weather conditions.

The following sensitivities related to Care of Water have been assessed:

Fish species

The Jensen Dam and Reservoir are part of the Waterton-St. Mary Headworks system which is owned and operated by AEP. This system conveys water for the Magrath, Raymond, Taber, and St. Mary River Irrigation Districts, as well as for municipal, domestic, industrial, and recreational use.

A field survey was completed by Golder on April 22, 2020 to assess fish habitat within the Project footprint. No fish sampling was conducted as species information for the area was determined to be sufficient from the desktop review. A summary of the assessment by Golder is as follows.

- Based on the desktop assessment, FWMIS data indicate 11 species of fish occur within Jensen Reservoir, reservoir outlet canal, and the main canal including five (5) sportfish, two (2) non-sport fish, and four (4) forage fish. Two species of which are listed are listed as potentially being at risk provincially.

- Rainbow Trout (*Onchynchus clarki*) and Walleye (*Sander vitreus*) were historically stocked into the Jensen Reservoir. Rainbow Trout were stocked in the early 1950s, while Walleye were stocked in 1990-1991 (AEP 2020a). There was also a commercial sportfish fishery in Jensen Reservoir between 1989-2009. The only instance of Rainbow Trout being captured during all documented surveys was during the fishery in the year 2000 (AEP 2020a). Native stocks of Rainbow Trout are listed as At Risk provincially (AEP 2020b) and the Athabasca River population of Rainbow Trout are considered Endangered by COSEWIC with a recommendation for listing under the SARA (GOC 2020b). However, Rainbow Trout within the Jensen Reservoir are introduced, and introduced stocks of Rainbow Trout in Alberta are Secure (AEP 2020b). Furthermore, the Jensen Reservoir is within the Oldman River watershed and these fish would not be considered within the Athabasca River population.

- Spoonhead Sculpin (*Cottus ricei*) is listed as May Be at Risk provincially (AEP 2020b) due to it occurring only in small populations. The species has declined in one area downstream of the Dickson Dam on the Red Deer River, presumably as a result of habitat degradation, while data are lacking on other populations.

A fish capture and release program has been incorporated into Greenfield's construction plans to prevent the death of fish as a result of construction operations. See Appendix G for details regarding Greenfields fish capture and release program for the Project.

Waterbodies

According to Alberta Environment and Parks (AEP) Code of Practice (COP) maps, Pothole Creek drains into the Jensen Reservoir from the south and is a Class C waterbody with a Restricted Activity Period (RAP) of April 1 to May 31, while the Jensen Reservoir (including the reservoir outlet canal and main canal) is unclassified. (Figure 1.) However, the RAP of April 1 to May 31 would be considered appropriate for the Jensen Reservoir and the associated reservoir outlet canal and main canal due to the reservoir being the result of the damming of Pothole Creek.

No wetlands will be impacted by the Project.

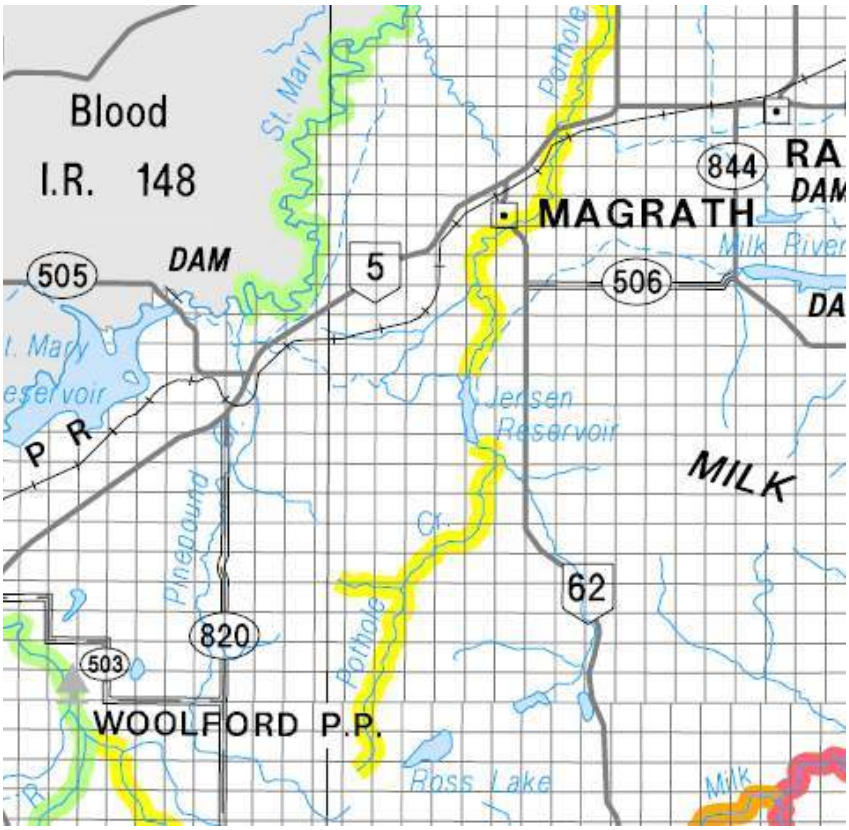


Figure 1. AEP COP Map for the project area.

Whirling Disease

The Project falls within the Whirling Disease Decontamination Risk Yellow Zone, which is rated as high to moderate risk. (Figure 2.) Greenfield shall follow AEP's whirling disease decontamination protocol for watercraft, equipment, material and personal used with in the bed or banks of waterbodies (Appendix I). In addition to whirling disease the protocol will minimize the spread of other fish diseases and aquatic invasive species.

AEP's whirling disease decontamination protocol can be found at the following link:

https://www.alberta.ca/decontamination-protocol-engagement-for-industry-and-construction.aspx



Figure 2. AEP Whirling Disease Decontamination Risk Zone Map.

Soils

The Project ERA indicates that construction will likely result in soil erosion, compaction or loss of soil structure, and admixing of topsoil and subsoil. The recommended soil mitigations found within the Project ERA seek to minimize these potential effects. Despite mitigations, the loss or alteration of landforms and soils capability to support healthy ecosystems is expected to occur. If standard best management practices are carried out, then construction is not anticipated to result in increased landform instability despite the presence of steep slopes within the proposed Construction Limits (1 to 70 percent [%]).

3.0 Care of Water Regulatory Requirements

Table 1- Care of Water Regulatory Requirements

Name of Permit or Approval	**Conditions**
Provincial	
Water Act Approval # 5048049	Water Act Approval attached as Appendix A
Fish Research License # 20-5020	License Appended as Appendix B
Federal	
DFO Letter of Advice 20-HCAA-01094 issued under the *Fisheries Act*	Letter of Advice attached as Appendix C

4.0 Design Care of Water Provisions

4.1 Site Overview

The proposed Project is located along the main Reservoir outlet canal between the Jensen Reservoir and Bridge 70408. (Figure 3.) The landscape within the proposed construction limits is generally undulating to hummocky (2-9% slopes) with limited areas of high relief (up to 70% grade) recorded adjacent to the current reservoir.



Figure 3. Site Overview

Fuse Plug 1 Access Road

There is an undeveloped road allowance from Range Road 222 to the proposed location of Fuse Plug 1 (Figure 4.) A trail has been developed by the local landowners to provide access to the adjacent lands. The trail follows the topography and has 600 mm and 300 mm culverts to provide access across the existing watercourses. The two (2) culverts were observed to be

damaged. The trail is proposed to be improved to provide a construction access road for the equipment and materials required for the construction of Fuse Plug 1. It is proposed to replace the two (2) damaged culverts and grade and place road gravel along the trail alignment to improve trafficability. A barbed wire fence is proposed along the south and north boundary of the road allowance to restrict access to the adjacent lands.



Figure 4: Undeveloped road allowance looking west towards the Main Canal.

Fuse Plug 1 Project Area

A coffer dam is required at the entrance of the Reservoir outlet canal to prevent water from flowing out of the Reservoir; and two additional coffer dams are proposed to manage water and isolate the work area from the downstream canal. (Figure 5, 7 and 8.) Work in the area of FP1 involves the removal of deteriorated riprap (existing concrete rubble) along the left and right banks of the Reservoir outlet canal (Figure 7 and 8.), temporary soil stripping and stockpiling, excavation of approximately 170,000m3 of material near the Reservoir outlet to lower the ground elevation to the Reservoir full supply level of 1072.64m (Figure 9.), placement of excavated material in the designated fill placement area, installation of rip rap, and installation of Fuse Plug 1.

The location of Fuse Plug 1 (FP1) is on the right bank of the reservoir outlet canal, approximately 400 m downstream of the inlet from Jensen Reservoir. The existing ground on the left side of the inlet of the reservoir outlet canal ranges from elevation 1,066.78 m to approximately 1,077.00 m. The land on the left bank will be lowered to the FSL (1,072.60 m), to allow the flood flow to pass over the land and in the direction perpendicular to the alignment of the reservoir outlet canal and FP1.

The topsoil and subsoil are proposed to be temporarily stockpiled in the SW27-4-22-W4M. The estimated quantity of excavation to lower the land in the SW27-4-22-W4M and NW22-4-22-W4M to the reservoir FSL (1,072.64 m) is approximately 170,000 m3. Riprap will be placed along the reservoir shoreline and gravel armour on the banks of the reservoir outlet canal. The land will be reclaimed with the placement of topsoil and seed. The reclamation area is approximately 6ha.



Figure 5. Reservoir outlet canal looking upstream, Nov 10th, 2017



Figure 6. Concrete rubble placed along right shoreline for erosion protection to be removed and replaced with riprap, looking upstream.



*Figure 7. NW27-4-22-W4M, Area proposed to be excavated to lower the ground elevation to the reservoir FSL **(1072.64 m)**. The concrete rubble placed along left bank for erosion protection to be removed and replaced with riprap.*



Figure 8 - Reservoir outlet canal looking downstream. Location of fuse plug (FP1) in the right bank. Area on the left side is the proposed topsoil stockpile area.



Figure 9 - Proposed disposal area of the excavated material along backslope of reservoir outlet canal, look upstream

Fuse Plug 2 Project Area

Fuse plug two (FP2) is located on the west bank of the canal approximately 200m upstream of bridge 70408 and downstream of the Taylor Coulee Chute. (Figure 10.) Works at the FP2 project area consist of erosion protection works (removing concrete rubble and replacing with rip rap), excavation and grading, construction of the Fuse Plug 2, reclamation and seeding, and barbwire fencing.



Figure 10- Main canal road embankments at the proposed location of FP2

4.2 Temporary Care of Water Measures

The design of temporary care of water measures includes, cofferdams, temporary erosion and sedimentation controls, pumping, fish salvage, turbidity monitoring and other protective measures to help maintain dry conditions during construction and protect the aquatic environment. All physical measures listed below will be removed and reclaimed once construction is complete.

4.2.1 Cofferdams

A cofferdam will be constructed upstream of FP1 prior to construction in order to isolate the reservoir outlet canal from the reservoir. (Figure 11.) The cofferdam will be limited to a height of 3.8 m or the sill of the Operation Spillway (1070.55 m).

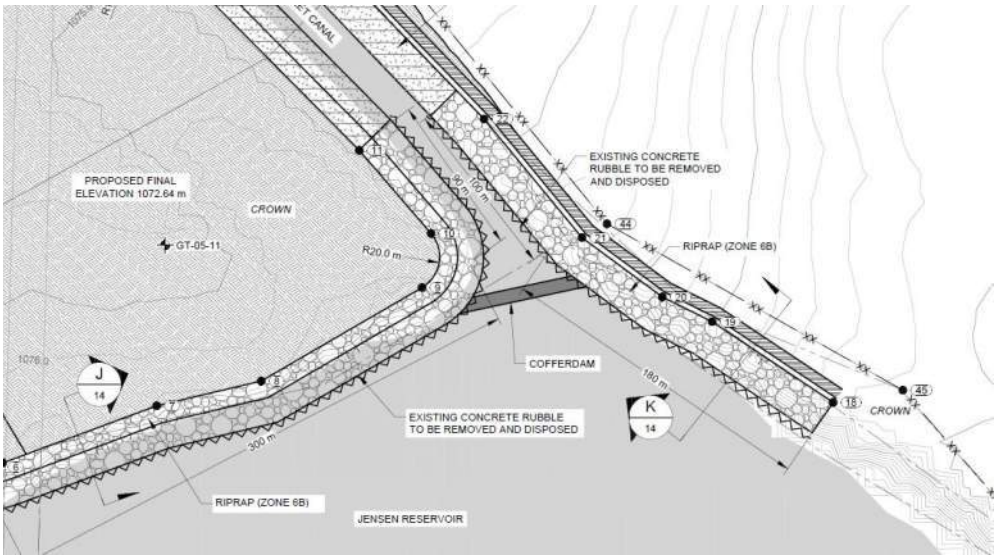


Figure 11 - Coffer Dam Location at entrance of Reservoir Outlet Canal

Two additional coffer dams will be installed at the FP1 project area to manage water and isolate the work area from the downstream canal. (Figure 12.)

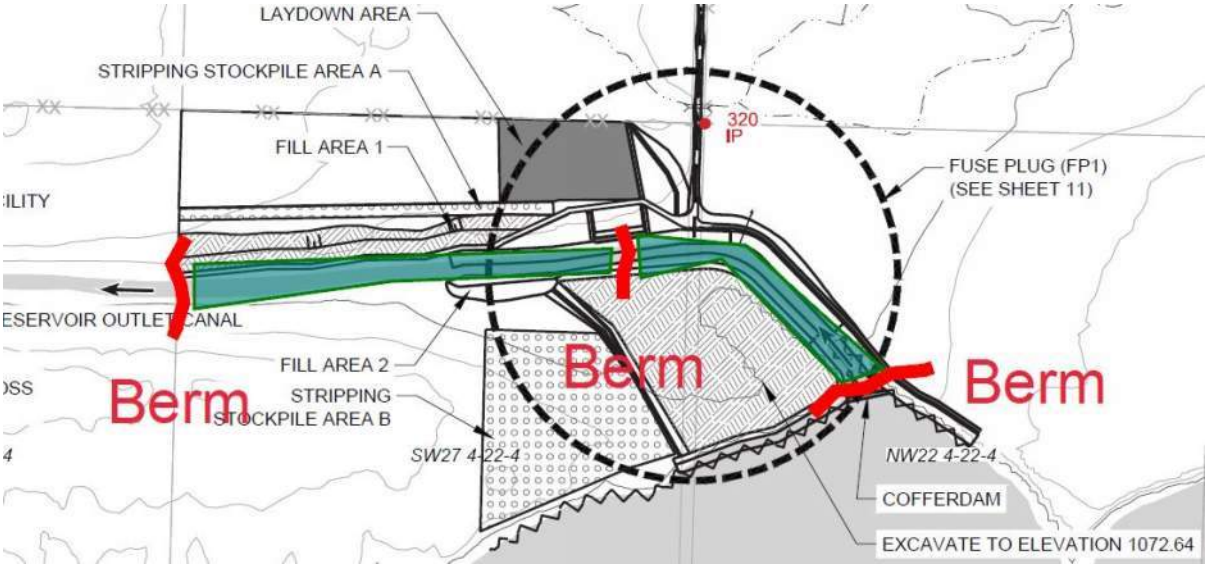


Figure 12- Location of Coffer Dams at FP1 project area.

An additional coffer dam will be installed at the FP2 project area and utilized in combination with channel dewatering to execute the project to design specs (Figure 13).

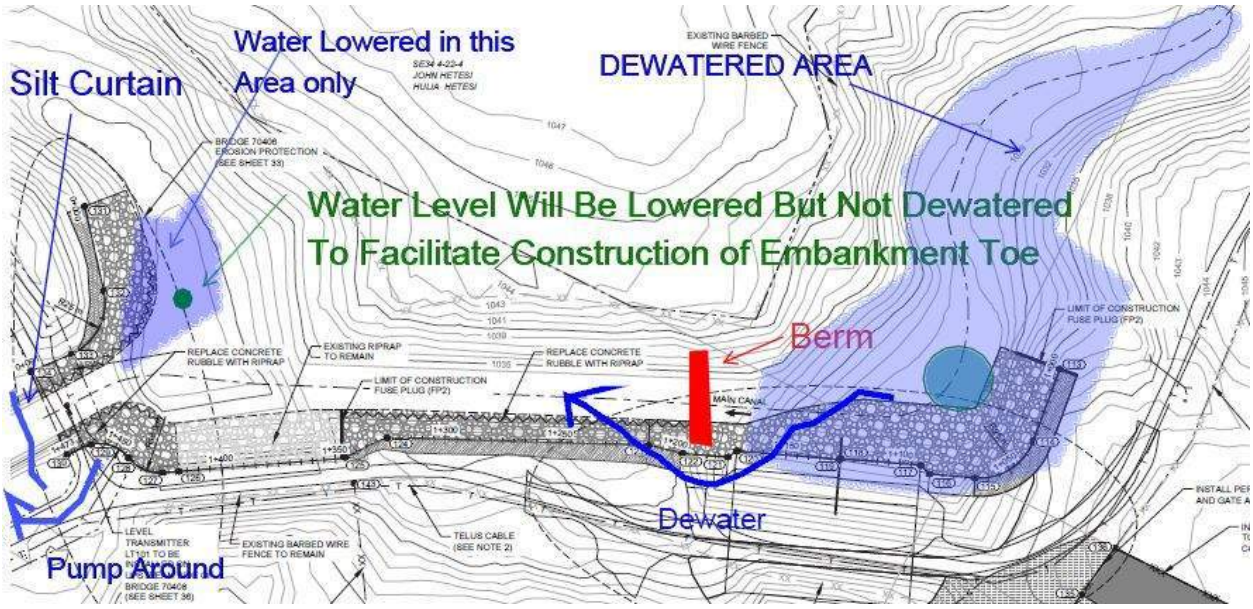


Figure 13- Coffer Dam, Pumping and Dewatering at FP2

All Cofferdams for the project shall be constructed to meet Project regulatory approval conditions.

In addition, Greenfield plans to install turbidity curtain on both side of each coffer dam, where feasible, to assist with installation / removal, and overall sediment containment to prevent sediment from being transported down stream.

4.2.2 Silt Curtains

Water within the canal channel is expected to be frozen or very low flow during construction but may fluctuate based on weather conditions (i.e. chinooks, precipitation, spring thaw, etc.). Silt curtains will be installed on the downstream end of the FP1 and FP2 work areas to isolate the work area from the downstream canal channel. The silt curtains will filter any water that may flow through the work areas and will also prevent fish from entering the isolation. The number of silt curtains installed across the canal channel shall be increased, as needed, to manage turbidity. Silt curtains will only be effective if flows in the canal channel are very low. Additional pumping resources shall be added as mitigation should excess flow cause the silt curtains to fail.

4.2.3 Dewatering and Water Level Lowering

Any water that will be directly impacted by construction activities shall be dewatered to create dry working conditions for construction.

Water quality shall be tested prior to dewatering. Only water that is of similar or better quality as background samples shall be pumped directly into the canal channel. Any water that is found to be silt-laden shall be pumped into a vegetated area / silt bags a minimum of 30m from the canal channel to manage turbidity.

See Care of Water Drawings in Appendix D for Greenfield's plans to dewater and lower water levels to accommodate construction operations.

4.2.3 Pumps and Hoses

Three-inch (3") electric submersible pumps, or similar, will be used to dewater the isolated work areas. All pump intakes shall be screened with a maximum mesh size of 2.54 mm to prevent entrainment or impingement of fish (Fisheries and Oceans Canada, 1995). An adequate supply of hose (~400m) shall be available to dewater the furthest reaches of the work area. A spare pump will always be required to be kept on site in case of mechanical failure.

Spill trays and/or drip clothes shall be placed under the pump generators while in operation to prevent any spills from entering the water body and/or local ecosystem. Fuel required for refuelling shall be stored 100m from all watercourses and waterbodies.

4.2.4 Erosion and Sediment Control

Once coffer dams are installed, the FP1 and FP2 work areas will be largely self-contained from the surrounding environment and works area will be dewatered to maintain dry working conditions. Temporary erosion and sedimentation controls will be installed in the following locations to prevent sediment from impacting downstream areas.

1. Silt fence installed around the base of all soil stockpile locations
2. Silt curtains will be used across the canal downstream of all work areas to contain sediment within the work area.
3. Silt fence shall be installed as perimeter control along any unstable slopes adjacent to the Jensen reservoir, to prevent sediment from entering the reservoir.

Greenfield shall follow the Erosion and Sediment Control Plan included within the Project ECO Plan.

4.2.5 Fish Passage

It will not be possible to maintain fish passage during construction due to installation of coffer dams and channel dewatering required to complete the project. Low water conditions are natural at this time of year; often resulting in dry canal bed conditions and trapped fish along the length of the outlet canal channel. Greenfield shall follow the conditions of Water Act approval 5048049 (Appendix A) and DFO Letter of Advice 20-HCAA-01094 (Appendix C).

4.3 Water Entering the Site

Precipitation, causing runoff, chinooks causing rapid melting, spring break up, or a sudden increase in the level of the reservoir are the most likely source of water entering the site.

Work is planned during the fall and winter months when the reservoir is at low water levels; however, rapid snow melt and heavy precipitation has potential to increase reservoir levels and runoff into the work area. In the case of a high precipitation event the pumps and hoses, as listed above, will be available to help maintain dry working conditions. Should site conditions not be suitable for construction then work shall stop immediately and only commence once site conditions are suitable.

4.4 Fish Salvage

A fish salvage will be completed as outlined within the November 11, 2020 Fish Rescue and QAES Memos attached as Appendix G and H.

All fish salvage activities require a Fisheries Research License and should be conducted by qualified personnel.

Fish capture and release will follow Alberta Transportation's supplemental specification 6.15 Fish Capture and Release best management practices (Alberta Transportation, 2008).

4.5 Emergency Flood Operation Plan

Please refer to Appendix E memorandum entitled Jensen Dam – Emergency Spillway, Emergency Flood Operation Plan During Construction which has been provided by the Project Consultant.

5.0Turbidity Control Execution Plan

6.0 Review

This plan was completed by CORE Environmental and reviewed and stamped by CVL Engineers Inc. All information contained within was provided by Greenfield Construction Ltd. and deemed to be accurate and complete. No warranties expressed or implied are made within. This report was reviewed and stamped for the usage of Greenfield Construction Ltd. and may not be relied upon by other third parties without the written consent of CORE and CVL.

The plan presents information available at the time of writing and instructions provide by Greenfield Construction Ltd., as well as best management practices and provincial and federal regulations effective at the time of writing.

Plan Reviewed by Michael Oleskiw, P.Eng.

Turbidity Monitoring Plan

for

Jensen Dam Flood Handling Project

Prepared for:

Greenfield Construction Ltd.

Prepared By:

RIDGE Environmental Planning Ltd.

NOVEMBER 2020

Monitoring Plan – Jensen Dam Flood Handling Upgrade Project

Instream construction works have the potential to disturb and re-suspend bed or bank sediments which are transported downstream, increasing turbidity above background conditions.

A water quality monitoring program has been developed for this project and is described below.

Water quality monitoring is intended to be completed during instream activities such as coffer dam construction or activities where flowing water is presents. The intent is to ensure construction activities are completed in isolation and/or away from flowing water to minimize potential downstream impacts or negative impacts on the aquatic environment.

A relationship between turbidity (measured as NTU) and total suspended solids (TSS; mg/L), as per Alberta Transportation's guide, has been completed for the Project. The turbidity-TSS regression has been calculated as:

$$y = 1.7813 \text{ x}$$

Where y is TSS and x is NTU, as measured from the turbidity meter. The relationship has been provided below, with lab results provided as an attachment.

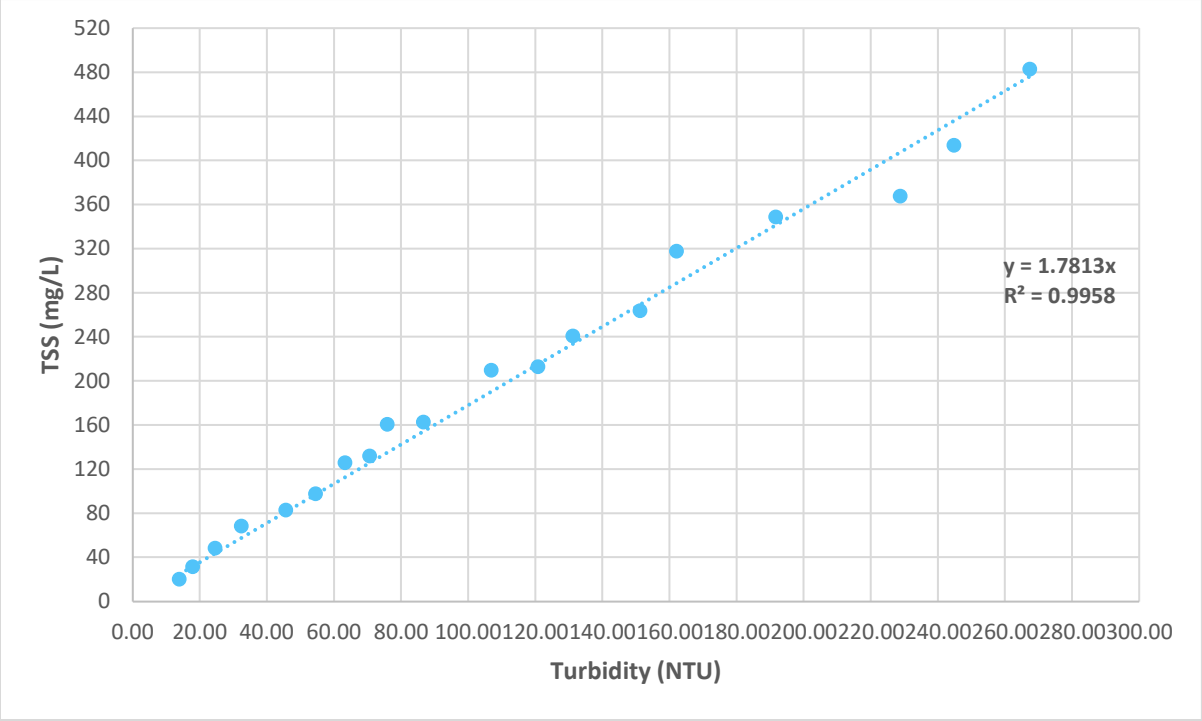


Figure 1: TSS to NTU relationship.

Frequency of Water Quality Monitoring

Water sampling for background conditions should occur 30 minutes prior to daily construction activities until 30 minutes after construction activities have been completed. Compile all sampling information in a daily report.

Sampling frequency is activity-dependent and summarized in **Table 1.**

The monitoring plan will be implemented during activities where water will be discharged below the downstream Project limits. Prior to the commencement of instream activities, the downstream Project will be checked to the extent of the flow within the Projects area. Based on where the extent of flow will determine the implementation of water quality monitoring.

Table 1: Frequency of Sampling – when required as per the plan

Site Condition	Monitoring Frequency
Instream Construction Activities and Accidental Occurrences	• During construction hours, sample at a minimum of once every hour at all compliance transects. • If an exceedance or plume is observed, sampling shall be done within the plume until turbidity values return to within guidelines for two consecutive sampling events. • No sampling events shall occur during Accidental Occurrences until it safe to do so.
Isolated Construction Activities	• When the Contractor is working within site isolation, samples will be taken at all transects at three-hour intervals, during construction hours. • If samples results have not exceeded 5 mg/L above background levels for five consecutive active construction day, the sample frequency may be reduced to a minimum of twice per day, as directed by the Consultant.

Compliance Point Location

Locations of the background and Compliance Points are provided in **Table 2**. The average mean wetted width downstream of the work is approximately greater than 10 m. Downstream sampling distances may be adjusted to ensure the Zone of Impact is sampled adequately. The Zone of Impact is defined as the area where 90% of the suspended discharged as a result of instream disturbances will be deposited.

The compliance sampling stations will be based on the current canal conditions (i.e. where water is present within the canal) at the time of construction. The approximate compliance point (CP 1) is showing in **Figure 1**. All compliance points will be documented. Site monitoring locations will be determined in the field based on current conditions



Samples will be collected at 25%, 50% and 75% of wetted width at each transect when possible. Site conditions (i.e. frozen conditions) will be taken into consideration and may impact the effectiveness of the implementation of the monitoring plan. Safety is paramount - sampling will not occur in unsafe locations or will be completed under unsafe conditions.

Table 2: Location of Compliance Testing

Background	Downstream Compliance Point Distance 1	Downstream Compliance Point Distance 2	Downstream Compliance Point Distance 3
upstream of instream disturbance	30 m downstream of work area	60 m downstream of work area	90 m downstream of work area

Notes: In the event that a visually conspicuous plume exists, turbidity will be measured at various locations across the watercourse, in accordance with the following:

- Cease all activities that may have a direct or indirect effect on water quality during all plume occurrences.
- Samples must be taken from the middle of the plume and samples must be taken as close to the source of the plume as possible.
    - Additional samples will be collected to document and track the extent of the plume.
- Monitor at all transects and the plume sampling points as often as feasible (a minimum of an hourly basis) and continue until two consecutive monitoring events show no compliance exceedances.

Maximum Allowable Increase of Turbidity

Visual Limits

In the event a visually conspicuous plume exists, the Contractor shall cease all activities which have the potential to generate sediment in the watercourse.

Compliance Criteria

- To demonstrate compliance with the monitoring plan multiple samples that collected at each site (background and the transects sites) will be averaged to calculate the recorded number used for the Turbidity Monitoring Results spreadsheet The spreadsheet takes the recorded value and automatically calculates the TSS (mg/l) value to show whether levels are within or over compliance level.

Table 3: Location of Compliance Testing

Site Conditions (Background TSS)	Exceedance Levels (TSS in Excess of Normal Background Levels)
TSS < 25 mg/L	• A maximum instantaneous increase of 25 mg/L over background levels at any time. • An average increase of >5 mg/L over background levels for more than 24 hours.
TSS 25 mg/L – 250 mg/L	• A maximum instantaneous increase of 25 mg/L from background levels at any time.
TSS > 250 mg/L	• A maximum instantaneous increase of 10% of background levels at any time.

In the event of an Accidental Occurrence that results in a visually conspicuous turbidity plume that exceeds the monitoring criteria guidelines, the Contractor shall:

- Notify the Consultant immediately,
- Undertake any mitigating actions necessary to comply with the specified compliance criteria,
- Report the event to Alberta Energy and Environment Response line at **1-800-222-6514**.

  - Upon a reportable event a 7-day letter report will be prepared which will be submitted to the Consultant for review prior to submission to AEP.
- If an exceedance occurs during Isolated Construction Activity and a reduced sampling program is in effect, the sampling frequency will be increased until the isolation measures are functioning as designed and turbidity downstream of the project works is within compliance.

Record Keeping and Reporting

- Daily sampling records during Instream Construction Activity and Isolated Construction Activity – report to Minister in a weekly summary format.
- Daily sampling records are kept up-to-date and keep onsite during the period in which the monitoring program is in effect.
- A final report containing all sampling and testing date to be submitted to the Minister upon completion of the Construction Activities.
- The weekly summary report shall include:
  - Brief description of the works and types of construction activities completed during the sampling.
  - Date and time of each sample.
  - Weather conditions at the time of each sample
  - Changes of depth of flow at the upstream transect.
  - Documentation of daily turbidity (NTU) instrument calibration (as needed).
  - Turbidity (NTU) for each sample.
  - Documentation of all non-compliance instances, including the level of exceedance, the duration of exceedance, the mitigation measures taken, verification of the reporting of the exceedance event, and future measures to be taken to avoid or control further exceedances.
  - Description of events or circumstances that may have prevented or hindered completion of the TSS monitoring program.

REFERENCES

CCME. 1999. Canadian Environmental Quality Guidelines. Canadian Council of Ministers of the Environment. Environment Canada. Hull, Quebec; 8 Chapters.

Appendix A – Water Act Approval

#340, 600 Crowfoot Cres. NW, Calgary, AB T3G 0B4
P: 403.648.2772 | F: 403.648.2767 | E: core@coregeomatics.com | www.coregeomatics.com

Alberta Environment and Parks

Approval No: 5048049
Page 1 of 4

APPROVAL
PROVINCE OF ALBERTA
WATER ACT, R.S.A. 2000, c.W - 3, as amended

APPROVAL NO.:	5048049
APPLICATION NO.:	5048048
ACTIVITY LOCATION:	TABLE 1
WATERBODY:	TABLE 2
EFFECTIVE DATE:	October 02, 2020
EXPIRY DATE:	November 01, 2021
APPROVAL HOLDER:	Her Majesty the Queen in Right of Alberta as represented by the Minister of Transportation - Southern Region

Pursuant to the Water Act, R.S.A. 2000, c.W - 3, as amended, an Approval is issued to the Approval Holder, subject to the attached terms and conditions.

Andun Jevne
Designated Director under the Act

Dated : October 02, 2020

TABLE 1 - Activity Location (LLD)

Qtr	Sec - Twp - Rge - Mer
NW	22 - 4 - 22 - 4
NW	34 - 4 - 22 - 4
NE	34 - 4 - 22 - 4
SW	27 - 4 - 22 - 4

TABLE 2

Water Body
JENSEN RESERVOIR

Part 1. ACTIVITY

1.1 Pursuant to the Water Act, R.S.A. 2000, c. W-3, as amended, an Approval is issued to the Approval Holder to commence, continue and discontinue the following activities:

placing, constructing, operating, maintaining, removing, disturbing works, in or on any land, water or water body;

maintaining, removing or disturbing ground, vegetation or other material in or on any land, water or water body;

altering the flow, direction of flow or level of water;

to construct two new fuse plugs downstream of Jensen Reservoir for the purpose(s) of enhancing emergency discharge capacity during major flood events

subject to the attached terms and conditions

Part 2. DEFINITIONS

2.1 All definitions from the Act and the Regulations apply except where expressly defined in this approval.

2.2 In all parts of this Approval:

(a) "Act" means the Water Act, RSA 2000, c. W-3, as amended;

(b) "Director" means an employee of the Government of Alberta designated as a Director under the Act;

(c) "Regulations" means the regulations, as amended, enacted under the authority of the Act;

(d) "Application" means the written submissions to the Director in respect of application number 5048048 and any subsequent applications for amendments of Approval Number 5048049;

Part 3. GENERAL

3.1 The Approval Holder shall immediately report to the Director by telephone, any contravention of the terms and conditions of this approval at 1-780-422-4505.

3.2 The terms and conditions of this Approval are severable. If any term or condition of this Approval is held invalid, the application of such term or condition to other circumstances and the remainder of this Approval shall not be affected thereby.

3.3 The Approval Holder shall not deposit or cause to be deposited any substance in, on, or around the water body that has, or may have, the potential to adversely affect the water body.

3.4 The Approval Holder shall retain a copy of this Approval at the site of the activity.

Part 4. PARTICULARS

4.1 This Approval is appurtenant to the following:

(b) the undertaking described as the installation of two fuse plugs downstream of Jensen Reservoir at NW 22-004-22-W4, NW 34-004-22-W4, NE 34-004-22-W4 and SW 27-004-22-W4 as described in the reports, as specified in 4.2.

4.2 The Approval Holder shall only undertake the Activity in accordance with the following plan(s) and report(s).

REPORTS AND PLANS

Report 5048049-R001 - Jensen Dam Flood Handling Upgrades - MPE Engineering Ltd. - 7 Pages - Dated July 21, 2020

Report 5048049-R002 - Jensen Dam Phase 2 Environmental Risk Assessment - Golder Associates Ltd. - 19 Pages - Dated August 2020

Report 5048049-R003 - Jensen Phase 2 Construction Sequencing - 1 Page

4.4 The Approval Holder shall retain a copy of the report(s) and plan(s) referred to in 4.2 at the site of the Activity at all times while conducting the Activity.

4.5 The Approval Holder shall not undertake the Activity in any manner or use any material that causes or may cause an adverse effect on the aquatic environment, human health, property or public safety.

4.10 The Approval Holder shall not cause or permit any water to enter an intake pipe leading to pumps unless the water has passed through a screen with openings no larger than 2.54 millimetres.

Part 6. SILTATION AND EROSION

6.1 The Approval Holder shall not do or permit anything to be done, nor omit or permit any omissions, which causes or may cause an adverse effect related to:

(a) siltation; or

(b) erosion

as a result of the activity.

Part 14. CERTIFICATE OF COMPLETION

14.1 A Certificate of Completion is not required for this activity.

Appendix B – Fish Research License

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Alberta

RESEARCH LICENCE
Pre-Approved Assessments and Salvages (RL-PAAS)

Licence #: 20-5020 - Amended

Licencee: **RIDGE Environmental Planning Ltd.** Eric Beveridge, Chris Stoesz, Krista Russell, and other RIDGE Environmental Planning Ltd. staff under their direct supervision.

Address:
RIDGE Environmental Planning Ltd.
5856 Bowwater Cres. NW
Calgary, AB.
T3B 2E2

Contact:
NAME: Eric Beveridge
Phone: 403-850-0895
Email: ebeveridge@ridgeenvironmental.ca

This Licence is valid for:

- Fish and fish habitat assessments within the Province of Alberta, excluding National Parks.
  - Note: that assessments are prohibited after October 31st.
- Fish salvages/rescues within the Province of Alberta, excluding National Parks.
- Activities, Locations and Timings not covered by this Licence are listed and described below in Section 3: *Activities, Sampling, and Timings not covered by this Licence.*

Permitted Sampling Gear:

Electrofishing (boat, float and backpack), seine nets, dip nets, and baited minnow traps.

- Gear not listed must be approved in writing by an Area Fisheries Contact.

Signature of Licencee

Digitally signed by Jason.Cooper
Date: 2020.10.07 10:27:43 -06'00'

Jason Cooper: for Director of Fisheries

This licence is valid from August 17, 2020 **to** March 31, 2021

Issue Date: 14-AUG-2020 **Amended Date**: 07-OCT-2020 **Issuing Region:** AEP Fisheries Management

This licence is not valid until signed by the Licencee and the Director of Fisheries or their designate.

Licence Conditions:

Fish and Wildlife Division Notification

1. The licencee shall advise the appropriate District Fish and Wildlife Officer and Area Fisheries Contact of the intended times and locations of collection at least **4 days** in advance of the commencement of field activities. Email notifications shall be sent to RLPAAS@gov.ab.ca identifying the correct office(s) and the District Fish and Wildlife Officer corresponding to the location of the work as based on the area contact maps and email listings provided.

Alberta

RESEARCH LICENCE
Pre-Approved Assessments and Salvages (RL-PAAS)

Approved Sampling Locations and Timings

2. The sampling/handling/collection of fish under the authority of this licence is permitted at the following locations within the Province of Alberta, excluding National Parks:
   (a) Fish and fish habitat assessments in Class C and D waterbodies (see Section 3c and 4 for exceptions)
   (b) Fish and fish habitat assessments in Class B waterbodies outside of the Restricted Activity Period (see Section 3c and 4 for exceptions)
   (c) Fish salvages and rescues in Class B, C and D waterbodies (see Section 3a for exceptions)
   (d) All mapped and unmapped waterbodies, water courses, and wetlands (see Section 3c and 4 for exceptions)

Activities, Sampling, and Timings not covered by this Licence

3. The sampling/handling/collection of fish under the authority of this licence is not permitted at the following locations within the Province of Alberta, unless approved in writing by an Area Fisheries Contact:
   a) Class A waterbodies
   b) Fish and fish habitat assessments in Class B waterbodies within the Restricted Activity Period
   c) Fish and fish habitat assessments in Special Waters, as defined in Appendix A.

4. Fish assessments are permitted to take place from the licence issue date to October 31st; fish salvages are permitted from the licence issue date to March 31st.

Gear Restrictions

5. Minnow traps set under the authority of this licence shall be affixed with a weather proof tag, of minimum size 5 x 10 cm bearing the Research Licence number and the name of the licencee, in letters not less than 20 mm high.

6. Minnow traps shall be checked at least once within a 24 hour period.

7. Minnow trapping, seine netting, and/or other stated methods shall follow, as a minimum, the protocol outlined in "Standards for Sampling Small Bodied Fish in Alberta" located on the Alberta Environment and Parks (AEP) website under Research Licences.

8. Fish assessments and sampling in small streams (defined as 'easily wadeable') in Alberta under the authority of this licence shall meet the 'minimum' standard for collecting and reporting data as per the "Standard Protocol for Sampling of Small Streams in Alberta" located on the AEP website under Research Licences. For electrofishing this shall require sampling a distance of 300 meters or 40 times the wetted width, whichever is greater.

9. The licencee shall operate in accordance with the "Alberta Fisheries Management Division Electrofishing Policy (link) Respecting Injuries to Fish. **If spawning fish or eggs are encountered cease electrofishing immediately and contact the Area Fisheries Contact.**

10. In an effort to prevent the introduction and spread of aquatic invasive species (AIS) and fish disease in Alberta, all licence holders shall adhere to the Government of Alberta Decontamination Protocol when conducting work in water (link). The most current version of the Alberta *Decontamination Protocol for Watercraft and Equipment* shall be followed in direct association with the most current *Whirling Disease decontamination risk zone map* (link).
    - Upon notification, the Area Fisheries Contact or Provincial Fish Disease Specialist may recommend and impose additional decontamination protocols and conditions depending on the risk posed by the proposed work (Example, Quaternary Ammonium Compound (QAC) solutions may be ineffective for some AIS and fish diseases, or based on any new Whirling Disease testing data or a delay in updating online decontamination risk zone maps).

11. The use of felt-soled wading boots is prohibited unless the felt can be removed and properly decontaminated.

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Alberta

RESEARCH LICENCE
Pre-Approved Assessments and Salvages (RL-PAAS)

Fish Handling

12. No lethal sampling of fish as listed on Alberta's *List of Native and Naturalized Fish Species in Alberta*, (Link) and no collection of fish tissues.
    Exceptions:
    (a) **Carp and Carassius species (i.e., Prussian, Common, Asian), and other non-naturalized Aquatic Invasive species are to be retained, euthanized, and disposed of according to Condition 13(g). If not previously documented in the Fisheries and Wildlife Management Information Mapping Tool (FWIMT), the Area Fisheries Contact is to be notified immediately if any Aquatic Invasive Fish Species are observed or captured.**
    (b) **Fish for identification purposes according to Condition 14.**

13. All captured fish shall be handled and disposed of as follows:
    (a) Specific to fish assessment works, all live fish (not approved for retention under this licence) shall be handled in such a manner as to ensure maximum survival and be released to the waters from which they were collected.
    (b) Specific to fish salvages, all live fish (not approved for retention under this licence) shall be handled in such a manner as to ensure maximum survival and be released to sites determined prior to capture in the waters from which they were collected (refer to Best Practices).
    (c) Any species captured that is not named on the Alberta Environment and Parks (AEP) List of Native and Naturalized Fish Species in Alberta shall be reported immediately to the Area Fisheries Contact. Voucher specimens and digital photos of the specimens shall be submitted to the Area Fisheries Contact immediately for confirmation purposes, unless otherwise agreed to, and shall be reported as per the data return requirements.
    (d) **All species must be identified and tallied.**
    (e) Fork lengths (mm) must be measured for all sport fish species and including Pygmy Whitefish, Stonecat, Brassy Minnow, and Western Silvery Minnow, with the exception of Burbot, Rocky Mountain Sculpin, and Deepwater Sculpin which require total length (mm).
    (f) All fish mortalities shall have at a minimum, count of species collected.
        i. All sport fish mortalities must have length (mm), weight (g), and an ageing structure, sex, and maturity collected.
    (g) All fish mortalities shall be disposed of:
        i. By incineration or disposal at an approved sanitary landfill; or
        ii. In a manner approved by the Area Fisheries Contact where the collection occurred, if disposal under sub-clause (i) is not practical.

14. For the purpose of this licence, the following species, or group of species, and numbers of fish shall be retained for identification purposes only:
    (a) If captured, voucher specimens to (up to 5 per species) of any species named on the AEP List of Native and Naturalized Fish Species in Alberta, and which shall be surrendered to the Area Fisheries Contact immediately unless otherwise agreed to.
    (b) **NO SPORT FISH SHALL BE RETAINED UNLESS APPROVED IN WRITING BY AN AREA FISHERIES CONTACT.**

15. Where an authorized number of fish have been permitted to be culled in one of the preceding conditions or by approval in writing, if the combined total mortality of those species identified in this Licence is exceeded, the Area Fisheries Contact shall be notified immediately before continued sampling takes place.

16. This licence **does not** permit tagging or marking of fish.

17. The licencee is permitted to transport and temporarily hold live fish within the immediate study area, however, they shall be returned into the same waterbody from which they were captured.
    Exception:
    (a) For sampling approved in Special Waters (Appendix A), specific fish release locations may be requested by the Area Fisheries Contact prior to fish collection activities.

Alberta

RESEARCH LICENCE
Pre-Approved Assessments and Salvages (RL-PAAS)

18. Any proposed release of collected fish outside the immediate sampling area (waterbody) where fish are collected shall be submitted to, and approved by the Head of Fisheries Allocation and Use of the Fisheries Management Branch and may additionally require a review by the Alberta Introductions and Transfers Committee.

Reporting

19. Locations where sampling occurred and no fish were captured shall be recorded in the data return, including reason (e.g., frozen conditions). The number of passes/attempts shall be recorded.

20. Data return requirements shall be satisfied by providing a digital copy of all fisheries data in the appropriate FWMIS loadform format within 90 days following the end date provided in the email notification for all works, as per the FWMIS data submission requirements. For the RL-PAAS licence, please note that every separate notification or sampling event requires an individual loadform submission. If a report was produced, a copy of the final report of the work (or the portions of the final report that includes all aspects pertaining to the assessment), as well as any ageing structures if collected, and/or genetic samples (if approved/collected) shall be provided within 180 days of the expiry of the licence.

21. All data returns shall be sent to RLPAAS@gov.ab.ca.

Other

22. The use of explosives or piscicide chemicals is not permitted.

23. Any of the proposed activities shall adhere to as a minimum the "Standards for the Ethical Use of Fishes in Alberta" located on the AEP website under Research Licences (link).

24. This licence and any additional approval in writing from an Area Fisheries Contact shall be in possession and available upon the request of staff from the Fish and Wildlife Division or Area Fisheries Contact.

25. This licence is subject to cancellation at any time and shall be surrendered to the issuer upon written notice of its cancellation.

26. This licence is non-transferable. This licence is only valid for the company and/or individuals listed on the licence; the further transference or delegation of the licence from the Licencee to another private or public body, including sub-contractors is not permitted. The responsibility and authority of the issued licence is given solely to that of the Licencee and the individuals listed on the licence.

Alberta

RESEARCH LICENCE
Pre-Approved Assessments and Salvages (RL-PAAS)

Best Practices

1. Where fish population data is collected, the corresponding fish habitat information that complies with the Fisheries Management Information System (FWMIS) protocol shall be reported.

2. Where the following fish species are captured, photographic evidence (preferably through the use of a water filled photographic chamber) shall be provided in the Licence return for Fisheries Management Branch verification purposes: Brassy Minnow, Deepwater Sculpin, Emerald Shiner, Finescale Dace, Goldeye, Largescale Sucker, Logperch, Mooneye, Mountain Sucker, Northern Pikeminnow, Northern Redbelly Dace, Pearl Dace, Pygmy Whitefish, Redside Shiner, River Shiner, Round Whitefish, Rocky Mountain Sculpin, Shortjaw Cisco, Silver Redhorse, Slimy Sculpin, Spoonhead Sculpin, and Western Silvery Minnow. Photographs should focus on characteristic features of that species. The return shall also identify in the species comments section, the meristic features used to identify the above species, particularly in the case where photographic evidence may be by itself inconclusive AND should identify whether the species was captured outside of its expected range according to "Fishes of Alberta" (Nelson and Paetz 1992).

3. If approved by an Area Fisheries Contact where chemicals are used as an anesthetic to facilitate fish handling, this use must comply with manufacturer's instructions governing the use of these chemicals and appropriate holding times shall be observed. Where MS222 is used, appropriate consumption advisories shall be provided to the public and shall follow current Health Canada direction.

4. Special care and planning shall occur when engaged in cold weather non-lethal sampling to avoid frost damage to fish. Certain parts of fish, such as eyes, gill tissue, and thin fins may freeze in a few seconds if proper care is not taken at low temperatures. Heated tents or shelters over sampling areas shall be used and insulated coolers containing water taken from the sampled waterbody shall be used to hold fish for short periods (water must be changed regularly to ensure water temperatures are consistent between waterbody and the cooler). Care must be used to prevent fish from freezing to measuring boards, weigh scales, and sampling tools. When signs of undue stress and/or mortality of individuals is observed during cold weather, fish collection operations shall be postponed until warmer conditions prevail.

5. Locations where sampling did not occur at an intended site shall be recorded in the data return spreadsheet and the reason for not sampling provided (e.g. low or no water flow).

6. When electrofishing, and where not already considered mandatory under a referenced Standard, temperature and conductivity shall be measured, recorded, and included in the FWMIS loadform return.

7. Testing for fish diseases, pathogens, and parasites shall be done according to a protocol specified by the Provincial Fish Disease Specialist within the Fisheries Management Branch. Any deformities or irregularities for measured fish shall be noted in the FWMIS data return, and photographic documentation provided.

THE FOLLOWING BEST PRACTICES FOR FISH SALVAGES ONLY.

8. Measures shall be taken to minimize the number of fish requiring salvage prior to works being conducted (passive fish removal). This can include but is not limited to herding fish and/or providing an escape route out of the area of operation, prior to and during the dewatering process or other salvaging techniques. Any passive fish removal techniques used shall be reported in the project notes of the FWMIS return loadform.

9. Relocation sites shall be determined prior to fish being salvaged. The site shall mimic the habitat the fish were salvaged from. During ice cover this shall necessitate drilling multiple holes in the ice, when it is safe to do so, and testing habitat to ensure enough water and oxygen is available to sustain fish for the duration of the winter.

10. Fish handling times shall be kept to a minimum and soft wet gloves used to reduce exposure to air, stress and prevent removal of the protective mucous barrier.

Alberta

RESEARCH LICENCE
Pre-Approved Assessments and Salvages (RL-PAAS)

11. Large bodied fish shall be supported at the tail and head to reduce internal injury. Where possible, all fish should be kept in their natural horizontal position.

12. If using holding tanks, they shall contain a minimum of 15 L per 1 kg of fish and be monitored regularly for oxygen and stress related issues, to ensure maximum fish survival.

13. Fish salvage shall occur between -20ºC to 20ºC, taking wind and extreme weather conditions into consideration. If it is required to salvage beyond this temperature range and in inclement weather extra precautions shall be taken when holding/handling fish to reduce stress (i.e. increased frequency of monitoring fish in holding tanks to detect stress induced issues, holding tanks be kept out of the elements; in summer - fewer fish/holding tank, employ aerators; keep in shaded area; in winter – limited/no air exposure (i.e. transfer of fish from collection pails and capture gear to holding tanks occur in water or in shelter from the elements), use of insulated holding tanks and heated or insulated sampling tents and wind breaks).

14. In situations where extreme temperatures may injure fish before completion of sampling, it is acceptable to only record numbers and species of fish handled, and not collect length and weight data.

15. All nets (including entanglement gear and dip nets) shall be knotless and made of non-abrasive materials to reduce injury to fish.

16. A minimum of 2 consecutive passes of each active gear type (i.e. electrofishing, seining etc.) that produces a zero catch shall be completed to ensure all/the majority of fish have been removed from the salvage area.

17. Each pass of a single gear type and its associated catch shall be recorded in the data return spreadsheet. If fish are released immediately due to extreme conditions it should be iterated in the survey comments.

cc. Bill Patterson for the Executive Director of Fisheries and Wildlife
District Fish & Wildlife Officers
Area Fisheries Contacts
file

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Appendix C – DFO Letter of Advice

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Fisheries and Oceans Canada

Ontario and Prairie Region
Fish and Fish Habitat Protection Program
501 University Crescent
Winnipeg, MB
R3T 2N6

Pêches et Océans Canada

Région de l'Ontario et des Prairies
Programme de la protection du poisson et son habitat
501 croissant University
Winnipeg (Manitoba)
R3T 2N6

28 September 2020

Your file *Votre référence*

Our file *Notre référence*
20-HCAA-01094

Carl Wirzba
Alberta Transportation
909-3rd Ave North
Lethbridge, AB
T1H 0H5

Subject: Spillway and Bank Repair, Jensen Dam, Magrath (20-HCAA-01094) – Implementation of Measures to Avoid and Mitigate the Potential for Prohibited Effects to Fish and Fish Habitat

Dear Carl Wirzba:

The Fish and Fish Habitat Protection Program (the Program) of Fisheries and Oceans Canada (DFO) received your proposal on 25 May 2020. We understand that you propose to:

- Replace the existing bank protection along the emergency spill way with riprap for a total replacement footprint of 33 162m2
- Perform the work in the dry during the winter operating levels and relocate any stranded fish

Our review considered the following information:

- Request for Review form and associated documents submitted on 25 May 2020
- Email and Phone correspondence with Carl Wirzba (Alberta Transportation), Leslie Wensmann (Alberta Transportation), Ronald Kitagawa (Golder Associates Ltd), and Michael Day (Golder Associates Ltd.) confirming additional project details

Your proposal has been reviewed to determine whether it is likely to result in:

- the death of fish by means other than fishing and the harmful alteration, disruption or destruction of fish habitat which are prohibited under subsections 34.4(1) and 35(1) of the *Fisheries Act*
- effects to listed aquatic species at risk, any part of their critical habitat or the residences of their individuals in a manner which is prohibited under sections 32, 33 and subsection 58(1) of the *Species at Risk Act*

Canada

.../2

- the introduction of aquatic species into regions or bodies of water frequented by fish where they are not indigenous, which is prohibited under section 10 of the *Aquatic Invasive Species Regulations*.

The aforementioned impacts are prohibited unless authorized under their respective legislation and regulations.

To avoid and mitigate the potential for prohibited effects to fish and fish habitat (as listed above), we recommend implementing the measures listed below:

- Capture, relocate and monitor for fish trapped within isolated, enclosed, or dewatered areas
  - Dewater gradually to reduce the potential for stranding fish
- Screen intake pipes to prevent entrainment or impingement of fish
  - Use the code of practice for water intake screens
- Apply the interim code of practice for temporary cofferdams and diversion channels
- Limit impacts on riparian vegetation to those approved for the work, undertaking or activity
- Replace/restore any other disturbed habitat features and remediate any areas impacted by the work, undertaking or activity
- Develop and implement an Sediment Control Plan to minimize sedimentation of the waterbody during all phases of the work, undertaking or activity
  - Conduct all in-water works, undertakings or activities in isolation of open or flowing water to reduce the introduction of sediment into the watercourse
  - Inspect and maintain regularly the erosion and sediment control measures and structures during all phases of the project
  - Remove all exposed non-biodegradable sediment control materials once site has been stabilized
  - Use methods to prevent substrate compaction (e.g., swamp mats, pads)
  - Dispose and stabilize all dredged material above the high water mark of nearby waterbodies to prevent entry in the water
- Do not deposit any deleterious substances in the water course
- Develop and implement a response plan to avoid a spill of deleterious substances

Provided that you incorporate these measures into your plans, the Program is of the view that your proposal is not likely to result in the contravention of the above mentioned prohibitions and requirements.

Should your plans change or if you have omitted some information in your proposal, further review by the Program may be required. Consult our website (http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html) or consult with a qualified environmental consultant to determine if further review may be necessary. It remains your responsibility to remain in compliance with the *Fisheries Act*, the *Species at Risk Act* and the *Aquatic Invasive Species Regulations*.

.../3

20-HCAA-01094 - 3 -

Whirling disease, a disease of finfish, caused by infection with a microscopic parasite called *Myxobolus cerebralis*, has been identified in Alberta. There may be a requirement for you to apply for a permit from the Canadian Food Inspection Agency to move certain species of finfish, such as rainbow trout, and things, such as sediments, within or out of Alberta. Please visit http://www.inspection.gc.ca/animals/aquatic-animals/domestic-movements/eng/1450122972517/1450122973466 for more information.

It is also your *Duty to Notify* DFO if you have caused, or are about to cause, the death of fish by means other than fishing and/or the harmful alteration, disruption or destruction of fish habitat. Such notifications should be directed to (http://www.dfo-mpo.gc.ca/pnw-ppe/CONTACT-eng.html).

We recommend that you notify this office at least 10 days before starting your project and that a copy of this letter be kept on site while the work is in progress. It remains your responsibility to meet all other federal, territorial, provincial and municipal requirements that apply to your proposal.

If you have any questions with the content of this letter, please contact Sheeva Nakhaie at 905-315-5270, or by email at Sheeva.Nakhaie@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,

Lynn Dupuis

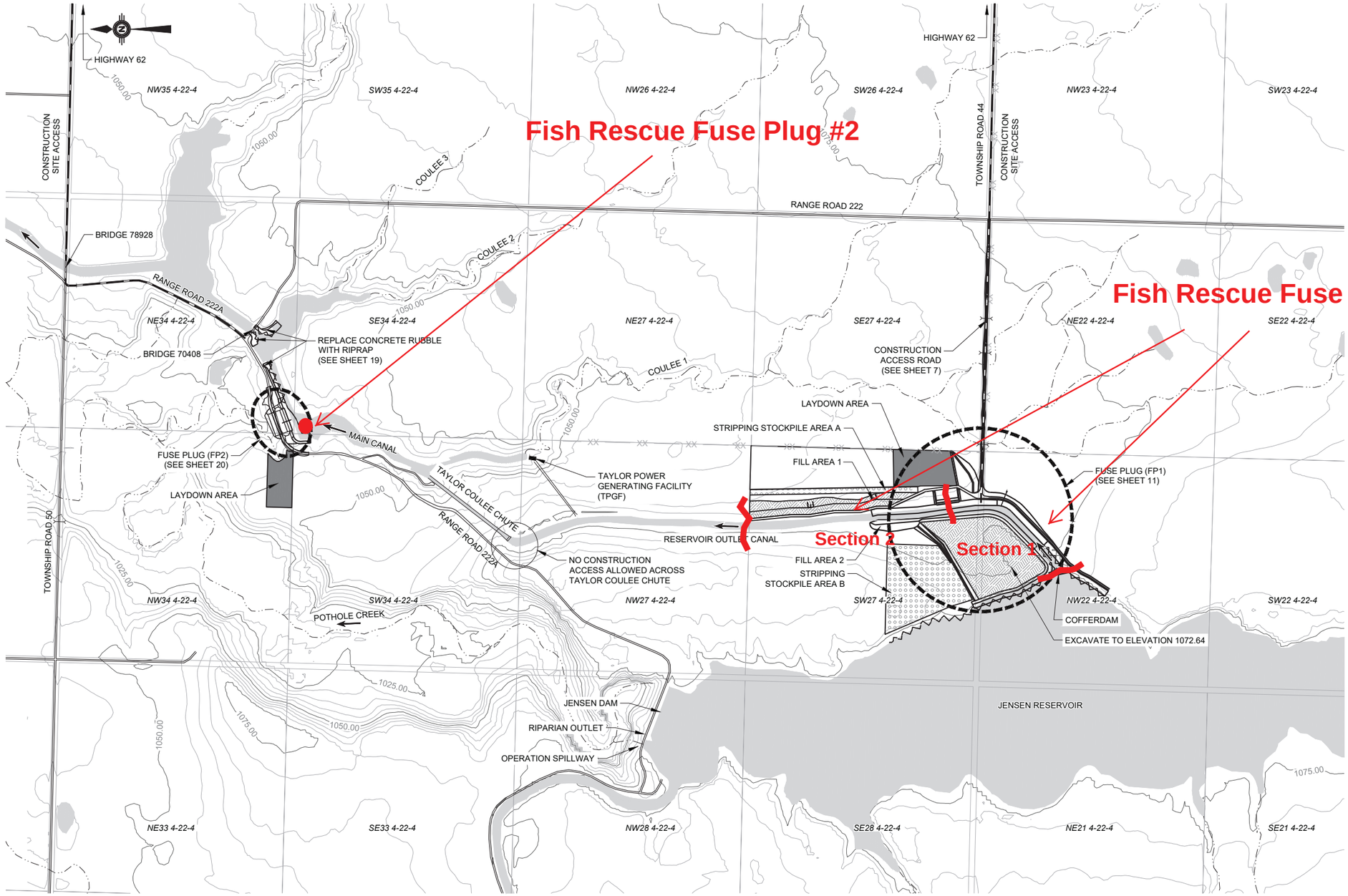
Lynn Dupuis
Senior Biologist, Hydro and Flows Regulatory Review
Fish and Fish Habitat Protection Program

Copy: Sheeva Nakhaie (DFO)
Neil Fisher (DFO)
Leslie Wensmann (Alberta Transportation)
Ronald Kitagawa (Golder Associates Ltd)
Michael Day (Golder Associates Ltd.)

Appendix D – Care of Water Drawings

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Fish Rescue Fuse Plug # 2



LEGEND

- EXISTING GROUND CONTOURS (5 m INTERVALS)
- EXISTING MINOR TRIBUTARY
- EXISTING ROADS
- EXISTING CONCRETE RUBBLE
- XX EXISTING BARBED WIRE FENCE
- CONSTRUCTION SITE ACCESS ROAD
- FLOW DIRECTION
- EXISTING WATERBODY / CANAL
- TOPSOIL AND SEED
- STRIPPING STOCK PILE AREA

NOTE(S)

1. ELEVATIONS, STATIONS AND DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

REFERENCE(S)

1. COORDINATES IN NAD83 UTM ZONE 12.
2. EXISTING GROUND DEVELOPED FROM 2018 LIDAR PROVIDED BY MPE, FILENAME 'BE_Z12_0260E_05464N.DWG'.

ISSUED FOR

TENDER

0 250 500

1:7,500 METRES

AUTOCAD FILE No. 1895260DW002.dwg TENDER No. TND 0021462

THINK SAFETY FIRST

DEPARTMENT BAR CODE

THIS DRAWING MAY HAVE BEEN REDUCED. ALL SCALE NOTATIONS INDICATED (i.e. 1:1000 etc) ARE BASED ON 22" X 34" FORMAT DRAWINGS

MPE Engineering Ltd. / GOLDER

MPE JOB NO. 1716-063-00

PERMIT TO PRACTICE
Golder Associates Ltd.
PERMIT NUMBER: P5122
The Association of Professional Engineers and Geoscientists of Alberta

DESIGNER: ORIGINAL SIGNED AND SEALED BY RONALD KITAGAWA 2020-09-04

CHECKER: ORIGINAL SIGNED AND SEALED BY DENNIS BECKER 2020-09-04

REV	DATE	REVISIONS	BY
0	2020-09-04	ISSUED FOR TENDER	AS

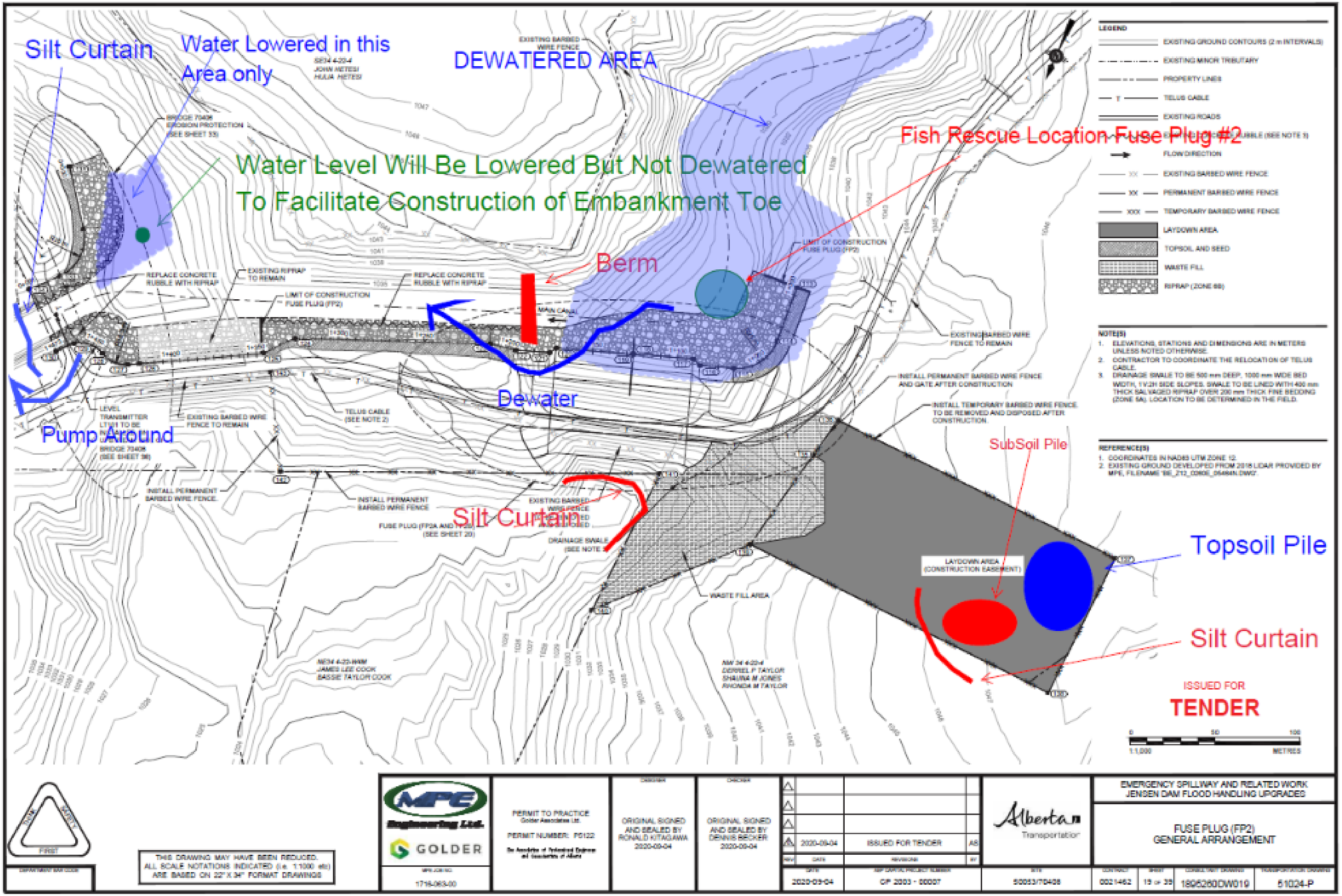
Alberta Transportation

EMERGENCY SPILLWAY AND RELATED WORK
JENSEN DAM FLOOD HANDLING UPGRADES

GENERAL ARRANGEMENT

DATE	AEP CAPITAL PROJECT NUMBER	SITE	CONTRACT	SHEET	CONSULTANT DRAWING	TRANSPORTATION DRAWING
2020-09-04	CP 2003 - 00007	50052/50053	0021462	3 OF 39	1895260DW003	51008-P

Fish Rescue Location Fuse Plug #2



AUTOCAD FILE No. 1895260DW024.dwg TENDER No. TND 0021462

THIS DRAWING MAY HAVE BEEN REDUCED. ALL SCALE NOTATIONS INDICATED (i.e. 1:1000 etc) ARE BASED ON 22" X 34" FORMAT DRAWINGS

MPE Engineering Ltd. / GOLDER

1716-063-00

PERMIT TO PRACTICE Golder Associates Ltd.
PERMIT NUMBER: P5122
The Association of Professional Engineers and Geoscientists of Alberta

DESIGNED: ORIGINAL SIGNED AND SEALED BY RONALD KITAGAWA 2020-09-04

CHECKED: ORIGINAL SIGNED AND SEALED BY DENNIS BECKER 2020-09-04

REV	DATE	REVISIONS	BY
3			
2			
1			
A	2020-09-04	ISSUED FOR TENDER	AS

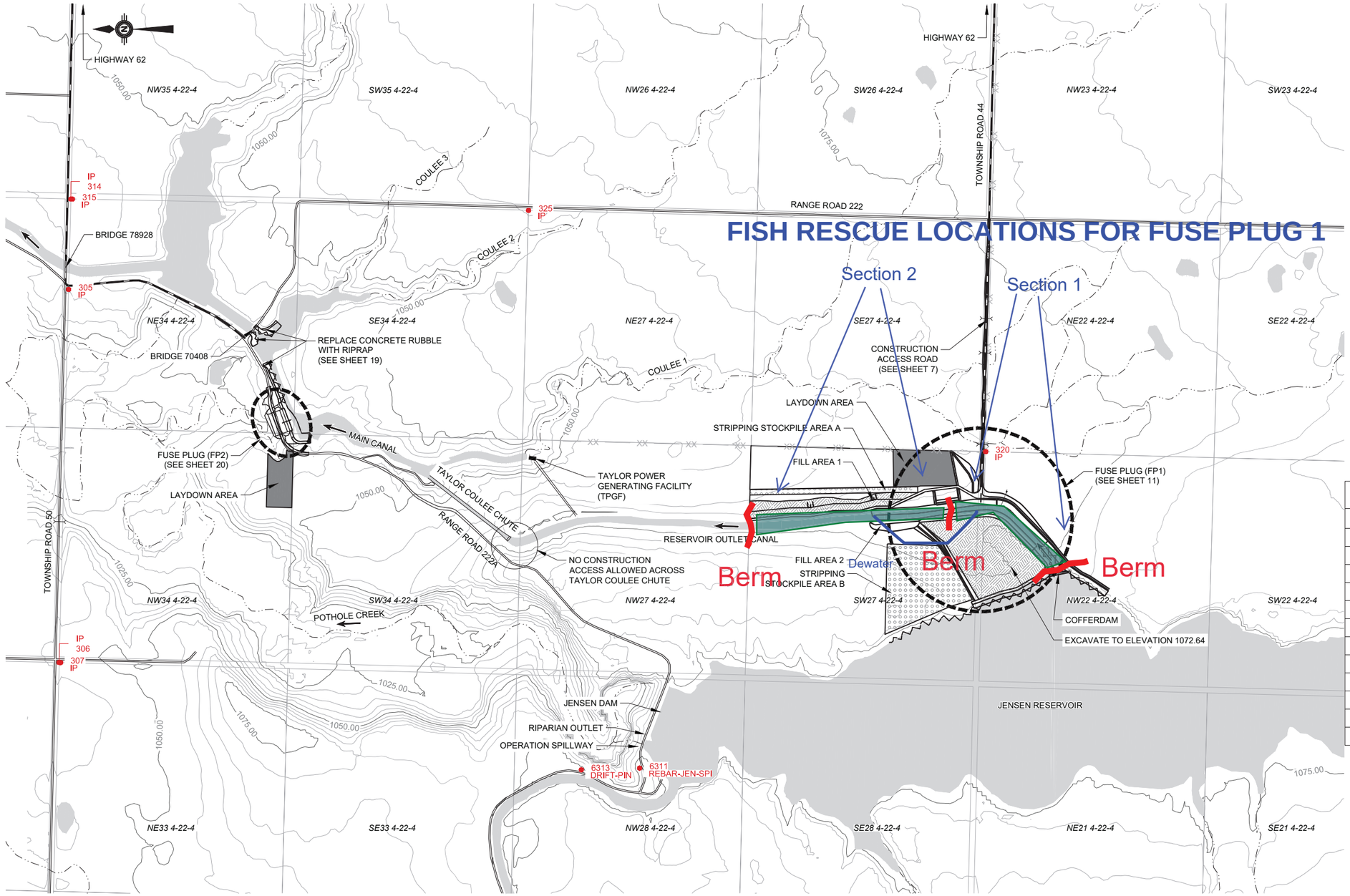
DATE: 2020-09-04
MP CAPITAL PROJECT NUMBER: CP 2003 - 00007

Alberta Transportation

EMERGENCY SPILLWAY AND RELATED WORK
JENSEN DAM FLOOD HANDLING UPGRADES

FUSE PLUG (FP2)
GENERAL ARRANGEMENT

SITE	CONTRACT	SHEET	CONSULTANT DRAWING	TRANSPORTATION DRAWING
50053/7D408	0021462	19 OF 35	1895260DW019	51024-P



LEGEND

- EXISTING GROUND CONTOURS (5 m INTERVALS)
- EXISTING MINOR TRIBUTARY
- EXISTING ROADS
- EXISTING CONCRETE RUBBLE
- XX EXISTING BARBED WIRE FENCE
- CONSTRUCTION SITE ACCESS ROAD
- FLOW DIRECTION
- EXISTING WATERBODY / CANAL
- TOPSOIL AND SEED
- STRIPPING STOCK PILE AREA
- 325 IP CONTROL POINT

NOTE(S)

1. ELEVATIONS, STATIONS AND DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

REFERENCE(S)

1. COORDINATES IN NAD83 UTM ZONE 12.
2. EXISTING GROUND DEVELOPED FROM 2018 LIDAR PROVIDED BY MPE, FILENAME 'BE_Z12_0260E_05464N.DWG'.

SURVEY CONTROL POINTS

POINT ID.	EASTING (m)	NORTHING (m)	ELEVATION (m)
305	363489.50	5467887.51	1035.12 IP
306	362178.96	5467920.73	1045.85 IP
307	362178.82	5467915.54	1045.93 IP
311*	357294.88	5468043.84	1048.08 IP
314	363806.62	5467879.47	1041.79 IP
315	363806.50	5467874.30	1042.70 IP
316*	364640.33	5467853.08	1054.22 IP
320	362919.44	5464665.96	1070.60 IP
325	363767.08	5466271.80	1060.77 IP
6311	361807.83	5465881.90	1080.39 REBAR-JEN-SPI
6313	361801.94	5466086.62	1077.72 DRIFT-PIN
710467*	355683.67	5468000.00	1065.93 ASCM 710467-ADJ

NOTE:
* POINTS THAT ARE OUTSIDE OF PLAN VIEW.

ISSUED FOR
TENDER

0 250 500
1:7,500 METRES

AUTOCAD FILE No. 1895260DW004.dwg TENDER No. TND 0021462

THINK SAFETY FIRST

DEPARTMENT BAR CODE

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MPE Engineering Ltd. / GOLDER

MPE JOB NO. 1716-063-00

PERMIT TO PRACTICE
Golder Associates Ltd.
PERMIT NUMBER: P5122
The Association of Professional Engineers and Geoscientists of Alberta

DESIGNER: ORIGINAL SIGNED AND SEALED BY RONALD KITAGAWA 2020-09-04

CHECKER: ORIGINAL SIGNED AND SEALED BY DENNIS BECKER 2020-09-04

REV	DATE	REVISIONS	BY
0	2020-09-04	ISSUED FOR TENDER	AS

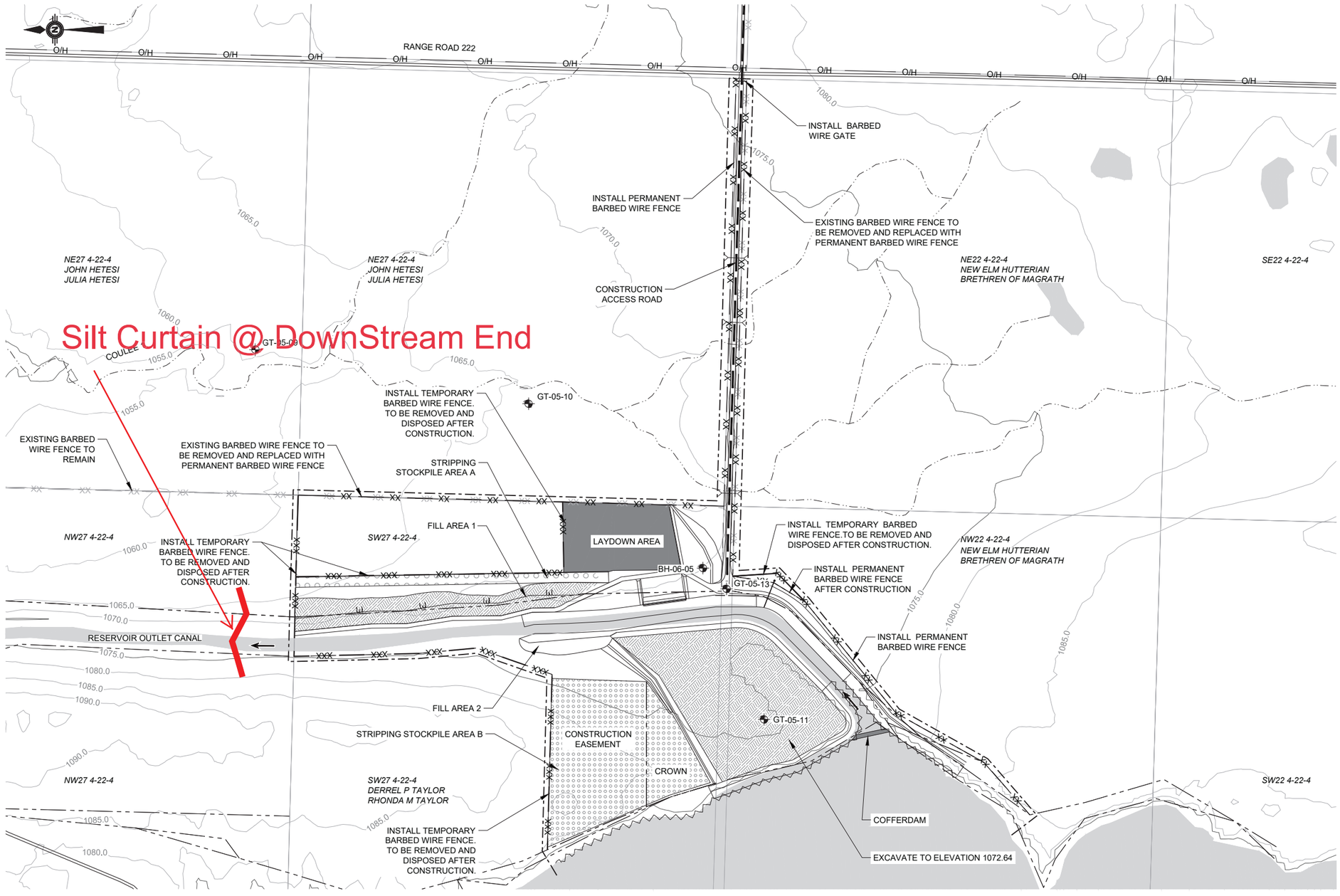
DATE 2020-09-04 | AEP CAPITAL PROJECT NUMBER CP 2003 - 00007 | SITE 50052/50053

Alberta Transportation

EMERGENCY SPILLWAY AND RELATED WORK
JENSEN DAM FLOOD HANDLING UPGRADES

SURVEY CONTROL PLAN
GENERAL ARRANGEMENT

CONTRACT 0021462 | SHEET 4 OF 39 | CONSULTANT DRAWING 1895260DW004 | TRANSPORTATION DRAWING 51009-P



LEGEND

- EXISTING GROUND CONTOURS (5 m INTERVALS)
- EXISTING MINOR TRIBUTARY
- PROPERTY LINES
- EXISTING ROADS
- EXISTING CONCRETE RUBBLE
- O/H — OVERHEAD POWER LINE
- XX — EXISTING BARBED WIRE FENCE
- XX — PERMANENT BARBED WIRE FENCE
- XXX — TEMPORARY BARBED WIRE FENCE
- CONSTRUCTION SITE ACCESS ROAD
- CONSTRUCTION SITE LIMITS
- FLOW DIRECTION
- GT-05-11 — BH
- EXISTING WATERBODY / CANAL
- LAYDOWN AREA
- TOPSOIL AND SEED
- STRIPPING STOCK PILE AREA

NOTE(S)

1. ELEVATIONS, STATIONS AND DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. REFER TO DRAFT REPORT ENTITLED 'JENSEN AUXILIARY SPILLWAY - 2005 SITE INVESTIGATION, AMEC EARTH AND ENVIRONMENTAL, MAY 2005' FOR BOREHOLE INFORMATION.

REFERENCE(S)

1. COORDINATES IN NAD83 UTM ZONE 12.
2. EXISTING GROUND DEVELOPED FROM 2018 LIDAR PROVIDED BY MPE, FILENAME 'BE_Z12_0260E_05464N.DWG'.

ISSUED FOR

TENDER

0 200 400

1:4,000 METRES

AUTOCAD FILE No. 1895260DW026.dwg TENDER No. TND 0021462

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MPE Engineering Ltd. / GOLDER

MPE JOB NO. 1716-063-00

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REV	DATE	REVISIONS	BY
0	2020-09-04	ISSUED FOR TENDER	AS

Alberta Transportation

EMERGENCY SPILLWAY AND RELATED WORK
JENSEN DAM FLOOD HANDLING UPGRADES

FUSE PLUG (FP1)
CONSTRUCTION SITE LIMITS

DATE	AEP CAPITAL PROJECT NUMBER	SITE	CONTRACT	SHEET	CONSULTANT DRAWING	TRANSPORTATION DRAWING
2020-09-04	CP 2003 - 00007	50052	0021462	6 OF 39	1895260DW006	51011-P

EXISTING BARBED WIRE FENCE TO BE REMOVED AND REPLACED WITH PERMANENT BARBED WIRE FENCE

SW27-4-22-4

LAYDOWN AREA

STRIPPING STOCKPILE AREA A

INSTALL TEMPORARY BARBED WIRE FENCE. TO BE REMOVED AFTER CONSTRUCTION.

MAINTENANCE ROAD

FILL AREA (SEE SHEET 15)

EXISTING BARBED WIRE FENCE TO BE REMOVED AND REPLACED WITH PERMANENT BARBED WIRE FENCE

CONSTRUCTION ACCESS ROAD (SEE SHEET 7)

INSTALL TEMPORARY BARBED WIRE FENCE. TO BE REMOVED AFTER CONSTRUCTION.

MAINTENANCE ROAD

NW22 4-22-4
NEW ELM HUTTERIAN BRETHREN OF MAGRATH

DOMESTIC TURNOUT (SEE SHEET 17)

INSTALL PERMANENT BARBED WIRE FENCE AFTER CONSTRUCTION

INSTALL PERMANENT BARBED WIRE FENCE

RAISE CANAL BANK ROAD TO EL. 1075.00

GRAVEL ARMOUR (ZONE 5C)

EXISTING CANAL ACCESS ROAD

FUSE PLUG (FP1)

RESERVOIR OUTLET CANAL

FILL AREA 2 (SEE SHEET 15)

Silt Fence

SUBSOIL

TOPSOIL

PROPOSED FINAL ELEVATION 1072.64 m

CROWN

CONSTRUCTION EASEMENT

SW27-4-22-4
DERREN P TAYLOR
RHONDA M TAYLOR

INSTALL TEMPORARY BARBED WIRE FENCE. TO BE REMOVED AFTER CONSTRUCTION.

EXISTING CONCRETE RUBBLE (TO REMAIN)

EXISTING CONCRETE RUBBLE TO BE REMOVED AND DISPOSED

COFFERDAM

RIPRAP (ZONE 6B)

JENSEN RESERVOIR

Silt Fence

JENSEN RESERVOIR

Turbidity Curtains For Berm Construction And Removal Later

LEGEND

- EXISTING GROUND CONTOURS (1 m INTERVALS)
- EXISTING MINOR TRIBUTARY
- PROPERTY LINES
- EXISTING ROADS
- EXISTING CONCRETE RUBBLE
- XX EXISTING BARBED WIRE FENCE
- XX PERMANENT BARBED WIRE FENCE
- XXX TEMPORARY BARBED WIRE FENCE
- CONSTRUCTION SITE ACCESS ROAD
- FLOW DIRECTION
- GT-05-11 BH
- SETOUT POINT
- EXISTING WATERBODY / CANAL
- EXISTING CANAL BANK ROAD
- EROSION CONTROL MAT
- LAYDOWN AREA
- TOPSOIL AND SEED
- STRIPPING STOCKPILE AREA
- IMPERVIOUS FILL (ZONE 1A)
- RANDOM FILL (ZONE 2A)
- FINE FILTER (ZONE 3A)
- COARSE FILTER (ZONE 3B)
- ROAD GRAVEL (ZONE 4B)
- GRAVEL ARMOUR (ZONE 5C)
- RIPRAP (ZONE 6B)

NOTE(S)

1. ELEVATIONS, STATIONS AND DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. REFER TO DRAFT REPORT ENTITLED 'JENSEN AUXILIARY SPILLWAY - 2005 SITE INVESTIGATION, AMEC EARTH AND ENVIRONMENTAL, MAY 2005' FOR BOREHOLE INFORMATION.

REFERENCE(S)

1. COORDINATES IN NAD83 UTM ZONE 12.
2. EXISTING GROUND DEVELOPED FROM 2018 LIDAR PROVIDED BY MPE, FILENAME 'BE_Z12_0260E_05464N.DWG'.

ISSUED FOR

TENDER

0 50 100
1:1,500 METRES

THINK SAFETY FIRST

DEPARTMENT BAR CODE

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MPE Engineering Ltd. / GOLDER

MPE JOB NO. 1716-063-00

PERMIT TO PRACTICE
Golder Associates Ltd.
PERMIT NUMBER: P5122
The Association of Professional Engineers and Geoscientists of Alberta

DESIGNER: ORIGINAL SIGNED AND SEALED BY RONALD KITAGAWA 2020-09-04

CHECKER: ORIGINAL SIGNED AND SEALED BY DENNIS BECKER 2020-09-04

REV	DATE	REVISIONS	BY
0	2020-09-04	ISSUED FOR TENDER	AS

Alberta Transportation

EMERGENCY SPILLWAY AND RELATED WORK
JENSEN DAM FLOOD HANDLING UPGRADES

FUSE PLUG (FP1)
PLAN

DATE	AEP CAPITAL PROJECT NUMBER	SITE	CONTRACT	SHEET	CONSULTANT DRAWING	TRANSPORTATION DRAWING
2020-09-04	CP 2003 - 00007	50052	0021462	11 OF 39	1895260DW011	51016-P

AUTOCAD FILE No. 1895260DW034.dwg TENDER No. TND 0021462

Appendix E – Emergency Flood Memo from MPE Engineering Ltd

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Suite 300, 714 – 5 Avenue South
Lethbridge, AB T1J 0V1
Phone: 403-329-3442
1-866-329-3442
Fax: 403-329-9354

MPE Engineering Ltd.

MEMORANDUM

To:	**Carl Wirzba**	**From:**	**Jeff Olitch**
		cc:	**Ron Kitagawa**
Re:	**Jensen Dam – Phase 2**	**Date:**	**July 2, 2020**
File:	**N/17/16/063.doc**	**Pages:**	**2**
Email:			

Jensen Dam – Emergency Spillway

EMERGENCY FLOOD OPERATION PLAN DURING CONSTRUCTION MEMORANDUM

BACKGROUND

Alberta Transportation (AT) has requested that MPE Engineering Ltd. (MPE) provide a memorandum outlining the emergency flood operation procedure during construction of the new emergency fuse plug spillways. The following provides some background information about the characteristics of the Jensen Reservoir flood management system and construction.

System Operation

- There is to requirement for irrigation flows within the system between October and May. The reservoir is lowered to the winter water level (1066.78 m) in October each year.
- The service spillway at Jensen Reservoir has never been operated and rehabilitation construction will commence in July 2020.
- Taylor Coulee Chute has a gate sill elevation of 1068.70 m and can pass the 1:1000 yr flood event of 170 m^3/s and a flow of 287 m^3/s at maximum reservoir water level (1074.24 m).
- Maximum flow with a water level at the top of the main canal bank between Taylor Coulee Chute to Taylor Wasteway is 220 m^3/s,
- Maximum flow with water to the top of main canal bank downstream between Taylor Wasteway to Milk River Ridge Reservoir is 120 m^3/s,
- Taylor Wasteway has never been operated in a storm event situation past July 1. The new structure built in 2016 has never been operated and the previous structure has only been operated twice (in 2002 and 2010) since it was constructed in 1952.

EMERGENCY FLOOD OPERATION PLAN DURING CONSTRUCTION

Construction on Fuse Plug 1 (FP1) and Fuse Plug 2 (FP2) will be undertaken between November 2020 and March 2021 and considered the low-risk flood period for operations. In the event of a high runoff (rainfall or snow melt) event occurring during construction the proposed procedure will be followed;

- Waterton-St. Mary Operations staff will begin monitoring precipitation, Jensen reservoir inflow and outflow rates and the Jensen to Ridge Canal level on an hourly basis.
- As per the EPP for Jensen Dam and the operation of Taylor Wasteway, downstream residents and local authorities will be notified of impending flood flows that could be released from the canal downstream of Jensen Reservoir,

FP1

- A cofferdam will be constructed upstream of FP1 prior to construction which will isolate the reservoir outlet canal from the reservoir. The cofferdam will be limited to a height of 3.8 m or the sill of the Operation Spillway (1070.55 m).
- The cofferdam will be required to be removed by the contractor if the reservoir elevation reaches 1070.0 m and the Operations staff signal a large rainfall/snowmelt event to be able to divert water through Taylor Coulee Chute.
- As the reservoir water level rises above elevation 1070.55 m, flood flows will be directed through the Operation Spillway. Refer to the Operation Spillway Rehabilitation Emergency Preparedness Plan (EPP) attached.
- If the reservoir levels reach the sill elevation of FP1 (1071.45 m), water will also be allowed to flow through the excavated opening through the canal bank, depending on the stage of construction.

FP2

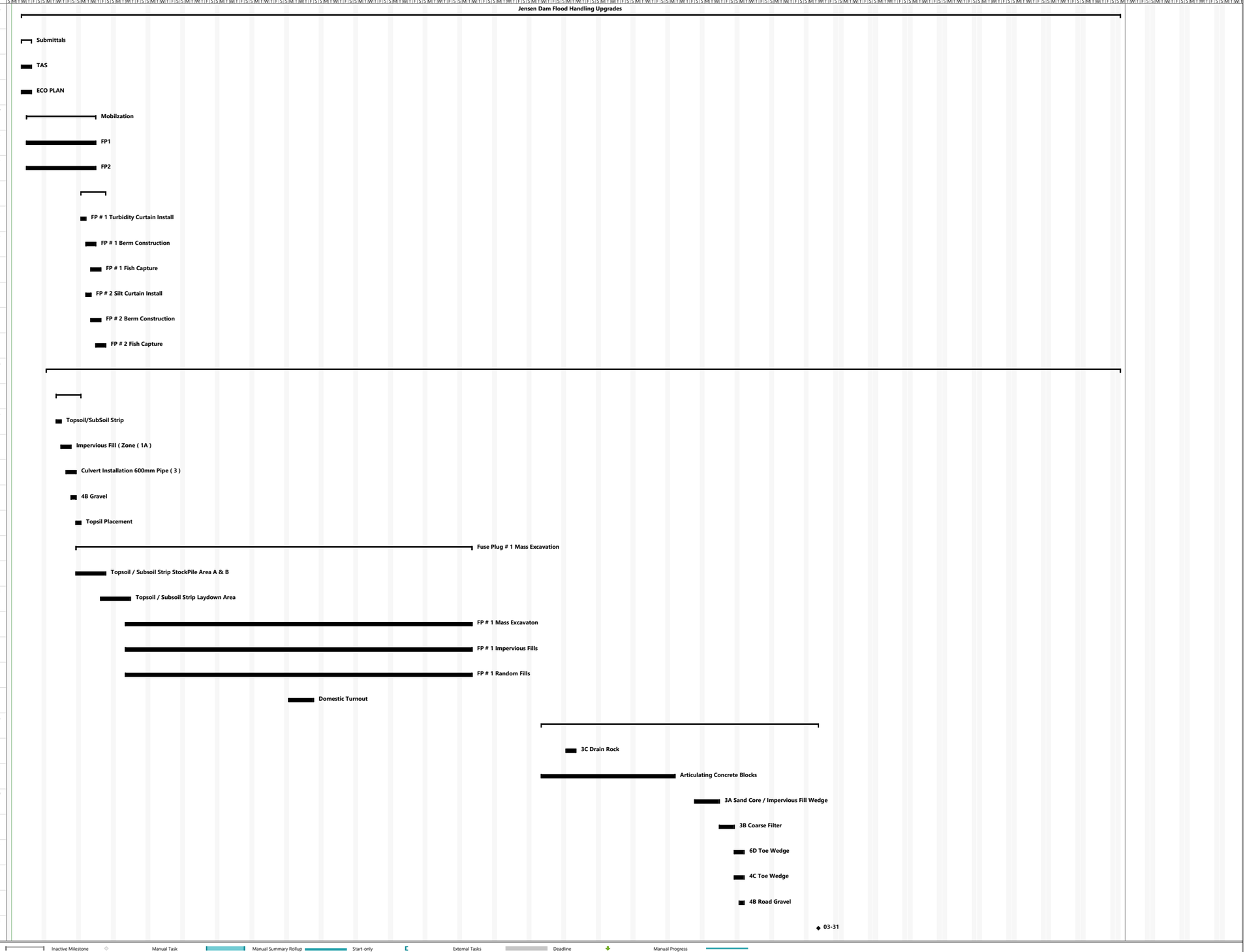
- A cofferdam will be constructed upstream of Bridge 70408 to allow for the dewatering of the main canal, between the Taylor Coulee Chute basin and Bridge 70408.
- if the reservoir elevation reaches 1070.0 m and the cofferdam upstream of FP1 is required to be removed, the contractor will be required to remove the cofferdam downstream of Bridge 70408.
- The gates for Taylor Wasteway will be opened and flood flows will allowed to pass through the wasteway and the downstream canal towards Milk River Ridge Reservoir.
- After the water level in the canal reaches elevation 1034.0 m (excavated opening for FP2), flood flow will be allowed to flow through the opening to Pothole Creek.

The Contract Documents will require that the Prime Contractor have provide an excavator close to each of the cofferdam when the Operations staff signal a large rainfall/snowmelt event. The equipment will be on located no more than 15 minutes from the cofferdam. The Prime Contractor will also be required to develop an Emergency Preparedness Plan for their operations, personnel, equipment and materials as part of the Contract Documents.

Appendix F – Project Schedule

#340, 600 Crowfoot Cres. NW, Calgary, AB T3G 0B4
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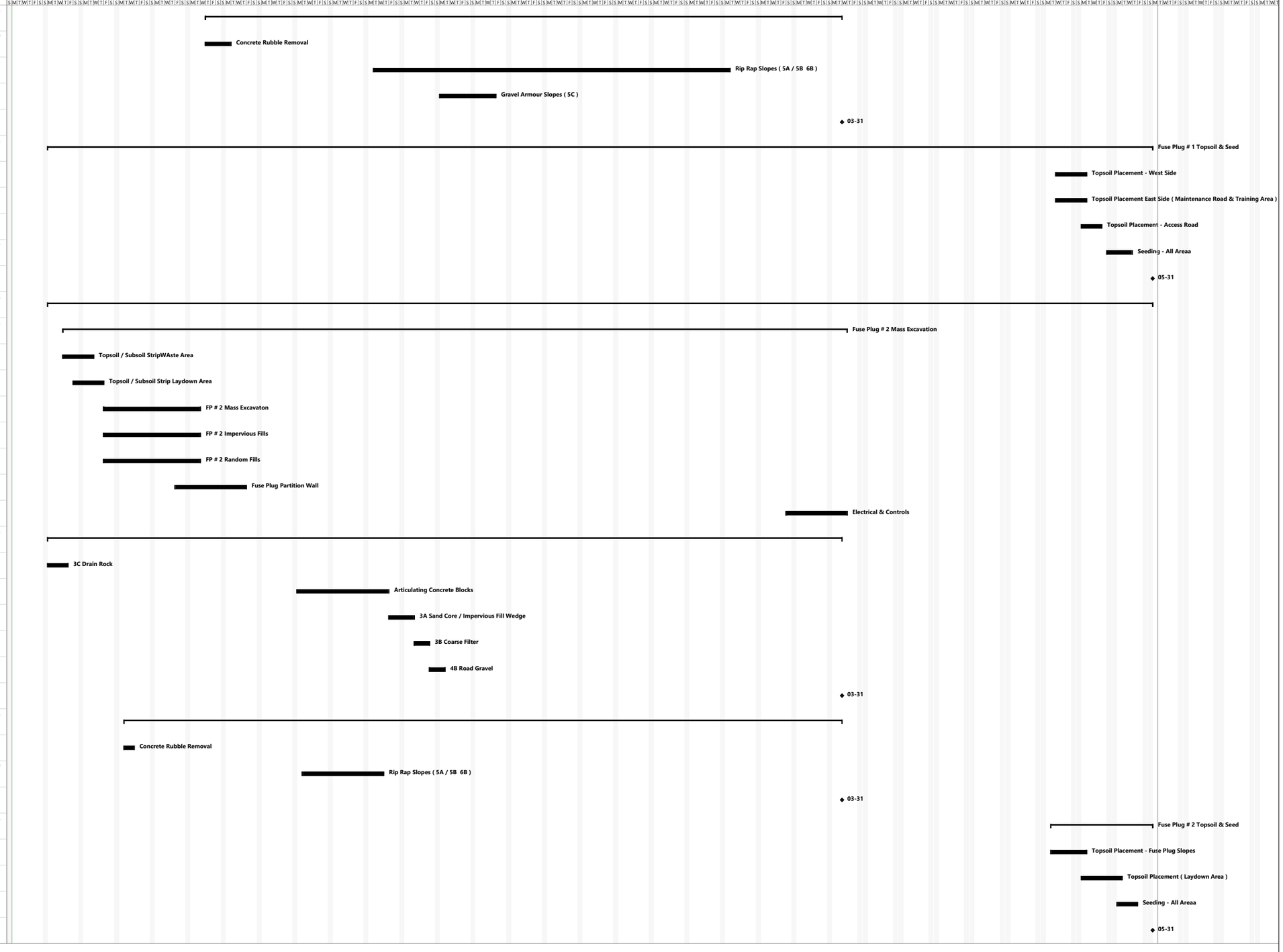
ID	Task Mode	Task Name	Duration	Start	Finish
1		**Jensen Dam Flood Handling Upgrades**	**181 days**	**Wed 20-10-21**	**Mon 21-05-31**
2		**Submittals**	**2 days**	**Wed 20-10-21**	**Thu 20-10-22**
3		TAS	2 days	Wed 20-10-21	Thu 20-10-22
4		ECO PLAN	2 days	Wed 20-10-21	Thu 20-10-22
5		**Mobilzation**	**12 days**	**Thu 20-10-22**	**Wed 20-11-04**
6		FP1	12 days	Thu 20-10-22	Wed 20-11-04
7		FP2	12 days	Thu 20-10-22	Wed 20-11-04
8		**CARE OF WATER**	**5 days**	**Mon 20-11-02**	**Fri 20-11-06**
9		FP # 1 Turbidity Curtain Install	1 day	Mon 20-11-02	Mon 20-11-02
10		FP # 1 Berm Construction	2 days	Tue 20-11-03	Wed 20-11-04
11		FP # 1 Fish Capture	2 days	Wed 20-11-04	Thu 20-11-05
12		FP # 2 Silt Curtain Install	1 day	Tue 20-11-03	Tue 20-11-03
13		FP # 2 Berm Construction	2 days	Wed 20-11-04	Thu 20-11-05
14		FP # 2 Fish Capture	2 days	Thu 20-11-05	Fri 20-11-06
15		**FUSE PLUG 1**	**177 days**	**Mon 20-10-26**	**Mon 21-05-31**
16		**Fuse Plug # 1 Const. Access Road**	**4 days**	**Wed 20-10-28**	**Sun 20-11-01**
17		Topsoil/SubSoil Strip	1 day	Wed 20-10-28	Wed 20-10-28
18		Impervious Fill (Zone (1A)	2 days	Thu 20-10-29	Fri 20-10-30
19		Culvert Installation 600mm Pipe (3)	2 days	Fri 20-10-30	Sat 20-10-31
20		4B Gravel	1 day	Sat 20-10-31	Sat 20-10-31
21		Topsil Placement	1 day	Sun 20-11-01	Sun 20-11-01
22		**Fuse Plug # 1 Mass Excavation**	**68 days**	**Sun 20-11-01**	**Tue 21-01-19**
23		Topsoil / Subsoil Strip StockPile Area A & B	6 days	Sun 20-11-01	Fri 20-11-06
24		Topsoil / Subsoil Strip Laydown Area	5 days	Fri 20-11-06	Wed 20-11-11
25		FP # 1 Mass Excavaton	60 days	Wed 20-11-11	Tue 21-01-19
26		FP # 1 Impervious Fills	60 days	Wed 20-11-11	Tue 21-01-19
27		FP # 1 Random Fills	60 days	Wed 20-11-11	Tue 21-01-19
28		Domestic Turnout	5 days	Mon 20-12-14	Fri 20-12-18
29		**Fuse Plug # 1 Core**	**48 days**	**Wed 21-02-03**	**Wed 21-03-31**
30		3C Drain Rock	2 days	Mon 21-02-08	Tue 21-02-09
31		Articulating Concrete Blocks	23 days	Wed 21-02-03	Mon 21-03-01
32		3A Sand Core / Impervious Fill Wedge	4 days	Sat 21-03-06	Wed 21-03-10
33		3B Coarse Filter	3 days	Thu 21-03-11	Sat 21-03-13
34		6D Toe Wedge	2 days	Sun 21-03-14	Mon 21-03-15
35		4C Toe Wedge	2 days	Sun 21-03-14	Mon 21-03-15
36		4B Road Gravel	1 day	Mon 21-03-15	Mon 21-03-15
37		SUBSTANTIAL PREFORMANCE	0 days	Wed 21-03-31	Wed 21-03-31



Project: Project1
Date: Mon 20-10-19

Task | Milestone | Project Summary | Inactive Milestone | Manual Task | Manual Summary Rollup | Start-only | External Tasks | Deadline | Manual Progress
Split | Summary | Inactive Task | Inactive Summary | Duration-only | Manual Summary | Finish-only | External Milestone | Progress

ID	Task Mode	Task Name	Duration	Start	Finish
38		**Fuse Plug # 1 Canal Slopes**	**107 days**	**Thu 20-11-26**	**Wed 21-03-31**
39		Concrete Rubble Removal	4 days	Thu 20-11-26	Mon 20-11-30
40		Rip Rap Slopes (5A / 5B 6B)	60 days	Tue 20-12-29	Mon 21-03-08
41		Gravel Armour Slopes (5C)	10 days	Mon 21-01-11	Thu 21-01-21
42		SUBSTANTIAL PREFORMANCE	0 days	Wed 21-03-31	Wed 21-03-31
43		**Fuse Plug # 1 Topsoil & Seed**	**177 days**	**Mon 20-10-26**	**Mon 21-05-31**
44		Topsoil Placement - West Side	4 days	Wed 21-05-12	Mon 21-05-17
45		Topsoil Placement East Side (Maintenance Road & Training Area)	4 days	Wed 21-05-12	Mon 21-05-17
46		Topsoil Placement - Access Road	4 days	Mon 21-05-17	Thu 21-05-20
47		Seeding - All Areaa	4 days	Sat 21-05-22	Wed 21-05-26
48		TOTAL PERFORMANCE	0 days	Mon 21-05-31	Mon 21-05-31
49		**FUSE PLUG 2**	**177 days**	**Mon 20-10-26**	**Mon 21-05-31**
50		**Fuse Plug # 2 Mass Excavation**	**132 days**	**Thu 20-10-29**	**Wed 21-03-31**
51		Topsoil / Subsoil StripWAste Area	5 days	Thu 20-10-29	Tue 20-11-03
52		Topsoil / Subsoil Strip Laydown Area	5 days	Sat 20-10-31	Thu 20-11-05
53		FP # 2 Mass Excavaton	16 days	Fri 20-11-06	Tue 20-11-24
54		FP # 2 Impervious Fills	16 days	Fri 20-11-06	Tue 20-11-24
55		FP # 2 Random Fills	16 days	Fri 20-11-06	Tue 20-11-24
56		Fuse Plug Partition Wall	12 days	Fri 20-11-20	Thu 20-12-03
57		Electrical & Controls	10 days	Sat 21-03-20	Wed 21-03-31
58		**Fuse Plug # 2 Core**	**134 days**	**Mon 20-10-26**	**Wed 21-03-31**
59		3C Drain Rock	4 days	Mon 20-10-26	Thu 20-10-29
60		Articulating Concrete Blocks	16 days	Mon 20-12-14	Thu 20-12-31
61		3A Sand Core / Impervious Fill Wedge	4 days	Fri 21-01-01	Tue 21-01-05
62		3B Coarse Filter	3 days	Wed 21-01-06	Fri 21-01-08
63		4B Road Gravel	2 days	Sat 21-01-09	Mon 21-01-11
64		SUBSTANTIAL PREFORMANCE	0 days	Wed 21-03-31	Wed 21-03-31
65		**Fuse Plug # 2 Canal Slopes**	**121 days**	**Tue 20-11-10**	**Wed 21-03-31**
66		Concrete Rubble Removal	2 days	Tue 20-11-10	Wed 20-11-11
67		Rip Rap Slopes (5A / 5B 6B)	14 days	Tue 20-12-15	Wed 20-12-30
68		SUBSTANTIAL PREFORMANCE	0 days	Wed 21-03-31	Wed 21-03-31
69		**Fuse Plug # 2 Topsoil & Seed**	**14 days**	**Tue 21-05-11**	**Mon 21-05-31**
70		Topsoil Placement - Fuse Plug Slopes	5 days	Tue 21-05-11	Mon 21-05-17
71		Topsoil Placement (Laydown Area)	6 days	Mon 21-05-17	Mon 21-05-24
72		Seeding - All Areaa	4 days	Mon 21-05-24	Thu 21-05-27
73		TOTAL PERFORMANCE	0 days	Mon 21-05-31	Mon 21-05-31



Appendix G – Fish Rescue Recommendations

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403-850-0895

Fuse Plug Sites 1-2: Fish Rescue Recommendations

Date: November 11, 2020

Fuse Plug 2

At site Fuse Plug 2 (FP2), RIDGE recommends dewatering gradually as per mitigations provided in the Fisheries and Oceans Canada (DFO) letter of advice, dated September 28, 2020 (file 20-HCAA-01094). Dewatering procedures should adhere to the DFO code of practice for water intake screens.

FP2 should be dewatered gradually to a water level that supports safe and practical access by the fish rescue crew. This water level is expected to coincide with the mapped contour of 1027 m elevation (see tender consultant drawing 18952600W019; Golder 2020). Once the water level is at or near the 1027 m elevation, any ice that can possibly be removed shall be done so via a tracked excavator walking along the existing shoreline.

All reasonable efforts to remove fish from the remaining pool of water will then be undertaken by RIDGE with the understanding that mortality of some fish may occur during the rescue, as described in section 3.5.2.3 (Predicted Residual Effects) of the Environmental Evaluation report (Golder Associates Ltd. 2020). Further, existing winter conditions at the site may limit effective removal of any stranded fish at the site as efforts could be hampered by extreme environmental or weather conditions experienced at the time of rescue. Work and activities associated with the fish salvage will not be completed if site conditions are deemed unsafe. In the event of a fish kill, the consultant and the appropriate regulatory agencies will be contacted. All fish removed from FP2 will be relocated to a suitable downstream location, within the same drainage.

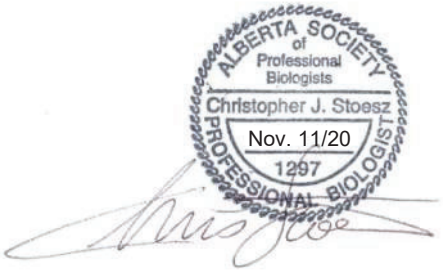
Fuse Plug 1-Section 1.

The work area for Fuse Plug 1 had two (2) coffer dam berms installed, one at the midway point and the second at the northern end of the section's limits. This divided this reach into two (2) areas – section 1 (closet to the reservoir) and section 2 (northern end). Greenfield (GF) had started to draw down the water within these areas to manageable levels in support of the fish salvage operations. The entire area was frozen and covered in snow and ice. There was no open water within either of these sections. Fish rescue efforts were undertaken on November 10, 2020 (see Nov. 10, 2020 QAES memo for details) with no fish captured or observed. Based on existing site conditions (i.e., frozen and slush ice in channel), no further rescue efforts will be completed.

RIDGE ENVIRONMENTAL PLANNING LTD

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Calgary, Alberta, T3B 2E2
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403-850-0895

Completed by:



Chris Stoesz, B.Sc., P.Biol.
Sr. Aquatic Biologist.

Reviewed by:



Eric Beveridge, EP, QAES
RIDGE Environmental Planning Ltd.

References

Fisheries and Oceans Canada. 2020. 20-HCAA-01094. Spillway and bank repair, Jensen Dam, Magrath (20-HCAA-0194)-Implementation of Measures to Avoid and Mitigate the Potential for Prohibited Effects to Fish and Fish Habitat. September 28, 2020.

Golder Associates Ltd. 2020. Environmental Evaluation. Jensen Dam-Flood Handling Upgrades. Phase 2-Emergency Spillway and Related Work. 56pp.

RIDGE ENVIRONMENTAL PLANNING LTD

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Calgary, Alberta, T3B 2E2
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Fuse Plug Sites 1-2: Fish Rescue Recommendations

Date: November 17, 2020

Environmental conditions at the Project location had changed such that the prescribed measures regarding fish salvage details outlined in the project's environmental assessment report (Golder 2020) and Fisheries and Oceans Canada (DFO) Letter of Advice (File #: 20-HCAA-01094) were not feasible to be completed as described.

A Project meeting was held on November 16, 2020 attended by representatives from Golder Associates Inc., MPE Engineering Ltd., Greenfield Construction and RIDGE Environmental Planning Ltd. to discuss options for proceeding. Supplemental information was requested by Golder and MPE regarding details on fish rescue plans and construction methods at Fuse Plug (FP) 1 and 2 and is provided below.

Fuse Plug 1

The work area for Fuse Plug 1 had two coffer dam berms installed, the first one at the midway point and the second at the northern end of the project, dividing canal into two reaches: Section 1, closest to the reservoir, and Section 2, the northern end of the project.

On November 10, 2020, fish rescue efforts were attempted in Section 1 (see Nov. 10, 2020 QAES memo for details) with no fish captured or observed. Prior to the fish rescue, environmental conditions had changed, following a severe snowstorm that left the canal with a thick layer of ice over top of slush extending to the bottom, inhibiting fish rescue efforts. Ice removal was not possible due to the amount present and the likelihood of removing fish was not feasible. Minnow trapping and dip netting efforts found no fish.

On November 11, 2020, Section 1 remained unchanged (ice covered and thick slush to the bottom) and Section 2 was assessed for fish rescue potential. Ice thickness averaged 0.3 m thick and there was ~1.0 m of water remaining at the northern-most end of the canal at the berm.

On November 16, 2020, efforts were made to break through the ice using hand tools with minimal success. Removal of the amount of ice present within this area was not considered feasible by hand and heavy equipment access was limited by the canal bank height and steep slopes (Photos 1 and 2, attached).

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As a follow up request from the November 16, 2020 meeting, additional efforts were undertaken on November 17, 2020 to determine the feasibility of fish rescue within Sections 1 and 2, using a tracked excavator to break ice. Details of the attempts are described in the November 17, 2020 QAES Memo (RIDGE, 2020) and below.

At the downstream end of Section 1 (upstream of the first berm), the amount of ice that could be broken was limited by the reach of the excavator from the berm. Ice thickness was 0.3 m, with a dense layer of slush down to the bed substrate. On the opposite side of the first berm (downstream, start of Section 2), ice was 0.3 m thick and water depth was <0.05 m. At the second berm (downstream end of Section 2), ice thickness was 0.3 m thick with a maximum water depth of 0.4 m.

RIDGE personnel waded into each opening and attempted to capture fish with a dip net, with no fish captured. Fish rescue efforts were hampered by the presence of large amounts of thick ice and slush which clogged the dip net. Ice and slush also presented wading hazards to the rescue personnel, reducing efficiency and probability of capturing fish. One juvenile White Sucker (*Catastomus commersoni*; 70 mm fork length) mortality was observed floating on the ice just upstream of the opened area of the downstream end of section 2. The cause and time of mortality was undetermined.

Based on the environmental conditions and efforts undertaken within Sections 1 and 2 of the canal, RIDGE is of the opinion that further efforts for fish rescue here are no longer feasible. While it is likely there are some fish remaining within each section of the canal, the potential for overwintering within the canal is considered limited, regardless of project impacts. Historically, water flows within the canal after mid-November are stopped, trapping any fish that may be there at the time. With stagnant water, the canal likely freezes to or near bottom. Similarly, water quality in the standing water under the ice would further limit overwintering potential, resulting in yearly fish mortality. Considering that yearly winterkill of fish trapped in the canal likely occurs, the success of the project's fish rescue is unlikely to affect the local fish populations within Jensen Reservoir and the canal.

Fuse Plug 2

At site Fuse Plug 2 (FP2), where the canal forms a small "lake" (Photos 3 and 4, attached), RIDGE recommends dewatering gradually as per mitigations provided in the Fisheries and Oceans Canada (DFO) letter of advice (20-HCAA-01094). Dewatering procedures should adhere to the DFO code of practice for water intake screens.

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FP2 should be dewatered gradually to a water level that supports safe and practical access by the fish rescue crew. This water level is expected to coincide with the mapped contour of 1027 m elevation (see tender consultant drawing 18952600W019; Golder 2020). Once the water level is at or near the 1027 m elevation, any ice that can possibly be removed shall be done so via a tracked excavator.

To facilitate adequate dewatering and feasible project execution, Greenfield has pumped water levels down about 2 m where the shoreline slope increases significantly. Greenfield plans to continue to dewater this area and will then build out an access ramp with fill material towards the deepest section of the “lake”, taking the shortest route possible to minimize impacts. The plan is for Greenfield to lower the water level within the lake to a depth that allows for construction activities to be completed but does not plan to dewater the entire waterbody if not required.

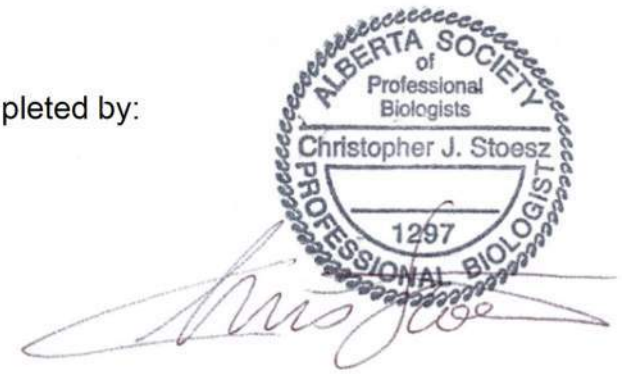
Once the pump intake is at the deepest section of the “lake”, Greenfield will remove surrounding ice within the reach of the tracked excavator. The end goal will be that the center of the “lake” will contain any stranded fish which will then be rescued by the RIDGE team. All rescue efforts will be undertaken as safely as possible. Initial exploration of the bed substrate by Greenfield has found that sediment deposition within the “lake” is high and the bed is very soft, precluding further access by tracked excavator or on foot. If conditions at the fish rescue area are similar, efforts will be limited to what can be accessed safely.

All reasonable efforts to remove fish from the remaining pool of water will then be undertaken with the understanding that mortality of some fish may occur during the rescue, as described in section 3.5.2.3 (Predicted Residual Effects) of the Environmental Evaluation report (Golder Associates Ltd. 2020). Further, existing winter conditions at the site may limit effective removal of any stranded fish at the site as efforts could be hampered by extreme environmental or weather conditions experienced at the time of rescue. Work and activities associated with the fish salvage will only be completed if site conditions are deemed safe. In the event of a fish kill beyond the assessed prediction, the consultant and the appropriate regulatory agencies will be contacted. All fish removed from FP2 will be relocated to a suitable downstream location, within the same drainage.

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Completed by:



Chris Stoesz, B.Sc., P.Biol.
Sr. Aquatic Biologist.

Reviewed by:



Eric Beveridge, EP, QAES
RIDGE Environmental Planning Ltd.

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Photo 1. November 16, 2020. Section 1, downstream end at berm.



Photo 2. November 16, 2020. Section 2, downstream end at berm.

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Photo 3. November 16, 2020. Fuse Plug 2, looking upstream at “lake” portion of the canal.



Photo 4. November 16, 2020. Fuse Plug 2, looking downstream at “lake” portion of the canal.

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References

Fisheries and Oceans Canada. 2020. 20-HCAA-01094. Spillway and bank repair, Jensen Dam, Magrath (20-HCAA-0194)-Implementation of Measures to Avoid and Mitigate the Potential for Prohibited Effects to Fish and Fish Habitat. September 28, 2020.

Golder Associates Ltd. 2020. Environmental Evaluation. Jensen Dam-Flood Handling Upgrades. Phase 2-Emergency Spillway and Related Work. 56pp.

RIDGE Environmental Planning Ltd. 2020. Jensen Dam Flood Handling Upgrade Project. QAES Memo. November 17, 2020.

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Fuse Plug Sites 2: Fish Rescue Recommendations

Date: November 19, 2020

Environmental conditions at the Project location had changed such that the prescribed measures regarding fish salvage details outlined in the project's environmental assessment report (Golder 2020) and Fisheries and Oceans Canada (DFO) Letter of Advice (File #: 20-HCAA-01094) were not feasible to be completed as described. Since conditions have changed the following steps and strategies that will be implemented to complete a fish rescue at Fuse Plug 2 are described below.

At site Fuse Plug 2 (FP2), where the canal forms a small "lake" (Photos 1 and 2, attached), RIDGE recommends dewatering gradually as per mitigations provided in the Fisheries and Oceans Canada (DFO) letter of advice (20-HCAA-01094). Dewatering procedures should adhere to the DFO code of practice for water intake screens.

FP2 should be dewatered gradually to a water level that supports safe and practical access by the fish rescue crew. RIDGE will work with the Greenfield crew during the dewatering operation. As part of the dewatering plan, a pumping platform will be needed, consisting of creating a berm from the existing pump location on the west side of the work area in order to reach the deepest section of the canal. At this stage, the water level is expected to coincide with the mapped contour of 1027 m elevation (see tender consultant drawing 18952600W019; Golder 2020). The dewatering operation will continue to follow the Turbidity Monitoring Plan for the project to ensure the management of downstream sedimentation.

Once the water level is at or near the 1027 m elevation, any ice that can possibly be removed shall be done so via a tracked excavator. The plan, based on the anticipated elevation within the project drawings, is to allow the remaining water within the system to concentrate into an area that will allow a fish rescue to take place. A number of fish rescue tools and equipment will be available to be implemented to maximize the efforts. This will include the following: dip nets, minnow traps, seine nets, electrofishing unit and a boat will be on site that can be utilized as needed.

To facilitate adequate dewatering and feasible project execution, Greenfield has pumped water levels down about 2 m where the shoreline slope increases significantly. Greenfield plans to continue to dewater this area and will then build out an access ramp/pumping platform with fill material towards the deepest section of the "lake", taking the shortest route possible to minimize impacts (**Figure 1**). The plan is for Greenfield to lower the water level within the lake to a depth that allows for construction activities to be completed but does not plan to dewater the entire waterbody if not required. **Figure 1** shows the approximate location of the berm/pumping platform will be built out into the lake. This will allow pump access into the deepest section of the lake. The fish salvage will concentrate within the anticipated deepest section of the lake. RIDGE and Greenfield will work together as the water is lowered in stages to evaluate in-lake

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water conditions. Efforts will be made to assess for any stranded fish but understand that access throughout the area may be limited due to natural conditions.

Once the pump intake is at the deepest section of the “lake”, Greenfield will remove surrounding ice within the reach of the tracked excavator. The end goal will be that the center of the “lake” will contain any stranded fish which will then be rescued.



Figure 1 – Fuse Plug 2 working area – looking north

All rescue efforts will be undertaken as safely as possible. Initial exploration of the bed substrate by Greenfield has found that sediment deposition within the “lake” is high and the bed is very soft, precluding further access by tracked excavator or on foot. If conditions at the fish rescue area are similar, efforts will be limited to what can be accessed safely. The tools and equipment that are listed above will be used based on what can be safely implemented – under the lowered water conditions.

All reasonable efforts to remove fish from the remaining pool of water will then be undertaken with the understanding that mortality of some fish may occur during the rescue, as described in Section 3.5.2.3 (Predicted Residual Effects) of the Environmental Evaluation report (Golder Associates Ltd. 2020). Further, existing winter conditions at the site may limit effective removal of any stranded fish at the site as efforts could be hampered by extreme environmental or weather conditions experienced at the time of rescue. Work and activities associated with the fish salvage will only be completed if site conditions are deemed safe. In the event of a fish kill beyond the assessed prediction, the consultant and the appropriate regulatory agencies will be contacted. All fish removed from FP2 will be relocated to a suitable downstream location, within the same drainage.

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Completed by:

ALBERTA SOCIETY of Professional Biologists
Christopher J. Stoesz
19/11/2020
1297
PROFESSIONAL BIOLOGIST

Chris Stoesz, B.Sc., P.Biol.
Sr. Aquatic Biologist.

Reviewed by:

Eric Beveridge, EP, QAES
RIDGE Environmental Planning Ltd.

References

Fisheries and Oceans Canada. 2020. 20-HCAA-01094. Spillway and bank repair, Jensen Dam, Magrath (20-HCAA-0194)-Implementation of Measures to Avoid and Mitigate the Potential for Prohibited Effects to Fish and Fish Habitat. September 28, 2020.

Golder Associates Ltd. 2020. Environmental Evaluation. Jensen Dam-Flood Handling Upgrades. Phase 2-Emergency Spillway and Related Work. 56pp.

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Photo 1. November 19, 2020. Fuse Plug 2, looking upstream at “lake” portion of the canal – viewing east.



Photo 2. November 19, 2020. Fuse Plug 2, looking north at “lake” portion of the canal.

Appendix H – QAES Memo

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JENSEN DAM FLOOD HANDLING UPGRADE PROJECT – QAES Memo

Attention: Mike Allain – Greenfield Construction

Date: November 11, 2020

Completed by: Eric Beveridge

Location: Jensen canal – Fuse Plug 1

The following memo details the results of the site inspection and fish rescue operations completed on November 10, 2020 as part of the Jensen Dam Flood Handling Upgrade Project specially regarding the canal section associated with Fuse Plug 1.

November 10, 2020

Weather: Snowing, high winds, low visibility: -9c to -4c

The work area for Fuse Plug 1 had two (2) coffer dam berms installed, one at the midway point and the second at the northern end of the section's limits. This divided this reach into two (2) areas – section 1 (closet to the reservoir) and section 2 (northern end). Greenfield (GF) had started to draw down the water within these areas to manageable levels in support of the fish salvage operations.

Site Conditions:
The entire area was frozen covered in snow and ice. There was no open water within these sections. Snow drifts along the banks down to the canal.

Fish Rescue:
Entered the canal into section 1 at the coffer dam berm between the sections. The area was covered in approximately 2" of ice. I was able to break through the ice by walking on it. Once broken through there was between 10" to 12" of slush slurry – did not appear to be any free-flowing water. Section 2 was not entered due to unsafe conditions with the presumed depth of 2 m+-.

Working back towards the reservoir (upstream) an opening in the ice was created about every 10 – 15 m for the first 75 – 85 m. At that point, the depth shallowed to where I was not breaking through the ice. A total 8 openings were created.

Between 10:30 and 15:00 dip-netting was completed through the ice at all location. Conditions of freezing weather and slushy water made the operation difficult as ice and slush had to be continually removed. In addition to dip-netting 3 minnow traps were set with the furthest downstream holes. The depth within the holes was just enough to cover the traps to allow them to be submerged. The slushy water made the traps difficult to operate as they were inundated with ice and slush. The minnow traps were set two times for periods of nearly 2 hours each.

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Environmental conditions caused the holes to ice over. This resulted in ice/slush be removed continuously over this time period.

All feasible efforts were undertaken to complete fish rescue within this section. No fish were captured or observed.

November 11, 2020

Weather: Overcast: -14c

Site Conditions:
The entire area was frozen covered in snow and ice. There was no open water within these sections. Snow had built up over sections of the canal due the previous day/night storm. The area of the creek that the fish rescue was attempted in the previous day had iced over to the extent that the area that had previously been disturbed was not noticeable as it had frozen over completely.
Went into the section again to check on ice thickness. The level of ice had increased and in the sections where I was able to break through the ice was completely inundated with slush.

Due to unsafe conditions section 2 of this area was not entered.

On both Nov. 10 and 11 the Fuse Plug 2 work area was inspected in terms of looking at the scheduled planned activities in relation to the sites conditions (frozen) and fish rescue options.

Prepared by:



Eric Beveridge, EP, QAES
RIDGE Environmental Planning Ltd.
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Site Photos



Photo 1: Nov. 10 – Ice thickness with dip net.



Photo 2: Nov. 10 – Looking north from within the canal. Sample holes and tracks through the ice/slush.

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Photo 3: Nov. 10 – Minnow trap placed through ice.



Photo 4: Nov. 10 – Looking south in the canal.

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Photo 5: Nov. 10 – Looking south in the canal – extent of fish rescue efforts.



Photo 6: Nov. 10 – Looking south in the canal – section 2 of Fuse Plug area 1.

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Photo 7: Nov. 11 – Looking south in the canal.



Photo 8: Nov. 11 – Looking north in the canal – section 2 of Fuse Plug area 1.

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Photo 10: Nov. 11 – Ice depth in canal – section 1 of Fuse Plug area 1 – area of fish rescue from Nov 10.



Photo 11: Nov. 11 – Looking south in the canal – section 1 of Fuse Plug area 1 - area of fish rescue from Nov 10.

APPENDIX E

Permits, Authorizations, Notifications

Alberta Environment and Parks

APPROVAL
PROVINCE OF ALBERTA
WATER ACT, R.S.A. 2000, c.W - 3, as amended

APPROVAL NO.:	5048049
APPLICATION NO.:	5048048
ACTIVITY LOCATION:	TABLE 1
WATERBODY:	TABLE 2
EFFECTIVE DATE:	October 02, 2020
EXPIRY DATE:	November 01, 2021
APPROVAL HOLDER:	Her Majesty the Queen in Right of Alberta as represented by the Minister of Transportation - Southern Region

Pursuant to the Water Act, R.S.A. 2000, c.W - 3, as amended, an Approval is issued to the Approval Holder, subject to the attached terms and conditions.



Andun Jevne
Designated Director under the Act

Dated : October 02, 2020

TABLE 1 - Activity Location (LLD)

Qtr	Sec	Twp	Rge	Mer
NW	22	4	22	4
NW	34	4	22	4
NE	34	4	22	4
SW	27	4	22	4

TABLE 2

Water Body
JENSEN RESERVOIR

Part 1. ACTIVITY

1.1 Pursuant to the Water Act, R.S.A. 2000, c. W-3, as amended, an Approval is issued to the Approval Holder to commence, continue and discontinue the following activities:

placing, constructing, operating, maintaining, removing, disturbing works, in or on any land, water or water body;

maintaining, removing or disturbing ground, vegetation or other material in or on any land, water or water body;

altering the flow, direction of flow or level of water;

to construct two new fuse plugs downstream of Jensen Reservoir for the purpose(s) of enhancing emergency discharge capacity during major flood events

subject to the attached terms and conditions

Part 2. DEFINITIONS

2.1 All definitions from the Act and the Regulations apply except where expressly defined in this approval.

2.2 In all parts of this Approval:

(a) "Act" means the Water Act, RSA 2000, c. W-3, as amended;

(b) "Director" means an employee of the Government of Alberta designated as a Director under the Act;

(c) "Regulations" means the regulations, as amended, enacted under the authority of the Act;

(d) "Application" means the written submissions to the Director in respect of application number 5048048 and any subsequent applications for amendments of Approval Number 5048049;

Part 3. GENERAL

3.1 The Approval Holder shall immediately report to the Director by telephone, any contravention of the terms and conditions of this approval at 1-780-422-4505.

3.2 The terms and conditions of this Approval are severable. If any term or condition of this Approval is held invalid, the application of such term or condition to other circumstances and the remainder of this Approval shall not be affected thereby.

3.3 The Approval Holder shall not deposit or cause to be deposited any substance in, on, or around the water body that has, or may have, the potential to adversely affect the water body.

3.4 The Approval Holder shall retain a copy of this Approval at the site of the activity.

Part 4. PARTICULARS

4.1 This Approval is appurtenant to the following:

(b) the undertaking described as the installation of two fuse plugs downstream of Jensen Reservoir at NW 22-004-22-W4, NW 34-004-22-W4, NE 34-004-22-W4 and SW 27-004-22-W4 as described in the reports, as specified in 4.2.

4.2 The Approval Holder shall only undertake the Activity in accordance with the following plan(s) and report(s).

REPORTS AND PLANS

Report 5048049-R001 - Jensen Dam Flood Handling Upgrades - MPE Engineering Ltd. - 7 Pages - Dated July 21, 2020

Report 5048049-R002 - Jensen Dam Phase 2 Environmental Risk Assessment - Golder Associates Ltd. - 19 Pages - Dated August 2020

Report 5048049-R003 - Jensen Phase 2 Construction Sequencing - 1 Page

4.4 The Approval Holder shall retain a copy of the report(s) and plan(s) referred to in 4.2 at the site of the Activity at all times while conducting the Activity.

4.5 The Approval Holder shall not undertake the Activity in any manner or use any material that causes or may cause an adverse effect on the aquatic environment, human health, property or public safety.

4.10 The Approval Holder shall not cause or permit any water to enter an intake pipe leading to pumps unless the water has passed through a screen with openings no larger than 2.54 millimetres.

Part 6. SILTATION AND EROSION

6.1 The Approval Holder shall not do or permit anything to be done, nor omit or permit any omissions, which causes or may cause an adverse effect related to:

(a) siltation; or

(b) erosion

as a result of the activity.

Part 14. CERTIFICATE OF COMPLETION

14.1 A Certificate of Completion is not required for this activity.

Fisheries and Oceans Canada
Pêches et Océans Canada

Ontario and Prairie Region
Fish and Fish Habitat Protection Program
501 University Crescent
Winnipeg, MB
R3T 2N6

Région de l'Ontario et des Prairies
Programme de la protection du poisson et son habitat
501 croissant University
Winnipeg (Manitoba)
R3T 2N6

Your file *Votre référence*

28 September 2020

Our file *Notre référence*
20-HCAA-01094

Carl Wirzba
Alberta Transportation
909-3rd Ave North
Lethbridge, AB
T1H 0H5

Subject: Spillway and Bank Repair, Jensen Dam, Magrath (20-HCAA-01094) – Implementation of Measures to Avoid and Mitigate the Potential for Prohibited Effects to Fish and Fish Habitat

Dear Carl Wirzba:

The Fish and Fish Habitat Protection Program (the Program) of Fisheries and Oceans Canada (DFO) received your proposal on 25 May 2020. We understand that you propose to:

- Replace the existing bank protection along the emergency spill way with riprap for a total replacement footprint of 33 162m2
- Perform the work in the dry during the winter operating levels and relocate any stranded fish

Our review considered the following information:

- Request for Review form and associated documents submitted on 25 May 2020
- Email and Phone correspondence with Carl Wirzba (Alberta Transportation), Leslie Wensmann (Alberta Transportation), Ronald Kitagawa (Golder Associates Ltd), and Michael Day (Golder Associates Ltd.) confirming additional project details

Your proposal has been reviewed to determine whether it is likely to result in:

- the death of fish by means other than fishing and the harmful alteration, disruption or destruction of fish habitat which are prohibited under subsections 34.4(1) and 35(1) of the *Fisheries Act*
- effects to listed aquatic species at risk, any part of their critical habitat or the residences of their individuals in a manner which is prohibited under sections 32, 33 and subsection 58(1) of the *Species at Risk Act*

- the introduction of aquatic species into regions or bodies of water frequented by fish where they are not indigenous, which is prohibited under section 10 of the *Aquatic Invasive Species Regulations*.

The aforementioned impacts are prohibited unless authorized under their respective legislation and regulations.

To avoid and mitigate the potential for prohibited effects to fish and fish habitat (as listed above), we recommend implementing the measures listed below:

- Capture, relocate and monitor for fish trapped within isolated, enclosed, or dewatered areas
  - Dewater gradually to reduce the potential for stranding fish
- Screen intake pipes to prevent entrainment or impingement of fish
  - Use the code of practice for water intake screens
- Apply the interim code of practice for temporary cofferdams and diversion channels
- Limit impacts on riparian vegetation to those approved for the work, undertaking or activity
- Replace/restore any other disturbed habitat features and remediate any areas impacted by the work, undertaking or activity
- Develop and implement an Sediment Control Plan to minimize sedimentation of the waterbody during all phases of the work, undertaking or activity
  - Conduct all in-water works, undertakings or activities in isolation of open or flowing water to reduce the introduction of sediment into the watercourse
  - Inspect and maintain regularly the erosion and sediment control measures and structures during all phases of the project
  - Remove all exposed non-biodegradable sediment control materials once site has been stabilized
  - Use methods to prevent substrate compaction (e.g., swamp mats, pads)
  - Dispose and stabilize all dredged material above the high water mark of nearby waterbodies to prevent entry in the water
- Do not deposit any deleterious substances in the water course
- Develop and implement a response plan to avoid a spill of deleterious substances

Provided that you incorporate these measures into your plans, the Program is of the view that your proposal is not likely to result in the contravention of the above mentioned prohibitions and requirements.

Should your plans change or if you have omitted some information in your proposal, further review by the Program may be required. Consult our website (http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html) or consult with a qualified environmental consultant to determine if further review may be necessary. It remains your responsibility to remain in compliance with the *Fisheries Act*, the *Species at Risk Act* and the *Aquatic Invasive Species Regulations.*

.../3

Whirling disease, a disease of finfish, caused by infection with a microscopic parasite called *Myxobolus cerebralis*, has been identified in Alberta. There may be a requirement for you to apply for a permit from the Canadian Food Inspection Agency to move certain species of finfish, such as rainbow trout, and things, such as sediments, within or out of Alberta. Please visit http://www.inspection.gc.ca/animals/aquatic-animals/domestic-movements/eng/1450122972517/1450122973466 for more information.

It is also your *Duty to Notify* DFO if you have caused, or are about to cause, the death of fish by means other than fishing and/or the harmful alteration, disruption or destruction of fish habitat. Such notifications should be directed to (http://www.dfo-mpo.gc.ca/pnw-ppe/CONTACT-eng.html).

We recommend that you notify this office at least 10 days before starting your project and that a copy of this letter be kept on site while the work is in progress. It remains your responsibility to meet all other federal, territorial, provincial and municipal requirements that apply to your proposal.

If you have any questions with the content of this letter, please contact Sheeva Nakhaie at 905-315-5270, or by email at Sheeva.Nakhaie@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,



Lynn Dupuis
Senior Biologist, Hydro and Flows Regulatory Review
Fish and Fish Habitat Protection Program

Copy: Sheeva Nakhaie (DFO)
Neil Fisher (DFO)
Leslie Wensmann (Alberta Transportation)
Ronald Kitagawa (Golder Associates Ltd)
Michael Day (Golder Associates Ltd.)

Alberta

HRA Number: 4825-19-0023-002
June 10, 2020

Historical Resources Act Approval with Conditions

Proponent: Alberta Transportation
Main Floor, Administration Building, 909 - 3rd Avenue N, Lethbridge, AB T1H 0H5
Contact: Carl Wirzba

Agent: Golder Associates
Contact: Megan Trefry

Project Name: **Alberta Transportation Jensen Dam Flood Handling Upgrades - Phase 2 Emergency Spillway/Related Works**

Project Components: Reservoir
Dam
Other - modify spillway/outlet/canal, road upgrades

Application Purpose: Requesting HRA Approval / Requirements
Amendment or Update to Project Submitted Previously

Historical Resources Act approval is granted for the activities described in this application and its attached plan(s)/sketch(es) subject to the following conditions.

David Link
Assistant Deputy Minister
Heritage Division
Alberta Culture, Multiculturalism
and Status of Women

SCHEDULE OF CONDITIONS

ARCHAEOLOGICAL RESOURCES

There are no *Historical Resources Act* requirements associated with archaeological resources; however, the proponent must comply with Standard Requirements under the *Historical Resources Act*: Reporting the Discovery of Historic Resources, which are applicable to all land surface disturbance activities in the Province.

PALAEONTOLOGICAL RESOURCES

Conditional *Historical Resources Act* approval is granted on the understanding that a Historic Resources Impact Assessment for palaeontological resources in the form of a monitoring program will be conducted, as outlined below.

SCHEDULE OF CONDITIONS (continued)

1. The monitoring program must include all areas where bedrock will be impacted by excavation activities.

2. No excavation activities, as described above, are to take place on the project until a professional consulting palaeontologist is on-site to monitor construction activities. Should significant palaeontological resources be encountered during the conduct of the monitoring program, the Royal Tyrrell Museum of Palaeontology must be contacted. It may then be necessary for Alberta Culture, Multiculturalism and Status of Women to issue further instructions regarding these resources.

3. The Historic Resources Impact Assessment for palaeontological resources is to be conducted on behalf of the proponent by a palaeontologist qualified to hold a palaeontological research permit within the Province of Alberta. A permit must be issued by Alberta Culture, Multiculturalism and Status of Women prior to the initiation of any palaeontological field investigations. Please allow ten working days for the permit application to be processed. To obtain contact information for consultants qualified to undertake this work, please consult the list of Alberta Historic Resource Consultants.

ABORIGINAL TRADITIONAL USE SITES

There are no *Historical Resources Act* requirements associated with Aboriginal traditional use sites of a historic resource nature; however, the proponent must comply with Standard Requirements under the Historical Resources Act: Reporting the Discovery of Historic Resources, which are applicable to all land surface disturbance activities in the Province.

HISTORIC STRUCTURES

There are no *Historical Resources Act* requirements associated with historic structures; however, the proponent must comply with Standard Requirements under the *Historical Resources Act*: Reporting the Discovery of Historic Resources, which are applicable to all land surface disturbance activities in the Province.

PROVINCIALLY DESIGNATED HISTORIC RESOURCES

There are no *Historical Resources Act* requirements associated with Provincially Designated Historic Resources; however, the proponent must comply with Standard Requirements under the *Historical Resources Act*: Reporting the Discovery of Historic Resources, which are applicable to all land surface disturbance activities in the Province.

ADDITIONAL COMMENTS

1. In addition to any specific conditions detailed above, the proponent must abide by all Standard Conditions under the *Historical Resources Act*.

Lands Affected: All New Lands

Proposed Development Area:

MER	RGE	TWP	SEC	LSD List
4	22	4	22	12-15

SCHEDULE OF CONDITIONS (continued)

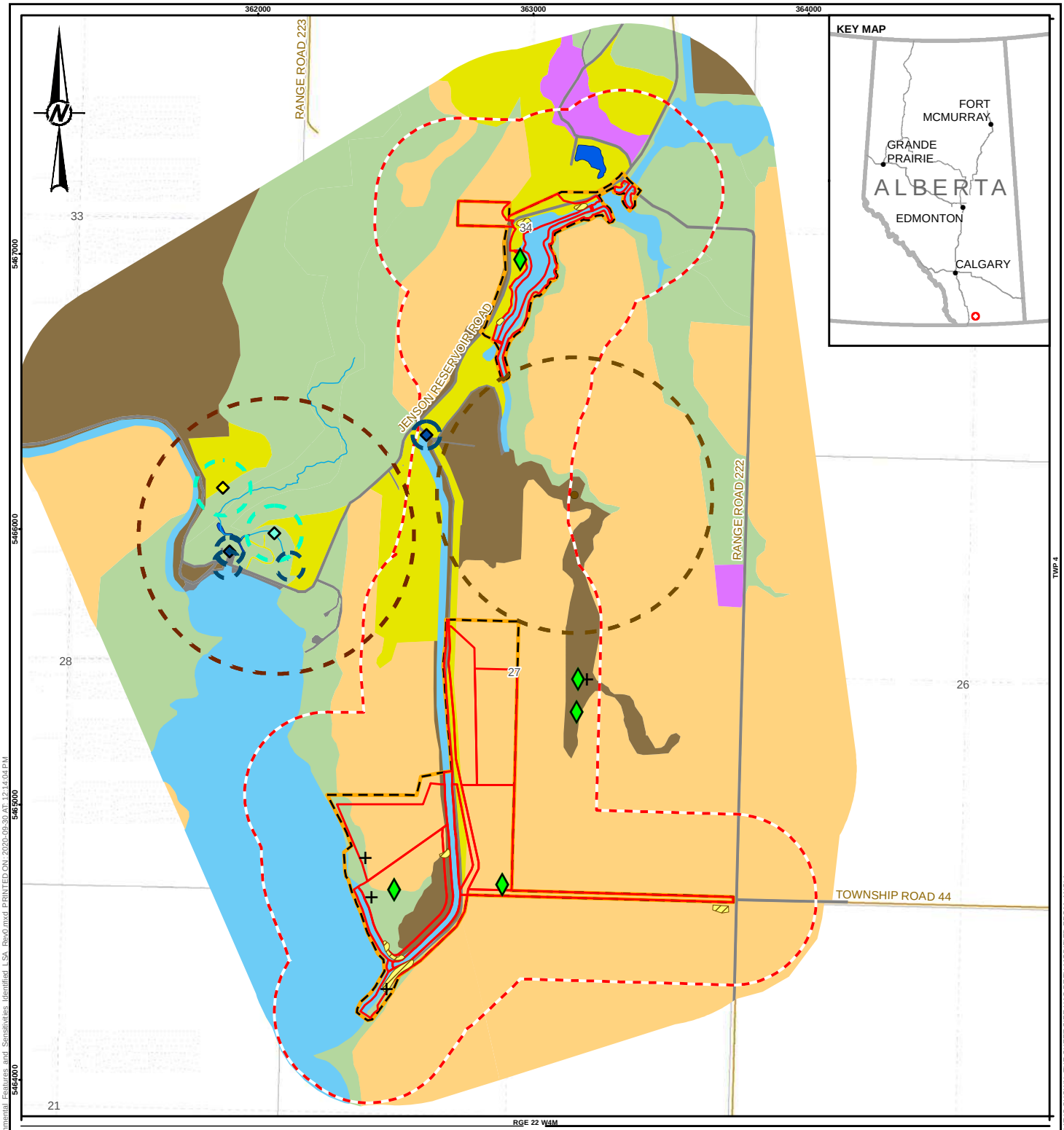
4	22	4	27		1-4,6,11
4	22	4	34		3,6-7,10-11

Documents Attached:

Document Name	Document Type
Project Footprint and LSA	Illustrative Material

ATTACHMENT 3

Environmental Features and Sensitivities Identified in the Local Study Area



LEGEND

- PROJECT FOOTPRINT
- PROPOSED CONSTRUCTION LIMITS
- LOCAL STUDY AREA
- LOCAL ROAD
- CLIFF SWALLOW COLONY
- RED-TAILED HAWK NEST
- GREAT-HORNED OWL POTENTIAL NEST
- POTENTIAL SNAKE HIBERNACULUM
- POTENTIAL SNAKE HIBERNACULUM HABITAT
- CLIFF SWALLOW BUFFER (50m)
- RED-TAILED HAWK AND GREAT-HORNED OWL BUFFER (100m)
- POTENTIAL SNAKE HIBERNACULUM BUFFER (500m)
- WATERCOURSE
- CANADA THISTLE OCCURRENCES
- VELVETY GOLDENROD

LAND COVER TYPE

- CROP (NON-IRRIGATED)
- DEVELOPED
- FARM YARD
- MAN-MADE WATERBODY
- MODIFIED GRASSLAND
- NATIVE
- TAME PASTURE OR HAY (NON-IRRIGATED)
- ANTHROPOGENIC WETLAND

0 500 1,000

1:20,000 METRES

REFERENCE(S)

ALBERTA DIGITAL BASE DATA MAY BE OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED, ALTALIS LTD.© GOVERNMENT OF ALBERTA 2016. ALL RIGHTS RESERVED. OR IHS MARKIT CANADA ULC. 2018-06-28.
PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT
ALBERTA TRANSPORTATION

PROJECT
JENSEN DAM FLOOD HANDLING UPGRADES
PHASE 2 - EMERGENCY SPILLWAY AND RELATED WORKS

TITLE
ENVIRONMENTAL FEATURES AND SENSITIVITIES IDENTIFIED IN AND NEAR THE LOCAL STUDY AREA

CONSULTANT
GOLDER

YYYY-MM-DD	2020-09-30
DESIGNED	AO
PREPARED	NO
REVIEWED	KS
APPROVED	RK

PROJECT NO.	CONTROL	REV.	FIGURE
1895260	2100	0	A-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

25mm

0

PATH: I:\2019\1\895260\M\apmp\MXD\Wildlife\1895260_FigA-1_JensenDam_Phase2_EnvironmentalFeatures_and_SensitivitiesIdentified_LSA_Rev0.mxd PRINTED ON: 2020-09-30 AT: 12:14:04 PM

Alberta

RESEARCH LICENCE
Pre-Approved Assessments and Salvages (RL-PAAS)

Licence #: 20-5020

Licencee: **RIDGE Environmental Planning Ltd.** Eric Beveridge, Chris Stoesz, Krista Russell, and other RIDGE Environmental Planning Ltd. staff under their direct supervision.

Address: RIDGE Environmental Planning Ltd.
5856 Bowwater Cres. NW
Calgary, AB.
T3B 2E2

Contact: NAME: Eric Beveridge
Phone: 403-850-0895
Email: ebeverage@ridgeenvironmental.ca

This Licence is valid for:

- Fish and fish habitat assessments within the Province of Alberta, excluding National Parks.
  - Note: that assessments are prohibited after October 31st
- Fish salvages/rescues within the Province of Alberta, excluding National Parks.
- Activities, Locations and Timings not covered by this Licence are listed and described below in Section 3: *Activities, Sampling, and Timings not covered by this Licence.*

Permitted Sampling Gear:

Electrofishing (boat, float and backpack), seine nets, dip nets, and baited minnow traps.
- Gear not listed must be approved in writing by an Area Fisheries Contact.

Signature of Licencee

Digitally signed by Jason.Cooper
Date: 2020.08.13 09:25:32 -06'00'

Jason Cooper: for Director of Fisheries

This licence is valid from August 17, 2020 **to** March 31, 2021

Issue Date: 14-AUG-2020 **Issuing Region:** AEP Fisheries Management

This licence is not valid until signed by the Licencee and the Director of Fisheries or their designate.

Licence Conditions:

Fish and Wildlife Division Notification

1. The licencee shall advise the appropriate District Fish and Wildlife Officer and Area Fisheries Contact of the intended times and locations of collection at least **4 days** in advance of the commencement of field activities. Email notifications shall be sent to RLPAAS@gov.ab.ca identifying the correct office(s) and the District Fish and Wildlife Officer corresponding to the location of the work as based on the area contact maps and email listings provided.

Approved Sampling Locations and Timings

2. The sampling/handling/collection of fish under the authority of this licence is permitted at the following locations within the Province of Alberta, excluding National Parks:
   (a) Fish and fish habitat assessments in Class C and D waterbodies (see Section 3c and 4 for exceptions)
   (b) Fish and fish habitat assessments in Class B waterbodies outside of the Restricted Activity Period (see Section 3c and 4 for exceptions)
   (c) Fish salvages and rescues in Class B, C and D waterbodies (see Section 3a for exceptions)
   (d) All mapped and unmapped waterbodies, water courses, and wetlands (see Section 3c and 4 for exceptions)

Activities, Sampling, and Timings not covered by this Licence

3. The sampling/handling/collection of fish under the authority of this licence is not permitted at the following locations within the Province of Alberta, unless approved in writing by an Area Fisheries Contact:
   a) Class A waterbodies
   b) Fish and fish habitat assessments in Class B waterbodies within the Restricted Activity Period
   c) Fish and fish habitat assessments in Special Waters, as defined in Appendix A.

4. Fish assessments are permitted to take place from the licence issue date to October 31st; fish salvages are permitted from the licence issue date to March 31st.

Gear Restrictions

5. Minnow traps set under the authority of this licence shall be affixed with a weather proof tag, of minimum size 5 x 10 cm bearing the Research Licence number and the name of the licencee, in letters not less than 20 mm high.

6. Minnow traps shall be checked at least once within a 24 hour period.

7. Minnow trapping, seine netting, and/or other stated methods shall follow, as a minimum, the protocol outlined in "Standards for Sampling Small Bodied Fish in Alberta" located on the Alberta Environment and Parks (AEP) website under Research Licences.

8. Fish assessments and sampling in small streams (defined as 'easily wadeable') in Alberta under the authority of this licence shall meet the 'minimum' standard for collecting and reporting data as per the "Standard Protocol for Sampling of Small Streams in Alberta" located on the AEP website under Research Licences. For electrofishing this shall require sampling a distance of 300 meters or 40 times the wetted width, whichever is greater.

9. The licencee shall operate in accordance with the "Alberta Fisheries Management Division Electrofishing Policy (link) Respecting Injuries to Fish. **If spawning fish or eggs are encountered cease electrofishing immediately and contact the Area Fisheries Contact.**

10. In an effort to prevent the introduction and spread of aquatic invasive species (AIS) and fish disease in Alberta, all licence holders shall adhere to the Government of Alberta Decontamination Protocol when conducting work in water (link). The most current version of the Alberta *Decontamination Protocol for Watercraft and Equipment* shall be followed in direct association with the most current *Whirling Disease decontamination risk zone map* (link).
    - Upon notification, the Area Fisheries Contact or Provincial Fish Disease Specialist may recommend and impose additional decontamination protocols and conditions depending on the risk posed by the proposed work (Example, Quaternary Ammonium Compound (QAC) solutions may be ineffective for some AIS and fish diseases, or based on any new Whirling Disease testing data or a delay in updating online decontamination risk zone maps).

11. The use of felt-soled wading boots is prohibited unless the felt can be removed and properly decontaminated.

Fish Handling

12. No lethal sampling of fish as listed on Alberta's *List of Native and Naturalized Fish Species in Alberta*, (Link) and no collection of fish tissues.
    Exceptions:
    (a) **Carp and Carassius species (i.e., Prussian, Common, Asian), and other non-naturalized Aquatic Invasive species are to be retained, euthanized, and disposed of according to Condition 13(g). If not previously documented in the Fisheries and Wildlife Management Information Mapping Tool (FWIMT), the Area Fisheries Contact is to be notified immediately if any Aquatic Invasive Fish Species are observed or captured.**
    (b) **Fish for identification purposes according to Condition 14.**

13. All captured fish shall be handled and disposed of as follows:
    (a) Specific to fish assessment works, all live fish (not approved for retention under this licence) shall be handled in such a manner as to ensure maximum survival and be released to the waters from which they were collected.
    (b) Specific to fish salvages, all live fish (not approved for retention under this licence) shall be handled in such a manner as to ensure maximum survival and be released to sites determined prior to capture in the waters from which they were collected (refer to Best Practices).
    (c) Any species captured that is not named on the Alberta Environment and Parks (AEP) List of Native and Naturalized Fish Species in Alberta shall be reported immediately to the Area Fisheries Contact. Voucher specimens and digital photos of the specimens shall be submitted to the Area Fisheries Contact immediately for confirmation purposes, unless otherwise agreed to, and shall be reported as per the data return requirements.
    (d) **All species must be identified and tallied.**
    (e) **Fork lengths (mm) must be measured for all sport fish species and including Pygmy Whitefish, Stonecat, Brassy Minnow, and Western Silvery Minnow, with the exception of Burbot, Rocky Mountain Sculpin, and Deepwater Sculpin which require total length (mm).**
    (f) All fish mortalities shall have at a minimum, count of species collected.
        i. All sport fish mortalities must have length (mm), weight (g), and an ageing structure, sex, and maturity collected.
    (g) All fish mortalities shall be disposed of:
        i. By incineration or disposal at an approved sanitary landfill; or
        ii. In a manner approved by the Area Fisheries Contact where the collection occurred, if disposal under sub-clause (i) is not practical.

14. For the purpose of this licence, the following species, or group of species, and numbers of fish shall be retained for identification purposes only:
    (a) If captured, voucher specimens to (up to 5 per species) of any species named on the AEP List of Native and Naturalized Fish Species in Alberta, and which shall be surrendered to the Area Fisheries Contact immediately unless otherwise agreed to.
    (b) **NO SPORT FISH SHALL BE RETAINED UNLESS APPROVED IN WRITING BY AN AREA FISHERIES CONTACT.**

15. Where an authorized number of fish have been permitted to be culled in one of the preceding conditions or by approval in writing, if the combined total mortality of those species identified in this Licence is exceeded, the Area Fisheries Contact shall be notified immediately before continued sampling takes place.

16. This licence **does not** permit tagging or marking of fish.

17. The licencee is permitted to transport and temporarily hold live fish within the immediate study area, however, they shall be returned into the same waterbody from which they were captured.
    Exception:
    (a) For sampling approved in Special Waters (Appendix A), specific fish release locations may be requested by the Area Fisheries Contact prior to fish collection activities.

18. Any proposed release of collected fish outside the immediate sampling area (waterbody) where fish are collected shall be submitted to, and approved by the Head of Fisheries Allocation and Use of the Fisheries Management Branch and may additionally require a review by the Alberta Introductions and Transfers Committee.

Reporting

19. Locations where sampling occurred and no fish were captured shall be recorded in the data return, including reason (e.g., frozen conditions). The number of passes/attempts shall be recorded.

20. Data return requirements shall be satisfied by providing a digital copy of all fisheries data in the appropriate FWMIS loadform format within 90 days following the end date provided in the email notification for all works, as per the FWMIS data submission requirements. For the RL-PAAS licence, please note that every separate notification or sampling event requires an individual loadform submission. If a report was produced, a copy of the final report of the work (or the portions of the final report that includes all aspects pertaining to the assessment), as well as any ageing structures if collected, and/or genetic samples (if approved/collected) shall be provided within 180 days of the expiry of the licence.

21. All data returns shall be sent to RLPAAS@gov.ab.ca.

Other

22. The use of explosives or piscicide chemicals is not permitted.

23. Any of the proposed activities shall adhere to as a minimum the "Standards for the Ethical Use of Fishes in Alberta" located on the AEP website under Research Licences (link).

24. This licence and any additional approval in writing from an Area Fisheries Contact shall be in possession and available upon the request of staff from the Fish and Wildlife Division or Area Fisheries Contact.

25. This licence is subject to cancellation at any time and shall be surrendered to the issuer upon written notice of its cancellation.

26. This licence is non-transferable. This licence is only valid for the company and/or individuals listed on the licence; the further transference or delegation of the licence from the Licencee to another private or public body, including sub-contractors is not permitted. The responsibility and authority of the issued licence is given solely to that of the Licencee and the individuals listed on the licence.

Best Practices

1. Where fish population data is collected, the corresponding fish habitat information that complies with the Fisheries Management Information System (FWMIS) protocol shall be reported.

2. Where the following fish species are captured, photographic evidence (preferably through the use of a water filled photographic chamber) shall be provided in the Licence return for Fisheries Management Branch verification purposes: Brassy Minnow, Deepwater Sculpin, Emerald Shiner, Finescale Dace, Goldeye, Largescale Sucker, Logperch, Mooneye, Mountain Sucker, Northern Pikeminnow, Northern Redbelly Dace, Pearl Dace, Pygmy Whitefish, Redside Shiner, River Shiner, Round Whitefish, Rocky Mountain Sculpin, Shortjaw Cisco, Silver Redhorse, Slimy Sculpin, Spoonhead Sculpin, and Western Silvery Minnow. Photographs should focus on characteristic features of that species. The return shall also identify in the species comments section, the meristic features used to identify the above species, particularly in the case where photographic evidence may be by itself inconclusive AND should identify whether the species was captured outside of its expected range according to "Fishes of Alberta" (Nelson and Paetz 1992).

3. If approved by an Area Fisheries Contact where chemicals are used as an anesthetic to facilitate fish handling, this use must comply with manufacturer's instructions governing the use of these chemicals and appropriate holding times shall be observed. Where MS222 is used, appropriate consumption advisories shall be provided to the public and shall follow current Health Canada direction.

4. Special care and planning shall occur when engaged in cold weather non-lethal sampling to avoid frost damage to fish. Certain parts of fish, such as eyes, gill tissue, and thin fins may freeze in a few seconds if proper care is not taken at low temperatures. Heated tents or shelters over sampling areas shall be used and insulated coolers containing water taken from the sampled waterbody shall be used to hold fish for short periods (water must be changed regularly to ensure water temperatures are consistent between waterbody and the cooler). Care must be used to prevent fish from freezing to measuring boards, weigh scales, and sampling tools. When signs of undue stress and/or mortality of individuals is observed during cold weather, fish collection operations shall be postponed until warmer conditions prevail.

5. Locations where sampling did not occur at an intended site shall be recorded in the data return spreadsheet and the reason for not sampling provided (e.g. low or no water flow).

6. When electrofishing, and where not already considered mandatory under a referenced Standard, temperature and conductivity shall be measured, recorded, and included in the FWMIS loadform return.

7. Testing for fish diseases, pathogens, and parasites shall be done according to a protocol specified by the Provincial Fish Disease Specialist within the Fisheries Management Branch. Any deformities or irregularities for measured fish shall be noted in the FWMIS data return, and photographic documentation provided.

THE FOLLOWING BEST PRACTICES FOR FISH SALVAGES ONLY.

8. Measures shall be taken to minimize the number of fish requiring salvage prior to works being conducted (passive fish removal). This can include but is not limited to herding fish and/or providing an escape route out of the area of operation, prior to and during the dewatering process or other salvaging techniques. Any passive fish removal techniques used shall be reported in the project notes of the FWMIS return loadform.

9. Relocation sites shall be determined prior to fish being salvaged. The site shall mimic the habitat the fish were salvaged from. During ice cover this shall necessitate drilling multiple holes in the ice, when it is safe to do so, and testing habitat to ensure enough water and oxygen is available to sustain fish for the duration of the winter.

10. Fish handling times shall be kept to a minimum and soft wet gloves used to reduce exposure to air, stress and prevent removal of the protective mucous barrier.

11. Large bodied fish shall be supported at the tail and head to reduce internal injury. Where possible, all fish should be kept in their natural horizontal position.

12. If using holding tanks, they shall contain a minimum of 15 L per 1 kg of fish and be monitored regularly for oxygen and stress related issues, to ensure maximum fish survival.

13. Fish salvage shall occur between -20°C to 20°C, taking wind and extreme weather conditions into consideration. If it is required to salvage beyond this temperature range and in inclement weather extra precautions shall be taken when holding/handling fish to reduce stress (i.e. increased frequency of monitoring fish in holding tanks to detect stress induced issues, holding tanks be kept out of the elements; in summer - fewer fish/holding tank, employ aerators; keep in shaded area; in winter – limited/no air exposure (i.e. transfer of fish from collection pails and capture gear to holding tanks occur in water or in shelter from the elements), use of insulated holding tanks and heated or insulated sampling tents and wind breaks).

14. In situations where extreme temperatures may injure fish before completion of sampling, it is acceptable to only record numbers and species of fish handled, and not collect length and weight data.

15. All nets (including entanglement gear and dip nets) shall be knotless and made of non-abrasive materials to reduce injury to fish.

16. A minimum of 2 consecutive passes of each active gear type (i.e. electrofishing, seining etc.) that produces a zero catch shall be completed to ensure all/the majority of fish have been removed from the salvage area.

17. Each pass of a single gear type and its associated catch shall be recorded in the data return spreadsheet. If fish are released immediately due to extreme conditions it should be iterated in the survey comments.

cc. Bill Patterson for the Executive Director of Fisheries and Wildlife
District Fish & Wildlife Officers
Area Fisheries Contacts
file

APPENDIX F

Environmental Reports

CLASSIFICATION: PROTECTED A

REPORT

Jensen Dam Phase 2 Environmental Risk Assessment

Submitted to:

MPE Engineering Ltd.

Jeff Olitch, P.Eng.

Submitted by:

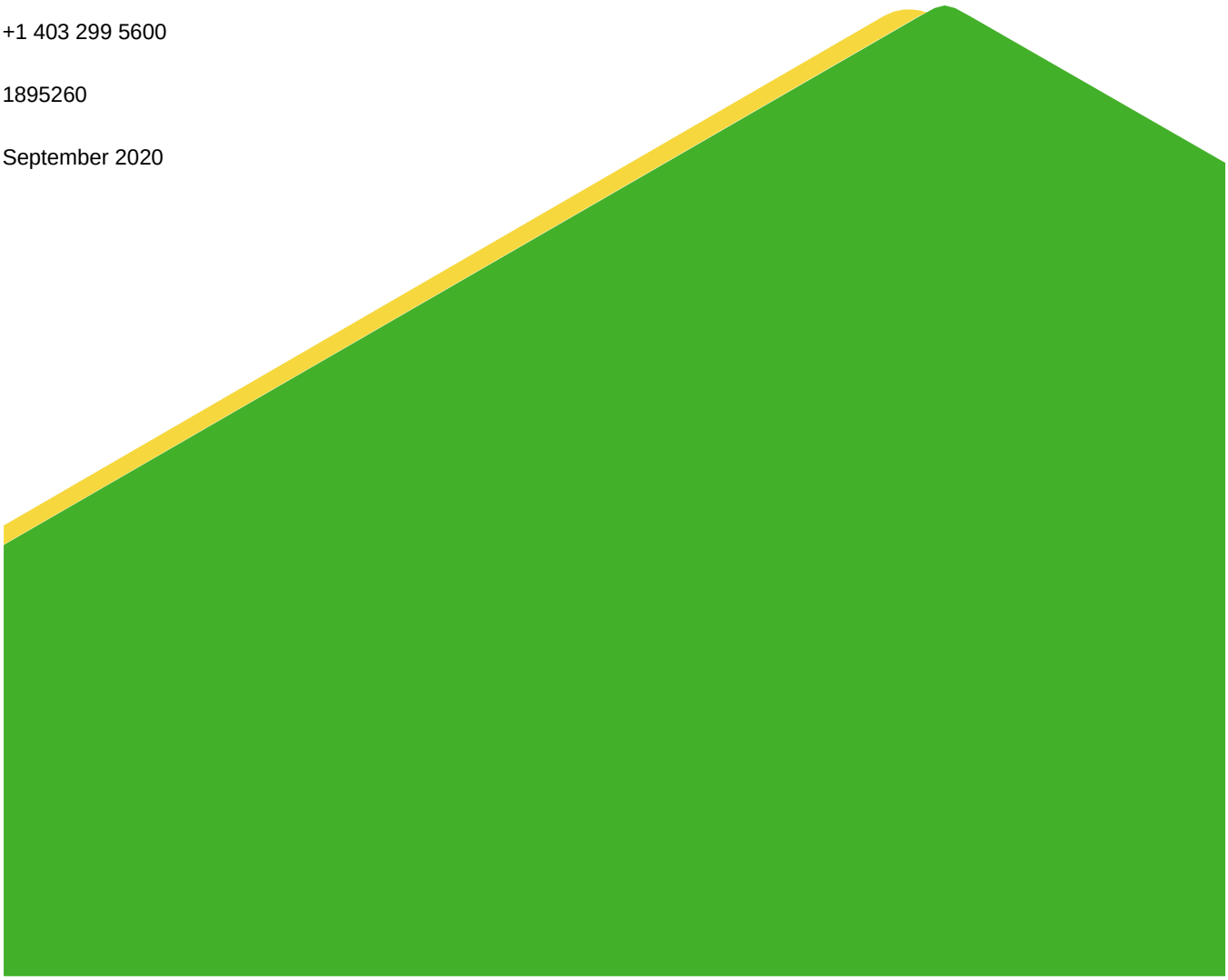
Golder Associates Ltd.

2800, 700 - 2nd Street SW, Calgary, Alberta, T2P 2W2, Canada

+1 403 299 5600

1895260

September 2020



Distribution List

1 Electronic Copy - Alberta Transportation

1 Electronic Copy - MPE Engineering Ltd.

1 Electronic Copy - Golder Associates Ltd.

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Historical Resources Act Response Letter

Attachment 3
Environmental Features and Sensitivities Identified in the Local Study Area

1.0 INTRODUCTION

Alberta Transportation (AT) has retained MPE Engineering Ltd. (MPE) and Golder Associates Ltd. (Golder) to complete the Jensen Dam Flood Handling Upgrades (Government of Alberta [GOA] 2018a, b). The Jensen Dam is in southern Alberta, approximately 10 km south of Magrath, Alberta. The Jensen Reservoir captures the runoff water from the upper Pothole Creek catchment area. The Jensen Dam and Reservoir are part of the Waterton-St. Mary Headworks system and are owned and operated by Alberta Environment and Parks (AEP).

The Jensen Dam – Flood Handling Upgrades will be completed in two (2) separate phases (or contracts). Phase 1 includes the rehabilitation of the Operation Spillway and Phase 2 includes the design and construction of the Emergency Spillway and related works. The rehabilitation of the Operation Spillway is planned to start in the summer 2020 and be completed by March 2021. The design of the Emergency Spillway and Related Work is currently in progress and construction is scheduled to start in November 2020 and be completed by March 2021.

This technical memorandum represents the Environmental Risk Assessment (ERA) required as part of the tender document package for the Emergency Spillway (Phase 2). The following sections describe potentially relevant provincial and federal legislation and provide an overview of permanent and temporary measures required to protect the environment during the construction of the Jensen Dam Emergency Spillway and Related Work (Phase 2).

2.0 RELEVANT PROVINCIAL/FEDERAL LEGISLATION

2.1 Federal Permits/Authorizations

2.1.1 Fisheries Act

The Fish and Fish Habitat Protection Program administers and ensures compliance for development of projects taking place in and around fish habitat under the fish and fish habitat protection provisions of the *Fisheries Act*. Measures to Protect Fish and Fish Habitat must be adhered to during construction activities (DFO 2020a). Potential impacts to fish and fish habitat due to the construction of Phase 2 cannot be avoided and therefore a request for review was submitted to the Department of Fisheries and Oceans Canada (DFO) on May 25, 2020. DFO has responded with a Letter of Advice (LOA) outlining the implementation measures necessary to avoid and mitigate the potential for prohibited effects to fish and fish habitat (Attachment 1).

DFO's Interim Code of Practice for end-of-pipe fish protection screens (DFO 2020b) and Interim Code of Practice for temporary cofferdams and diversion channels (DFO 2020c) are applicable to the Project. Notification Forms are required to be submitted by the Contractor to DFO prior to commencement of activities.

2.1.2 Migratory Birds Convention Act

Environment Canada administers the *Migratory Birds Convention Act* (MBCA), which prohibits the disturbance of nests of bird species covered under the MBCA (primarily migratory birds). A 2005 amendment to the MBCA further protects disturbance to individual migratory birds and prohibits release of deleterious substances into waters or areas frequented by migratory birds. The migratory bird nesting period is April 14 to August 19 for 95% of the species breeding in the Local Study Area (LSA), which is in Nesting Zone A3 (ECCC 2018a). Migratory bird nests require setbacks from disturbance when active, with setback distances determined based on bird behaviour, specific circumstances of the nest (e.g., location, habitat), the type of activity occurring in the vicinity of the nest and Environment and Climate Change Canada guidance (ECCC 2018b). There is the potential for migratory birds to nest in the Local Study Area (LSA).

2.1.3 Species at Risk Act

The federal *Species at Risk Act* (SARA) contains prohibitions against the killing, harming, harassing, capturing, taking, possessing, collecting, buying, selling or trading of individuals of extirpated, endangered, or threatened species listed in Schedule 1 of the SARA (GOC 2020a). The SARA also contains a prohibition against the damage or destruction of their residences (e.g., nest or den).

Two species listed as threatened under Schedule 1 of the SARA were observed within the LSA including bank swallow (*Riparia riparia*) and loggerhead shrike (*Lanius ludovicianus*). No extirpated or endangered species were observed within the LSA.

2.2 Provincial Permits/Authorizations

2.2.1 Alberta Environment and Parks

2.2.1.1 Fish Research Licence

A Fish Research Licence from AEP will be required to conduct a fish rescue in isolated areas prior to any in-water work that may be required during construction.

2.2.1.2 Alberta Wetland Policy

The *Alberta Wetland Policy* (GOA 2013) applies to naturally occurring wetlands; none of which were identified within the LSA (Golder 2020).

2.2.1.3 Alberta Water Act

An approval is required under the *Alberta Water Act* (GOA 2000a) for any construction activity that may impact natural drainages, waterbodies or wetlands. Such approval is not required for anthropogenic waterbodies. Only anthropogenic wetlands (i.e., main canal, reservoir outlet canal) were identified within the LSA (Golder 2019). However, *Alberta Water Act* approval is required for the Project for non-environmental reasons (i.e., triggered by changes to the Project's water license).

2.2.1.4 Weed Control Act

The *Weed Control Act* provides guidelines for enforcement during construction; it is not linked to formal approvals. Weeds designated as Noxious are required to be controlled and weeds designated as Prohibited Noxious are required to be destroyed (GOA 2010). Weeds were observed during the field survey of the LSA and therefore control measures are required during the Phase 2 construction.

2.2.1.5 Wildlife Act

The Alberta *Wildlife Act* prohibits disturbance to a nest or den of prescribed wildlife species (GOA 2000b). There is potential to impact nests or dens during the Phase 2 construction.

2.2.1.6 Historical Resources Act

Any development with potential to disturb historic resources requires approval by Alberta Culture, Multiculturalism and Status of Women (ACMSW), pursuant to the Alberta *Historical Resources Act* (GOA 2000c). There is potential for historic resources to be disturbed by the Phase 2 construction. A Statement of Justification and *Historical Resources Act* (HRA) application was submitted to ACMSW on May 20, 2020. ACMSW responded to the Statement of Justification and Heritage Resource application on June 10, 2020, granting *Historical Resources Act* Approval with Conditions for the Project (HRA Number 4825-19-0023-002; Attachment 2). The Conditions of the HRA approval relate primarily to the potential for palaeontological resources. If bedrock is to be impacted by the Project, no excavation activities are to take place until a professional consulting palaeontologist is on-site to monitor construction activities. The Conditions letter also states that the Project must comply with *Standard Requirements under the Historical Resources Act: Reporting the Discovery of Historic Resources*.

3.0 SUMMARY OF THE ENVIRONMENTAL SENSITIVITIES

The following environmental sensitivities were summarized based on the EE prepared for the Project (Golder 2020). The mitigation required to address these environmental sensitivities is summarized in Table 1, Section 9 of this ERA.

- The Phase 2 construction will likely result in soil erosion, compaction or loss of soil structure, and admixing of topsoil and subsoil. The recommended mitigations seek to minimize these potential effects (Golder 2020). Despite mitigations, the loss or alteration of landforms and soils capability to support healthy ecosystems is expected to occur. If standard best management practices are carried out, then construction is not anticipated to result in increased landform instability despite the presence of steep slopes within the proposed Construction Limits (1 to 70 percent [%]).
- A portion of the disturbance footprint is classified as native grassland (10%) (Attachment 3). The construction has the potential to remove or alter native grassland and, consequently, areas with high suitability for listed plant species. No provincially or federally listed plant species were observed during the 2018, 2020 field surveys or the pre-construction survey completed on September 3, 2020 which focused on areas of native grassland in the disturbance footprint.
- Given the existing populations of the noxious weed, Canada thistle (*Cirsium arvense*), and other invasive species within the LSA, there is increased likelihood of spreading invasive species during construction and reclamation of the Project.
- No naturally occurring wetlands are present within the LSA (Attachment 3).
- The potential effects of the construction on wildlife species and habitat include mortality, habitat alteration or loss, and habitat avoidance or reduced reproductive success. Three federally listed species were observed within the LSA during 2018 and 2020 field surveys. Of these, two are federally listed under Schedule 1 of the SARA, bank swallow and loggerhead shrike, and one is listed under Schedule 1 of the SARA as special concern, American badger. Seven provincially listed species were observed in the LSA and include American white pelican (*Pelecanus erythrorhynchos*), eastern kingbird (*Tyrannus tyrannus*), osprey (*Pandion haliaetus*), bank swallow, bald eagle (*Haliaeetus leucocephalus*), loggerhead shrike, and American badger (*Taxidea taxus*). Several other migratory bird species are known to occur in the LSA including one colony of cliff swallows (Attachment 3).
- Construction activities are planned to occur within 500 m of a potential snake hibernaculum. The hibernaculum was not active during multiple rounds of field surveys at the appropriate times of year but is identified to be precautionary (Attachment 3).
- No provincially or federally listed fish species were documented within the LSA during the desktop assessment conducted for the Environmental Evaluation (EE). In-stream habitat will be disturbed or altered as a result of construction. Potential effects include the alteration of topography, hydrology and water quality within the Jensen Reservoir, the reservoir outlet canal and the main canal. Fish and fish habitat could be affected by changes to water quality as a result of increased sediment load or accidental spills of deleterious substances. Potential effects include direct fish mortality. A request for review was submitted to the DFO on May 25, 2020. The DFOs response to the request for review is pending.

- While the Project footprint occurs on lands within Historic Resource Value 4a and 5p lands, the Project footprint is located predominately within disturbed lands from dam/canal development, road construction, and cultivation. One area of note with native grassland occurs along the edges of the main canal where riprap will be installed, but aerial imagery indicates that the edge to be impacted is likely below the prairie level and on slope (based on fence line and cultivation extents). A Historic Resource application and supporting Statement of Justification was submitted to ACMSW on May 20, 2020. ACMSW responded to the Statement of Justification and Heritage Resource application on June 10, 2020, granting *Historical Resources Act* Approval with Conditions for the Project (HRA Number 4825-19-0023-002).

4.0 SUMMARY OF THE BORROW PRE-DISTURBANCE ASSESSMENT

The Contractor will be responsible for the conducting a pre- and post-disturbance assessment as per Alberta Transportations specifications for land disturbance.

5.0 SUMMARY OF THE SOIL STRIPPING PLAN

AT's Consultant will complete a pre-disturbance soils assessment within areas identified as construction easement. The assessment report will be provided to the Contractor. The Contractor will be responsible to prepare a Soil Stripping Plan prior to commencement of construction activities. The Soil Stripping Plan will address the landform and soils mitigation measures summarized in Table 1. AT's Consultant will complete a post-disturbance soils assessment, for the same areas, at the completion of reclamation activities.

6.0 WHIRLING DISEASE REQUIREMENTS

In Alberta, whirling disease has been detected in several waterbodies of four major watersheds, primarily in central and southern Alberta including the Bow River, North Saskatchewan River, Oldman River, and Red Deer River. Any equipment or watercraft identified in the Decontamination Protocol for Working In or Near Water (the protocol; AEP 2020) that will be in contact with the water in the Jensen Reservoir will need to follow the protocol.

7.0 SUMMARY OF THE WEED SURVEY

Thirteen species of weeds were observed during the field survey of the LSA including one provincially regulated noxious weed, Canada thistle. Canada thistle was observed sporadically throughout the valley bottom (Attachment 3). Additionally, 13 non-regulated invasive, exotic species were also identified (Golder 2020).

8.0 IDENTIFICATION OF CLUBROOT INFECTED AREAS THROUGH CONSULTATION WITH ALBERTA AGRICULTURE AND FORESTRY AND THE LOCAL AGRICULTURAL FIELDMEN

There are no known clubroot infected areas in Cardston County; however, in correspondence with the local agricultural fieldman, it was highlighted as a concern (Foggin 2019, pers. comm.). All equipment should be pressure-wash cleaned and mud-free prior to arrival to the Work Site.

9.0 IDENTIFICATION OF KNOWN SITE CONTAMINATION

The AEP Environmental Site Assessment Repository (ESAR) database was searched on June 23, 2020. The results of the ESAR search indicated that there are no available records of previous Environmental Site Assessments (Phase 1 or Phase 2) conducted in the LSA. Therefore, there were no environmental reports pertaining to the risk of environmental contamination liabilities available at the time this ERA was prepared.

10.0 ENVIRONMENTAL FEATURES AND SENSITIVITIES

A figure providing information on the locations of known environmental features and sensitivities available at the time of preparing this ERA is included in Attachment 3.

Table 1: Summary of Mitigations as Described in the Jensen Dam Phase 2 Environmental Evaluation (Golder 2020)

Potential Project Effects	Mitigations
Landforms and Soils	
Soil Erosion: The physical loss of topsoil lowers the capability of the land to support healthy ecosystems by decreasing the amount of available nutrients and organic matter in the root zone.	• The amount of soil stripping will be limited to the extent practicable. • Limit the area of disturbance and the time between salvage, storage and reclamation. • Do not handle coarse or moderately course textured soils in windy conditions. • Tackifiers or seeding the stockpiles may be used to stabilize soil stockpiles, if necessary. • After soil replacement, tackifiers such as shredded straw or other mulches may be spread over coarse or moderately coarse soils prior to re-vegetation. • AT approved seed mixes similar to local vegetation will be applied to stabilize soil in disturbed areas, as appropriate. • Erosion or sediment control measures such as sediment fences will be placed along Project components where required. • Follow-up inspections of the workspaces will occur so that potential erosion issues are addressed in a proactive manner.
Compaction/loss of soil structure: The capability of soil to support healthy ecosystems can be reduced if the soil is compacted.	• Earthwork-related construction activities will be either shut down during wet weather or conducted after appropriate mitigation measures are applied such as; limiting equipment travel, restricting activities to areas where topsoil has been removed, and/or using equipment with low ground pressure tires or wide-pad tracks to reduce rutting. • Heavy equipment activities and soil handling will be restricted on fine and moderately fine-textured soils during wet conditions. • Heavy equipment and vehicles will operate on fine and moderately fine-textured soils during dry or frozen ground conditions, and on previously disturbed area or using low ground pressure tires or wide-pad tracks, wherever possible. • Rig matting or geotextile material will be used in areas identified as sensitive to compaction/loss of soil structure to the extent practicable.
Soil admixing: Admixing of soils can affect the capability of the soil to support vegetation.	• The amount of soil stripping will be limited to the extent practicable. • In areas where soil will be salvaged, the topsoil (A horizons) will be stripped and stored separately from subsoil (B or C horizons) to limit the potential for admixing.
Landforms: Changes to existing slopes and natural drainage conditions through construction (e.g., grading) and post-construction have the potential to affect landform stability	• Regrade and reclaim disturbed areas to a stable angle after work is completed. • Re-establish vegetation as soon as possible. • Install soil erosion control mitigation (e.g., sediment fences, use of rig matting or geotextile material in sensitive areas identified by the Contractor's Environmental Monitor at the time of construction).
Vegetation	
Loss or alteration of native grassland: Construction activity within the proposed Construction Limits can remove or alter native grassland	• Restrict construction activities to areas of existing disturbance to the extent practicable. • Avoid disturbing native grassland outside the proposed Construction Limits and outside the Project Footprint (Attachment 3). • A qualified ecologist conducted pre-construction surveys within native grassland within the Project footprint on September 3, 2020 which falls within the late rare plant survey window from mid July to mid September. No listed plants were identified. • Vehicle travel speed will be restricted, as appropriate, for local conditions. • Complete brushing and clearing activities under dry or unfrozen ground conditions to the extent practicable and use matting/geo textiles to minimize ground disturbance. • Areas vulnerable to soil structure damage will be identified by the Contractor's Environmental Monitor throughout the construction phase. Vulnerable areas will be avoided where practical. Rig matting/geotextiles will be used to minimize ground disturbance within areas vulnerable to soil structure damage from rutting, soil admixture or compaction to the extent practicable (e.g., for temporary workspaces or access roads). • Restrict grading to what is required for access routes and safe operation of equipment and vehicles. • Use existing roads and trails to access the site.
Introduction or spreading of noxious weed species: Construction activity can increase spread of noxious or invasive weed species present	• Wash/clean construction equipment outside the site prior to arrival. • Treat topsoil that is stockpiled for more than 30 days, as appropriate, to prevent the colonization and proliferation of weeds. • Re-contour and re-vegetate disturbed ground as soon as reasonably possible following construction to limit the potential establishment of weeds. • Re-vegetate disturbed ground, where appropriate, with a native seed mix compatible with the surrounding vegetation • Monitor and control weeds after completion of construction.

Table 1: Summary of Mitigations as Described in the Jensen Dam Phase 2 Environmental Evaluation (Golder 2020)

Potential Project Effects	Mitigations
Wildlife	
Mortality: Ingestion of hazardous materials, site clearing, increased animal-vehicle collisions	• If construction activities are required during the migratory bird nesting period (April 14 to August 19) the Contractor's Environmental Monitor will conduct regular wildlife surveys prior to clearing activities to monitor for signs of active migratory bird nests. • If construction activities are required during the raptor breeding period (March 15 to July 15) the Contractor's Environmental Monitor will identify active raptor nests within 1,000 m of the activities. • Migratory bird nests and raptor nests require setbacks from disturbance when active. • Contractor's Environmental Monitor will identify potential nests and apply appropriate setbacks. • Cliff swallow nests require an approximate 50 m setback when active, with the exact setback dependent on the level of disturbance and the sensitivity of the colony to disturbance. • If construction will occur within recommended nest setbacks during the migratory bird nesting period (April 14 to August 19) or the raptor breeding period (March 15 to July 15), the Contractor's Environmental Monitor will monitor the nest(s) during construction for signs of disturbance. If signs of disturbance are noted (e.g., behavioural changes), the Contractor's Environmental Monitor will recommend further mitigations as needed to prevent harm to the nest. • Schedule construction between November 1, 2020 and March 2021 to the extent practicable to minimize potential harm to birds. • Snake hibernacula typically require a 500 m setback year-round for high disturbance activities. • A qualified ecologist (Consultant) conducted pre-construction snake searches on September 3, 2020. No snakes or their sign were observed in areas of the disturbance footprint with high potential to provide snake hibernacula. The Project is unlikely to affect snakes or their hibernacula but if a hibernaculum is observed during construction, the Contractor's Environmental Monitor and Consultant will work with the AEP Area Wildlife Biologist to develop additional mitigations, as required. • Wildlife encounters or conflicts will be reported to AEP. • Follow best management practices for collection and disposal of all construction-related garbage, debris, wastes, and hazardous materials.
Habitat alteration or loss: Due to vegetation clearing or construction of Project infrastructure	• Contractor's Environmental Monitor will identify appropriate setbacks and Contractor's on-site coordinator/supervisor will be required to confirm that the setbacks are implemented and adhered to during construction activities. • Avoid locating temporary workspaces in or near known locations of sensitive wildlife habitat features as depicted in Attachment 3 or identified by the Consultant during pre-construction surveys, to the extent practicable.
Habitat avoidance or reduced reproductive success: Due to sensory disturbance	• Restrict construction and post-construction activities to daylight periods where practicable; many species of concern are nocturnal. • Lighting for ground infrastructure will be reduced, down shielded, and controlled by proximity sensors. • Reduce construction noise (i.e., muffler systems in good working order, no idling unless necessary, operating equipment at optimum rated loads, and routine equipment maintenance). • Prohibit Project personnel from having pets at the site during the period of construction. • Prohibit Project personnel from hunting or fishing on the work site. • Project personnel will not feed or harass wildlife.
Fisheries	
Altered hydrology and topography: In the Jensen Reservoir and the main canal and the reservoir outlet canal	• Instream work will be conducted outside the RAP (April 1 to May 31). • Instream work below the ordinary high-water mark will be completed in dry conditions. • If water is flowing at the time of construction, any instream work areas will be isolated from flowing water. • Planning and construction activities will adhere to Fisheries and Oceans Canada (DFO) Measures to Protect Fish and Fish Habitat (DFO 2020a). • The Contractor will submit Notification Forms prior to commencement of activities in accordance with DFO's Interim Code of Practice for end-of-pipe fish protection screens (DFO 2020b) and DFO's Interim Code of Practice for temporary cofferdams and diversion channels (DFO 2020c). • If equipment is working in water or below the high water mark, equipment will be decontaminated prior to and after work is completed as per the Alberta Decontamination Protocol for work in or near water (AEP 2020).

Table 1: Summary of Mitigations as Described in the Jensen Dam Phase 2 Environmental Evaluation (Golder 2020)

Potential Project Effects	Mitigations
Water quality: Due to suspended sediment, accidental spills or erosion during redirection of water	• A site-specific Erosion and Sediment Control and Response Plan will be developed by the Contractor prior to construction. • Temporary (e.g., silt fences, turbidity curtains) and permanent (e.g., riprap) sediment control measures will be installed, maintained, and repaired, as needed, during and after construction to prevent sediment from entering the watercourse. • The size of riprap used will be selected to withstand anticipated flows and thereby minimize the potential for erosion. • Excavated material will be stabilized and stored above the high-water mark. • Excavated materials deemed unsuitable for reuse as embankment fill will be disposed in a designated waste area within the proposed Construction Limits. • An Environmental Construction Operations Plan will be developed by the Contractor prior to the start of construction activities to direct pollution control measures, including spill prevention and recommended remediation measures. • All equipment will be clean and free from leaks and other sources of contamination (e.g., grease, mud, plant material). • Fuel, motor lubricants, other hazardous substances, and washrooms will not be located within 100 m of the watercourse or waterbody. • All fuels, oils, lubricants and other petroleum-based products will be stored on or in secondary containment that must be capable of holding at least 110% of the products volume. • All hazardous substances and waste dangerous goods will be stored on or in secondary containment until proper disposal occurs. • As much as possible, machinery and equipment will not be cleaned, serviced, fuelled, or stored within 100 m of the watercourse or waterbody. In the event project conditions require working with equipment within 100 m of the watercourse or waterbody, additional mitigation measures will be instituted to control environmental risks. • Emergency spill kits and spill/drip trays will be readily available onsite and the Contractor will develop a response plan to avoid a spill of deleterious substances prior to construction. • Temporary structures (e.g., silt curtains) will be removed and disposed of in an appropriate manner.
Fish and fish habitat in the Jensen Reservoir, main canal and outlet canal: Potential to be affected by changes in water quality	• A fish rescue to remove fish from the isolated area will be completed by the Contractor prior to initiating instream work below the high-water mark within the canals if dry conditions on the site are not present. • Fish screens will be installed on pump intakes used for dewatering during isolation to prevent entrainment or impingement of fish and will be checked and cleaned regularly. • Clearing of vegetation will be minimal, where possible, and will only occur above the high-water mark. • The Contractor will implement the measures to avoid and mitigate effects to fish and fish habitat outlined in DFO's LOA (Attachment 1).
Cultural Heritage	
Jensen Dam and Reservoir is recognized as an heritage structure site in the Province of Alberta	• ACMSW granted Historical Resources Act Approval with Conditions for the Project (HRA Number 4825-19-0023-002; Attachment 2). • If bedrock is to be impacted by the Project, no excavation activities are to take place until a professional consulting palaeontologist is on site to monitor construction activities. • If unanticipated historic resource sites are identified during any stage of Project development, the Accidental Finds Protocol should be implemented where all activity in the area ceases until a provincially qualified consulting archaeologist / palaeontologist can assess the findings. The chance discovery of historical resources is to be reported to the contacts identified within Standard Requirements under the Historical Resources Act: Reporting the Discovery of Historic Resources (https://open.alberta.ca/publications/standard-requirements-under-the-historical-resources-act-reporting-the-discovery-of-historic).

11.0 CLOSURE

This technical memorandum was prepared by Golder for MPE. The material in this report reflects Golder's best judgment considering information available to Golder at the time of preparation. If MPE edits, revises, alters, or adds to the material in this report, reference to Golder and Golder's employees must be removed unless MPE changes are agreed to by Golder. Any use which a third party makes of this report or any reliance on or decisions to be made based on it, are the responsibility of such third party. Golder accepts no responsibility for damages, if any, suffered by any third party as a result of decision made or action based on this technical memorandum.

We trust the information contained in this report is sufficient for your present needs. Should you have any questions regarding this memorandum, please do not hesitate to contact Kristine Sare (403-387-8460) or Ronald Kitagawa (403-532-5778).

Yours truly,

Golder Associates Ltd.

Original signed by:

Jamie Sparrow, BSc
Ecologist

Original signed by:

Ronald Kitagawa, PEng
Associate, Project Manager

Original signed by:

Kristine Sare, MSc, PBiol
Senior Wildlife Biologist

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JENSEN DAM FLOOD HANDLING UPGRADE PROJECT – QAES Memo

Attention: Mike Allain – Greenfield Construction

Date: November 11, 2020

Completed by: Eric Beveridge

Location: Jensen canal – Fuse Plug 1

The following memo details the results of the site inspection and fish rescue operations completed on November 10, 2020 as part of the Jensen Dam Flood Handling Upgrade Project specially regarding the canal section associated with Fuse Plug 1.

November 10, 2020

Weather: Snowing, high winds, low visibility: -9c to -4c

The work area for Fuse Plug 1 had two (2) coffer dam berms installed, one at the midway point and the second at the northern end of the section's limits. This divided this reach into two (2) areas – section 1 (closet to the reservoir) and section 2 (northern end). Greenfield (GF) had started to draw down the water within these areas to manageable levels in support of the fish salvage operations.

Site Conditions:
The entire area was frozen covered in snow and ice. There was no open water within these sections. Snow drifts along the banks down to the canal.

Fish Rescue:
Entered the canal into section 1 at the coffer dam berm between the sections. The area was covered in approximately 2" of ice. I was able to break through the ice by walking on it. Once broken through there was between 10" to 12" of slush slurry – did not appear to be any free-flowing water. Section 2 was not entered due to unsafe conditions with the presumed depth of 2 m+-.

Working back towards the reservoir (upstream) an opening in the ice was created about every 10 – 15 m for the first 75 – 85 m. At that point, the depth shallowed to where I was not breaking through the ice. A total 8 openings were created.

Between 10:30 and 15:00 dip-netting was completed through the ice at all location. Conditions of freezing weather and slushy water made the operation difficult as ice and slush had to be continually removed. In addition to dip-netting 3 minnow traps were set with the furthest downstream holes. The depth within the holes was just enough to cover the traps to allow them to be submerged. The slushy water made the traps difficult to operate as they were inundated with ice and slush. The minnow traps were set two times for periods of nearly 2 hours each.

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Environmental conditions caused the holes to ice over. This resulted in ice/slush be removed continuously over this time period.

All feasible efforts were undertaken to complete fish rescue within this section. No fish were captured or observed.

November 11, 2020

Weather: Overcast: -14c

Site Conditions:
The entire area was frozen covered in snow and ice. There was no open water within these sections. Snow had built up over sections of the canal due the previous day/night storm. The area of the creek that the fish rescue was attempted in the previous day had iced over to the extent that the area that had previously been disturbed was not noticeable as it had frozen over completely.
Went into the section again to check on ice thickness. The level of ice had increased and in the sections where I was able to break through the ice was completely inundated with slush.

Due to unsafe conditions section 2 of this area was not entered.

On both Nov. 10 and 11 the Fuse Plug 2 work area was inspected in terms of looking at the scheduled planned activities in relation to the sites conditions (frozen) and fish rescue options.

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Site Photos



Photo 1: Nov. 10 – Ice thickness with dip net.



Photo 2: Nov. 10 – Looking north from within the canal. Sample holes and tracks through the ice/slush.

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Photo 3: Nov. 10 – Minnow trap placed through ice.



Photo 4: Nov. 10 – Looking south in the canal.

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Photo 5: Nov. 10 – Looking south in the canal – extent of fish rescue efforts.



Photo 6: Nov. 10 – Looking south in the canal – section 2 of Fuse Plug area 1.

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Photo 7: Nov. 11 – Looking south in the canal.



Photo 8: Nov. 11 – Looking north in the canal – section 2 of Fuse Plug area 1.

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Photo 10: Nov. 11 – Ice depth in canal – section 1 of Fuse Plug area 1 – area of fish rescue from Nov 10.



Photo 11: Nov. 11 – Looking south in the canal – section 1 of Fuse Plug area 1 - area of fish rescue from Nov 10.

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JENSEN DAM FLOOD HANDLING UPGRADE PROJECT – QAES Memo

Attention: Mike Allain – Greenfield Construction

Date: November 16, 2020

Completed by: Eric Beveridge

Location: Jensen canal – Fuse Plug 2 and Fuse Plug 1 Sections 1 & 2

The following memo details the results of the site inspection completed by RIDGE (Eric Beveridge and Chris Stoesz) along with Greenfield (Mike Allain) on November 16, 2020.

Weather: Mainly sunny: 2°C

Fuse Plug 2

The entire working area (footprint and beyond) is covered in ice (>0.2 m thick) with no open water within the "lake" area of the canal at Fuse Plug 2. The water level had been drawn down approximately 2 m from the water level observed last week. The bank at the water's edge is a steep drop-off with an ice bench.

Greenfield is looking at options for placing a pump further out into the "lake" at the deepest part, in an effort to draw down the water level suitable for project construction. The solution would require equipment access via the shortest distance from the shore out into the deepest section of the lake to place the intake.

The project environmental assessment report (Golder 2020) and Fisheries and Oceans Canada (DFO) Letter of Advice (File #: 20-HCAA-01094) prescribed completing a fish salvage and water withdrawal to allow work to proceed in the dry; however, environmental conditions have changed drastically, with ice forming shortly after project start-up. Typically, ice is removed from the surface prior to fish rescue efforts are completed. At Fuse Plug 2, removal of ice within the project area is not feasible as access with a tracked excavator is not possible due to the steep approach slope, extremely soft bed substrate and extensive area of surface ice. In order to proceed with current conditions.

Greenfield will need to push fill material downslope, creating a suitable access ramp to the deepest portion of the lake, working forward in steps to reach the edge of the project footprint, pumping down water in stages.

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Fuse Plug 1 – section 2

Section 2 was completely covered in ice (0.2 m thick) with no open water in this section of the canal. Greenfield estimates that there is still ~1.0 m of water in the canal, verified at the northern-most end of the canal at the berm. Efforts were made to break through the ice with hand tools which was met with minimal success. Removal of this amount of ice within this area is not considered feasible by hand. Similarly, canal bank height and steep slopes preclude access with a tracked excavator. Similar to the conditions at Fuse Plug 2, the environmental conditions have changed resulting in the prescribed measures regarding fish salvage details outlined in the project's environmental assessment report (Golder 2020) and Fisheries and Oceans Canada (DFO) Letter of Advice (File #: 20-HCAA-01094) not feasible to be completed.

Participated in a conference-call meeting that was attended by MPE and Golder representative along with Greenfield and RIDGE to discuss the projects plans regarding the next phases of the fish salvage operations. Golder/MEP requested that Greenfield via RIDGE prepare an updated fish rescue that addresses to the existing site conditions at both Fuse Plug 1 and Fuse Plug 2. Once the Golder/MEP has reviewed the plan they will contact DFO to discuss.

It was recommended and requested that both Golder and MPE attend a site meeting either on November 16 or 17, 2020 to review the site conditions and to address concerns that had been expressed. Golder stated that they did not need to come to site.

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Site Photos



Photo 1: Nov. 16 – "Lake" area of canal at Fuse Plug 2 – looking SE



Photo 2: Nov. 16 – "Lake" area of canal at Fuse Plug 2 (berm in background) – looking NE

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Photo 3: Nov. 16 – Ice shelve along shoreline – Fuse Plug 2 area.



Photo 4: Nov. 16 – Ice covered canal of Fuse Plug 1 - Section 2 – looking S

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Photo 5: Nov. 16 – northern end of section of canal 2 of Fuse Plug 1 - Looking W



Photo 6: Nov. 16 – Section 2 of the canal of Fuse Plug 1 - Looking SW

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Photo 7: Nov. 16 – Section 1 of the canal of Fuse Plug 1 - Looking SW

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JENSEN DAM FLOOD HANDLING UPGRADE PROJECT – QAES Memo

Attention: Mike Allain – Greenfield Construction

Date: November 17, 2020

Completed by: Eric Beveridge

Location: Jensen canal - Fuse Plug 1 Sections 1 & 2

The following memo details the results the fish rescue operation completed by RIDGE (Eric Beveridge and Chris Stoesz) on November 17, 2020.

Weather: Partially overcast and windy: 3°C

Fuse Plug 1 – Section 1 (downstream end adjacent to berm)

Greenfield, from the berm was able to reach out approximately 1. 8 m where a layer of ice was removed. The ice was approximately 0.2 m throughout the entire area. The ice/slush slurry was frozen to the bottom as the dip net was not able to penetrate under the ice. Once some of the larger chucks of ice were moved the depth was approximately 0.3 m. The approximate area of the fish rescue was 1.8 m x 3.6 m. Multiple attempts throughout the entire area was completed with the dip net. The majority of the attempts with the dip net resulted in the net being filled with small ice chunks and slush.

- No fish were rescued or observed.

Fuse Plug 1 – Section 2 (upstream end adjacent to berm).

Greenfield, from the berm was able to reach out approximately 1. 3 m where a layer of ice was removed. The ice was approximately 0.2 m throughout the entire area and appeared to be frozen to the bottom. Once some of the larger chucks of ice were moved the depth was <0.05 m. The approximate area of the fish rescue was 1.3 m x 3 m. Multiple attempts throughout the entire area was completed with the dip net. Most of the attempts with the dip net resulted in the net being filled with small ice chucks and slush.

- No fish were rescued or observed.

Fuse Plug 1 – Section 2 (downstream end adjacent to berm).

Greenfield, from the berm was able to reach out approximately 2.2 m where a layer of ice was removed. The ice was approximately 0.2 m throughout the entire area with approximately 0.15 gap between the bottom of the canal and ice layer. This appeared to be primarily an ice slurry mix. Once some of the larger chucks of ice were moved the depth was approximately 0.4 m (max). The approximate area of the fish rescue was

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2.2 m x 2.9 m. Multiple attempts throughout the entire area was completed with the dip net.

- No fish were rescued or observed with the opened area.
- Approximately 3 m upstream of the work area, a 70 mm white sucker (*Catostomus commersoni*) mortality was located on the surface. Cause of mortality was unknown.

All efforts were taken by Greenfield when breaking through the ice to minimize the level of disturbance. Visibility within the salvage areas was limited due the ice/slush and turbid slurry. Due to the frozen state of the canal when the ice was removed it disturbed the bottom of the canal. There is not flow throughout the canal

Due to environmental (i.e. frozen) additional fish rescue efforts within the Fuse Plug sections is not feasible.

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Site Photos



Photo 1: Nov. 17 – Section 1 – downstream end.



Photo 1: Nov. 17 – Section 1 – depth.

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Photo 3: Nov. 17 – Ice/slush slurry during dip netting – Section 1.



Photo 4: Nov. 17 – Ice depth section 2 – upstream end.

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Photo 5: Nov. 17 – Ice depth section 2 – downstream end.



Photo 6: Nov. 17 – White Sucker mortality.

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JENSEN DAM FLOOD HANDLING UPGRADE PROJECT – QAES Memo

Date: November 29, 2020
Attention: Mike Allain – Greenfield Construction
Completed by: Eric Beveridge

Location: Jensen canal - Fuse Plug 2
Weather: 28th - Predominately sunny & windy, 3°C. 29th – Overcast & breezy, 2°C.

The following memo details the results the fish rescue operation completed by RIDGE (Eric Beveridge) on November 28 & 29, 2020.

Fuse Plug 2 Area

RIDGE (EB) along Greenfield (MA), completed an inspection of the Fuse plug 2 area by walking around the entire circumference of canal/lake at approximately 09:30. The majority of the area remains frozen with approximately 15 to 25 cm of ice. A high area adjacent to middle section to the south coming from the NE was forming under the ice. It was evident that there was a ridge of sediment through this area, forming sections within the lake/canal under the ice cover. A number of locations were noted that had open water and limited ice along the shoreline which would allow for the placement of a minnow trap into the lake/canal. Five (5) areas where chosen to complete a minnow trap sets (locations 4 and 5 were chosen after the 1st set as the water level receded). The locations are shown in **Figure 1**. Access along the shore is limited primary due to steep banks, ice cover and soft unstable ground. The depth of the substrate (muck – soft bottom) along the shoreline was unknow and walking through the areas was ineffective and dangerous. Extremely difficult walking through the exposed bottom areas and within the open water areas (if even accessible).



Figure 1 - Minnow trap locations – Fuse Plug 2

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Minnow trap sets (November 28/20)

1st occurred at 11:00 with traps checked at 14:15. Traps were set at location 1, 2 & 3.

- No fish were captured.
- In an area not accessible from shore to the NE of trap 3 - 3 or 4 white sucker or lake fish were observed as they swam by.
- Due to the reduced water levels within the lake/canal the trap at location 3 was moved to location 4.

2nd occurred at 14:35 with traps being checked at 16:30.

- No fish were captured. The trap located at location 4 was not checked as it had become stuck under an ice shelf along the edge. Attempts were made to get it unstuck from the ice ledge but was not successful. Attempts to go into the lake/canal occurred but due to the heavy layer of ice made it not possible. Attempt to remove it will be made on November 29.
- The trap from location 2 was moved to location 5 as the water within the pooled area had receded. Dip netting through this area resulted in zero fish.

3rd occurred at 17:15. Traps will be checked on November 29, 2020.

On **November 29, 2020** the traps from the overnight set, at locations 1, 4 & 5 were checked at 09:00. Approximately 7 to 10 cm of ice had formed which had to be broken to get the traps out. No fish were captured or observed.

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Location 1 – Located within the lake/canal below a high steep bank – which is about 4 m above the water line. The trap was lowered into the water on a long line. The visibility within the water appeared to be about 30 cm. The trap was set down the steep side of canal approximately 60 to 70 cm. Accessing the bench into the open water section of the canal/lake along the shore was not possible as the bank was too steep and covered in ice. As well, the bottom within the open area appeared to be very soft, similar to the substrate throughout the lake/canal.



Location 1 (1st set) – November 28, 2020

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Location 2 – At the southern end of the canal an isolated pool had formed as the water receded from the main body of the lake/canal. The bottom within the pool was too soft to walk through. Prior to setting the minnow trap, the area was thoroughly dip netted. No fish were captured or observed during the dip netting operation. The trap rested on the bottom in about 30 – 40 cm of water. Surface flow from the south was entering into this pooled area. Water levels within the pool had receded by late afternoon. The area was again dip netted – which resulted in zero fish captured or observed. The trap from this location was then moved to location 5.



Location 2 (1st set) – November 28, 2020

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Location 3 – East side along the out cropping. From this location it is evident that there is a ridge of sediment deposited that was in the process of isolating this area as the water dropped. Depth was unknown. Was not able to wade into this area as bottom to soft and depth of sediment was unknown. Tried to wade into the area but sunk into 60 cm +- of muck up to knee height. Extremely difficult to maneuver within the area.



Location 3 (1st set) – November 28, 2020

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Location 4 – Access was possible due to the layer of ice covering the sediment ridge within the lake/canal. This location was across from location 3. By the end of the day, the water level had reduced greatly and appeared to be drying up. If the ridge did not have a layer of ice on top of it, walking out to this location would not be possible. The survey stake that was used to tether trap to easily pushed down into the sediment layer through the crack in the ice. To get the traps into the water, they were rolled down the ice over a subsurface ledge into the water. The gradient into the water was relatively steep and very slippery. Walking to the water edge was not possible as it was extremely slippery and would be very difficult get back up out of the water. When checking the trap at location 4 on the 2nd set, the trap became stuck on the subsurface ledge and could not be checked. The trap was left in place and will be pulled on November 29, 2020.



Location 4 (2nd set) – November 28, 2020

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Location 5 – Located in the NE corner. This area had become accessible near the end of the day as the water receded within the lake/canal. Water appeared to be relatively deep in the section as the trap was not visible where it rested on the bottom.



Location 5 (3rd set) – November 28, 2020

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Access into the open water of the lake/canal is limited due to the ice/frozen conditions, steep slippery shoreline and soft, muddy substrate throughout the entire area. Water level within the system was noticeably lower by the end of the day as the water levels at trap set locations 2 and 3 had significantly reduced resulting on longer suitable locations for minnow trap sets. Water overnight from November 28 to November 29, 2020 had dropped another 60 to 80 cm. There was no longer any open water as those areas had frozen over with about 7 to 10 cm of ice.

No fish were captured during the fish rescue effort completed on November 28 & 29, 2020. The only fish observed were the fish noted in close proximity to the trap set at location 3. The entire circumference of the lake/canal was walked a number of times on November 28. During these inspections, the lake/canal was visually inspected for possible isolated areas. None were noted.

Greenfield will continue to draw down the water. Once the water is drawn into a concentrated area or as isolated areas form fish rescue efforts will recommence.

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Photo 1 - Overview of conditions at Fuse Plug 2 (17:30) November 28, 2020

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Photo 2 – Location 1 – trap under 7 to 10 cm of ice – steep bank – November 29, 2020



Photo 3 – Location 1 – checking trap 09:00 – November 29, 2020

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Photo 4 – Location 5 – trap under 7 to 10 cm of ice – November 29, 2020



Photo 5 – Location 5 – looking at location 4 – sediment ridge – November 29, 2020

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Photo 6 – Location 4 – ice that had been broken to access trap – November 29, 2020



Photo 7 – Overall condition of Fuse Plug 2 area (10:00) – November 29, 2020

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JENSEN DAM FLOOD HANDLING UPGRADE PROJECT – QAES Memo

Date: December 3, 2020
Attention: Mike Allain – Greenfield Construction
Completed by: Eric Beveridge

Location: Jensen canal - Fuse Plug 2
Weather: Sunny – wind gusts in the afternoon, 5°C at 08:30 - 12°C at 15:00

The following memo details the results the fish rescue operation completed by RIDGE (Eric Beveridge) on December 3, 2020.

Fuse Plug 2 Area

RIDGE (EB), completed an inspection of the Fuse plug 2 area by walking around the entire circumference of the canal/lake at approximately 08:30. As the water level had dropped, the ice continued to drop with the water level. The majority of the area remained frozen and covered in ice. Ice that had been removed from the area in and around the pumping site was 10 to 20 cm thick. The majority of the canal/lake remained ice covered with limited open water either along the shoreline or middle portions of the sections of the canal/lake. No fish were observed during the perimeter inspection.

The eastern portion of canal/lake appeared to have become isolated due to a high ridge of sediments that cuts across the canal/lake. Directly on the north side of the sediment ridge to the western side, there was a small pocket of open water as shown in **Figure 1**. The only access to this area was walking along the ice-covered ridge. Prior to going to across the ice to the open water, we discussed a safety plan and had a throw-bag with us at all time. Extreme caution was used as the sediment layer was extremely soft. A survey stake was easily pushed in without hitting a hard bottom. Walking on the sediment was not possible. The ice throughout the canal/lake including the area around the open water area had shelves and voids, so had to stay on the higher sections to avoid the shoreline.



Figure 1 – Fish rescue location (Fuse plug 2)

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The open water area turned out to be smaller than first thought as there was a layer of submerged ice resulting the in the opening being approximately 1.5 x 2 meters. There was a low spot on the sediment ridge which turned out to be a channel under the ice, which had water flowing from the south portion into the north portion.

The water depth was approximately 30 cm deep. Visibility was limited due to the ice shelves and turbid water (the water flowing from the south was turbid). A number (estimated to be 6 to 8) Lake whitefish were observed swimming within the open section. I was able to work my way down to the edge of the open water area to use the dip net to capture (over a 5-hour period) 7 adult Lake whitefish. No fish were observed within this area by the end of the rescue attempt. In addition, a minnow trap was set for a 2-hour period from 12:00 to 14:00. The minnow trap set resulted in the capture and release of 1 juvenile White sucker. The minnow trap was set in about 30 cm of water, which allowed the trap to be totally submerged. By 14:00, as the water continued to drop, the minnow trap sat in about 5 cm of water and was slightly submerged in the sediments. Fish salvage results are included in **Table 1** with the release location shown in **Figure 2**.

Table 1 Fish Salvage Results - December 3, 2020 – Fuse Plug 2

Species	Length (mm)	Method	Comment(s)
Lake whitefish	450	dip net	Dip netting occurred over an approximately 4-hour period, which was broken into 4 dip netting sessions. 1st session resulted in 1 Lake whitefish. 2nd session resulted in 2 Lake whitefish. 3rd session resulted in 3 Lake whitefish. The 4th session after the minnow traps set resulted in 1 Lake whitefish.
Lake whitefish	465	dip net	
Lake whitefish	475	dip net	
Lake whitefish	460	dip net	
Lake whitefish	490	dip net	
Lake whitefish	425	dip net	
Lake whitefish	455	dip net	
White sucker	58	minnow trap	Minnow trap set from 12:00 to 14:00.

The release location was chosen as it was the only location in the area that had open water and suitable depth for fish to be released in. All fish captured were successfully released into about 30 cm of water and were observed swimming south towards the deeper section of the canal/lake as showed in **Figure 2**.

In addition to the use of the dip net and minnow traps, a seine net was utilized through the open water area. The net was rigged with ropes on the one end which was thrown out into the open water. Securing the end that stayed on shore, the seine was slowly pulled through the area. This was completed 5 times during the day. Seine netting resulted in no fish captured.

By 14:00, due to the warm weather (12 °C), the ice was getting soft and it was no longer safe to be out on the ridge at the open water location or along the shoreline. Due to the conditions (frozen, ice and sediment levels), there was very limited access into sections of the canal/lake.

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Figure 2 – Fish release location

At approximately 16:45 – 2 minnow traps were set in the open water area around the pump set up. The depth where the traps were set was not known, but they were totally submerged. The traps were to be set for an overnight set and checked in the morning of December 4, 2020.

Fish Salvage Location – Located directly on the north side of the sediment ridge on the western side of the canal/lake. There was a channel with water flowing from the south to the north. At approximately 16:45, the flow was down to a trickle. The area that was accessible to be salvaged was approximately 1.5 x 2 m and approximately 30 to 40 cm in depth.



Photo 1 - Fish Salvage Location – looking north – December 3, 2020

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Access into the open water of the lake/canal was limited due to the ice/frozen conditions, steep slippery shoreline and soft, muddy substrate throughout the entire area along with the majority of the canal/lake being iced covered. Efforts were made from the shore to remove ice with the use of the heavy equipment (excavator). This had limited success as the equipment has limited reaching capabilities. Due to the extremely soft bottom, there is limited access along the shoreline. Fish salvage effort completed in completed as outlined in the projects Fish Rescue Recommendations (November 17, 2020). All feasible and safe efforts were undertaken that resulted in the successful capture and release of 7 adult Lake whitefish and a single juvenile White sucker. All feasible and safe efforts were completed by the Greenfield team to attempt to remove ice to increase areas where fish salvage operations could be safely completed. A boat was on site and available to be utilized if conditions allowed.

Ongoing efforts to draw down the water will continue, and fish salvage efforts will continue on December 4, 2020.

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Photo 2 – looking west on ice covered sediment ridge – December 3, 2020



Photo 3 – Seine netting – December 3, 2020

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Photo 4 – Minnow trap – fish salvage location – December 3, 2020



Photo 5 – Fish salvage location (14:30) – water level reduced - December 3, 2020

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Photo 6 – Thickness of ice from around the pumping location - December 3, 2020



Photo 7 – Minnow trap set at pumping location – note ice shelf in background - December 3, 2020

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Photo 8 – Salvaged Lake whitefish - December 3, 2020



Photo 9 – Salvaged White sucker - December 3, 2020

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Photo 10 – Ice removal from pumping location - December 3, 2020



Photo 11 – Fuse plug 2 area (17:00) - December 3, 2020

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JENSEN DAM FLOOD HANDLING UPGRADE PROJECT – QAES Memo

Date: December 4, 2020
Attention: Mike Allain – Greenfield Construction
Completed by: Eric Beveridge

Location: Jensen canal - Fuse Plug 2
Weather: Sunny – wind gusts in the afternoon, 4°C at 08:00 - 10°C at 16:00

The following memo details the results the fish rescue operation completed by RIDGE (Eric Beveridge) on December 4, 2020.

Fuse Plug 2 Area

08:00 – the minnow traps that were set on December 3 were checked. No fish were captured or observed as part of the minnow trap sets.

At 08:30 Greenfield attempted to push-out material past the pump location in an effort to create an area for the fish rescue. Solid material was moved down the slope to the shoreline in front of where the pump was situated. This material covered the soft material of the bottom of the canal/lake. The excavator had limited access along the shoreline due to the soft material and while moving material nearly got stuck in the materials. By doing this, it allowed access to an open water area directly adjacent to the submerged pump intake. The intake was in approximately 20 to 40 cm of water. It also allowed access out onto the ice covered area of the canal/lake, which provided access to 2 small open water areas along the south side, one of which was the area that the December 3, 2020 fish rescue concentrated on. The open water within the 3 areas had water sitting on top of ice shelves. (**Figure 1**) The water depth throughout these areas was 10 to 30 cm in depth. No other areas within the canal/lake were safely accessible. Access along the shoreline for the majority of the canal/lake was not possible and was not required as most of the shoreline was ice covered.



Figure 1 – Fish rescue location (Fuse plug 2)

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Dip netting occurred throughout the day (8-hour period). The last approximately 1.5 hours of the day resulted in the capture of 2 fish and no fish were noted by the end of the day. A total of 43 adult Lake whitefish were successful salvaged. Fish salvage results are included in **Table 1** with the release location shown in **Figure 2**.

Table 1 Fish Salvage Results - December 4, 2020 – Fuse Plug 2

Count	Species	Length (mm)	Method	Comment(s)
1	Lake whitefish	485	dip net	All fish (adult Lake whitefish) appeared healthy when released at the fish release site. One matured female was noted - fish # 22. Dip netting occurred over an approximately 8-hour period through the areas that were safety accessible - **Figure 1**.
2	Lake whitefish	375	dip net	
3	Lake whitefish	470	dip net	
4	Lake whitefish	460	dip net	
5	Lake whitefish	480	dip net	
6	Lake whitefish	495	dip net	
7	Lake whitefish	300	dip net	
8	Lake whitefish	460	dip net	
9	Lake whitefish	410	dip net	
10	Lake whitefish	475	dip net	
11	Lake whitefish	520	dip net	
12	Lake whitefish	480	dip net	
13	Lake whitefish	460	dip net	
14	Lake whitefish	430	dip net	
15	Lake whitefish	435	dip net	
16	Lake whitefish	495	dip net	
17	Lake whitefish	475	dip net	
18	Lake whitefish	475	dip net	
19	Lake whitefish	450	dip net	
20	Lake whitefish	380	dip net	
21	Lake whitefish	500	dip net	
22	Lake whitefish*	520	dip net	
23	Lake whitefish	460	dip net	
24	Lake whitefish	390	dip net	
25	Lake whitefish	400	dip net	
26	Lake whitefish	420	dip net	
27	Lake whitefish	440	dip net	
28	Lake whitefish	470	dip net	
29	Lake whitefish	465	dip net	
30	Lake whitefish	365	dip net	
31	Lake whitefish	440	dip net	
32	Lake whitefish	470	dip net	
33	Lake whitefish	410	dip net	
34	Lake whitefish	490	dip net	
35	Lake whitefish	445	dip net	

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36	Lake whitefish	450	dip net	
37	Lake whitefish	400	dip net	
38	Lake whitefish	425	dip net	
39	Lake whitefish	475	dip net	
40	Lake whitefish	485	dip net	
41	Lake whitefish	420	dip net	
42	Lake whitefish	465	dip net	
43	Lake whitefish	390	dip net	

** mature female with eggs*

The release location was chosen as it was the only location in the area that had open water and suitable depth for fish to be released in. All fish captured were successfully released into about 30 cm of water and were observed swimming south towards the deeper section of the canal/lake. Location is shown in **Figure 2**.



Figure 2 – Fish release location

Fish Salvage Locations – The fish rescue areas were located along the shoreline where water was able to come to the surface onto shelf ice. The 2 locations along the south side were accessed by walking across the frozen surface. A ridge under the ice was followed to gain access across the canal/lake. The water depth in the rescue areas was approximately 10 to 30 cm deep depending on the depth of the shelf ice. Visibility was limited due to the ice shelves with water clarity that was less than 10 cm. Access (wading) into these areas was not possible and would have been extremely dangerous. Access with dip nets was possible by reaching in from the edges.

Fish salvage effort completed in completed as outlined in the projects Fish Rescue Recommendations (November 17, 2020). All reasonable and safe efforts to complete the fish rescue within the work zone of Fuse Plug 2 were completed. Fish rescue operations were

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attempted within sections of work zones of Fuse plug 2 that were safely accessible. The rescue efforts resulted in the release of 43 adult Lake whitefish. No mortalities were noted or observed.

RIDGE worked with Greenfield during the salvage operations on December 3 & 4. Fish rescue equipment (dip net) has been left onsite incase additional fish are encountered as Greenfield continues with the approved works at Fuse Plug 2. Any fish rescued will be documented and released at the identified release location. Fish rescue efforts will be competed under the guidance of the project's QAES.

As required additional fish salvage efforts will be undertaken as part of the scheduled works.

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Photo 1 – fish rescue location adjacent to pump location on north shore. December 4, 2020



Photo 2 – Looking west at Fuse plug 2 area. December 4, 2020

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Photo 3 – Pump location with access point to canal/lake. December 4, 2020



Photo 4 – Fish salvage on south side of canal/lake. December 4, 2020

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Photo 5 – Looking east at Fuse plug 2 area. December 4, 2020



Photo 6 – Typical adult Lake whitefish. December 4, 2020.

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Photo 7 – Fish # 22 – female adult Lake whitefish. December 4, 2020



Photo 8 – Fish release location. December 4, 2020

APPENDIX G

Emergency Response Plan for Flood Events

EMERGENCY RESPONSE PLAN FOR FLOOD EVENTS

Construction on Fuse Plug 1 (FP1) and Fuse Plug 2 (FP2) will be undertaken between November 2020 and March 2021 and considered the low-risk flood period for operations. In the event of a high runoff (rainfall or snow melt) event occurring during construction the proposed procedure will be followed;

- Waterton-St. Mary Operations staff will begin monitoring precipitation, Jensen reservoir inflow and outflow rates and the Jensen to Ridge Canal level on an hourly basis.
- As per the EPP for Jensen Dam and the operation of Taylor Wasteway, downstream residents and local authorities will be notified of impending flood flows that could be released from the canal downstream of Jensen Reservoir,

FP1

- Greenfield Construction will remove Cofferdam once reservoir elevation reaches 1070.0 m and the Operations staff signal a large rainfall/snowmelt event to be able to divert water through Taylor Coulee Chute.
- As the reservoir water level rises above elevation 1070.55 m, flood flows will be directed through the Operation Spillway. Refer to the Operation Spillway Rehabilitation Emergency Preparedness Plan included in the Care of Water Plan.
- If the reservoir levels reach the sill elevation of FP1 (1071.45 m), water will also be allowed to flow through the excavated opening through the canal bank, depending on the stage of construction.

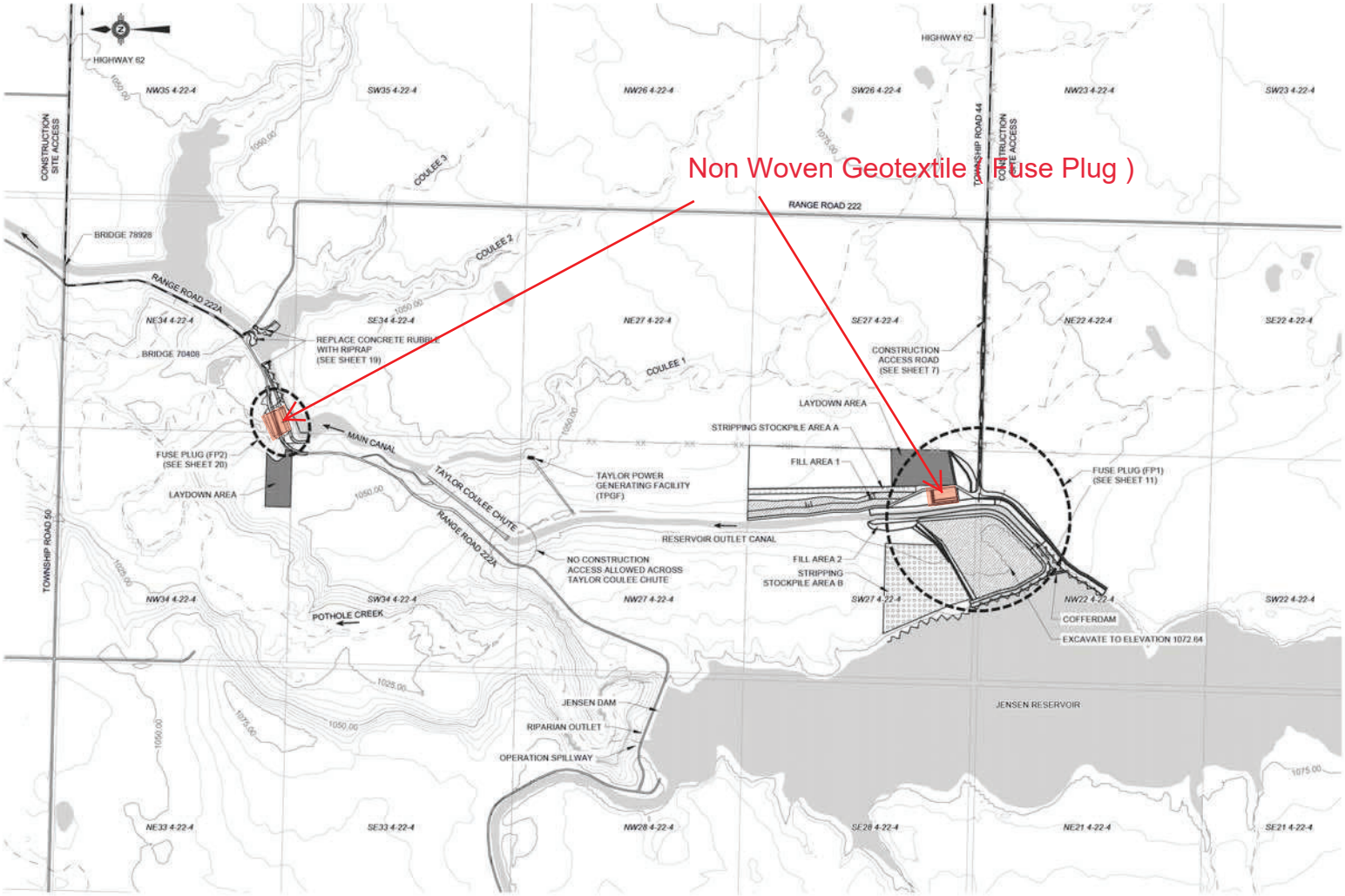
FP2

- if the reservoir elevation reaches 1070.0 m and the cofferdam upstream of FP1 is required to be removed, Greenfield Construction will remove the cofferdam downstream of Bridge 70408.
- The gates for Taylor Wasteway will be opened and flood flows will allowed to pass through the wasteway and the downstream canal towards Milk River Ridge Reservoir.
- After the water level in the canal reaches elevation 1034.0 m (excavated opening for FP2), flood flow will be allowed to flow through the opening to Pothole Creek.

Greenfield Construction will provide an excavator close to each of the cofferdam when the Operations staff signal a large rainfall/snowmelt event. Each location will have accessible at all times a 490 Komatsu Excavator with the Operator nearby.

APPENDIX H

Non-Woven Geotextile Plans



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2	2020-10-16	ISSUED FOR CONSTRUCTION	AS
1	2020-09-04	ISSUED FOR TENDER	AS

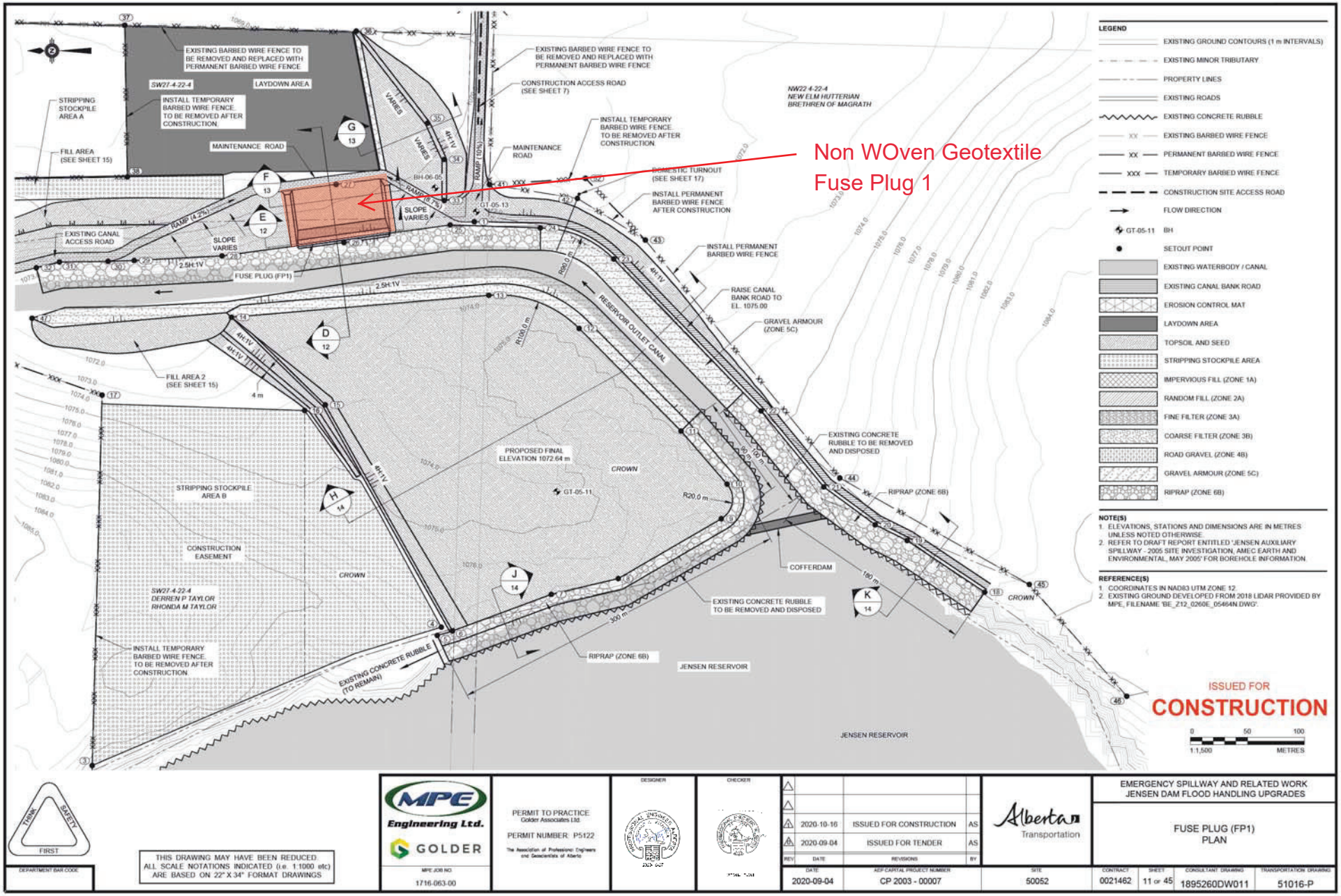
DATE 2020-09-04
AEP CAPITAL PROJECT NUMBER CP 2003 - 00007
SITE 50052/50053

Alberta Transportation

EMERGENCY SPILLWAY AND RELATED WORK
JENSEN DAM FLOOD HANDLING UPGRADES

GENERAL ARRANGEMENT

CONTRACT 0021462
SHEET 3 OF 45
CONSULTANT DRAWING 1895260DW003
TRANSPORTATION DRAWING 51008-P



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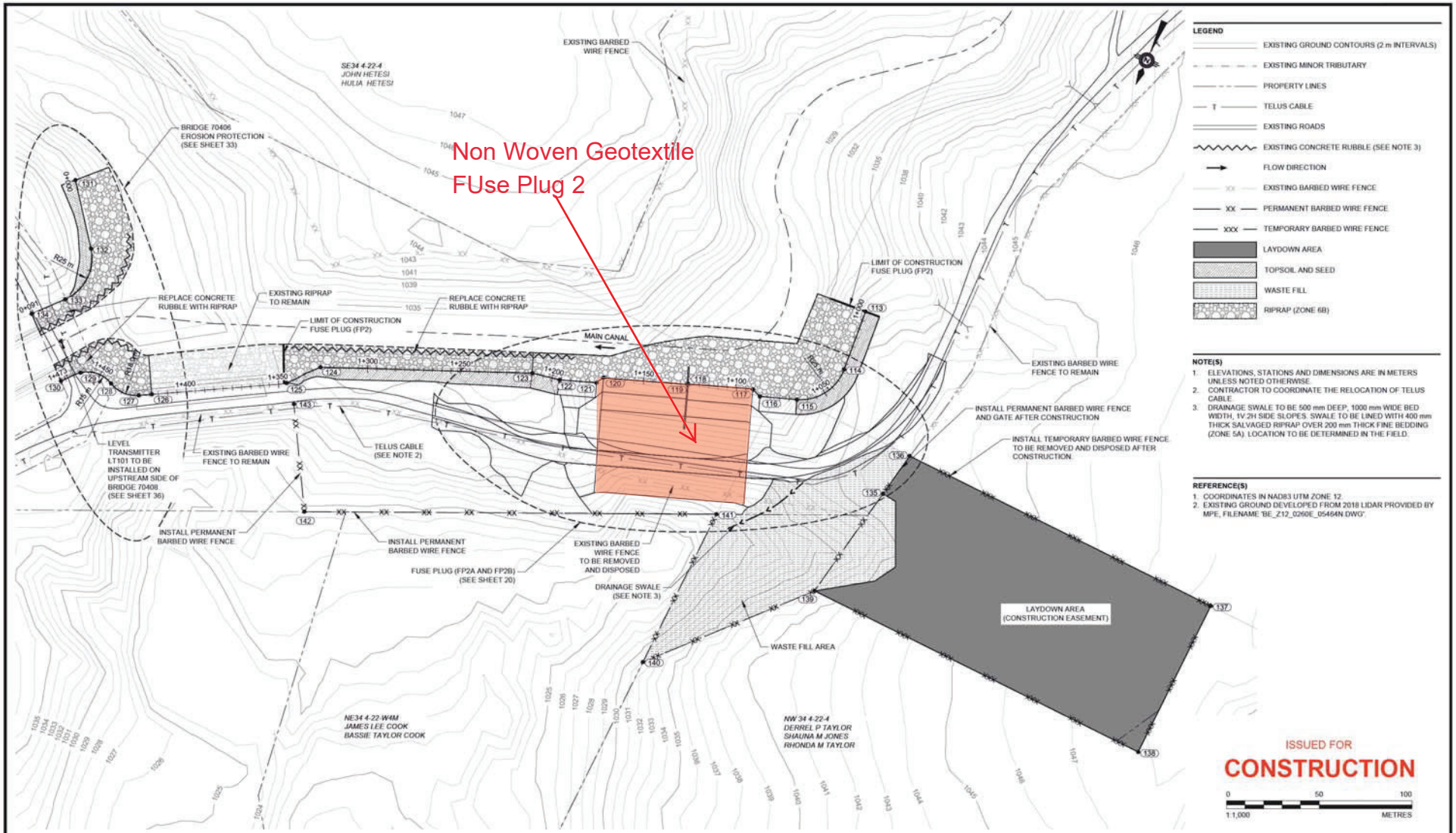
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1	2020-09-04	ISSUED FOR TENDER	AS

Alberta Transportation

EMERGENCY SPILLWAY AND RELATED WORK
JENSEN DAM FLOOD HANDLING UPGRADES

FUSE PLUG (FP1) PLAN

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2020-09-04	CP 2003 - 00007	50052	0021462	11 of 45	1895260DW011	51016-P



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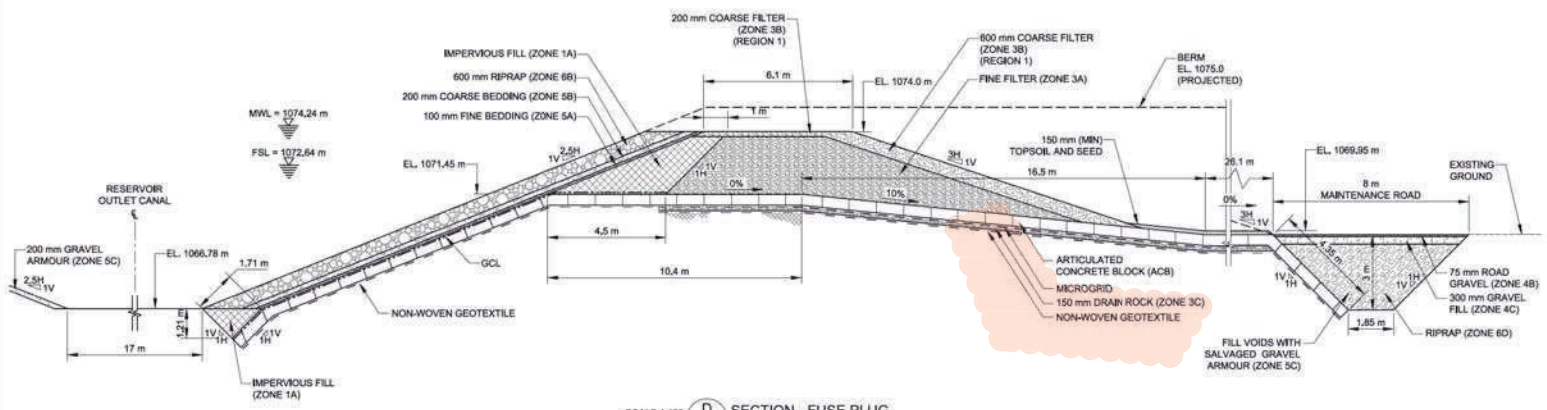
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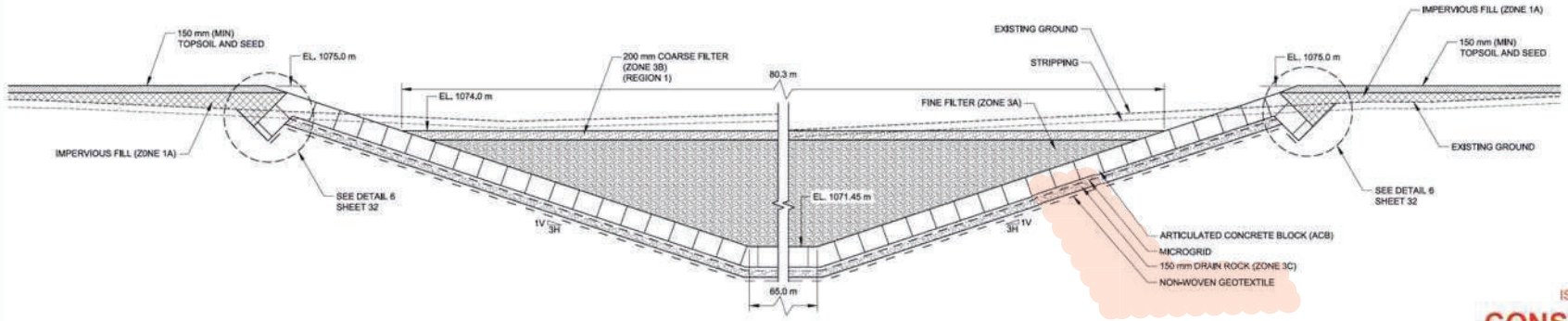
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JENSEN DAM FLOOD HANDLING UPGRADES

FUSE PLUG (FP2)
GENERAL ARRANGEMENT

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2020-09-04	CP 2003 - 00007	50053/70408	0021462	19 of 45	1895260DW019	51024-P



SCALE 1:100 D 11 SECTION - FUSE PLUG



SCALE 1:50 E 11 SECTION - FUSE PLUG

LEGEND

- NON-WOVEN GEOTEXTILE
- MICROGRID
- GCL
- ARTICULATED CONCRETE BLOCK (ACB)
- TOPSOIL AND SEED
- IMPERVIOUS FILL (ZONE 1A)
- FINE FILTER (ZONE 3A)
- COARSE FILTER (ZONE 3B)
- ROAD GRAVEL (ZONE 4B)
- GRAVEL FILL (ZONE 4C)
- FINE BEDDING (ZONE 5A)
- COARSE BEDDING (ZONE 5B)
- GRAVEL ARMOUR (ZONE 5C)
- RIPRAP (ZONE 6B)
- RIPRAP (ZONE 6D)

NOTE(S)

1. ELEVATION, STATIONS AND DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.

ISSUED FOR
CONSTRUCTION

0 2 4
1:50 METRES

0 5 10
1:100 METRES

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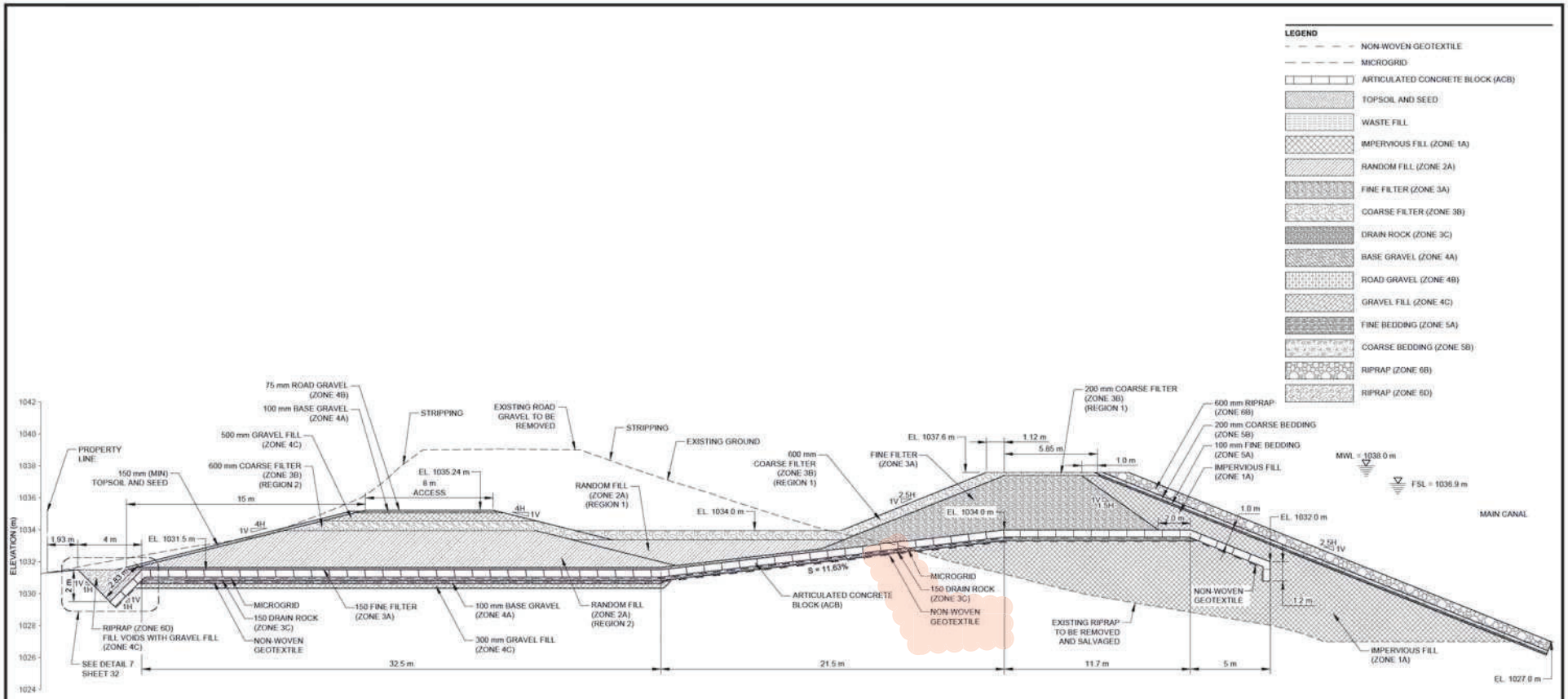
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EMERGENCY SPILLWAY AND RELATED WORK
JENSEN DAM FLOOD HANDLING UPGRADES

FUSE PLUG (FP1)
SECTIONS (1 of 3)

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SCALE 1:125 — Q 20 — SECTION - FUSE PLUG (FP2A)

NOTE(S)

1. ELEVATIONS, STATIONS AND DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

REFERENCE(S)

1. COORDINATES IN: NAD83 UTM ZONE 12.
2. EXISTING GROUND DEVELOPED FROM 2018 LIDAR PROVIDED BY MPE, FILENAME 'BE_Z12_626OE_5646N.DWG'.

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0 5 10
1:125 METRES

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Alberta Transportation

EMERGENCY SPILLWAY AND RELATED WORK
JENSEN DAM FLOOD HANDLING UPGRADES

FUSE PLUG (FP2A AND FP2B)
SECTIONS (1 OF 6)

DATE	AEP CAPITAL PROJECT NUMBER	SITE	CONTRACT	SHEET	CONSULTANT DRAWING	TRANSPORTATION DRAWING
2020-09-04	CP 2003 - 00007	50053	0021462	22 OF 45	1895260DW022	51027-P

AUTOCAD FILE No. 1895260DW013.dwg TENDER No. TND 0021462

APPENDIX G

Technical Data Reports

G1

Vegetation and Wetlands Technical Report

Horsefly Regional Emergency Spillway
Vegetation and Wetlands Technical Report

December 2021

Prepared for:

Municipal District of Taber

Prepared by:

Stantec Consulting Ltd.

This document entitled Horsefly Regional Emergency Spillway Vegetation and Wetlands Technical Report was prepared by Stantec Consulting Ltd. (“Stantec”) for the account of Municipal District of Taber (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Borton, Adam Digitally signed by Borton, Adam Date: 2021.12.03 09:16:35 -07'00'
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(signature)
Nick DeCarlo, B.Sc. P.Biol.

Approved by James D. Howell Digitally signed by James D. Howell Date: 2021.12.03 08:50:19 -07'00'
(signature)
James D. Howell, M.Sc., P.Geol.

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Abbreviations

ABWRET	Alberta Wetland Rapid Evaluation Tool
ACIMS	Alberta Conservation Information Management System
AEP	Alberta Environment and Parks
AMWI	Alberta Merged Wetland Inventory
AWA	Alberta *Wildlife Act*
AWCS	Alberta Wetland Classification System
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ECCC	Ecological Communities of Conservation Concern
ESRD	Environment and Sustainable Resource Development
GPS	Global Positioning System
GVI	Grassland Vegetation Inventory
SARA	*Species at Risk Act*
SMRID	St. Mary River Irrigation District
SOCC	Species of Conservation Concern
TID	Taber Irrigation District



1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by the Municipal District (MD) of Taber to provide engineering and environmental support for the Horsefly Regional Emergency Spillway Project (the Project). The existing canal system, owned by the Taber Irrigation District (TID) and the St. Mary River Irrigation District (SMRID), was not designed to accommodate drainage from overland flows. The Project involves upgrading the existing canal system to receive drainage and overland flows in order to prevent flooding of agricultural lands. The upgraded canal system would divert the water flow to the Oldman River.

1.1 PROJECT DESCRIPTION

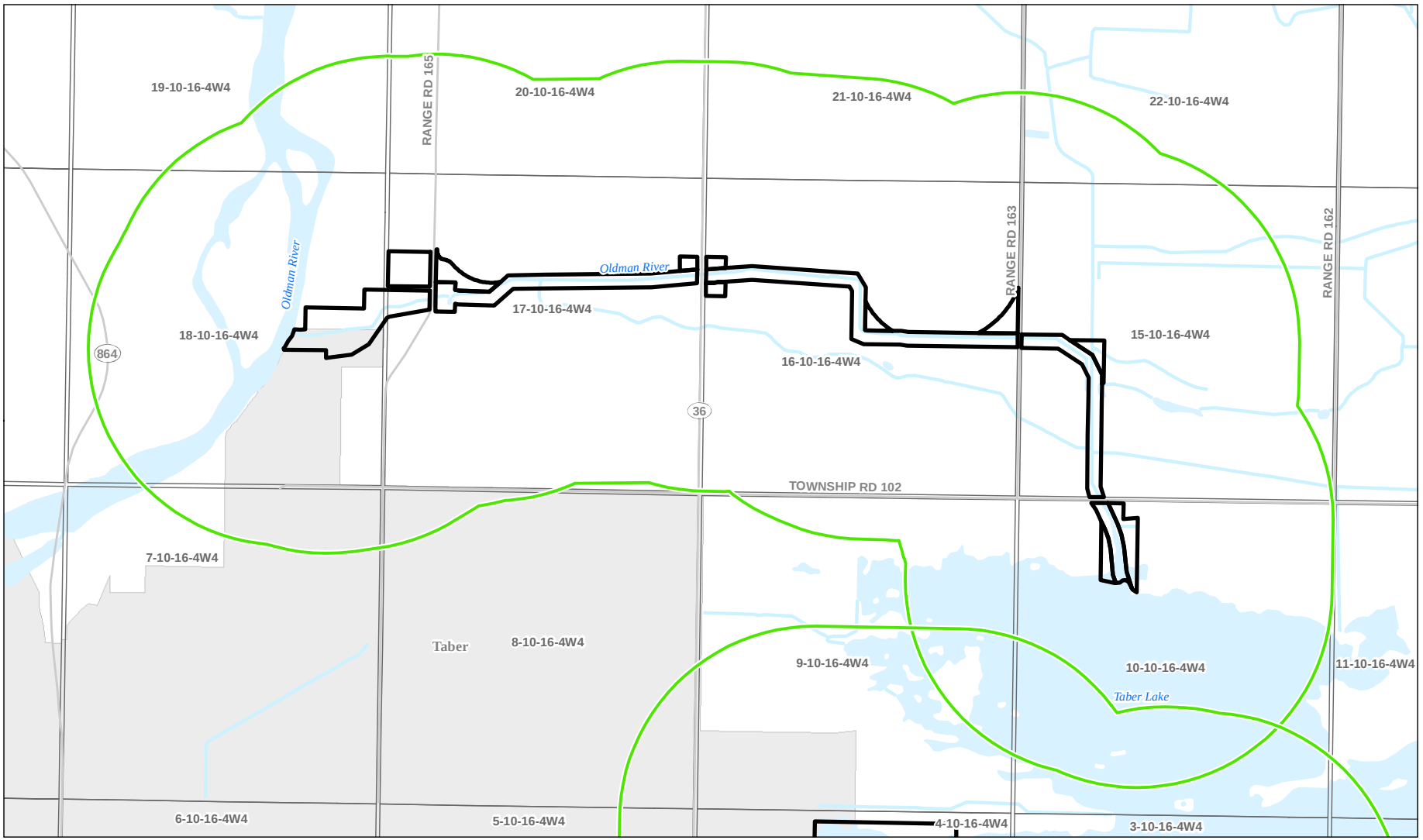
Agricultural lands surrounding the TID and SMRID were exposed to overland flooding in 2010, 2011, 2013, 2014, and 2018. The existing canal system was not designed to manage overland flows from spring runoff, storm events, and/or snow melt. The Project upgrades to the existing canal system will increase the flood attenuation capacity of the system and divert the water flow into the Oldman River.

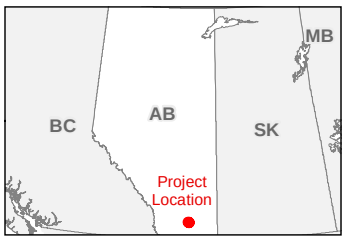
The Project is divided into three phases:

- Phase 1 (Figure 1.1): Oldman River to Taber Lake - The outlet from Taber Lake will be replaced and approximately 1 km of the existing canal (the Big Bend Lateral) will be widened to convey greater capacity. At this location, a check structure will direct water into the Big Bend Canal north for irrigation. The next 3.5 km of the system west of this point is a constructed earthen drain. The existing drain, which normally carries a small volume of runoff, will also be enlarged to convey greater capacity. The final 1 km of the spillway will install erosion protection measures and enlarge drainage through a natural coulee to the Oldman River.;
- Phase 2 (Figure 1.2): Taber Lake to Horsefly Reservoir - Approximately 5 km of canals between Taber Lake and Horseshoe Lake Reservoir are proposed to be enlarged. Concrete control structures will be replaced in order to convey greater flows. In addition, the outlet structure from Horsefly Reservoir Lake is proposed to be replaced; and,
- Phase 3 (Figure 1.3): Horsefly Reservoir to the SMRID - Replacement of the runout structure on the SMRID Main Canal and enlargement of 3.5 km of the SMRID canals that convey flows to the Horsefly Reservoir are proposed to be upgraded. Two drop structures will also need to be enlarged to convey additional flow. The existing wetland in Horsefly Reservoir will be expanded and enhanced to improve water quality.

1.2 SPATIAL BOUNDARIES

A 1 km buffer on either side of the Project footprint is used as the Vegetation Study Area to assess Project-related effects to vegetation and wetlands. The Project footprint encompasses the anticipated areas of physical disturbance associated with Project construction activities and operation.





Vegetation and Wetland Study Area
Project Footprint
Road
Section
Urban Area

N

0 375 750 metres

(At original document size of 8.5x11)
1:30,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 12N
2. Data Sources: AltaLIS, NRCAN, Alberta Parks, GeoLogic, NRN

Stantec

Project Location
T9&10N, R15&16W
Town of Taber

Prepared by SL on 2021-11-26
TR by DS on 2021-11-26
IR Review by JH on 2021-11-26

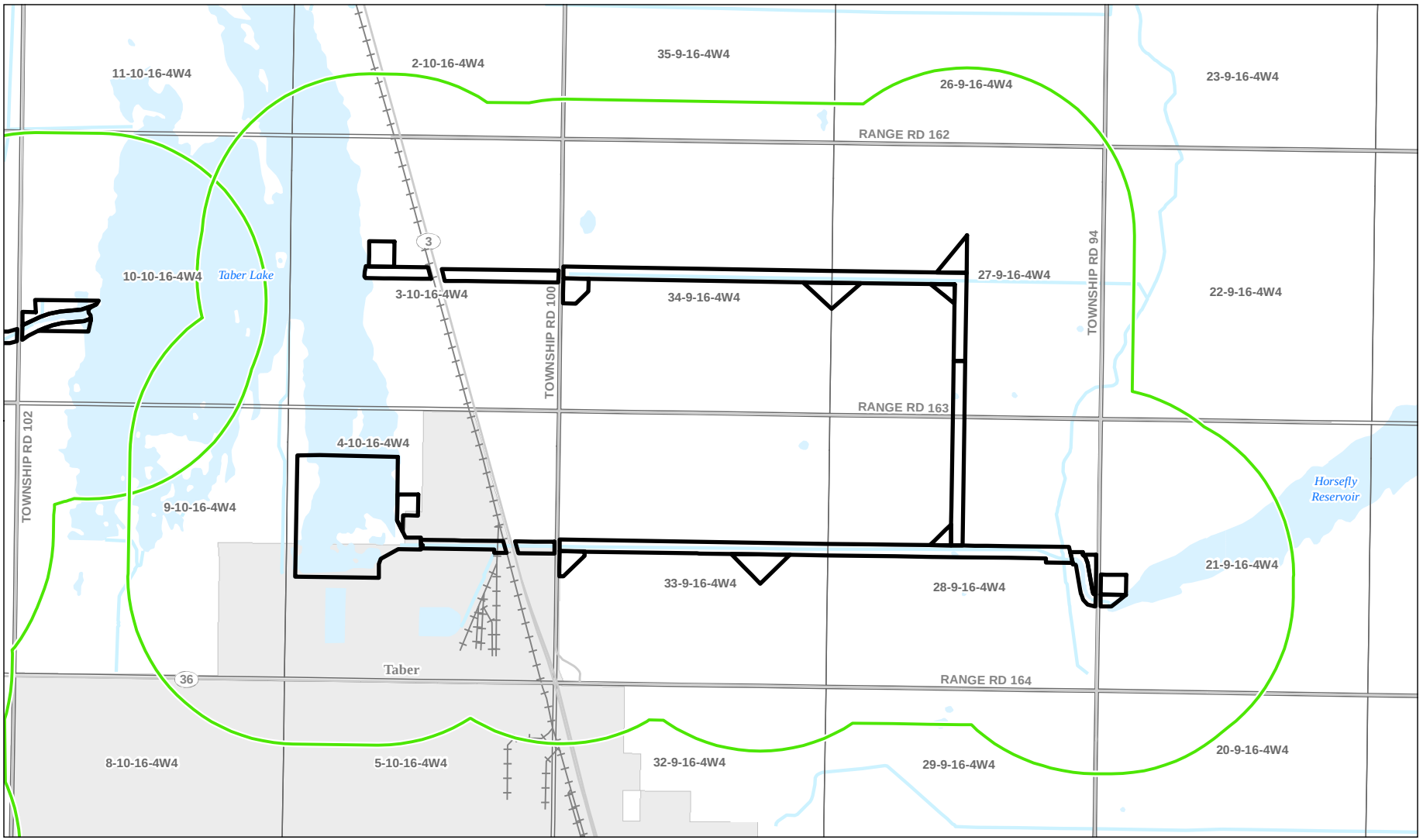
Client/Project 110773806-0016 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway

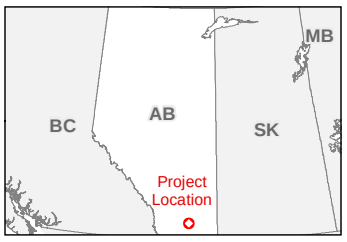
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- Vegetation and Wetland Study Area
- Project Footprint
- Road
- Railway
- Section
- Urban Area

N

0 430 860 metres

(At original document size of 8.5x11)

1:35,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 12N

2. Data Sources: AltaLIS, NRCAN, Alberta Parks, GeoLogic, NRN

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Project Location
T9&10N, R15&16W
Town of Taber

Prepared by SL on 2021-11-26
TR by DS on 2021-11-26
IR Review by JH on 2021-11-26

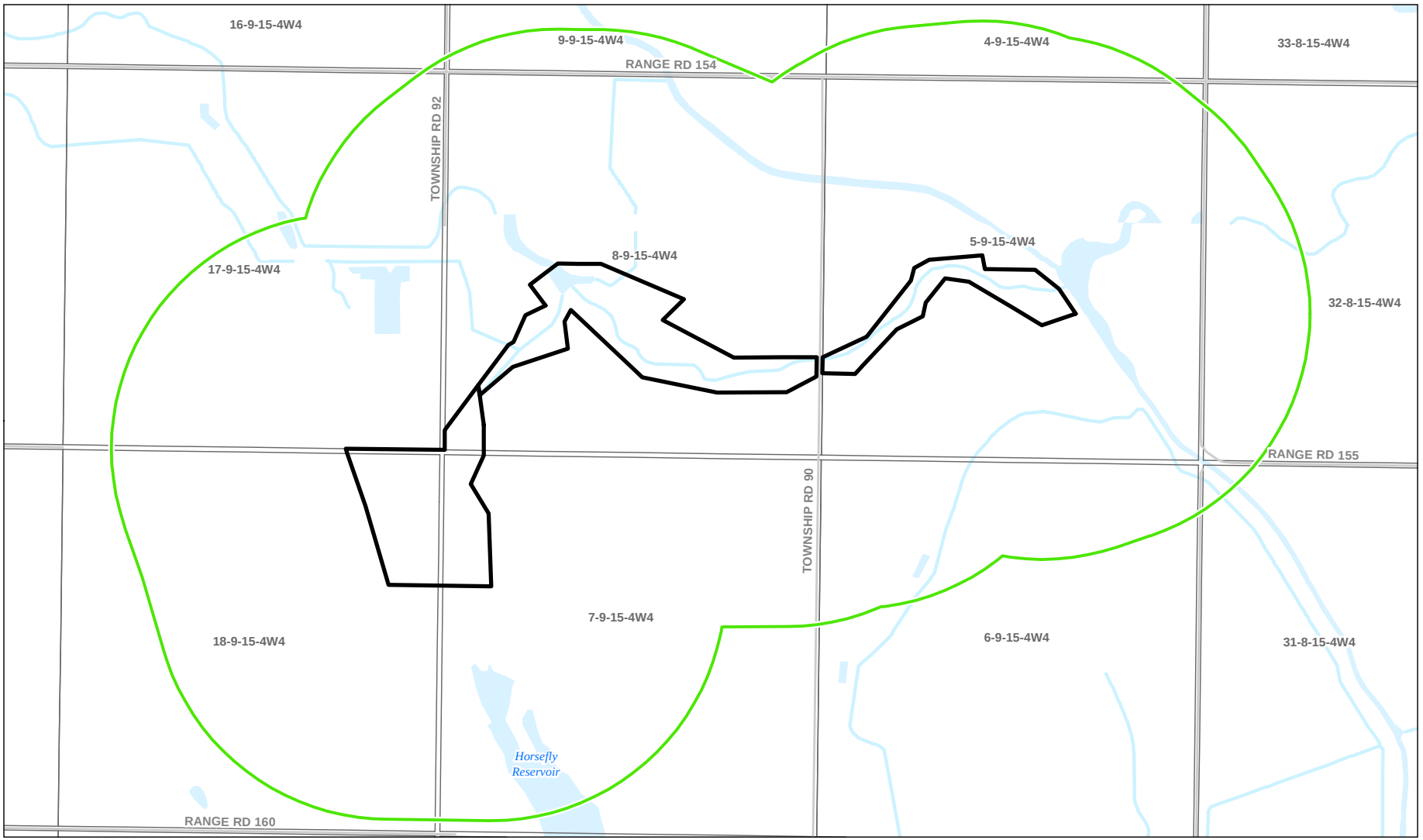
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110773806-0016 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway

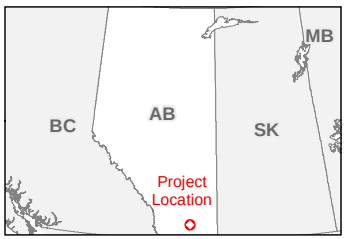
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Vegetation and Wetland Study Area

Project Footprint

Road

Section

N

0 310 620 metres

(At original document size of 8.5x11)

1:25,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 12N

2. Data Sources: AltaLIS, NRCAN, Alberta Parks, GeoLogic, NRN

Stantec

Project Location
T9&10N, R15&16W
Town of Taber

Prepared by SL on 2021-11-26
TR by DS on 2021-11-26
IR Review by JH on 2021-11-26

Client/Project
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Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway

Figure No.
1.3

Title
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2.0 METHODS

2.1 DESKTOP ASSESSMENT

2.1.1 Land Cover

A desktop review of aerial imagery publicaly available information was conducted to identify existing vegetation and wetland conditions in the study area. The following data sources were reviewed:

- Grassland Vegetation Inventory (GVI) (AEP 2019)
- Alberta Merged Wetland Inventory (AMWI) (AEP 2017)
- Aerial BING imagery (May 2015)

Existing GVI mapping was revised based on review of land cover conditions in 2015 imagery and AMWI data. Desktop delineation of wetlands focused on areas with low topographic relief, areas bordering waterbodies, potential drainage areas, changes in vegetation and presence of standing water, bare ground or salt/carbonates. Wetlands were classified according to the Alberta Wetland Classification System (AWCS) (Environment and Resource Development 2013). Uplands and wetlands were mapped at a 1:5,000 scale with a minimum polygon size of 0.1 ha.

2.1.2 Species and Ecological Communities of Conservation Concern

Species of conservation concern (SOCC) and ecological communities of conservation concern (ECCC) are plant species or vegetation communities listed provincially, under the *Alberta Wildlife Act,* federally, under Schedule 1 of the *Species at Risk Act* (SARA), as endangered, threatened or special concern or on the Alberta Consrervation Magaement System's (ACIMS) tracked or watched elements list. SOCC and ECCC potentially occurring in the study area were determined from a review of the SARA Public Registry endangered, threatened and special concern ranges (Government of Canada 2021) and the ACIMS element occurrence database (2017). The ACIMS database was searched for documented SOCC and ECCC occurrences within 5 km of the Project footprint.

2.1.3 Weeds

Historical occurrences of noxious and prohibited noxious weed species listed by the Alberta *Weed Control Act* were obtained for the M.D. of Taber from Alberta Agriculture and Forestry Weed Survey Results On-line Map (Alberta Agriculture and Forestry 2018).

2.2 FIELD ASSESSMENT

Land cover mapping, wetland delineation and surveys for SOCC and ECCC were completed for Phase 1 on June 22, 2021 and again on August 20 and 21 for Phase 1, 2 and 3.

2.2.1 Land Cover

Land cover classifications within the Project footprint for all three phases were evaluated during field surveys. Surveys focused in areas of native vegetation and areas where wetlands may overlap the Project footprint. Vegetation was assessed in 20 m x 20 m (400 m^2) plots located in a homogenous area of each assessed land cover type. In each plot, all vascular plant species with sufficient vegetative (i.e., developed leaves) or reproductive features (e.g., flowers, fruits or seeds) needed for identification were recorded along with the percent ground of each species. Percent cover was recorded for each species in the following layers:

- tree layer (i.e., single stemmed woody plants taller than 5 m) if present, including species in the canopy layer (i.e., trees with more than 50% of the canopy surface exposed to direct sunlight) and the subcanopy layer (i.e., trees with less than 50% of the canopy surface exposed to direct sunlight)
- shrub layer (i.e., single or multi stemmed woody plants 20 cm to 5 m tall) if present, including tall shrub layers (i.e., species between 150 cm and 5 m tall) and short shrub layers (i.e., species between 20 cm and 15 cm)
- ground cover (i.e., all woody, herbaceous and graminoid plants less than 20 cm tall)

Percent cover was estimated to the nearest whole number for species occupying less than 5% of the plot and to the nearest 5% for species occupying 5% or more of the plot. Total ground cover of vascular, non-vascular, litter, water and bare soil was recorded along with plot characteristics such as slope position, aspect, moisture regime and nutrient regime. Coordinates of each plot were recorded using a global positioning system device and photographs were taken of ground cover and in all cardinal directions.

Hydrology and vegetation were examined to confirm a wetland or ephemeral waterbody was present and, if so, classify the feature according to the AWCS and determine the wetland extent. Vegetation and ground cover was assessed using 20 m x 20 m plots located in a homogenous area of each wetland zone (e.g., wet-meadow, shallow-marsh) larger than 10 m x 10 m in each wetland as described above for other land cover types.

Wetland and ephemeral waterbody hydrology indicators were qualitatively assessed by observing if surface water was present at the site and looking for evidence of recent saturation or ponding (e.g., drift lines, algal mats, bare ground in low topographic locations). Quantitative measurements of hydrological indicators included water depth and depth to saturation (depth at which soil pores are saturated).

Soils were examined to a depth of 29 cm, the active rooting zone (National Research Council 1995), in the outermost community of the potential wetland, and depth, texture, color, structure and abundance of redox features (i.e., gleys and mottling) in each soil horizon recorded. Redox features in the upper soil profile develop under conditions of inundation or saturation over a long period of time and are, therefore,

used to determine the extent of each wetland and waterbody. Assessed areas were considered wetlands if redox features were recorded within the top 29 cm and plant species characteristic of wet conditions were also recorded. Areas were considered ephemeral waterbodies if they lacked hydric soil indicators in the top 29 cm but had plant species characteristic of ephemeral flooding.

Wetland boundaries were walked in the field with boundaries equaling similar topography of the outermost zone with hydric soil indictors present. Global positioning system tracksof the walked boundary were collected and used to assist with mapping refinement. Wetland notes and photos were also taken of each wetland and adjacent upland area. For areas subject to *Water Act* approval (Horsefly Reservoir and Taber Lake), wetland function and value was assessed following the Alberta Wetland Rapid Evaluation Tool-Actual (ABWRET-A) Guide (Government of Alberta 2015). Completed forms will be submitted to AEP for disturbances to wetlands in support of *Water Act* aproval.

2.2.2 Species and Ecological Communities of Conservation Concern

A qualified vegetation ecologist searched for occurrences of SOCC were surveyed at each land cover plot location and the adjacent area. Areas of variable terrain and vegetation community transition areaswere searched for SOCC and ECCC. Plants lists documented at surveyed plots and transition areas were compared against ECCC descriptions of Allen (2014) post field survey for similar plant composition. A sub-sample of sites surveyed in the spring were re-surveyed in the summer to identify if additional plants had emerged or if previously unidentifiable plants had matured and could be positively identified. Not all sites visited during spring SOCC/ECCC survey were re-visited during summer SOCC/ECCC survey and instead, additional areas were surveyed to increase spatial coverage of the Project footprint.

If an SOCC or ECCC was observed, the area was searched to determine the occurrence size and extent. The occurrence size was estimated for occurrences greater than 50 plants. When at least 50 individuals of an SOCC were present, a single specimen was collected and the identification confirmed using plant keys such as *Vascular Flora of Alberta* (Kershaw and Allen 2020).

2.2.3 Weeds

Occurrences of noxious and prohibited noxious species were recorded when observed at each land cover, wetland and SOCC/ECCC survey site and when encountered incidentally when travelling between survey sites. The location, density, extent and number of plants was estimated for each occurence. Weed occurrence density was estimated using density distribution classes (Table 2.1) from *Rangeland Health and Assessment for Grassland, Forest and Tame Pasture* (Adams et al. 2016).

Table 2.1 Weed Abundance Density Distribution Classes

Class	Abundance Description
0	None
1	Rare
2	A few sporadically occurring individual plants
3	A single patch
4	A single patch plus a few sporadically occurring plants
5	Several sporadically occurring plants
6	A single patch plus several sporadically occurring plants
7	A few patches
8	A few patches plus several sporadically occurring plants
9	Several well spaced patches
10	Continuous uniform occurrences of well spaced plants
11	Continuous occurrence of plants with a few gaps in the distribution
12	Continuous dense occurrence of plants
13	Continuous occurrence of plants with a distinct linear edge in the polygon
SOURCE: Reproduced from Adams et al. (2016).	

3.0 RESULTS

3.1 VEGETATION AND WETLANDS

3.1.1 Land Cover

The Project is located in the Dry Mixedgrass Natural Subregion, an area characterized by long, warm summers with the lowest precipitation of any natural subregion in Alberta (Alberta Parks 2015). Vegetation communities in the subregion are dominated by drought-tolerant grasses including blue grama (*Bouteloua gracilis*), needle-and-thread (*Hesperostipa comata*) and June grass (*Koeleria macrantha*), herbs such as moss phlox (*Phlox hoodii*) and prairie selaginella (*Selaginella densa*) and shrubs like buckbrush (*Symphoricarpos occidentalis*) and prickly rose (*Rosa acicularis*). Many of the moister areas have been converted to agricultural uses, including cultivation and grazing. Almost 10% of the subregion is irrigated cultivation (Alberta Parks 2015).

The majority of land intersected by the Vegetation Study Areas has been converted for agricultural use for all three Project phases (Table 3.1 and Figures 3.1, 3.2 and 3.3) with cropped areas the most common land cover class, occupying from 41.3% to 56.7% of the study area. Although large areas within the Vegetation Study Area have been disturbed by previous land use activities, native prairie and wetlands are still present in the study area and Project footprints. Native upland cover classes and wetlands are most in the Vegetation Study Area of Phase 3 and no native upland occurs in the Vegetation Study Area of Phase 2. Native prairie is primarily concentrated east of the Oldman River at the western extent of Phase 1 (Figure 3.1) and near the midway point of Phase 3, bordered by the existing canal and Horsefly Reservoir (Figure 3.3).

A total of 58 wetlands were identified within the Vegetation Study Area. Wetlands occur most frequently adjacent to waterbodies and low lying sections of land, with the largest area of wetland occurring in Phase 3 at the eastern edge of the Horsefly Reservoir (Figure 3.3). Temporary graminoid marshes were are the most common wetland class. All Project routes intersect wetlands with Phase 3 intersecting the most wetland area at 30.7 ha, compared to 1.7 ha on Phase 1 and 3.1 ha on Phase 2 (Table 3.1).

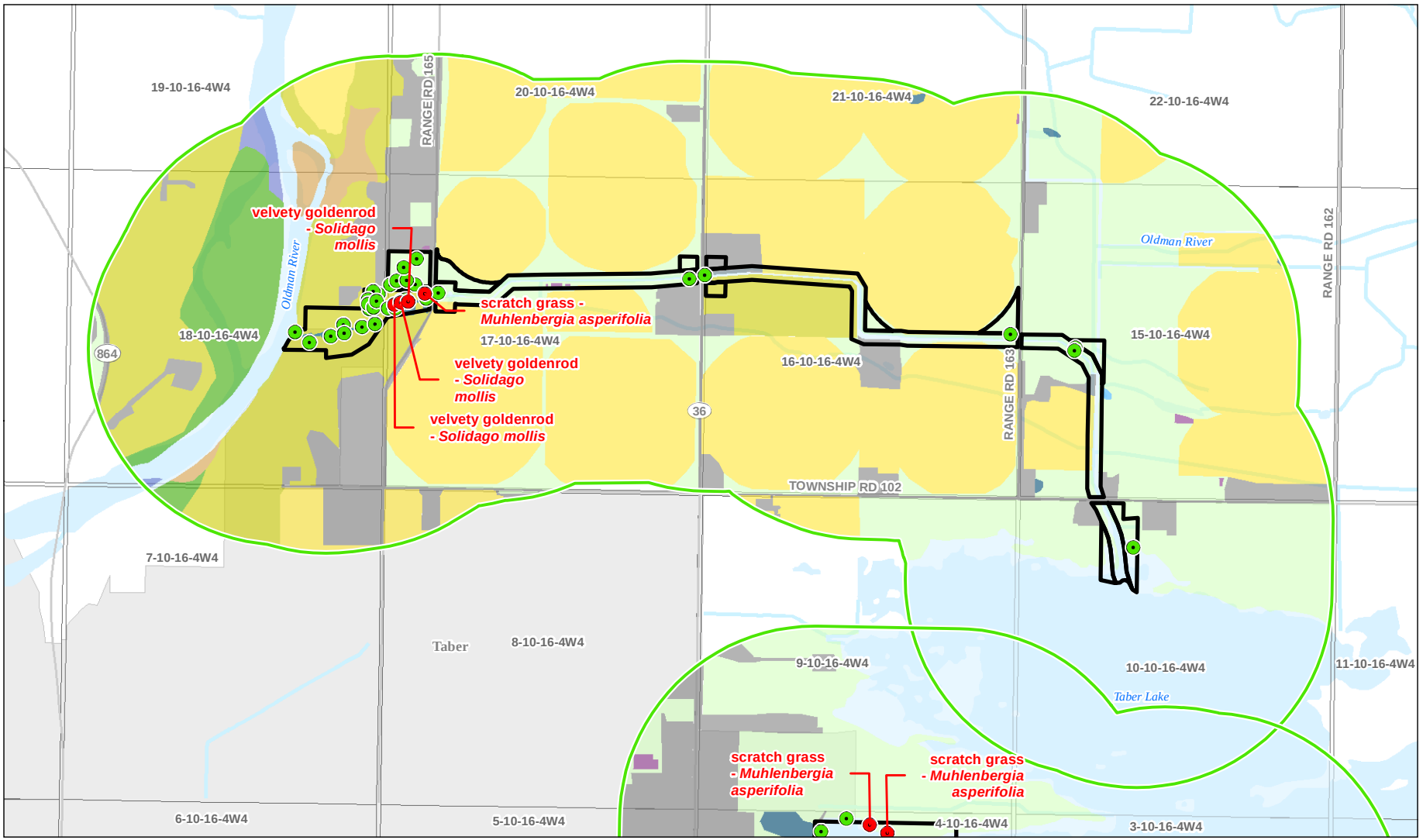
A total of 156 plant species were identified within the Project footprint during 2021 field surveys, including 4 trees, 21 shrubs, 36 gramoinoids and 95 forbs (Appendix A, Table A-1).

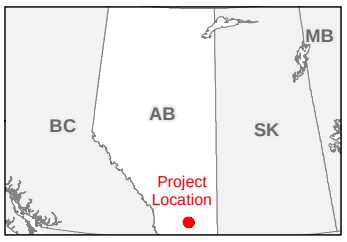
Table 3.1 Land Cover Classes within the Horsefly Emergency Spillway Project Footprint and Vegetation Study Area

Cover Class	Phase 1				Phase 2				Phase 3			
	Vegetation Study Area		Project Footprint		Vegetation Study Area		Project Footprint		Vegetation Study Area		Project Footprint	
	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Native Upland												
Deciduous	47.2	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Native prairie	177.0	11.4	15.1	23.8	0.0	0.0	0.0	0.0	304.2	24.8	27.4	34.5
Shrub	12.7	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	236.9	15.2	15.1	23.8	0.0	0.0	0.0	0.0	304.2	24.8	27.4	34.5
Wetlands and Waterbodies												
Marsh Graminoid – Temporary (MGII)	1.0	0.1	0.6	0.9	6.0	0.3	0.7	0.6	9.6	0.8	0.2	0.2
Marsh Graminoid – Seasonal (MGIII)	0.8	0.0	0.0	0.0	5.4	0.2	0.6	0.5	14.1	1.2	2.6	3.2
Marsh Graminoid – Semi-permanent (MGIV)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.4	5.7	23.2	29.2
Swamp Shrubby – Temporary (SSII)	4.9	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shallow Open Water Bare – Seasonal (WBIII)	0.2	0.0	0.0	0.0	0.6	0.0	0.0	0.0	3.8	0.3	3.7	4.6
Shallow Open Water Bare – Permanent (WBV)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.1	0.0	0.0
Drainage Marsh Graminoid – Temporary (MGII-D)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6	0.6	0.9	1.1
Drainage Marsh Graminoid – Seasonal (MGIII-D)	0.9	0.1	0.9	1.4	0.0	0.0	0.0	0.0	5.1	0.4	0.0	0.0
Drainage Shallow Open Water Aquatic Vegetation – Permanent (WAV-D)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.5	0.0	0.0
Dugout	0.8	0.1	0.2	0.3	10.7	0.4	1.8	1.4	5.9	0.5	0.2	0.3
Subtotal	**8.6**	**0.6**	**1.7**	**2.7**	**22.6**	**0.9**	**3.1**	**2.4**	**124.1**	**10.1**	**30.7**	**38.6**

Table 3.1 Land Cover Classes within the Horsefly Emergency Spillway Project Footprint and Vegetation Study Area

	Phase 1				Phase 2				Phase 3			
	Vegetation Study Area		Project Footprint		Vegetation Study Area		Project Footprint		Vegetation Study Area		Project Footprint	
Cover Class	**ha**	**%**	**ha**	**%**	**ha**	**%**	**ha**	**%**	**ha**	**%**	**ha**	**%**
Water												
Canal	11.7	0.7	7.2	11.3	26.5	1.1	19.3	15.1	35.7	2.9	10.9	13.7
Lake	193.4	12.4	3.2	5.0	286.0	12.0	36.9	29.0	0.0	0.0	0.0	0.0
Reservoir	0.0	0.0	0.0	0.0	31.0	1.3	0.4	0.3	12.4	1.0	0.0	0.0
River	28.1	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	**233.1**	**15.0**	**10.4**	**16.4**	**343.5**	**14.4**	**56.6**	**44.4**	**48.2**	**3.9**	**10.9**	**13.8**
Agricultural												
Crop	641.9	41.3	4.7	7.4	1,351.1	56.7	48.6	38.1	687.1	56.0	1.8	2.2
Tame pasture	311.9	20.1	28.8	45.5	244.5	10.3	14.4	11.3	37.5	3.1	8.6	10.8
Subtotal	**953.8**	**61.4**	**33.5**	**52.9**	**1,595.6**	**67.0**	**63.0**	**49.4**	**724.6**	**59.1**	**10.4**	**13.1**
Disturbed												
Industrial	5.3	0.3	0.0	0.0	151.9	6.4	1.7	1.3	0.0	0.0	0.0	0.0
Road	21.0	1.3	0.0	0.0	66.5	2.8	0.8	0.6	16.3	1.3	0.1	0.1
Settled	94.9	6.1	2.6	4.2	202.0	8.5	2.3	1.8	9.4	0.8	0.0	0.0
Subtotal	121.2	7.8	2.6	4.2	420.4	17.6	4.8	3.7	25.7	2.1	0.1	0.1
Total	**1,553.6**	**100.0**	**63.3**	**100.0**	**2,382.2**	**100.0**	**127.5**	**100.0**	**1,226.8**	**100.0**	**79.4**	**100.0**





Rare Plant Occurrence
Weed Observation

Agricultural
Crop
Tame Pasture

Disturbed
Disturbed Land

Native Upland
Deciduous
Native Prairie
Native Upland, Shrub

Water
Waterbody

Wetland/Waterbody
Dugout
Graminoid Marsh
Shrubby Swamp
Shallow Open Water

Vegetation and Wetland Study Area
Project Footprint

N

0 375 750 metres
(At original document size of 8.5x11)
1:30,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 12N
2. Data Sources: AltaLIS, NRCAN, Alberta Parks, GeoLogic, NRN

Stantec

Project Location
T9&10N, R15&16W
Town of Taber

Prepared by SL on 2021-11-26
TR by DS on 2021-11-26
IR Review by JH on 2021-11-26

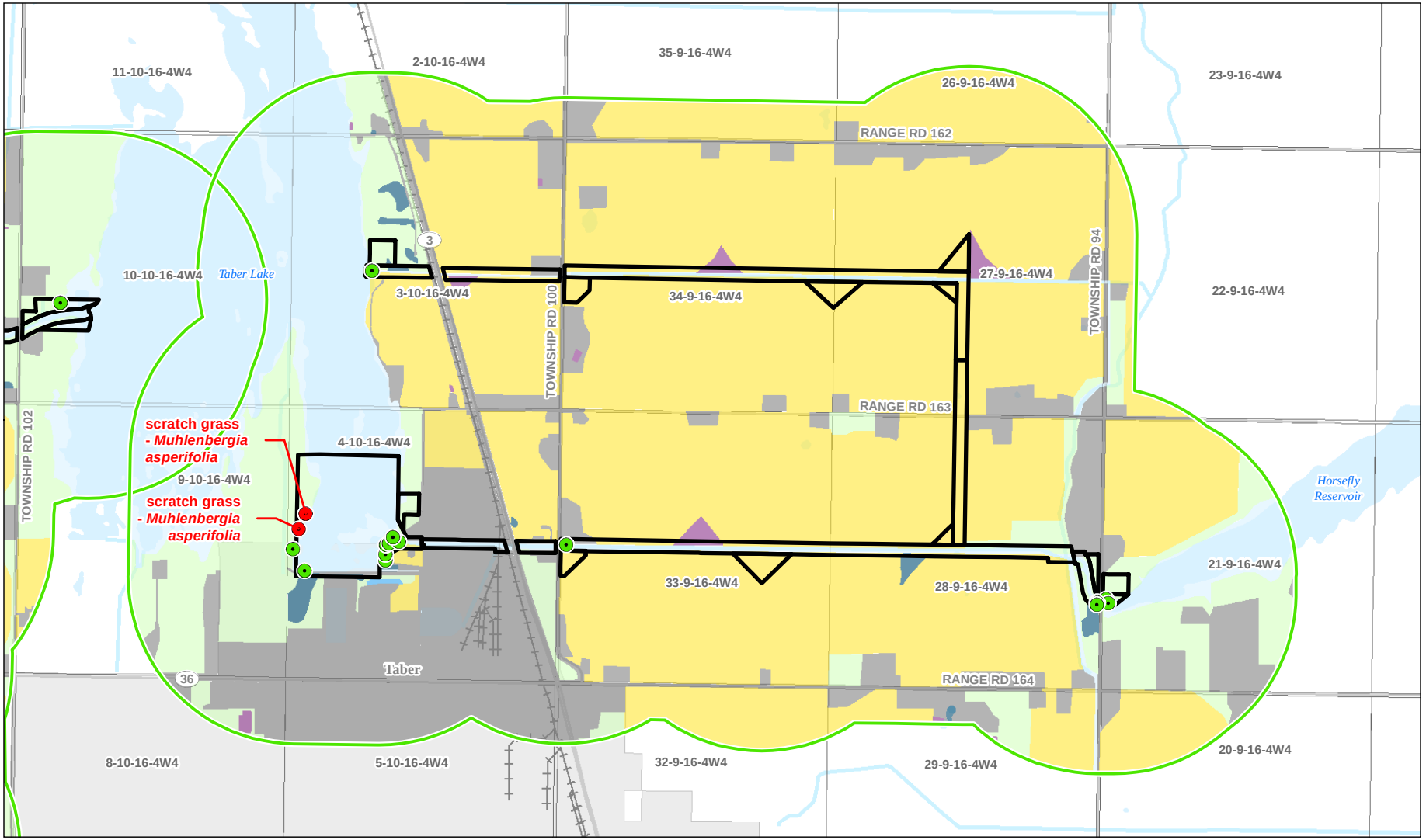
Client/Project 110773806-0017 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway

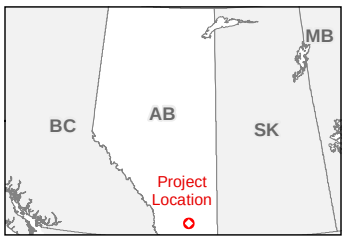
Figure No.
3.1

Title
Horsefly Regional Emergency Spillway Project Vegetation Land Cover and Species of Conservation Concern and Weed Occurrences - Phase 1

W:\Clients\110773806\Figures\110773806_0017_Veg_Landcover.mxd Revised: 2021-11-29 By: slemay

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- Rare Plant Occurrence
- Weed Observation

Agricultural
- Crop
- Tame Pasture

Disturbed
- Disturbed Land

Water
- Waterbody

Wetland/Waterbody
- Dugout
- Graminoid Marsh
- Shallow Open Water
- Vegetation and Wetland Study Area

- Project Footprint

N

0 440 880 metres
(At original document size of 8.5x11)
1:35,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 12N
2. Data Sources: AltaLIS, NRCAN, Alberta Parks, GeoLogic, NRN

Stantec

Project Location
T9&10N, R15&16W
Town of Taber

Prepared by SL on 2021-11-26
TR by DS on 2021-11-26
IR Review by JH on 2021-11-26

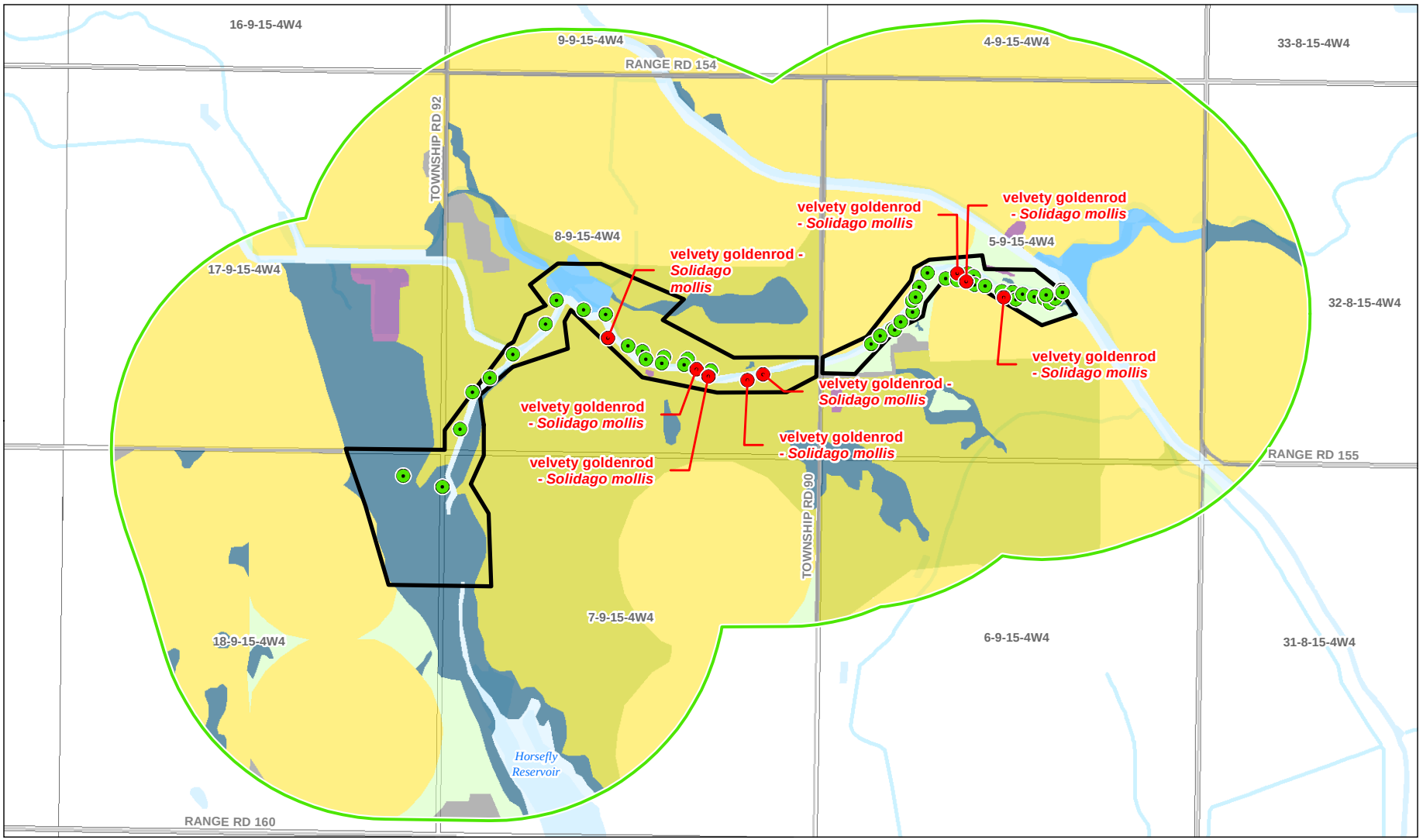
Client/Project 110773806-0017 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway

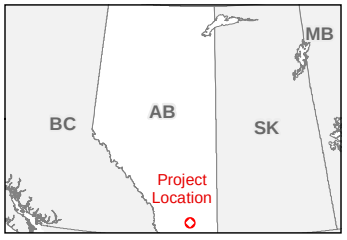
Figure No.
3.2

Title
Horsefly Regional Emergency Spillway Project Vegetation Land Cover and Species of Conservation Concern and Weed Occurrences - Phase 2

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- Rare Plant Occurrence
- Weed Observation

Agricultural
- Crop
- Tame Pasture

Disturbed
- Disturbed Land

Native Upland
- Native Prairie

Water
- Waterbody

Wetland/Waterbody
- Dugout
- Graminoid Marsh
- Shallow Open Water

- Vegetation and Wetland Study Area
- Project Footprint

N

0 310 620 metres
(At original document size of 8.5x11)
1:25,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 12N
2. Data Sources: AltaLIS, NRCAN, Alberta Parks, GeoLogic, NRN

Stantec

Project Location
T9&10N, R15&16W
Town of Taber

Prepared by SL on 2021-11-26
TR by DS on 2021-11-26
IR Review by JH on 2021-11-26

Client/Project
110773806-0017 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway

Figure No.
3.3

Title
Horsefly Regional Emergency Spillway Project Vegetation Land Cover and Species of Conservation Concern and Weed Occurrences - Phase 3

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3.1.2 Species and Ecological Communities of Conservation Concern

No historical SOCC or ECCC have been documented in the Vegetation Study Area (ACIMS 2017). The closest historical documented SOCC occurrence, smooth goosefoot (*Chenopodium subglabrum*), is approximately 1 km from Phase 1 and approximately 3.8 km from Phase 2. The closest historical documented ECCC occurrence, sand grass – needle and thread grassland (*Calamovilfa longifolia – Hesperostipa comata*), is located approximately 4 km east of Phase 1. have been documented outside of the Vegetation Study Area, greater than 1 km from the Project footprint. Smooth goosefoot is ranked S2, meaning the species is known from 20 or fewer occurrences and may be vulnerable to extirpation (ACIMS 2017). Smooth goosefoot typically grows in sandy soil or sand dune habitat (Kershaw et al. 2001). Sand grass – needle and thread grassland is ranked S3 provincally, meaning the community is known from 100 or fewer occurrences and is considered somewhat vulnerable due to restricted range or small population sizes (ACIMS 2018).

Two species of SOCC, velvety goldenrod (*Solidago mollis*) and scratchgrass (*Muhlenbergia asperifolia*), were observed during Project field surveys. Ten occurrences of velvety goldenrod were observed, two along the Phase 1, in upland areas at the western extent of the route (Figure 3.1), and eight along Phase 3, in drier areas adjacent to the canal (Figure 3.3). Three occurrences of scratchgrass were observed, with one in a wetland at the western end of Phase 1 (Figure 3.1) and two at the eastern end of the Phase 2, along the northern edge of Taber Lake (Figure 3.2).

Velvety goldenrod is a perennial forb species, typically growing to be 10 to 40 cm tall and often found in dry grasslands, along fencelines or roadsides (Appendix B – Photo 1) (Kershaw et al. 2001). Scratchgrass is a perennial grass species, typically growing to 30 to 60 cm tall (Leighton and Harms 2018). Scratchgrass is typically found in moist, sometimes alkaline meadows, prairie depressions, mud flats, sandy sloughs or around seeps or spring-like sites (Leighton and Harms 2018).

Both species are provincially ranked S3 and are on the Alberta watchlist (ACIMS 2017) (Table 3.2). Species the watchlist typically have restricted distributions but are often common within their range (ACIMS 2018). No species listed under the Alberta Wildfe Regulation or under SARA were observed. No ECCC were observed.

Table 3.2 Vegetation Species of Conservation Concern found within the Project Footprint during Field Surveys

Scientific Name	Common Name	ACIMS Rank[1]	Tracking Status[1]	Alberta Wildlife Regulation Rank[2]	SARA Rank[3]	Project Phase Observed (# observed)
Muhlenbergia asperifolia	scratchgrass	S3	Watch	Not listed	Not listed	1 (2), 2 (8)
Solidago mollis	velvety goldenrod	S3	Watch	Not listed	Not listed	1 (2), 3 (8)

SOURCES:
[1] ACIMS (2017)
[2] Alberta Wildlife Regulation
[3] Government of Canada (2021)

3.1.3 Weeds

Four prohibited noxious and 12 noxious weed species have been documented in the Muncipal District of Taber (Alberta Agriculture and Forestry 2018) (Table 3.3).

Table 3.3 Prohibited Noxious and Noxious Weed Species Occurring in the M.D of Taber

Weed Rank [1]	Scientific Name	Common Name [2]
prohibited noxious	*Carduus nutans*	nodding thistle
prohibited noxious	*Centaurea diffusa*	diffuse knapweed
prohibited noxious	*Centaurea stoebe*	spotted knapweed
prohibited noxious	*Rhaponticum repens*	Russian knapweed
noxious	*Bromus tectorum*	downy brome
noxious	*Cirsium arvense*	creeping thistle
noxious	*Convolvulus arvensis*	field bindweed
noxious	*Euphorbia esula*	leafy spurge
noxious	*Lepidium draba*	hoary cress
noxious	*Leucanthemum vulgar*	oxeye daisy
noxious	*Linaria dalmatica*	dalmation toadflax
noxious	*Linaria vulgaris*	toadflax
noxious	*Silene vulgaris*	bladder campion
noxious	*Sonchus arvensis*	perennial sow thistle
noxious	*Tanacetum vulgare*	common tansy
noxious	*Tripleurospermum inodorum*	scentless chamomile
NOTE: [1] Alberta *Weed Control Regulation*		
SOURCE: [2] Alberta Agriculture and Forestry (2018)		

Ten weed species were observed during surveys of the Project footprint, including one prohibited noxious species, Russian knapweed (*Rhaponticum repens*), and nine noxious species (Table 3.4). Russian knapweed was observed on Phase 1 at five survey sites and was primarily concentrated at the west end of the route in tame pasture adjacent to roadways. Density distributions for Russian knapweed ranged from a single patch to a few patches plus several sporadic occurrences. Population size of Russian knapweed ranged from 10 individuals to approximately 750 individuals.

Noxious weeds were observed on all project phases with Phase 1 having most occurrences. Noxious weeds were commonly observed within the Project footprint of Phase 1 and were most common on the western end of the route in native prairie and tame pasture (Figure 3.1). Noxious weeds were also abundant along Phase 3 (Figure 3.3). Noxious weeds were least common in Phase 2 and observed occurrences were recorded in wetland margins adjacent to Taber Lake and Horsefly Reservoir (Figure 3.2).

The most commonly observed weed species was creeping thistle (*Cirsium arvense*) with 64 occurences (Table 3.4). Occurrences were observed in disturbed areas adjacent to roadways, cropland and tame pasture. Perennial sow thistle (*Sonchus arvensis*) was also commonly observed with 39 occurrences documented. Perennial sow thistle was observed in disturbed areas, along existing canals and tame pasture.

Common baby's breath (*Gypsophila paniculata*) and Japanese chess (*Bromus japonicus*) were not identified during desktop review of the Alberta Agriculture and Forestry (2018) data set for the M.D. of Taber. Theses may be new occurrences for the M.D. of Taber lack of observation in the Alberta Agriculture and Forestry (2018) may due to the age of the data.

Table 3.4 Observed Weed Occurrences in the Project footprint

Scientific Name	Common Name	Provincial Designation	Number of Observations	Project Phase Observed	Quarter Sections Observed
Acroptilon repens	Russian knapweed	prohibited noxious	6	1, 2	NE-18-010-16W4
Bromus japonicus	Japanese chess	noxious	5	1, 3	NE-18-010-16W4, SE-18-010-16W4, SW-05-009-15W4
Bromus tectorum	downy brome	noxious	14	1, 2, 3	NE-03-010-16W4, NE-16-010-16W4, NE-17-010-16W4, NE-18-010-16W4, NE-33-009-16W4, NW-17-010-16W4, SW-05-009-15W4, SW-08-009-15W4, SW-15-010-16W4, SW-28-009-16W4
Cirsium arvense	creeping thistle	noxious	64	1 , 2, 3	NE-03-010-16W4, NE-04-010-16W4, NE-18-010-16W4, NW-04-10-16-W4,

Table 3.4 Observed Weed Occurrences in the Project footprint

Scientific Name	Common Name	Provincial Designation	Number of Observations	Project Phase Observed	Quarter Sections Observed
					NW-05-009-15W4, NW-08-009-15W4, NW-17-010-16W4, NW-21-009-16W4, SE-18-010-16W4, SW-05-009-15W4, SW-08-009-15W4, SW-15-010-16W4, SW-28-009-16W4,
Euphorbia esula	leafy spurge	noxious	2	1	NW-10-010-16W4, SE-18-010-16W4
Gypsophila paniculata	common baby's-breath	noxious	7	1	NE-18-010-16W4, NW-17-010-16W4
Linaria dalmatica	Dalmatian toadflax	noxious	5	1	NE-18-010-16W4, NW-17-010-16W4
Linaria vulgaris	common toadflax	noxious	5	1	NE-03-010-16W4, NE-18-010-16W4
Sonchus arvensis	perennial sow-thistle	noxious	39	1, 2, 3	NE-03-010-16W4, NE-04-010-16W4, NE-07-009-15W4, NE-18-010-16W4, NW-04-010-16W4, NW-05-009-15W4, NW-08-009-15W4, NW-16-010-16W4, NW-17-010-16W4, NW-21-009-16W4, SE-18-010-16W4, SW-05-009-15W4, SW-08-009-15W4,
Tanacetum vulgare	common tansy	noxious	1	1	SE-18-010-16W4

NOTE:
[1] Alberta *Weed Control Regulation*

4.0 REGULATORY CONTEXT

4.1 ALBERTA *WATER ACT*

Disturbance to wetlands on private or provincial land requires approval under the Alberta *Water Act* and must follow the goals of the *Alberta Wetland Policy* (Government of Alberta 2013). The goal of the *Alberta Wetland Policy* is to conserve, restore, protect and manage wetlands in Alberta. The policy covers natural and restored wetlands including fens, bogs, swamps, marshes, creeks, rivers and drainages. Ephemeral waterbodies are areas affected by the water table near the surface but the effect is not long enough for the water table to alter soils or result in water tolerant vegetation dominating the area (ESRD 2015). Due to the lack of water-altered soils and water tolerant vegetation, ephemeral waterbodies are not subject to replacement under the *Water Act*, but impact to them are subject to the Act. Effects on wetlands require approval under the *Water Act.*

4.2 ALBERTA *WEED CONTROL ACT*

Alberta's *Weed Control Act* requires landowners and disposition holders to destroy plants listed as *prohibited noxious* and control plants listed as *noxious*. These species are known to have a negative economic impact and degrade native plant communities.

4.3 ALBERTA *WILDLIFE ACT*

Wildlife and plant species listed as endangered or threatened under the Alberta Wildlife Regulation are protected under Section 36[1] of the Act: "a person shall not willfully molest, disturb or destroy a house, nest or den of a prescribed wildlife or beaver dam in prescribed area at prescribed times". The status of wildlife species in Alberta is assessed and designated by the Alberta Endangered Species Conservation Committee (2016).

4.4 *SPECIES AT RISK ACT*

The SARA was implemented to protect species at risk in Canada and their critical habitat. Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was established by the SARA to assess and designate wildlife species, including plants, as extinct, extirpated, endangered, threatened or special concern. Species status is designated using science and traditional knowledge to assess species at risk of extinction or extirpation from Canada.

4.5 *PUBLIC LANDS ACT*

Provincial Crown land in Alberta is managed under the Public Lands Act. Approval is required prior to disturbing or occupying Crown land, including Crown claimed semi-permanent to permanent wetlands.

5.0 SUMMARY

The majority of the Vegetation Study Area is composed of agricultural and disturbed land classes for all three Project phases. Fifty-eight wetlands were delineated within the Vegetation Study Area with the wetlands most abundant in Phase 3. Temporary and seasonal graminoid marshes (MGII) are the most common.

Two SOCC were observed with occurrences documented on all Project phases. Both species are ranked S3, watchlist under ACIMS and no provincially or federally protected species were observed.

Ten weed species, including one prohibited noxious and nine noxious, were observed in the Project footprint. Under the Alberta *Weed Control Regulation*, noxious weeds must be controlled and kept from spreading and prohibited noxious weeds must be destroyed.

6.0 REFERENCES

ACIMS (Alberta Conservation Information Management System). 2017. Rare Element Occurrence, Online Data. Alberta Environment and Parks, Edmonton, Alberta. Accessed June 2021 from: https://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-acims/download-data/.

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APPENDICES

HORSEFLY REGIONAL EMERGENCY SPILLWAY
VEGETATION AND WETLANDS TECHNICAL REPORT

Appendix A COMPREHENSIVE VEGETATION SPECIES LIST

Table A.1 List of Plant Species Observed During 2021 Vegetation Surveys

Form	Scientific Name	Common Name
Tree	*Fraxinus pennsylvanica*	green ash
Tree	*Populus balsamifera*	balsam poplar
Tree	*Populus deltoides*	plains cottonwood
Tree	*Populus tremuloides*	aspen
Shrub	*Amelanchier alnifolia*	saskatoon
Shrub	*Artemisia cana*	silver sagebrush
Shrub	*Artemisia frigida*	pasture sagewort
Shrub	*Atriplex gardneri*	Gardner's saltbush
Shrub	*Coryphantha vivipara*	Pincushion Cactus
Shrub	*Elaeagnus angustifolia*	Russian olive
Shrub	*Eriogonum umbellatum*	subalpine umbrellaplant
Shrub	*Gutierrezia sarothrae*	broomweed
Shrub	*Krascheninnikovia lanata*	winter-fat
Shrub	*Opuntia polyacantha*	prickly-pear
Shrub	*Prunus virginiana*	choke cherry
Shrub	*Rhus trilobata*	skunkbush
Shrub	*Ribes aureum*	golden currant
Shrub	*Rosa acicularis*	prickly rose
Shrub	*Rosa arkansana*	prairie rose
Shrub	*Rosa woodsii*	common wild rose
Shrub	*Salix exigua*	narrow-leaf willow
Shrub	*Salix interior*	sandbar willow
Shrub	*Salix lasiandra*	shinning willow
Shrub	*Shepherdia argentea*	thorny buffaloberry
Shrub	*Symphoricarpos occidentalis*	buckbrush
Graminoid	*Agropyron cristatum*	crested wheatgrass
Graminoid	*Alopecurus pratensis*	meadow foxtail
Graminoid	*Bolboschoenus maritimus*	alkali bulrush
Graminoid	*Bouteloua gracilis*	blue grama
Graminoid	*Bromus inermis*	smooth brome

Table A.1 List of Plant Species Observed During 2021 Vegetation Surveys

Form	Scientific Name	Common Name
Graminoid	*Bromus japonicus*	Japanese chess
Graminoid	*Bromus tectorum*	downy brome
Graminoid	*Calamovilfa longifolia*	sand grass
Graminoid	*Carex pellita*	woolly sedge
Graminoid	*Carex praticola*	meadow sedge
Graminoid	*Carex sartwellii*	Sartwell's sedge
Graminoid	*Carex stipata*	awl-fruited sedge
Graminoid	*Carex utriculata*	small bottle sedge
Graminoid	*Dactylis glomerata*	orchard grass
Graminoid	*Distichlis spicata*	saltgrass
Graminoid	*Eleocharis palustris*	creeping spike-rush
Graminoid	*Elymus trachycaulus*	slender wheatgrass
Graminoid	*Festuca campestris*	mountain rough fescue
Graminoid	*Glyceria grandis*	common tall manna grass
Graminoid	*Hordeum jubatum*	foxtail barley
Graminoid	*Juncus balticus*	wire rush
Graminoid	*Koeleria macrantha*	June grass
Graminoid	*Muhlenbergia asperifolia*	scratch grass
Graminoid	*Nassella viridula*	green needle grass
Graminoid	*Pascopyrum smithii*	western wheat grass
Graminoid	*Phalaris arundinacea*	reed canary grass
Graminoid	*Poa palustris*	fowl bluegrass
Graminoid	*Poa pratensis*	Kentucky bluegrass
Graminoid	*Psathyrostachys juncea*	Russian wild rye
Graminoid	*Puccinellia nuttalliana*	Nuttall's salt-meadow grass
Graminoid	*Schoenoplectus pungens*	three-square rush
Graminoid	*Schoenoplectus tabernaemontani*	common great bulrush
Graminoid	*Scirpus microcarpus*	small-fruited bulrush
Graminoid	*Setaria viridis*	green foxtail
Graminoid	*Sporobolus cryptandrus*	sand dropseed
Graminoid	*Thinopyrum ponticum*	rush wheatgrass
Forb	*Achillea millefolium*	common yarrow
Forb	*Allium textile*	prairie onion

Table A.1 List of Plant Species Observed During 2021 Vegetation Surveys

Form	Scientific Name	Common Name
Forb	*Artemisia absinthium*	absinthe wormwood
Forb	*Artemisia campestris*	plains wormwood
Forb	*Artemisia ludoviciana*	prairie sagewort
Forb	*Asclepias speciosa*	showy milkweed
Forb	*Asparagus officinalis*	asparagus
Forb	*Astragalus bisulcatus*	two-grooved milkvetch
Forb	*Astragalus cicer*	cicer milk vetch
Forb	*Astragalus missouriensis*	Missouri milkvetch
Forb	*Atriplex prostrata*	prostrate saltbush
Forb	*Campanula rotundifolia*	harebell
Forb	*Cerastium arvense*	field mouse-ear chickweed
Forb	*Ceratophyllum demersum*	hornwort
Forb	*Chenopodium album*	lamb's-quarters
Forb	*Chenopodium berlandieri*	Berlandier goosefoot
Forb	*Chenopodium salinum*	oak-leaved goosefoot
Forb	*Cirsium arvense*	creeping thistle
Forb	*Cirsium vulgare*	bull thistle
Forb	*Comandra umbellata*	common comandra
Forb	*Descurainia sophia*	flixweed
Forb	*Epilobium ciliatum*	northern willowherb
Forb	*Equisetum arvense*	common horsetail
Forb	*Equisetum laevigatum*	smooth scouring-rush
Forb	*Erigeron lonchophyllus*	short-rayed fleabane
Forb	*Euphorbia esula*	leafy spurge
Forb	*Euphorbia glyptosperma*	ridge-seeded spurge
Forb	*Fallopia convolvulus*	wild buckwheat
Forb	*Gaillardia aristata*	gaillardia
Forb	*Geum triflorum*	three-flowered avens
Forb	*Glycyrrhiza lepidota*	wild licorice
Forb	*Grindelia squarrosa*	curly-cup gumweed
Forb	*Gypsophila elegans*	common baby's-breath
Forb	*Gypsophila paniculata*	common baby's-breath
Forb	*Helianthus annuus*	common annual sunflower

Table A.1 List of Plant Species Observed During 2021 Vegetation Surveys

Form	Scientific Name	Common Name
Forb	*Heterotheca villosa*	golden aster
Forb	*Hymenoxys richardsonii*	Colorado rubber-plant
Forb	*Iva axillaris*	povertyweed
Forb	*Kochia scoparia*	summer-cypress
Forb	*Lactuca serriola*	prickly lettuce
Forb	*Lemna turionifera*	turion duckweed
Forb	*Liatris punctata*	dotted blazingstar
Forb	*Linaria dalmatica*	Dalmatian toadflax
Forb	*Linaria vulgaris*	common toadflax
Forb	*Linum lewisii*	wild blue flax
Forb	*Lycopus asper*	western water-horehound
Forb	*Lygodesmia juncea*	skeletonweed
Forb	*Medicago sativa*	alfalfa
Forb	*Melilotus alba*	white sweet-clover
Forb	*Melilotus officinalis*	yellow sweet-clover
Forb	*Mentha arvensis*	wild mint
Forb	*Nepeta cataria*	catnip
Forb	*Oenothera suffrutescens*	scarlet butterflyweed
Forb	*Oxytropis sericea*	early yellow locoweed
Forb	*Persicaria amphibia*	water smartweed
Forb	*Persicaria lapathifolia*	pale persicaria
Forb	*Phlox hoodii*	moss phlox
Forb	*Plantago major*	common plantain
Forb	*Polygonum aviculare*	prostrate knotweed
Forb	*Potentilla anserina*	silverweed
Forb	*Potentilla norvegica*	rough cinquefoil
Forb	*Ranunculus cymbalaria*	seaside buttercup
Forb	*Rhaponticum repens*	Russian knapweed
Forb	*Rorippa palustris*	marsh yellow cress
Forb	*Rumex crispus*	curled dock
Forb	*Rumex dentatus*	toothed dock
Forb	*Rumex stenophyllus*	narrow-leaved field dock
Forb	*Salicornia rubra*	samphire

Table A.1 List of Plant Species Observed During 2021 Vegetation Surveys

Form	Scientific Name	Common Name
Forb	*Salsola collina*	slender Russian-thistle
Forb	*Salsola tragus*	Russian-thistle
Forb	*Selaginella densa*	prairie selaginella
Forb	*Sisymbrium loeselii*	tall hedge mustard
Forb	*Solanum triflorum*	wild tomato
Forb	*Solidago altissima*	tall goldenrod
Forb	*Solidago missouriensis*	low goldenrod
Forb	*Solidago mollis*	velvety goldenrod
Forb	*Sonchus arvensis*	perennial sow-thistle
Forb	*Sonchus asper*	prickly annual sow-thistle
Forb	*Spergularia salina*	salt-marsh sand spurry
Forb	*Sphaeralcea coccinea*	scarlet mallow
Forb	*Suaeda calceoliformis*	western sea-blite
Forb	*Symphyotrichum ciliatum*	rayless aster
Forb	*Symphyotrichum ericoides*	tufted white prairie aster
Forb	*Symphyotrichum falcatum*	creeping white prairie aster
Forb	*Symphyotrichum laeve*	smooth aster
Forb	*Symphyotrichum lanceolatum*	western willow aster
Forb	*Tanacetum vulgare*	common tansy
Forb	*Taraxacum officinale*	common dandelion
Forb	*Thermopsis rhombifolia*	golden bean
Forb	*Thlaspi arvense*	stinkweed
Forb	*Tragopogon dubius*	common goat's-beard
Forb	*Trifolium hybridum*	alsike clover
Forb	*Typha latifolia*	common cattail
Forb	*Verbena bracteata*	carpet vervain
Forb	*Xanthium strumarium*	cocklebur

Appendix A Comprehensive Vegetation Species List
December 2021



Appendix B OBSERVED SOCC PHOTOGRAPHS

Photo 1 **Velvety goldenrod (*Solidago mollis*) occurrence within the Project footprint along the Phase 1 Project route**



Photo 2 **Scratchgrass (*Muhlenbergia asperifolia*) occurrence within Project footprint along the Phase 1 Project route.**



G2

2021 Field Surveys – Wildlife Technical Data Report

Horsefly Regional Emergency Spillway Project
2021 Field Surveys – Wildlife
Technical Data Report

December 2021

Prepared for:

MD of Taber

Prepared by:

Stantec Consulting Ltd.

Limitations and Sign-off

This document entitled Horsefly Regional Emergency Spillway Project 2021 Field Surveys – Wildlife Technical Data Report was prepared by Stantec Consulting Ltd. (“Stantec”) for the account of the MD of Taber (the “Client”) to support the regulatory review process by the Canadian Impact Assessment Agency Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule, and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify the information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

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Abbreviations

AEP	Alberta Environment and Parks
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ESCC	Endangered Species Conservation Committee
FWMIS	Fisheries and Wildlife Management Information System
IBA	Important Bird Area
LAA	local assessment area
SARA	*Species at Risk Act*
Stantec	Stantec Consulting Ltd.
TDR	technical data report
the Project	Horsefly Regional Emergency Spillway Project



1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) completed wildlife field surveys during spring 2021 to support the MD of Taber's Horsefly Regional Emergency Spillway Project (the Project) located in near Taber, Alberta. This technical data report (TDR) provides methods and results for the 2021 wildlife field surveys completed for Phase 1 of the Project.

2.0 SPATIAL BOUNDARIES

The following spatial boundaries (i.e., study areas) were used for the 2021 wildlife field surveys:

- **Project Area** – encompasses the anticipated areas of physical disturbance associated with construction activities and operation during Phase 1 of the Project. The Phase 1 Project Area is approximately 5.7 km long and ranges from a 70 to 320 m-wide corridor totaling 63.4 ha.
- **Local Assessment Area (LAA) –** encompasses the area in which Project-related effects (direct or indirect) are expected to occur. The LAA includes the Project Area plus a 1,000 m buffer on either side of the PDA, which represents a recommended maximum setback distance for sensitive raptor species (e.g., ferruginous hawk, bald eagle) (GOA 2021)

3.0 METHODS

3.1 OBJECTIVES

The objectives of the 2021 wildlife field surveys were to:

- identify features with prescribed setbacks (e.g., snake hibernacula, sharp-tailed grouse [*Tympanuchus phasianellus*] leks, sensitive amphibian breeding wetlands, active raptor nests) within the LAA, which may represent constraints to Project construction
- characterize distribution and relative abundance of migratory songbirds and other bird groups within the LAA

3.2 SPECIES OF MANAGEMENT CONCERN

The 2021 field surveys focused on species of management concern (SOMC) that have the potential to occur within the Project LAA.

Wildlife SOMC include those:

- listed under Schedule 1 of the *Species at Risk Act* (SARA) as endangered, threatened, or special concern (GOC 2021), or
- listed under the Alberta *Wildlife Act* as endangered or threatened (GOA 2017)
- listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as endangered, threatened, or special concern (GOC 2021) but not yet listed under SARA
- listed as special concern or considered data deficient in Alberta by the Endangered Species Conservation Committee (ESCC) and its Scientific Subcommittee (GOA 2017)
- listed as at risk, may be at risk, or sensitive according to the General Status of Alberta Wild Species (AEP 2020a)
- recognized in provincial guidelines (GOA 2021a)

3.3 DESKTOP REVIEW

A review of existing data was completed to gather information on wildlife species distributions and habitat features in the LAA. The desktop review was used to aid in Project siting and to guide survey planning by identifying key wildlife habitats and potential features. Several publicly available data sources were reviewed including:

- Alberta Fish and Wildlife Internet Mapping Tool (GOA 2021b)



- Alberta Wildlife Sensitivity Data Sets, including Key Range Layers and Key Wildlife Layers (GOA 2021c)
- Important Bird Areas (IBA) in Canada Online Database (Bird Studies Canada and Nature Canada 2017)

In addition to the database searches, the following additional information sources were used to determine potential SOMC interactions with the Project:

- Aerial imagery
- The Atlas of Breeding Birds of Alberta: A Second Look (Federation of Alberta Naturalists 2007)
- The Natural History of Canadian Mammals (Naughton 2012)
- The Amphibians and Reptiles of Alberta (Russell and Bauer 2000)

3.4 FIELD PROGRAM METHODS

The 2021 field program consisted of seven wildlife surveys: snake hibernacula, sharp-tailed grouse lek, burrowing owl (*Athene cunicularia*), raptor and colonial waterbird nest, waterbird activity, nocturnal amphibian and breeding bird surveys. In general, survey methods followed those outlined in the *Sensitive Species Inventory Guidelines* (ESRD 2013). All surveys that required an Alberta Environment and Parks (AEP) Wildlife Research Permit and Collection Licence (AEP 2020b) were completed under permit #21-140 (for low-risk surveys) and all data collected under the permit will be submitted to AEP as part of the permit completion report. Survey data were recorded digitally on a mobile device with georeferencing capabilities, using Stantec's data collection program for ESRI's ArcGIS Field Maps.

The following sections provide detailed methods for each survey type.

3.4.1 Snake Hibernacula Survey

Snake hibernacula surveys were completed for the Project following methods consistent with the provincial *Sensitive Species Inventory Guidelines* (ESRD 2013). The purpose of the surveys was to identify potential hibernacula and rookeries in the LAA that might require mitigation if the feature and/or its recommended setback overlap the Project Area. The Oldman River valley provides high suitability habitat for prairie rattlesnake (*Crotalus viridis*), where hibernacula are known to occur. The closest known hibernaculum is situated approximately two kilometres southwest of the Project Area (GOA 2021c). Prairie rattlesnakes are listed as special concern under SARA (GOC 2021) and all snake species in Alberta, including prairie rattlesnake, are considered sensitive (AEP 2020a). Snake hibernacula are protected year-round and active hibernacula have a recommended setback distance of 500 m from construction activities such as vegetation clearing (GOA 2021a).

Surveys targeted the Oldman River valley associated coulee habitat within 500 m of the Project Area. Per ESRD (2013), surveys were completed during the spring survey period (April 1- June 15) at temperatures above 15°C. A minimum of two survey visits were completed for the Project. During the survey, surveyors walked parallel transects at a slow pace (~2 km/hr) approximately 10 m apart following the contours of the

valley/coulee, searching for snakes, snake habitat features and signs of use such as sheds. When snakes were encountered, surveyors stopped to identify the snake and scanned for other snakes and hibernacula entrances. If an active hibernaculum was observed, surveyors plotted the location on an iPad tablet and counted the number of snakes and snake sheds present. Potential hibernacula were surveyed using an endoscope camera to help determine the size and depth of the burrow or cavity and to look for additional snakes or snake sheds.

3.4.2 Sharp-tailed Grouse Lek Survey

Sharp-tailed grouse lek surveys were completed for the Project using methods consistent with ESRD (2013). The purpose of the survey was to identify potential sharp-tailed grouse leks in the LAA that might require mitigation if the lek and/or recommended setback overlap the Project Area. Sharp-tailed grouse is considered sensitive in Alberta (AEP 2020a) and active leks have a recommended setback of 500 m from construction activities such as vegetation clearing (GOA 2021a).

Survey stations were pre-determined using aerial imagery; site selection targeted open habitats that provided suitable habitat for sharp-tailed grouse and their leks. Where possible, surveys were completed from elevated vantage points to ensure as comprehensive as possible a view of the surrounding landscape. Once in the field, where applicable, surveyors relocated stations to highest point of land within 100 m of the pre-planned survey station locations. Per ESRD (2013), each station was surveyed twice during the spring survey window (i.e., mid-April to early May); surveys were carried out within the appropriate timing period (i.e., peak lek activity), which extends from one hour before sunrise to three hours after sunrise.

Upon arrival at survey stations, surveyors waited for two minutes to let effects of disturbance subside, then a five-minute survey was completed where surveyors listened for grouse and scanned the landscape in all directions using binoculars. If an active lek was observed, surveyors plotted the location on an iPad tablet and attempted to count the number of grouse present, separating males and females if possible. Surveyor then returned to leks after lekking activity had ended and birds had dispersed (ideally the same day in the afternoon) to confirm the lek location (centre point) and delineate the lek boundary. Surveys were completed by experienced wildlife biologists familiar with sharp-tailed grouse biology.

3.4.3 Burrowing Owl Survey

Burrowing owl surveys were completed for the Project using call-playback methods consistent with ESRD (2013). The purpose of the survey was to identify burrowing owls and their nest sites (burrows) in the LAA. Burrowing owls are listed as endangered in Canada (GOC 2020) and are considered At Risk in Alberta (AEP 2020a). Active nests have a recommended setback of 500 m from construction activities such as vegetation clearing (GOA 2021a).

Survey stations were pre-determined using aerial imagery; site selection targeted open habitats that provide suitable habitat for burrowing owl, including native grassland, tame pasture and/or cultivation near tame pasture and native prairie. Where possible, surveys were completed from elevated vantage points to ensure as comprehensive as possible a view of the surrounding landscape. Once in the field, where

applicable, surveyors relocated stations to highest point of land within 100 m of the pre-planned survey station locations. Per ESRD (2013), each station was surveyed once during the nesting season (i.e., May 15 – July 15) and during the appropriate timing period between sunrise and 1000 hr.

Upon arrival at survey stations, surveyors waited for three minutes to let effects of disturbance subside and scan for burrowing owls. If burrowing owls were not detected during the initial scan, the two-note burrowing owl *coo-cooo* call was broadcast for three minutes using a Foxpro™ caller, followed by another silent 1-minute silent scan. Call playbacks were not initiated in the presence of potential predators (e.g., hawks, coyotes, foxes). If burrowing owls were observed, the area was investigated to determine whether a nest was present, and to record additional information such as the number of adults, and juveniles and presence of pellets or other indications of recent activity. Surveys were completed by experienced wildlife biologists familiar with burrowing owl biology.

3.4.4 Raptor Nest Survey

Raptor nest surveys were completed within the Project Area (construction footprint and temporary workspace) and the adjacent 1,000 m, per the maximum nest setback for raptors expected to occur in and adjacent to the Project Area (GOA 2021a). Surveys were completed by an experienced wildlife biologist. All potential nesting habitat was surveyed and all nests, their status (i.e., inactive or active), and evidence of nesting activity (e.g., raptor presence, signs of whitewash, presence of down/feathers) was recorded. Incidental observations of species of management concern and other wildlife habitat features (e.g., dens) were also recorded. The first visit was completed concurrently with the sharp-tailed grouse lek survey, and the second visit was completed concurrently with the breeding bird survey.

3.4.5 Waterbird Activity Survey

Based on historic FWMIS data, Taber Lake supports a breeding colony of American white pelican *(Pelecanus erythrorhynchos*). These colonies are sensitive to disturbance and have a recommended 1,000 m setback buffer from disturbance activities (GOA 2021a). A waterbird survey was completed on Taber Lake to determine the activity status and location of the breeding colony and to estimate the number of pelicans using Taber Lake during the breeding season. The survey was completed from the shore of Taber Lake using a spotting scope to scan for pelicans and identify potential breeding sites. Surveys were completed in the morning and lasted one hour.

3.4.6 Nocturnal Amphibian Survey

The purpose of the nocturnal surveys was to identify potential breeding sites for amphibian species of management concern that may occur in the LAA.

Survey stations were pre-determined using aerial imagery. Site selection targeted all potential breeding habitat within 100 m of the Project Area. Additional survey stations were identified in the field when suitable breeding habitat was encountered that was not mapped or visible from aerial images.

Surveys were completed by wildlife biologists with experience conducting nocturnal amphibian surveys. Surveys began 30 minutes after sunset and were completed by 0100 hours (ESRD 2013). Surveys were delayed or suspended if the air temperature was below 5°C, wind speed was greater than 20 km/h or if precipitation was heavier than a light rain (ESRD 2013) because such conditions diminished detectability of amphibian vocalization. Survey stations were sampled three times within the amphibian breeding period as per ESRD (2013) or until breeding activity was confirmed at a targeted wetland.

Survey stations were accessed by vehicle or on foot. Surveyors waited for one minute upon arrival at each station to allow noise from the surveyors to subside, this was followed by a 5-minute listening period. Calls were identified to species and relative abundance estimated using the following call index based on ESRD (2013):

0 = no frogs or toads of a given species can be heard calling

1 = individual calls, not overlapping

2 = calls are overlapping, but individuals are still distinguishable

3 = numerous frogs or toads can be heard; chorus is constant and overlapping

The location of each amphibian detection was plotted on a digital satellite image to accurately mark its location. For each detection, data attributes such as species, call index, detection time, and number of individuals were documented on Field Maps following standards described in ESRD (2013).

3.4.7 Breeding Bird Survey

Breeding bird surveys were completed for the Project using industrial survey methods consistent with the *Sensitive Species Inventory Guidelines* for grassland songbirds and woodpeckers (ESRD 2013). The objective of the breeding bird surveys was to provide baseline data on distribution, abundance, and habitat use of migratory birds, including bird species of management concern.

Fixed 100-m radius point-count surveys were completed within the LAA following the *Sensitive Species Inventory Guidelines* (ESRD 2013). Point counts stations were spaced at regular intervals within the LAA approximate every 300 m to 500 m. Stations were placed in upland, wetland and disturbed areas to sample representative songbird breeding habitats in the LAA. Each point count station was surveyed twice by wildlife biologists with experience conducting breeding bird surveys.

Survey sites were accessed by vehicle or on foot and point counts were completed between approximately sunrise until 1000 h during appropriate weather conditions. Surveys were delayed or cancelled if winds were greater than 20 km/h (<3 on the Beaufort scale), there was more than light precipitation, or temperatures were below 0 degrees Celsius. Upon arrival at each survey station, biologists remained quiet for two minutes prior to commencing the survey to allow potentially disturbed birds to resume normal activity. Each survey was ten minutes in duration. During the survey, birds detected within 100 m were recorded as survey detections. Birds observed outside of the 100 m point-count radii were recorded as incidentals.

Detections were recorded digitally on an iPad using Stantec's proprietary software application. The location of each bird detection was plotted on a digital satellite image using overlaid concentric rings and a range finder to accurately mark the location of each detection. For each detection, data attributes such as species, detection type (i.e., song, call, sight, fly over), detection time, distance to bird, and number of individuals were documented following standards described in the *Sensitive Species Inventory Guidelines* (ESRD 2013).

The maximum number of detections for each bird species observed during the two survey visits was used to summarize bird abundance and distribution within the LAA.

3.4.8 Incidental Observations

Wildlife species of management concern observations including their sign (e.g., tracks, scats) as well as wildlife habitat features (e.g., dens, nests, mineral licks, potential bat roosts and hibernacula) were recorded incidentally during systematic surveys, this includes birds detected outside 100-m survey radii during breeding bird surveys.

4.0 RESULTS

4.1 DESKTOP REVIEW

The Project LAA overlaps provincial sharp-tailed grouse range, burrowing owl range, sensitive raptor range (for ferruginous hawk), sensitive snake habitat, sensitive snake hibernacula range, sensitive amphibian range and the setback buffer for colonial nesting bird habitat (for American white pelican nesting sites at Taber Lake) (GOA 2021c). A hibernaculum used by prairie rattlesnake is located across the Oldman River from the Project Area; outside of the LAA (GOA 2021c). There are historic records for 27 species of management concern in the LAA (GOA 2021b).

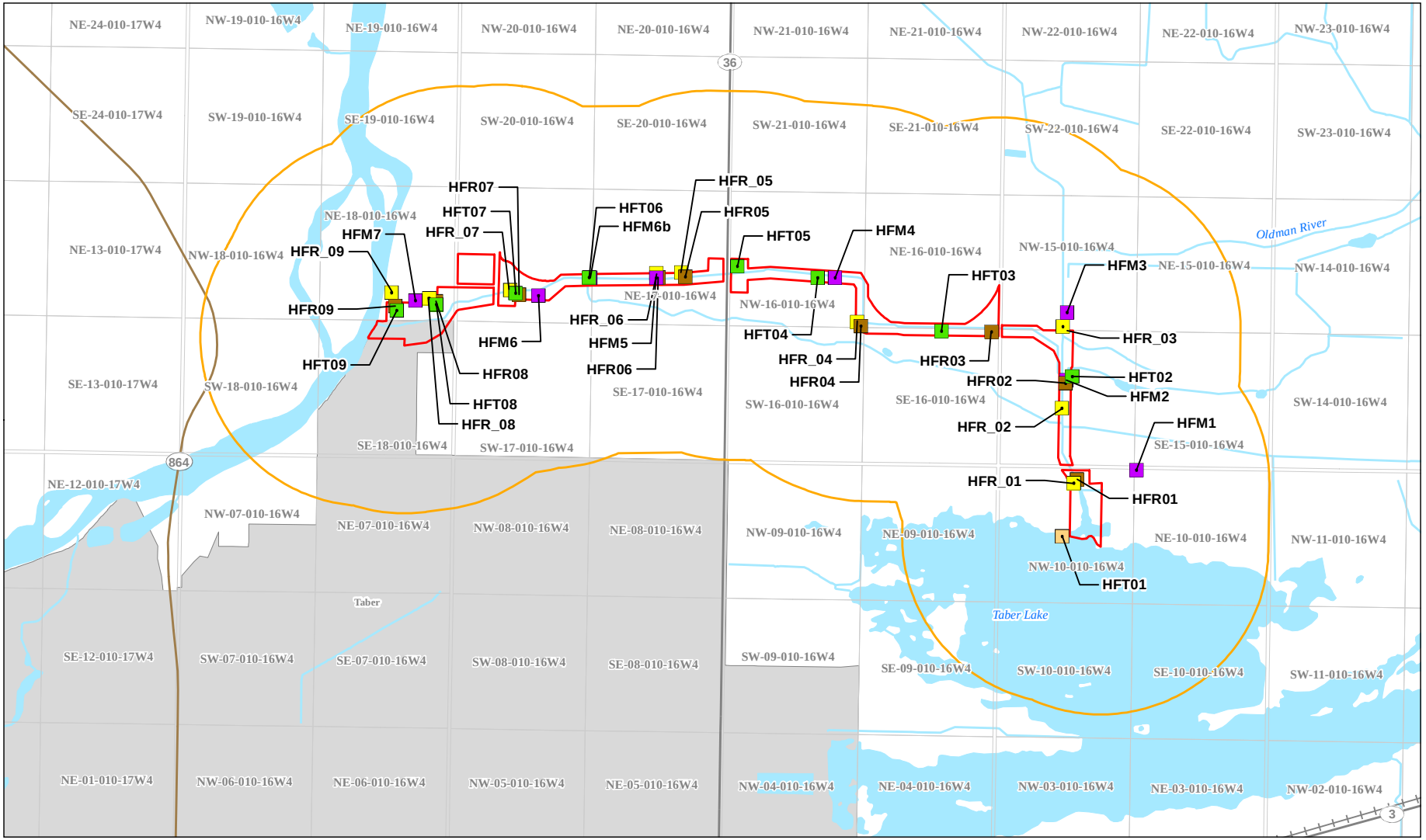
4.2 FIELD SURVEYS

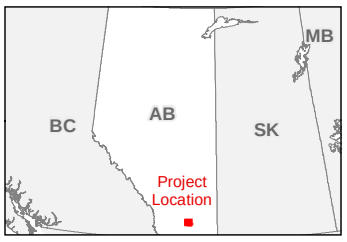
Wildlife field surveys were carried out across the Phase 1 project area; wildlife stations are shown in Figure 4.1.

4.2.1 Snake Hibernacula Survey

Snake hibernacula surveys were completed twice during the appropriate survey window; the first visit was completed on April 15, 2021, and the second visit completed on May 1, 2021. Weather conditions were appropriate for snake hibernacula surveys, with winds ranging from calm (0 km/h) to light breeze (6 to 11 km/h) and temperatures from 13˚C to 20˚C.

Four small potential hibernacula were identified within 500 m of the Project Area in the Oldman River valley (Figure 4.2; Table 4.1); bull snake (*Pituophus catenifer*) and/or prairie rattlesnake and snake sheds were found near entrances of each potential hibernaculum. These sites are presumed to be hibernacula based on the number of snakes and/or snake sheds observed and presence of a deep underground burrow or cavity. Two of the hibernacula were located within the Project Area on south facing slopes, one of which was associated with a debris pile of concrete and an old vehicle frame (Photo 4.1), the other with a small burrow (Photo 4.2).





Survey Station
- Breeding Bird
- Burrowing owl
- Nocturnal amphibian
- Sharp-tailed grouse lek
- Waterbird activity
- Local Assessment Area
- Primary Highway
- Secondary Highway
- Railway
- Watercourse
- Quarter Section
- Urban Area
- Waterbody

N

0 0.35 0.7 Kilometres
(At original document size of 8.5x11)
1:35,000

Notes
1. Coordinate System: NAD 1983 UTM Zone 12N
2. Data Sources: AltaLIS, NRCAN, Alberta Parks, GeoLogic, NRN, Alberta Government

Stantec

Project Location
T9&10N, R15&16W
Town of Taber

Prepared by NF on 2021-11-04
TR by ND on 2021-11-04
IR Review by JH on 2021-11-04

Client/Project
110773806-0014 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway

Figure No.
4.1

Title
Horsefly Regional Emergency Spillway Project Phase 1 - Wildlife Stations

W:\Clients\110773806\Figures\110773806_0014_wildlife.mxd Revised: 2021-12-01 By: slemay

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

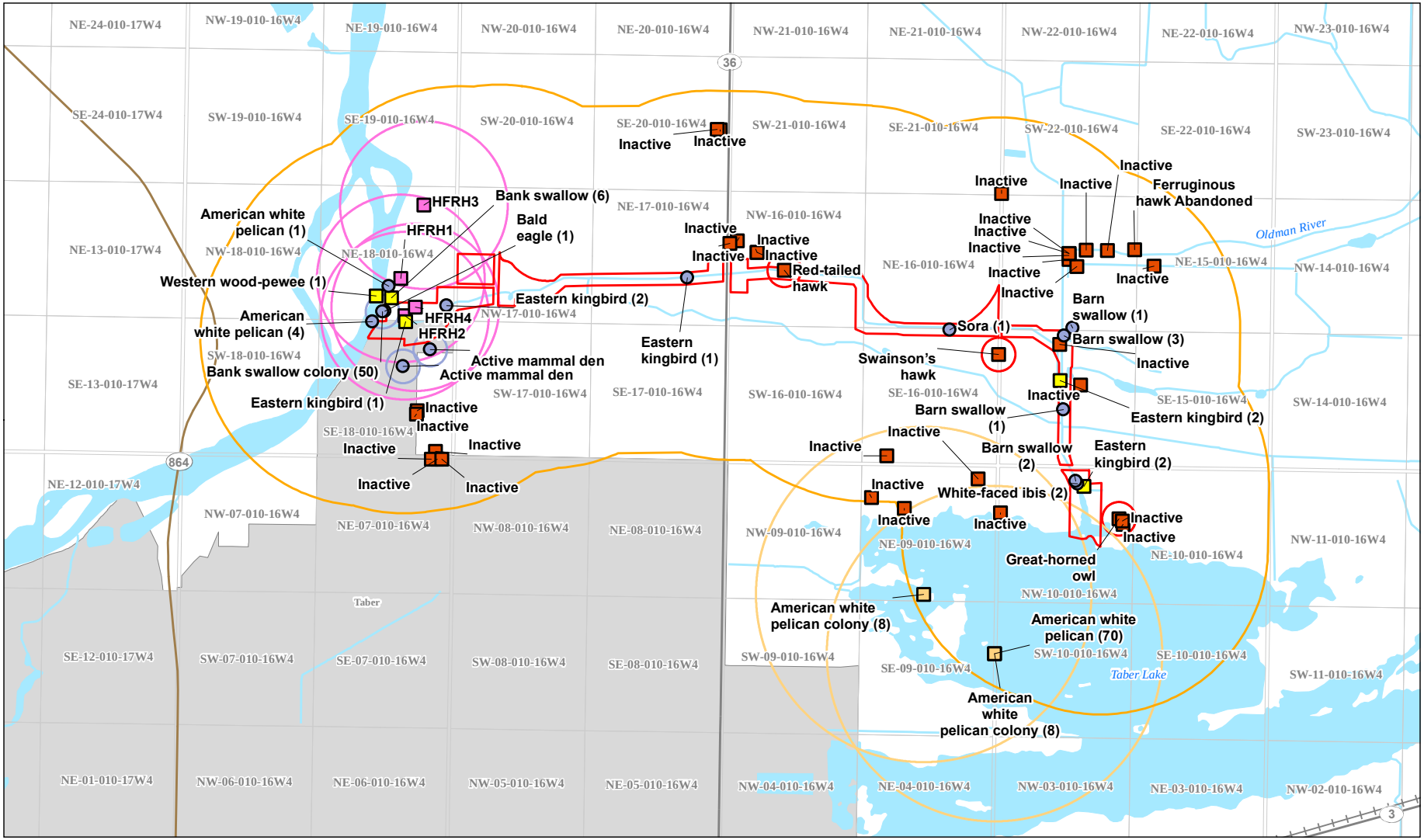

NE-24-010-17W4
NW-19-010-16W4
NE-19-010-16W4
NW-20-010-16W4
NE-20-010-16W4
NW-21-010-16W4
NE-21-010-16W4
NW-22-010-16W4
NE-22-010-16W4
NW-23-010-16W4
36
SE-24-010-17W4
SW-19-010-16W4
SE-19-010-16W4
SW-20-010-16W4
SE-20-010-16W4
SW-21-010-16W4
SE-21-010-16W4
SW-22-010-16W4
SE-22-010-16W4
SW-23-010-16W4
NE-13-010-17W4
NW-18-010-16W4
NE-18-010-16W4
NW-17-010-16W4
NW-16-010-16W4
NE-16-010-16W4
NE-15-010-16W4
NW-14-010-16W4
Oldman River
SW-18-010-16W4
SE-13-010-17W4
SW-17-010-16W4
SE-17-010-16W4
SW-16-010-16W4
SE-16-010-16W4
SE-15-010-16W4
SW-14-010-16W4
SE-18-010-16W4
864
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NE-08-010-16W4
NW-09-010-16W4
NE-09-010-16W4
NE-10-010-16W4
NW-11-010-16W4
Taber
NW-10-010-16W4
SE-12-010-17W4
SW-07-010-16W4
SE-07-010-16W4
SW-08-010-16W4
SE-08-010-16W4
SW-09-010-16W4
SE-09-010-16W4
SW-10-010-16W4
SE-10-010-16W4
Taber Lake
SW-11-010-16W4
NE-01-010-17W4
NW-06-010-16W4
NE-06-010-16W4
NW-05-010-16W4
NE-05-010-16W4
NW-04-010-16W4
NE-04-010-16W4
NW-03-010-16W4
NE-03-010-16W4
NW-02-010-16W4
3
Inactive
Inactive
Inactive

Table 4.1 Snake Hibernacula Observations in the LAA

ID	Species Observed (number observed)	Zone 12 U		Recommended Setback[1] (m)	Distance to Project Area (m)	Comments
		Easting	Northing			
HFRH1	bull snake (4)	416984	5519764	500	142	Six burrows on southwest facing slope. Snakes observed basking outside of main entrance during both visits and entering holes when approached.
HFRH2	prairie rattlesnake (2), bull snake (1)	417007	5519542	500	0	Cavity under rusted vehicle frame on lower south facing slope of coulee in Project Area. Snake shed observed at cavity entrance. Snakes observed outside of cavity entrance during both visits.
HFRH3	prairie rattlesnake (2), bull snake (1)	417121	5520203	500	356	Group of approximately 15 cavities. Juvenile bull snake at cavity entrance. Snakes observed outside of cavity entrance during both visits.
HFRH4	prairie rattlesnake (2)	417069	5519592	500	0	Large deep burrow with several satellite holes mid slope on south face of coulee in Project Area. Snakes observed basking outside of main entrance during both visits and entering holes when approached. Snake shed and bones observed at burrow entrance.

NOTE:
[1] GOA 2021a; note that alternate mitigations will be required as hibernacula are within setback distance of Project Area

Photo 4.1 Snake Hibernaculum HFRH2 in Project Area



NOTE: Red arrow indicates location of bull snake and prairie rattlesnake under vehicle frame.

Photo 4.2 Snake Hibernaculum HFRH4 in Project Area



4.2.2 Sharp-tailed Grouse Lek Survey

Sharp-tailed grouse lek surveys were completed at eight stations with suitable lekking habitat within 500 m of the Project Area (Figure 4.1). Overall, the suitability of lekking habitat in the LAA was predominantly nil to low with some small patches of moderate suitability grassland interspersed near the Oldman River. No sharp-tailed grouse or their leks were observed during the survey. Two stations were visited once based on nil to low suitability habitat observed at the station, all other stations were visited twice. The first visit was completed on April 16, 2021, and the second visit was completed on May 2, 2021. Weather conditions were appropriate for sharp-tailed grouse lek surveys, with winds ranging from light air (1-5 km/h) to light breeze (6 to 11 km/h) and temperatures from -2˚C to 5˚C. There was no snow cover on the ground during the survey.

4.2.3 Burrowing Owl Survey

Burrowing owl surveys were completed at nine stations with suitable habitat within 500 m of the Project Area on June 8, 2021 (Figure 4.1). No burrowing owl or burrows with sign of use were observed during the survey. Weather conditions were appropriate for burrowing owl surveys, with winds ranging from calm (<1 km/h) to calm air (1-5 km/h) and temperatures from 5˚C to 10˚C.

4.2.4 Raptor Nest Survey

Three active raptor nests were recorded within 1,000 m of the Project Area, including a Swainson's hawk (*Buteo swainsoni*) nest 106 m south of the Project Area, a red-tailed hawk (*Buteo jamaicensis*) nest within the Project Area, a great horned owl (*Bubo virginianus*) nest 108 m east of the Project Area (Figure 4.2; Table 4.2). A stick nest was occupied by two adult ferruginous hawks (*Buteo regalis*) on April 16, 2021 (adults perched on nest); however, the nest was no longer occupied by ferruginous hawk (or any other bird species) on May 2, 2021 and it remained unoccupied during subsequent nest checks for the remainder of the 2021 field season. Because this nest was abandoned early in the breeding season (i.e., prior to egg incubation) it is not considered to be occupied by ferruginous hawk in 2021. Thirty-one inactive stick nests were recorded in the LAA (Figure 4.2; Table 4.2).

Table 4.2 Raptor Nest Observations in the LAA

Nest ID	Nest Status	Species	Nest Structure	Zone 12 U		Recommended Setback[1] (m)	Distance to Project Area* (m)	Comments
				Easting	Northing			
HFNT01	Inactive	Unoccupied	Tree	417081	5518975	0	395	Large stick nest in aspen windrow, adjacent to HFNT02
HFNT02	Inactive	Unoccupied	Tree	417076	5518956	0	413	Small sticknest in aspen windrow, adjacent to HFNT01
HFNT03	Inactive	Unoccupied	Tree	417200	5518686	0	697	Small sticknest in aspen windrow, adjacent to HFNT24 and HFNT34
HFNT04	Inactive	Unoccupied	Tree	419882	5518706	0	727	Small sticknest in windrow near residence
HFNT05	Inactive	Unoccupied	Tree	419985	5518393	0	964	Small sticknest in lone balsam poplar near Taber Lake
HFNT06	Active	Great-horned owl	Tree	421266	5518331	100	108	Large sticknest in aspen near Taber Lake with at least one owl seen and heard
HFNT07	Inactive	Unoccupied	Tree	421291	5518298	0	133	Small sticknest nest in aspen near Taber Lake
HFNT08	Inactive	Unoccupied	Tree	421286	5518318	0	128	Large sticknest in aspen near Taber Lake
HFNT09	Inactive	Unoccupied	Tree	420912	5519370	0	0	Small sticknest in lone balsam poplar in Project Area, adjacent to road allowance/canal

Table 4.2 Raptor Nest Observations in the LAA

Nest ID	Nest Status	Species	Nest Structure	Zone 12 U		Recommended Setback[1] (m)	Distance to Project Area* (m)	Comments
				Easting	Northing			
HFNT10	Active	Red-tailed hawk	Tree	419270	5519812	100	0	Large sticknest nest in aspen along old canal
HFNT11	Inactive	Unoccupied	Tree	418990	5519989	0	107	Medium-sized sticknest near residence, adjacent to road
HFNT12	Inactive	Unoccupied	Tree	420969	5519902	0	448	Small sticknest in balsam poplar adjacent to road allowance/canal
HFNT13	Inactive	Unoccupied	Tree	420968	5519878	0	424	Small sticknest in balsam poplar adjacent to road allowance/canal
HFNT14	Inactive	Unoccupied	Tree	421038	5519129	0	60	Small sticknest in aspen
HFNT15	Active/Inactive	Ferruginous hawk/Unoccupied	Tree	421359	5519935	0*	606	Large sticknest in balsam poplar adjacent to canal, two adult ferruginous hawk observed on April 16, 2021, nest inactive during subsequent visit on May 2, 2021 and checks in June
HFNT16	Inactive	Unoccupied	Tree	421476	5519837	0	619	Large sticknest in lone balsam poplar
HFNT17	Inactive	Unoccupied	Tree	421197	5519931	0	520	Small sticknest in balsam poplar adjacent to road allowance/canal
HFNT18	Inactive	Unoccupied	Tree	421071	5519934	0	487	Small sticknest in balsam poplar adjacent to road allowance/canal



Table 4.2 Raptor Nest Observations in the LAA

Nest ID	Nest Status	Species	Nest Structure	Zone 12 U		Recommended Setback[1] (m)	Distance to Project Area* (m)	Comments
				Easting	Northing			
HFNT19	Inactive	Unoccupied	Tree	421015	5519836	0	383	Medium-sized sticknest in shrub
HFNT20	Inactive	Unoccupied	Tree	420559	5518367	0	414	Large sticknest nest in aspen
HFNT21	Inactive	Unoccupied	Tree	418946	5519974	0	92	Medium-sized sticknest near residence, adjacent to road
HFNT22	Active	Swainson's hawk	Tree	420549	5519310	100	106	Small sticknest nest in aspen
HFNT23	Inactive	Unoccupied	Tree	417190	5518733	0	649	Medium-sized sticknest in aspen windrow near residence
HFNT24	Inactive	Unoccupied	Tree	417166	5518687	0	692	Small sticknest nest in aspen
HFNT25	Inactive	Unoccupied	Tree	418887	5520652	0	769	Large sticknest near buildings with black-billed magpie in nest
HFNT26	Inactive	Unoccupied	Tree	418870	5520653	0	770	Small sticknest in farmyard, next to HFNT25
HFNT27	Inactive	Unoccupied	Tree	419109	5519920	0	69	Small sticknest in farmyard, in same tree as HFNT28
HFNT28	Inactive	Unoccupied	Tree	419109	5519920	0	69	Small sticknest in farmyard, in same tree as HFNT27
HFNT30	Inactive	Unoccupied	Tree	419790	5518457	0	977	Small sticknest nest in lone balsam poplar near Taber Lake

Table 4.2 Raptor Nest Observations in the LAA

Nest ID	Nest Status	Species	Nest Structure	Zone 12 U		Recommended Setback[1] (m)	Distance to Project Area* (m)	Comments
				Easting	Northing			
HFNT31	Inactive	Unoccupied	Tree	420566	5520272	0	548	Small sticknest in balsam poplar adjacent to road
HFNT32	Inactive	Unoccupied	Tree	420969	5519914	0	460	In same tree as HFNT33
HFNT33	Inactive	Unoccupied	Tree	420969	5519914	0	460	In same tree as HFNT32
HFNT34	Inactive	Unoccupied	Tree	417228	5518687	0	700	Medium-sized sticknest in aspen windrow, adjacent to HFNT24 and HFNT03
HFNT35	Inactive	Unoccupied	Tree	420425	5518568	0	493	Small sticknest nest in aspen

NOTES:
[1] GOA 2021a
* Approximate distance

4.2.4.1 Waterbird Activity Survey

The waterbird activity survey was completed from a survey station located at the Project outflow from Taber Lake. The survey was completed on April 16, 2021 and May 2, 2021. The historic American white pelican breeding colony (GOA 2021c) was active in 2021 and another potential breeding colony was observed on a nearby island (Figure 4.2). Eight adult pelicans were observed at each colony. In addition, seventy pelicans were observed on the lake adjacent to a colony during the second visit (Figure 4.2). The nesting colonies are located 831 m and 937 m from the Project Area, respectively (Figure 4.2).

4.2.4.2 Nocturnal Amphibian Survey

Nine nocturnal amphibian stations were surveyed three times within the LAA (Figure 4.1). Surveys were completed on May 14, June 7, and June 15, 2021. Weather conditions were appropriate for nocturnal amphibian surveys, with winds ranging from calm (0 km/h) to gentle breeze (12 to 19 km/h) and air temperatures ranging from 7˚C to 14˚C. When necessary, surveys were temporarily suspended to avoid periods of rain. Boreal chorus frogs (*Pseudacris maculata*) were detected at two stations during the survey; no amphibian species of management concern were detected in the LAA.

4.2.4.3 Breeding Bird Survey

Breeding bird surveys were completed at nine point-count stations in the LAA (Figure 4.1). Seven stations were visited twice and two stations were visited once during the recommended survey period of May 15 to July 1 for the Grassland Natural Region (ESRD 2013). The first visit occurred on May 15, 2021 and the second visit occurred on June 8, 2021.

Weather conditions were appropriate for breeding bird surveys, with winds ranging from calm (0 km/h) to gentle breeze (12 to 19 km/h) and air temperatures ranging from 7˚C to 14˚C. When necessary, surveys were temporarily suspended to avoid periods of rain.

Forty bird species, comprising 256 individual bird observations, were recorded within the 100 m survey point count radii (plot) during the two survey visits (Table 4.3). Red-winged blackbird (*Agelaius phoeniceus*) was the most commonly observed species (n = 45), accounting for 17.6% of individuals detected in survey plots, followed by brown-headed cowbird (*Molothrus ater* (n = 18), accounting for 7.0% of individuals observed.

Table 4.3 Bird Species Detected in the LAA during Breeding Bird Surveys by Survey Station

Species	Number of Individuals* Detected by Survey Station									Flyover**	Total
	HFR01	HFR02	HFR03	HFR04	HFR05	HFR06	HFR07	HFR08	HFR09		
Canada Goose	1	-	-	2	-	-	-	-	-	2	5
Blue-winged teal	-	-	-	4	-	-	2	-	-	-	6
Cinnamon teal	-	2	-	2	-	-	-	-	-	-	4
Northern shoveler	2	-	-	-	-	-	-	-	-	2	4
Gadwall	-	-	-	-	-	-	-	-	-	1	1
Mallard	3	-	-	-	-	-	-	-	-	5	8
Lesser scaup	4	6	-	-	-	-	-	-	-	-	10
Ring-necked pheasant	1	-	-	-	-	-	-	-	-	-	1
Eurasian collared-dove	1	-	-	-	-	-	-	-	-	-	1
Mourning dove	1	-	-	-	-	-	-	-	-	3	4
Killdeer	1	-	-	-	2	1	1	-	-	2	7
Wilson’s snipe	-	-	-	-	-	1	-	-	-	1	2
Spotted sandpiper	1	-	-	-	-	-	-	-	-	-	1
Franklin’s gull	-	-	-	-	-	-	-	-	-	2	2
Ring-billed gull	-	-	-	-	-	-	-	-	-	15	15
California gull	-	-	-	-	-	-	-	-	-	2	2
White-faced ibis	-	-	-	-	-	-	-	-	-	2	2
Turkey vulture	-	-	-	-	-	-	-	-	-	2	2
Red-tailed hawk	-	-	-	-	-	-	-	-	-	1	1
Belted kingfisher	-	-	-	-	-	-	-	-	-	1	1
Western kingbird	-	-	1	-	-	-	-	-	-	2	3
Eastern kingbird	2	2	-	-	-	-	-	-	-	1	5

Table 4.3 Bird Species Detected in the LAA during Breeding Bird Surveys by Survey Station

Species	Number of Individuals* Detected by Survey Station									Flyover**	Total
	HFR01	HFR02	HFR03	HFR04	HFR05	HFR06	HFR07	HFR08	HFR09		
Black-billed magpie	-	-	-	-	-	-	-	-	-	4	4
Tree swallow	-	-	-	-	-	-	-	-	-	11	11
Bank swallow	-	-	-	-	-	-	-	-	6	-	6
Barn swallow	-	-	-	-	-	-	-	-	-	6	6
Cliff swallow	-	-	-	-	-	-	-	-	-	6	6
European starling	-	-	5	-	-	-	-	-	-	9	14
American robin	1	-	-	1	1	-	-	-	-	2	5
Clay-colored sparrow	1	-	1	3	1	-	2	1	1	-	10
Lark sparrow	-	-	-	-	-	-	-	1	-	-	1
Vesper sparrow	-	-	1	1	1	-	1	3	1	-	8
Savannah sparrow	-	1	1	2	2	1	1	-	-	-	8
Song sparrow	1	-	-	-	-	-	-	-	-	-	1
Yellow-headed blackbird	1	-	-	5	-	-	-	-	-	-	6
Western meadowlark	1	2	1	-		1	3	1	-	-	9
Red-winged blackbird	4	1	-	10	2	2	4	4	-	18	45
Brown-headed cowbird	1	-	2	6	3	-	2	-	-	4	18
Brewer's blackbird	-	-	-	-	-	3	-	-	-	-	3
Common grackle	1	-	-	-	-	-	-	-	-	7	8
Total	28	14	12	36	12	9	16	10	8	111	256

NOTES:
[1] Indicates species of management concern
* maximum number of detections for each bird species observed within point-count radii during the two survey visits
** includes visual and acoustic (e.g., calls, winnowing) flyover detections

Four species of management concern (bank swallow, barn swallow, eastern kingbird, white-faced ibis) were recorded systematically during the breeding bird survey (Table 4.4, Figure 4.2). Bank swallow (*Riparia riparia*) was the most frequently recorded species of management concern during systematic surveys with six individuals recorded. All bank swallows were observed at station HFR09 near the Oldman River (Table 4.3; Figure 4.1).

Table 4.4 Species of Management Concern Observed During Breeding Bird Surveys

Common name	Scientific name	COSEWIC status[1]	SARA status (Schedule 1)[2]	AWA Status[2]	AEP General Status Ranking[3]
White-faced ibis	*Plegadis chihi*	Not listed	No status	No status	Sensitive
Bank swallow	*Riparia riparia*	Threatened	Threatened	No status	Sensitive
Barn swallow	*Hirundo rustica*	Threatened	Threatened	No status	May Be at Risk
Eastern kingbird	*Tyrannus tyrannus*	Not listed	No status	No status	Sensitive

NOTES:
[1] GOA 2020
[2] GOA 2017
[3] AEP 2020a

4.2.4.4 Incidental Observations

Seven species of management concern were observed incidentally within the LAA during 2021 field surveys for the Project (Table 4.5; Figure 4.2). A bank swallow colony with approximately 50 adults was observed at the western periphery of the Project Area above the Oldman River and two active mammal dens were also observed incidentally in that area (Figure 4.2); these features have a recommended setback of 100 m (GOA 2021a).

Table 4.5 Incidental Observations of Species of Management Concern Recorded within the LAA During 2021 Field Surveys

Common Name	Scientific Name	COSEWIC status[1]	SARA status[1]	AWA status[2]	Alberta General Status Listing[3]
American white pelican	*Pelecanis erythrorhynchos*	Not listed	No status	No status	Sensitive
Sora	*Porzana carolina*	Not listed	No status	No status	Sensitive
White-faced ibis	*Plegadis chihi*	Not listed	No status	No status	Sensitive
Bald eagle	*Haliaeetus leucocephalus*	Not listed	No status	No status	Sensitive
Bank swallow	*Riparia riparia*	Threatened	Threatened	No status	Sensitive
Barn swallow	*Hirundo rustica*	Threatened	Threatened	No status	May Be at Risk
Eastern kingbird	*Tyrannus tyrannus*	Not listed	No status	No status	Sensitive

NOTES:
[1] GOA 2020
[2] GOA 2017
[3] AEP 2020a

5.0 SUMMARY

Stantec completed wildlife field surveys in 2021 in support of the MD of Taber's Horsefly Regional Emergency Spillway (Phase 1) Project. Field surveys focused on species of management concern as well as wildlife habitat features that require mitigation such as prescribed setbacks.

Several wildlife features with recommended setbacks were recorded in the LAA, including, four snake hibernacula, three active raptor nests, two American white pelican breeding colonies on Taber Lake, a bank swallow colony and two active mammal dens (Figure 4.2). Sharp-tailed grouse leks and burrowing owl were not observed in the LAA and there is minimal breeding habitat for these species in the LAA. No amphibian species of management concern were detected during nocturnal amphibian surveys in the LAA. A total of 10 species of management concern were observed in the LAA during 2021 surveys (bull snake, prairie rattlesnake, American white pelican, sora, bald eagle, ferruginous hawk, white-faced ibis, bank swallow, barn swallow, eastern kingbird).

Survey results will be incorporated into the Project's ECO plans.

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G3

Fish and Fish Habitat Technical Report

Horsefly Regional Emergency Spillway Project
Fish and Fish Habitat Technical Report

December 2021

Prepared for:

Municipal District of Taber

Prepared by:

Stantec Consulting Ltd.

This document entitled Horsefly Regional Emergency Spillway Project Fish and Fish Habitat Technical Report was prepared by Stantec Consulting Ltd. (“Stantec”) for the account of the MD of Taber (the “Client”) to support the regulatory review process by the Canadian Impact Assessment Agency. Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule, and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify the information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Timothy Sargent Digitally signed by Timothy Sargent Date: 2021.12.03 09:33:13 -07'00' _____
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Tim Sargent, B.Sc., BIT

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Reviewed by Lacey AuCoin Digitally signed by Lacey AuCoin Date: 2021.12.06 11:32:32 -07'00' _____
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Lacey AuCoin, M.Sc., P.Biol

Approved by James D. Howell Digitally signed by James D. Howell Date: 2021.12.03 08:46:23 -07'00' _____
(signature)

James D. Howell, M.Sc., P.Geol

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Abbreviations

AEP	Alberta Environment and Parks
AT	Alberta Transportation
COP	Code of Practice
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans Canada
ESRD	Environment and Sustainable Resource Development
FRL	Fish Research Licence
FWIMT	Fish and Wildlife Internet Mapping Tool
HADD	Harmful alteration, disruption, or destruction
LDB	Left downstream bank
MD of Taber	Municipal District of Taber
QAES	Qualified Aquatic Environment Specialist
RAP	Restricted Activity Period
RDB	Right downstream bank
SARA	*Species at Risk Act*
SMRID	St. Mary River Irrigation District
TID	Taber Irrigation District



1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by the Municipal District (MD) of Taber to provide engineering and environmental support for the Horsefly Regional Emergency Spillway Project (the Project). The existing canal system, owned by the Taber Irrigation District (TID) and the St. Mary River Irrigation District (SMRID), was not designed to accommodate drainage from overland flows. The Project involves upgrading the existing canal system to receive drainage and overland flows in order to prevent flooding of agricultural lands. The upgraded canal system would divert the water flow to the Oldman River.

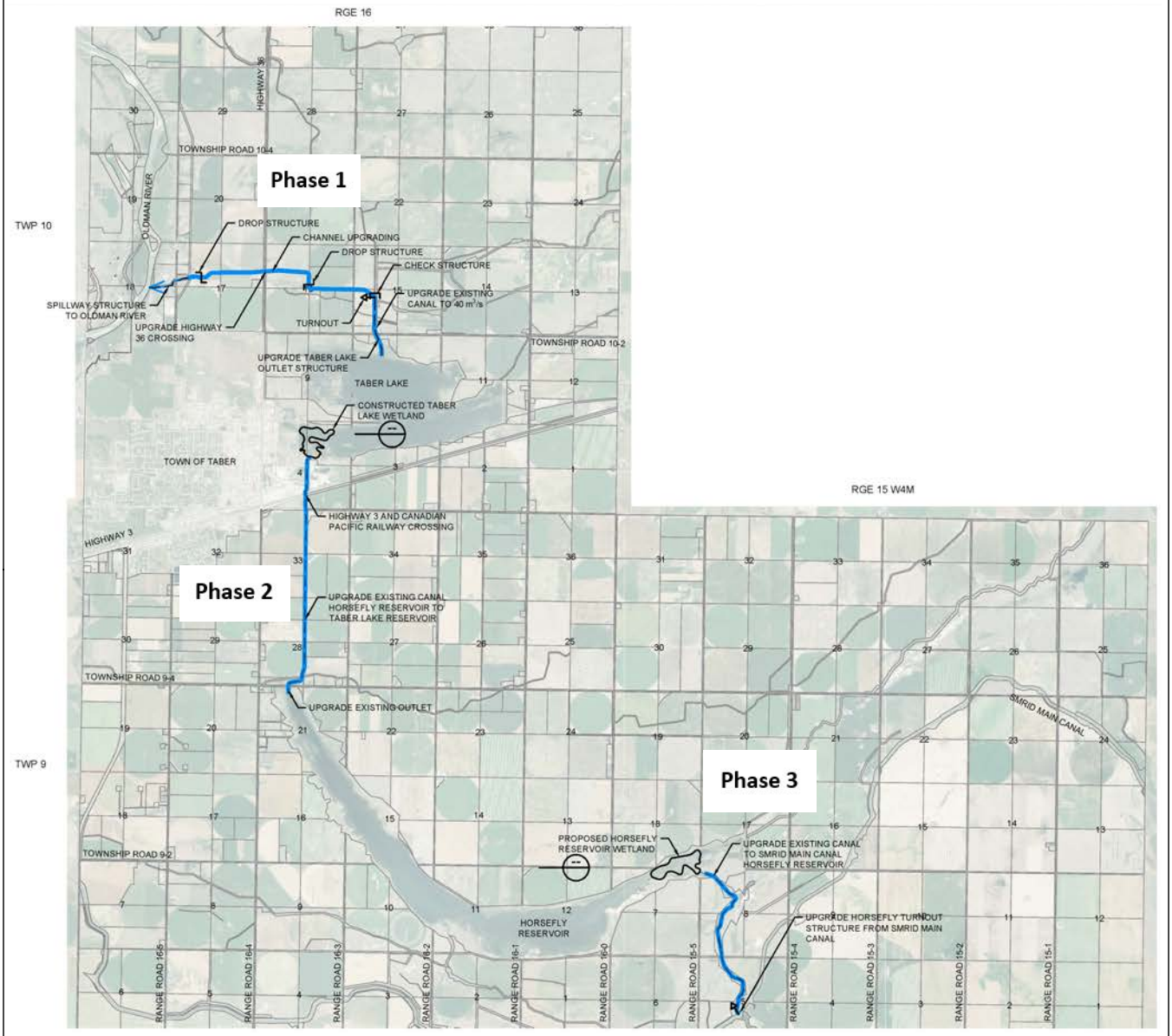
This report summarizes Stantec's assessment of the availability of existing fish habitat and assessment of the fish species community composition within the Project area.

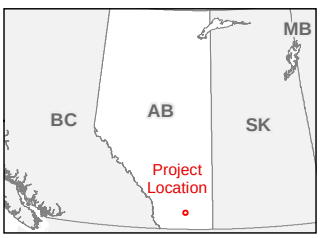
1.1 PROJECT DESCRIPTION

Agricultural lands surrounding the TID and SMRID have been exposed to overland flooding which occurred in 2010, 2011, 2013, 2014, and 2018. The existing canal system was not designed to manage overland flows from spring runoff, storm events, and/or snow melt. The Project upgrades to the existing canal system will increase the flood attenuation capacity of the system and divert the water flow into the Oldman River.

The Project is divided into three phases which are shown in Figure 1.1:

- Phase 1: Oldman River to Taber Lake - The outlet from Taber Lake will be replaced and approximately 1 km of the existing canal (the Big Bend Lateral) will be widened to convey greater capacity. At this location, a check structure will direct water into the Big Bend Canal north for irrigation. The next 3.5 km of the system west of this point is a constructed earthen drain. The existing drain, which normally carries a small volume of runoff, will also be enlarged to convey greater capacity. The final 1 km of the spillway will install erosion protection measures and enlarge drainage through a natural coulee to the Oldman River.
- Phase 2: Taber Lake to Horsefly Reservoir - Approximately 5 km of canals between Taber Lake and Horsefly Reservoir are proposed to be enlarged. Concrete control structures will be replaced in order to convey greater flows. In addition, the outlet structure from Horsefly Reservoir is proposed to be replaced.
- Phase 3: Horsefly Reservoir to the SMRID - Replacement of the turnout structure on the SMRID Main Canal and enlargement of 3.5 km of the SMRID canals that convey flows to the Horsefly Reservoir are proposed to be upgraded. Two drop structures will also need to be enlarged to convey additional flow. The existing wetland in Horsefly Reservoir will be expanded and enhanced to improve water quality.





Notes

1. Original figure content provided by MPE Engineering Ltd.

Project Location
T9&10N, R15&16W
Town of Taber

Prepared by SL on 2021-06-01
TR by TQ on 2021-06-06
IR Review by JH on 2021-06-01

Client/Project 10773806-0003 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway

Figure No.
1.1

Title
Horsefly Regional Emergency Spillway Project – Project Phases

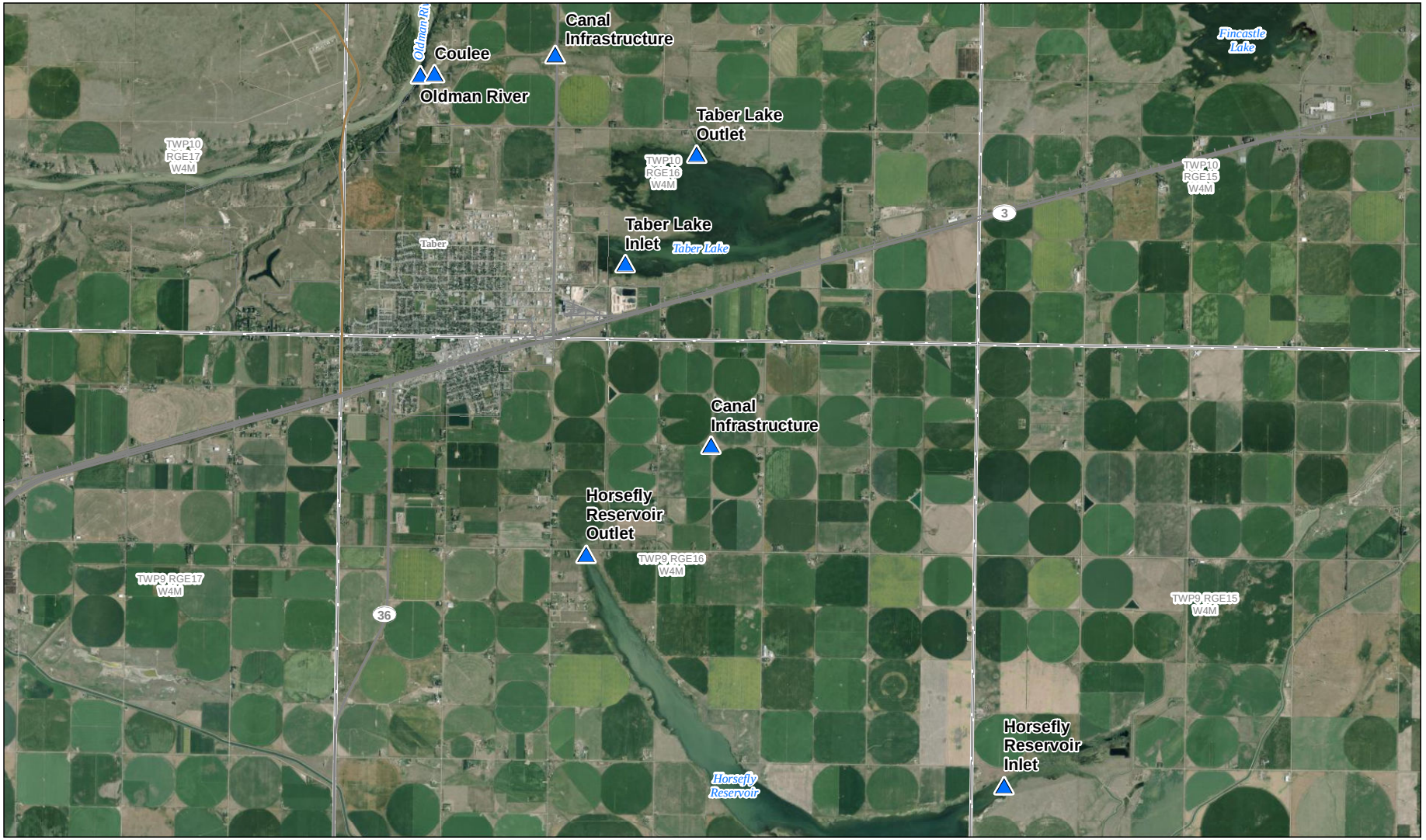
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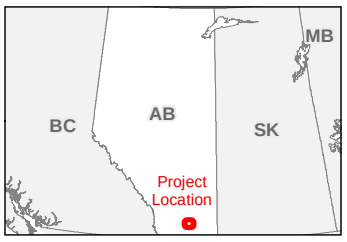
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The above three phases formed three main areas for assessment of fish and fish habitat within the Project area detailed herein. The following areas were assessed for fish and fish habitat (Figure 1.2):

- The Oldman River
- The coulee from the Oldman River to the top of slope at Range Road 164A
- The inlet and outlet of Taber Lake
- The inlet and outlet of Horsefly Reservoir





- Aquatics Site
- Primary Highway
- Secondary Highway
- Railway
- Watercourse
- Township
- Urban Area
- Waterbody

N

0 1,200 2,400 metres

(At original document size of 8.5x11)
1:90,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 12N
2. Data Sources: AltaLIS, NRCAN, Alberta Parks, GeoLogic, NRN, Alberta Government
3. Constraints: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Stantec

Project Location
T9&10N, R15&16W
Town of Taber

Prepared by SL on 2021-10-22
TR by TQ on 2021-10-25
IR Review by TS on 2021-10-25

Client/Project
110773806-0013 REVA
Client: M.D. of Taber
Project: Horsefly Regional Emergency Spillway

Figure No.
1.2

Title
Horsefly Regional Emergency Spillway Project
Aquatics Overview

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2.0 METHODS

2.1 DESKTOP ASSESSMENT

2.1.1 Fish Presence

A review of historical fish capture data within the Project area was compiled and reviewed using the Fisheries and Wildlife Internet Mapping Tool (FWIMT; Alberta Environment and Parks [AEP] 2021) and Fisheries and Oceans Canada's (DFO) aquatic species at risk map (DFO 2019) on October 7, 2021.

2.1.2 Species of Management Concern

The resulting historical fish capture data was reviewed for the presence of fish species listed under Schedule 1 of the *Species at Risk Act* (SARA) and the Alberta *Wildlife Act*. Other species designations and status reports were also considered, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the General Status of Alberta Wild Species (AEP 2017).

2.1.3 Restricted Activity Period

Restricted activity periods (RAP) have been developed by AEP to protect fish species and sensitive life stage that may be present in the watercourse. RAPs are based on a watercourse classification system, which utilize region-specific Management Area Maps and are typically used to advise timing of instream construction activities.

Watercourse class and RAP of the Oldman River and coulee were identified using the Lethbridge Management Area Map (Alberta Environment and Sustainable Resource Development [ESRD] 2006) and based on the *Water Act* Code of Practice for Watercourse Crossings (AEP 2019). The proposed RAPs for Taber Lake and Horsefly Reservoir were developed based on Qualified Aquatic Environment Specialist (QAES) recommendations and species presence and considered the Lethbridge Management Area Map (ESRD 2006).

2.2 FISH AND FISH HABITAT ASSESSMENT

2.2.1 Fish Sampling

Fish sampling was completed on Taber Lake because there was no existing historical fish species presence data in the lake. Prior to fish sampling, a Fish Research Licence (FRL) was obtained from AEP (RL PAAS 21-5030-15-LETH). As per the conditions of the FRL, data was then submitted to AEP for upload into the Alberta provincial FWIMT database.

Minnow traps were used on Taber Lake as well as a boat electrofishing unit. Captured fish were placed in a holding tank until they were processed. Fish were identified to species, examined for any deformities, weighed, and measured. Fish that avoided capture, but were positively identified, were enumerated and recorded as observed. Fish were released back into the lake after they had been processed.

2.2.2 Habitat Assessment

2.2.2.1 Watercourse Assessment

The fish habitat assessment used procedures based on standard protocols outlined in Alberta Transportation's (AT) Fish Habitat Manual (2009), and R.L. & L. Environmental Services Ltd. (1992) and criteria outlined in the Guide to the Code of Practice for Watercourse Crossings, including Guidelines for Complying with the Code of Practice (Government of Alberta 2001). At the crossing location, six cross channel transects were established to document channel characteristics along a 400 m reach, where feasible. Transects were established at 100 m upstream, 50 m upstream, centreline, 100 m downstream, 200 m downstream, and 300 m downstream. Where possible, the following field information and observations were recorded:

- Date and time
- Photographs
- Habitat-type (e.g., pool riffle, run) and area
- Channel characteristics (e.g., channel and wetted widths, depths, gradient)
- Bed material (substrate size distribution)
- Obstructions
- Vegetation (instream and riparian)
- Flood signs
- Stage of stream

Bank materials, bank stability, bank slopes, cover, vegetation, and fish habitat were estimated visually. Channel width, wetted width, water depth, and bank heights were measured quantitively. Instream substrate composition was estimated visually at each transect.

Habitat characteristics were incorporated into a physical habitat classification system, which rates the quality of each macro-habitat type based on physical characteristics (e.g., depth, cover, substrate) with respect to the life history requirements of fish species (e.g., rearing, spawning, migration, overwintering) documented or anticipated to occur in the vicinity of the Project. Fish habitat suitability for migration, spawning, rearing, and overwintering for the assessed habitat was rated (i.e., good, moderate, poor, or none) according to its suitability to support migration, spawning, rearing, and overwintering by fish species known to be present within the watercourse.

2.2.2.2 Lake Assessment

Lake habitat was assessed using the same methods stated above, although a boat was deployed each time for access. Where practicable, the boat was anchored at the site and the site assessed on foot if shallow enough (Taber Lake inlet and Horsefly Reservoir inlet). If depths prevented assessment by foot from occurring, the habitat assessment as well as any measurements were taken from a boat (Taber Lake outlet/Horsefly Reservoir outlet).

Habitat characteristics were incorporated into a physical habitat classification system, which rates the quality of each macro-habitat type based on physical characteristics (e.g., depth, cover, substrate) with respect to the life history requirements of fish species (e.g., rearing, spawning, migration, overwintering) documented or anticipated to occur in the vicinity of the Project. Fish habitat suitability for migration, spawning, rearing, and overwintering for the assessed habitat was rated (i.e., good, moderate, poor, or none) according to its suitability to support migration, spawning, rearing, and overwintering by fish species known to be present within the waterbody.



3.0 RESULTS

3.1 DESKTOP ASSESSMENT

3.1.1 Fish Presence

A total of 23 fish species have been documented within the FWIMT desktop assessment area. This area included a reach in the Oldman River 10 km upstream and 10 km downstream of the confluence of the coulee with the Oldman River and Horsefly Reservoir (Table 1).

There was no historical fish presence data available for the coulee or Taber Lake. Stantec's fish assessment completed on Taber Lake and the species captured are presented in Table 2.

3.1.2 Species of Management Concern

Table 1 provides the status for each fish species identified in the FWIMT search area. Lake sturgeon (*Acipenser fulvescens*) is considered "endangered" under COSEWIC and "at risk" under the General Status of Alberta Wild Species (AEP 2017). Sauger (*Sander canadensis*) is considered sensitive under the General Status of Alberta Wild Species (AEP 2017).

3.1.3 Restricted Activity Period

The Oldman River at the Project location is a Class C watercourse with a RAP from April 1 to July 31 (ESRD 2006). Taber Lake, Horsefly Reservoir and the coulee which conveys into the Oldman River are considered to be Class C waterbodies with a RAP from April 1 to July 31, given their connectivity with the South Saskatchewan River and historical fish species composition.

Table 1 Historical fish species documented within the Oldman River and Horsefly Reservoir at the Project area

Family	Common Name	Scientific Name	*SARA*[a] (Federal)	*Wildlife Act*[b] (Provincial)	COSEWIC[c] (Federal)	General Status[d] (Provincial)	Waterbody	
							Oldman River	Horsefly Reservoir
Acipenseridae	lake sturgeon	*Acipenser fulvescens*	No status	Threatened	Endangered	At risk	✓	-
Catostomidae	longnose sucker	*Catostomus catostomus*	No status	Not listed	Not assessed	Secure	✓	-
	quillback	*Carpiodes cyprinus*	No status	Not listed	Not assessed	Undetermined	✓	-
	shorthead redhorse	*Moxostoma macrolepidotum*	No status	Not listed	Not assessed	Secure	✓	-
	silver redhorse	*Moxostoma anisurum*	No status	Not listed	Not assessed	Undetermined	✓	-
	white sucker	*Catostomus commersonii*	No status	Not listed	Not assessed	Secure	✓	✓
Cyprinidae	emerald shiner	*Notropis atherinoides*	No status	Not listed	Not assessed	Secure	✓	✓
	fathead minnow	*Pimephales promelas*	No status	Not listed	Not assessed	Secure	-	✓
	lake chub	*Couesius plumbeus*	No status	Not listed	Not assessed	Secure	✓	-
	longnose dace	*Rhinichthys cataractae*	No status	Not listed	Not assessed	Secure	✓	-
	river shiner	*Notropis blennius*	No status	Not listed	Not assessed	Undetermined	✓	-
	spottail shiner	*Notropis hudsonius*	No status	Not listed	Not assessed	Secure	✓	✓
Esocidae	northern pike	*Esox lucius*	No status	Not listed	Not assessed	Secure	✓	✓
Gadidae	burbot	*Lota lota*	No status	Not listed	Not assessed	Secure	✓	-
Hiodontidae	goldeye	*Hiodon alosoides*	No status	Not listed	Not assessed	Secure	✓	-
	mooneye	*Hiodon tergisus*	No status	Not listed	Not assessed	Secure	✓	-
Percidae	sauger	*Sander canadensis*	No status	Not listed	Not assessed	Sensitive	✓	-
	walleye	*Sander vitreus*	No status	Not listed	Not assessed	Secure	✓	✓
	yellow perch	*Perca flavescens*	No status	Not listed	Not assessed	Secure	✓	✓
Percopsidae	trout-perch	*Percopsis omiscomaycus*	No status	Not listed	Not assessed	Secure	✓	-

Table 1 Historical fish species documented within the Oldman River and Horsefly Reservoir at the Project area

Family	Common Name	Scientific Name	*SARA*[a] (Federal)	*Wildlife Act*[b] (Provincial)	COSEWIC[c] (Federal)	General Status[d] (Provincial)	Waterbody	
							Oldman River	Horsefly Reservoir
Salmonidae	brown trout	*Salmo trutta*	No status	Not listed	Not assessed	Exotic/alien	✓	-
	lake whitefish	*Coregonus clupeaformis*	No status	Not listed	Not assessed	Secure	✓	-
	mountain whitefish	*Prosopium williamsoni*	No status	Not listed	Not assessed	Secure	✓	-

NOTES:
No historical presence for fish in Taber Lake. Results of fish assessment are provided in Table 2.
✓ Species is present (AEP 2020)
- Species has not been documented (AEP 2020)
[a] *Species at Risk Act* (SARA 2002) (GOC 2018)
[b] *Wildlife Act* – Wildlife Regulation (1997)
[c] COSEWIC (GOC 2018); considered a species of management concern if assessed as threatened
[d] General Status of Alberta Wild Species (AEP 2017d); considered a species of management concern for this assessment if designated as: sensitive, may be at risk, or at risk

3.2 FISH AND FISH HABITAT ASSESSMENT

A field assessment was conducted by two Stantec QAES between September 13 – 15, 2021 within the Project area to characterize existing fish habitat conditions. Fish sampling was conducted on Taber Lake on September 15, 2021.

3.2.1 Fish Sampling

Sampling was undertaken throughout Taber Lake using minnow traps baited with cat food and a boat electrofishing unit. With both methods combined, a total of 42,453 seconds of fishing effort and 27 fish were captured (Table 2). The average length of yellow perch captured was 127 mm fork length, the average total length of brook stickleback captured was 42 mm, and the average fork length of spottail shiner captured was 37 mm. The adult northern pike captured did not appear healthy and was very thin.

Table 2 Summary of Fish Captured in Taber Lake by Boat Electrofishing and Minnow Trapping

Species Information			Number of Individuals Captured	
Family	**Common Name**	**Scientific Name**	**Boat Electrofishing**	**Minnow Trapping**
Cyprinidae	spottail shiner	*Notropis hudsonius*	3	0
Esocidae	northern pike	*Esox lucius*	1	0
Gasterosteidae	brook stickleback	*Culaea inconstans*	2	11
Percidae	walleye	*Sander vitreus*	1	0
	yellow perch	*Perca flavescens*	9	0

3.2.2 Habitat Assessment

The fish habitat assessments targeted areas where Project activities have the potential to interact with fish habitat and collected baseline data on existing fish habitat conditions in the areas shown on Figure 1.2. Summary data is provided in Appendix A.

3.2.2.1 Oldman River

A field assessment was completed by two Stantec QAES on September 13, 2021, on the Oldman River centred at the confluence of the coulee with the river to characterize existing fish and fish habitat conditions. The confluence of the coulee with the Oldman River is located approximately 1.5 km downstream of the Highway 864 bridge crossing over the Oldman River (Figure 1.2).

At the confluence with the coulee, the Oldman River is a large permanent watercourse comprised of predominantly run habitat. At the confluence of the coulee with the Oldman River, the main channel is approximately 123 m wide. One beaver dam was observed along the left downstream bank, 240 m downstream from the coulee confluence (Photograph 1, Appendix B).

Within the channel, both right and left downstream bank are erosional and consisted of fines and cobble substrate. The right downstream bank had canyon-like walls that were very steep, whereas the left downstream bank was within the river floodplain and consisted of less steep banks. Riparian vegetation at the confluence of the coulee was limited, consisting of grasses (40%) and shrubs (10%) on the right downstream bank and grasses (20%) and shrubs (5%) on the left downstream bank. A large portion of the riparian zone on both banks was bare. Some mature trees existed at the top of the left downstream bank.

At the confluence of the coulee with the Oldman River, the channel is comprised predominantly of deep run (R1) habitat (Photographs 2 to 5, Appendix B) transitioning through to a shallower run (R2 and R3) towards the right downstream bank. Substrate is comprised of cobble (60%), fines (15%), large gravel (10%), small boulder (10%) and large boulder (5%). A flat (FL) parallels the right downstream bank at the confluence with the coulee. A clear delineation of substrate exists at the confluence of the coulee with the Oldman River, the coulee inputs fines into the coarser substrate of the Oldman River (Photograph 6, Appendix B).

Table 3 describes the quality of fish habitat within the assessment area of the Oldman River. Overall, the Oldman River has poor-moderate habitat within the assessment area given the lack of habitat complexity. There is poor spawning habitat for salmonids and forage fish. Spawning habitat is moderate for coarse fish given the abundant coarse substrate that is present. Spawning potential habitat for species that utilize flooded riparian vegetation (e.g., northern pike) is moderate. There is moderate rearing potential throughout the assessed area. Cover is primarily provided by depth; however, some aquatic vegetation and scattered boulders do provide alternative cover options. No overhead cover exists. Year-round flow and suitable depths provide moderate overwintering potential although there are no pools existing in the assessed area which would provide low velocity holding areas. No barriers to fish migration were observed within the assessed area.

Table 3 Habitat Ratings for the Oldman River Within the Assessed Area

Habitat	Quality Rating	Rationale
Spawning	Poor (redd-constructing salmonids) Moderate (sportfish and forage fish) Good (coarse fish)	• Gravels suitable for salmonids are limited • Substrate dominated by cobbles and fines • Abundant coarse substrate for broadcast spawners • Limited woody debris for cyprinids • Terrestrial vegetation along banks for species that would utilize flooded riparian vegetation
Rearing	Moderate	• Cover provided primarily by depth • Some aquatic vegetation on right downstream bank (RDB) affording cover • Lower velocity areas along RDB • No overhead cover provided
Overwintering	Moderate	• Suitable depths • Continuous flow year-round • No dedicated low velocity holding areas (i.e., pools) within reach
Migration	Good	• No barriers to migration were observed

3.2.2.2 Coulee

A field assessment was completed by a Stantec QAES on September 13, 2021 of the coulee between the Oldman River and Range Road 164A to characterize fish and fish habitat conditions. Due to land access, a portion of the assessed reach (downstream of Range Road 164A and 220 m upstream from the confluence with the Oldman River) could not be accessed and was therefore not assessed.

The coulee is a small ephemeral tributary to the Oldman River with predominantly cascade and rapid habitat (Appendix C); however, some riffle habitat is present. The gradient of the coulee is approximately 12% and insufficient to serve as a barrier to fish passage upstream. The confluence with the Oldman River is approximately 1.5 km downstream of Highway 864 bridge crossing the Oldman River. The channel is approximately 1.3 m wide. A small tributary enters the coulee 60 m upstream of the confluence with the Oldman River.

The coulee has a meandering pattern and both banks shift from erosional to depositional. Bank material consisted primarily of fines and organics and was moderately stable throughout the assessed reach. Substrate was comprised of fines (40%), cobble (20%), organics (10%), small gravel (10%), large gravel (10%) and small boulder (10%). The organic matter within the substrate also seemed to contain wood chips. The remainder of the assessed area is comprised of similar substrate.

Riparian vegetation throughout the assessed area was comprised primarily of grass (90%) and shrubs (10%) with the exception of the coulee's confluence with the Oldman River, which was comprised of less riparian vegetation and a barren area (25%). The riparian vegetation is growing such that the channel, throughout the majority of the assessed area, is not easily visible, having been covered almost fully.

Approximately 220 m downstream of Range Road 164A, the channel is comprised of cascade and rapid habitat with fast flowing water (Photographs 7 to 11, Appendix C). The cascade and rapid habitat extend for approximately 5 m where riffle habitat becomes dominant to the confluence with the Oldman River (Photographs 12 to 13, Appendix C). A small step-pool with a depth of 0.8 m exists between these microhabitats (Photograph 14, Appendix C). It is likely that similar cascade and rapid habitat that is described above exists in the area that could not be assessed, given that the gradient (12%) recorded at the downstream end of the assessed area, visually appears to be maintained upstream (Photograph 15, Appendix C).

Table 4 describes the quality of habitat within the assessed area of the coulee. Overall, the coulee provides moderate habitat potential. Abundant overhead riparian vegetation may serve as suitable spawning surfaces for some cyprinids and northern pike. Spawning potential for salmonids is poor due to the limited amount of gravel substrates suitable for building redds as well as the high stream velocities. Spawning potential is more suitable for forage fish (i.e., cyprinids) that utilize aquatic vegetation for spawning and broadcast spawners given the presence of cobble substrate. Spawning potential for species that utilize flooded riparian vegetation (i.e., northern pike) is good. Ample overhead cover provides good opportunities for rearing although stream velocities may limit holding areas for smaller bodies fish. There is poor overwintering potential as the coulee is likely ephemeral and will freeze to bottom come winter. Velocity barriers might impede upstream movement of small-bodied fish but would not impede movement of large bodied species that have stronger swimming ability.

Table 4 Habitat Ratings for the Coulee Within the Assessed Area

Habitat	Quality Rating	Rationale
Spawning	Poor (redd-constructing salmonids) Moderate (sportfish, coarse, forage fish) Good (sportfish)	• No gravels suitable for salmonids • Substrate dominated by fines and cobbles • Coarse substrate for broadcast spawners • Limited woody debris for cyprinids • Abundant terrestrial vegetation along banks for species that would utilize flooded riparian vegetation (i.e., northern pike)
Rearing	Moderate (salmonids) Moderate (forage fish) Good (sportfish and coarse fish)	• Water temperatures may get too high for salmonids • Ample overhead cover provided by grasses and shrubs • Riparian vegetation supports abundant terrestrial invertebrate community • Primarily cascade/rapid habitat, velocities too fast to provide holding areas

Table 4 Habitat Ratings for the Coulee Within the Assessed Area

Habitat	Quality Rating	Rationale
Overwintering	None-poor	• Flow likely ephemeral and may freeze to bottom in winter • Insufficient depths in step-pools
Migration	Good (sportfish) Moderate (coarse fish) Poor (forage fish)	• Some barriers to upstream movement for coarse and small-bodied cyprinids

3.2.2.3 Taber Lake Inlet

A field assessment was completed by two Stantec QAES on September 15th, 2021 on Taber Lake at the lake inlet, to characterize existing fish and fish habitat conditions.

Taber Lake is a large waterbody which lies to the east of the Town of Taber. It is connected by the canal system to Horsefly Reservoir to the south. The inlet is located approximately 500 m to the north of 57 Avenue (Photograph 16 to 20, Appendix D). A 1,200 mm culvert conveys water beneath 57 Avenue (Photograph 21, Appendix D). Upstream of this culvert, habitat within the canal system is entirely deep run (R1) dominated by cobble and boulder substrate (Photographs 22, Appendix D). The banks are constructed at approximately 45 degrees and consists of cobbles. Downstream of the culvert, the banks are armored with cobble for approximately 20 m. The culvert may act as a barrier because it is perched with a drop of approximately 0.5 m in height. A deep pool (P1) exists on the left downstream bank immediately downstream of the culvert outlet with a depth greater than 1 m (Photograph 23, Appendix D). On the right downstream bank immediately below the culvert outlet, there is a reach of deep run (R1) habitat (Photograph 23, Appendix D) which transitions into slightly shallower run (R2).

At the mouth of the canal system into Taber Lake, the canal is approximately 22 m in width with depths greater than 1.3 m and is comprised entirely of wetland habitat; however, there is some visible flow because of the run habitat within the canal system. Immediately north of the inlet, depths averaged 0.6 m. Banks are more gently defined at the at the inlet; however, there is a defined thalweg from the canal system which is primarily run habitat (R2) habitat. Riparian vegetation at the proposed crossing is entirely wetland vegetation (100%) which consists of bulrush.

Table 5 describes the quality of habitat within the assessed area of the inlet to Taber Lake. Overall, the inlet to Taber Lake has moderate fish habitat potential. Spawning potential is more suitable for forage fish that utilize aquatic vegetation and small woody debris. Spawning potential for species that utilize flooded riparian vegetation (i.e., northern pike) is moderate. Moderate spawning potential exists for broadcast spawners given only a small section of gravel substrate exists within the canal system. Good rearing habitat potential exists with sufficient cover afforded by aquatic vegetation. Flow year round through the winter and suitable depths provide good overwintering for all life stages of fish. Migration is unimpeded within the lake itself, however several manmade structures (i.e., culverts/spillways) exists which may impede the movement of smaller-bodied fish (cyprinids) out of Taber Lake.

Table 5 Habitat Ratings for Taber Lake Inlet Within the Assessed Area

Habitat	Quality Rating	Rationale
Spawning	Poor (salmonids) Moderate (sportfish/coarse fish) Moderate (forage)	• Velocities not suitable and lack of gravel substrate for salmonids • Coarse substrate for broadcast spawners (i.e., walleye, whitefish) is minimal at crossing location • Riparian vegetation when flooded could be suitable for species that utilize flooded vegetation (e.g., northern pike) • Some woody debris within lake body for cyprinids • Abundant aquatic vegetation (cyprinids)
Rearing	Good	• Substrate complexity supports invertebrate population • Some instream woody debris • Abundant aquatic vegetation • Abundant cover afforded by aquatic and wetland vegetation (i.e., bulrush)
Overwintering	Good	• Suitable depths year-round
Migration	Moderate/good	• Migration may be impeded into the main lake body • Migration impeded at lake inlet and outlet by control structures

3.2.2.4 Taber Lake Outlet

A field assessment was completed by two Stantec QAES on September 13, 2021 on Taber Lake at the outlet to characterize existing fish and fish habitat conditions.

The outlet of Taber Lake is approximately 380 m south of Township Road 102 and has a width of approximately 104 m (Appendix E). An isolation barrier, approximately 140 m in perimeter, has been constructed across the outlet of Taber Lake separating Taber Lake and the canal system to the north of the lake. The barrier is comprised of a gabion wall which makes up a large proportion of the isolation barrier and is approximately 1.1 m in width (Photograph 24, Appendix E). The gabion wall is connected to a short section of barrier on the eastern side of the perimeter, constructed from solid plastic and is supported by buoys (Photograph 25, Appendix E). It is unknown whether this isolation barrier creates a permanent barrier to fish movement. The outlet is located behind the isolation barrier, where the canal system joins the lake. Approximately 280 m downstream of the outlet is a control structure (Photographs 26 and 27, Appendix E). The outlet structure presents a 1 m height change, from upstream of the structure to downstream, which could serve as a barrier to fish passage, and it is not known if fish exclusion measures are present as part of the outlet structure. Both banks have been armored with rip rap upstream of the control structure for approximately 8 m. Downstream of the control structure, the riprap extends down for approximately 30 m on the left downstream bank whilst extending down for approximately 60 m on the right downstream bank.

The right downstream bank at the outlet consists of wetland habitat and the left downstream bank partially consists of wetland habitat and cleared farmland. Cattle activity has impacted a significant portion of the left downstream bank below the outlet. Riparian vegetation at the outlet was primarily wetland (i.e., bulrush), although a large portion of the left downstream bank was grazed by cattle leaving it partially bare and grass covered.

The channel at the outlet consists entirely of flat habitat (Photographs 28-31, Appendix E). Substrate at the outlet is comprised of fines (80%) and organics (20%). Downstream of the outlet to the control structure, habitat was comprised of a deep pool (P1) with a maximum depth of approximately 2.2 m (Photograph 32, Appendix E). Immediately below the control structure the substrate becomes coarser, with less fines and more cobble and boulder, potentially due to the bank armoring (Photograph 33, Appendix E). Below the control structure habitat transitions to run habitat (R1 and R3) because of increased flow (Photograph 34, Appendix E).

Table 6 describes the quality of habitat within the assessment area of the outlet of Taber Lake. Overall, the outlet of Taber Lake has moderate habitat within the assessment area. There is moderate spawning habitat for forage fish that utilize aquatic vegetation and small woody debris. Spawning potential for species that utilize flooded riparian vegetation (i.e., northern pike) is moderate. Poor spawning potential exists for sport fish requiring gravel substrate. Good rearing habitat potential exists with sufficient cover afforded by aquatic vegetation. Flow year round through the winter and suitable depths provide good overwintering for all stages of fish. Migration may be impeded by several man-made control structures.

Table 6 Habitat Ratings for Taber Lake Outlet Within the Assessed Area

Habitat	Quality Rating	Rationale
Spawning	Poor (salmonids) Poor/moderate (sportfish/coarse fish) Moderate (forage)	• Velocities not suitable and lack of gravel substrate for salmonids • Coarse substrate for broadcast spawners (i.e., walleye, whitefish) is minimal at crossing location • Riparian vegetation when flooded could be suitable for species that utilize flooded vegetation (e.g., northern pike) • Some woody debris within lake body for cyprinids • Abundant aquatic vegetation (cyprinids)
Rearing	Good	• Substrate complexity supports invertebrate population • Some instream woody debris • Abundant aquatic vegetation • Abundant cover afforded by aquatic and wetland vegetation (i.e., bulrush)
Overwintering	Good	• Suitable depths year-round
Migration	None-poor	• Migration may be impeded into the main lake body • Migration impeded at lake inlet and outlet by control structures

3.2.2.5 Horsefly Reservoir Inlet

A field assessment was completed by two Stantec QAES on September 14, 2021 on Horsefly Reservoir at the inlet on the east end of the reservoir, to characterize existing fish and fish habitat conditions.

At the inlet to the reservoir, the channel is approximately 60 m wide and is predominantly lake and wetland habitat (Appendix F). Approximately 1.74 km upstream of the inlet lies a spillway approximately 4 m in height and is a barrier to fish movement upstream (Photograph 35, Appendix F). Upstream of the spillway, there is a deep pool (P1) with banks that have been armored with cobble and covered with terrestrial grasses (Photograph 36, Appendix F). Downstream of the spillway, the banks have been armored with small and large boulder for a reach of approximately 55 m (Photograph 37, Appendix F). Deep pools (P1) exist on both side of the spillway structure while the thalweg is comprised of deep run (R2) habitat (Photograph 38, Appendix F). This run habitat extends down the canal to the reservoir inlet. The section of canal between the spillway and the reservoir inlet primarily consists of one main channel; however, there is a short section that is braided.

The inlet area consists entirely of wetland habitat with no discernible banks (Photographs 39-43, Appendix F). The wetland area transitions to a channel which is connected to the canal system. Throughout this area, the banks are more defined; however, definition is intermittent. Riparian vegetation transitioned at the inlet from wetland vegetation (100%) (i.e., bulrush) downstream, to primarily grass (70%) and shrubs (25%) and bulrush (5%) upstream where the channel was more defined. Substrate consisted entirely of fines (100%) although upstream within the canal system and more defined channel, cobble and small boulder substrate was found. Depths across the mouth of the inlet were consistent and averaged 0.4 m. A thalweg was apparent on the north side of the channel and had a maximum depth of 0.6 m.

Table 7 describes the quality of habitat within the assessment area of the inlet of Horsefly Reservoir. Overall, the inlet of Horsefly Reservoir has moderate habitat within the assessment area. Spawning potential is more suitable for forage fish that utilize aquatic vegetation and small woody debris and for species that utilize flooded riparian vegetation (i.e., northern pike). Moderate spawning potential exists for broadcast spawners given only a short section of gravel substrate exists within the canal system. Good rearing habitat potential exists with sufficient cover afforded by aquatic vegetation. Flow year round through the winter and suitable depths provide good overwintering for all stages of fish. Migration is unimpeded within the lake itself, however the spillway upstream of the inlet impedes the movement of all fish species upstream.

Table 7 Habitat Ratings for Horsefly Reservoir Inlet Within the Assessed Area

Habitat	Quality Rating	Rationale
Spawning	Poor (salmonids) Moderate-good (sportfish/coarse fish) Moderate (forage)	• Velocities not suitable and lack of gravel substrate for salmonids) • Coarse substrates for broadcast spawners (i.e., walleye, whitefish) is minimal • Riparian vegetation when flooded could be suitable for species that utilize flooded vegetation (e.g., northern pike) • Some woody debris within lake body for cyprinids • Abundant aquatic vegetation (cyprinids)
Rearing	Good	• Substrate complexity supports invertebrate population • Some instream woody debris • Abundant aquatic vegetation • Abundant cover afforded by aquatic and wetland vegetation (i.e., bulrush)
Overwintering	Good	• Suitable depths year-round
Migration	Moderate	• Migration unimpeded within the lake body • Migration impeded at lake inlet and outlet by control structures

3.2.2.6 Horsefly Reservoir Outlet

A field assessment was completed by two Stantec QAES on September 14, 2021 on Horsefly Reservoir at the outlet to characterize existing fish and fish habitat conditions.

The outlet of Horsefly Reservoir is located approximately 70 m south of Township Road 94 and is comprised predominantly of wetland (80%) and run (20%) habitat (Appendix G). The channel is approximately 26 m with a maximum depth of approximately 1.4 m. A 4,400 mm culvert conveys water beneath Township Road 94 (Photographs 44 to 45, Appendix G).

The banks are well vegetated with grass (90%) and shrubs (10%) on the right downstream bank and grass (50%), wetland vegetation (40%), and shrubs (10%) on the left downstream bank at the proposed outlet upgrade. Some mature trees were present at the top of each bank. Downstream of the culvert, the banks were more sparsely vegetated with grass (Photograph 51, Appendix G). Substrate consists of fines (90%), cobble (5%) and small boulder (5%). The remainder of the assessed area was comprised of similar substrate.

At the outlet, the channel is comprised predominantly of wetland habitat (80%) and deep run habitat (20%) (Photographs 46 to 51, Appendix G). The wetland habitat gradually transitions into a deep run before entering the culvert beneath Township Road 94 (Photograph 47, Appendix G). Downstream of the



culvert, the canal system is entirely deep run (R1) habitat with primarily fine (80%) and cobble (20%) substrate (Photograph 51, Appendix G). The banks are constructed at 45 degrees and have been armored with cobble and large gravel (Photograph 51, Appendix G).

Table 8 describes the quality of habitat within the assessment area of Horsefly Reservoir outlet. Overall, the outlet of Horsefly Reservoir has moderate habitat within the assessment area. Spawning potential for salmonids is poor. Spawning potential is more suitable for forage fish that utilize aquatic vegetation and small woody debris and for species that utilize flooded riparian vegetation (i.e., northern pike). Moderate spawning potential exists for broadcast spawners given only a short section of gravel substrate exists within the canal system. Good rearing habitat potential exists with sufficient cover afforded by aquatic vegetation and overhead cover afforded by grass and shrubs/trees. Flow year round through the winter and suitable depths provide good overwintering for all stages of fish. Migration is unimpeded within the reservoir itself, however the manmade structure below the outlet may impede the movement of all fish species upstream or downstream of the manmade structure.

Table 8 Habitat Ratings for Horsefly Reservoir Outlet Within the Assessed Area

Habitat	Quality Rating	Rationale
Spawning	Poor (salmonids) Moderate-good (sportfish/coarse fish) Moderate (forage)	• Velocities not suitable and lack of gravel substrate for salmonids • Coarse substrate for broadcast spawners (i.e., walleye, whitefish) is minimal • Riparian vegetation when flooded could be suitable for species that utilize flooded vegetation (e.g., northern pike) • Some woody debris within lake body for cyprinids • Abundant aquatic vegetation (cyprinids)
Rearing	Good	• Substrate complexity supports invertebrate population • Some instream woody debris • Abundant aquatic vegetation • Abundant cover afforded by aquatic and wetland vegetation (i.e., bulrush)
Overwintering	Good	• Suitable depths year-round
Migration	Good	• Migration unimpeded within the lake body • Migration upstream impeded by control structures downstream of lake outlet

3.2.2.7 Canal System

The canal system connecting Horsefly Reservoir and Taber Lake is generally a slow-moving run but also consist of flat and pool habitat (Photographs 52 to 56, Appendix H). Substrate was primarily fines with a mix of cobble and large gravels. Coarse substrate was generally embedded within the fine materials. Banks were armored with cobble and small boulders, constructed at 45 degrees, and vegetated primarily with terrestrial grass and shrubs affording good overhead cover. They contained abundant instream aquatic vegetation providing excellent cover opportunities for fish.

There are multiple barriers which may potentially impede fish passage. These barriers are a series of stepped spillways positioned throughout the length of the canal system and range in height from 0.6 m to 1 m (Photograph 57, Appendix H). The majority of these barriers are found in the canal system linking Horsefly Reservoir with Taber Lake; however, there are also several present downstream of Taber Lake.

Table 9 describes the quality of the habitat within the canal system connecting Horsefly Reservoir and Taber Lake to the Oldman River. Overall, the canal system affords moderate-good habitat potential. Spawning habitat potential is poor for salmonid species requiring a mix of small and large gravel substrate and suitable velocities. Spawning potential is more suitable for forage fish that utilize aquatic vegetation and small woody debris and for species that utilize flooded riparian vegetation (i.e., northern pike). Moderate spawning potential exists for broadcast spawners given larger substrate does exist within the canal system. Good rearing habitat potential exists for all fish with excellent instream and overhead cover afforded by aquatic vegetation and grass and shrubs/trees respectively. Shallow areas may freeze during winter months but depending on the flow there may be holding areas with suitable depths available. Fish migration upstream and downstream is impeded by numerous control structures throughout the canal system.

Table 9 Habitat Ratings Within the Canal System

Habitat	Quality Rating	Rationale
Spawning	None-poor (salmonids) Moderate (coarse/sportfish) Good (forage fish)	• Velocities may be too slow for salmonids • No suitable gravels for salmonids • Coarse substrates present for broadcast spawners although embedded in fine substrate • Instream aquatic vegetation and small woody debris suitable for cyprinids • Riparian vegetation abundant for species that utilize flooded vegetation (i.e., northern pike)

Table 9 Habitat Ratings Within the Canal System

Habitat	Quality Rating	Rationale
Rearing	Good	• Substrate complexity supports benthic invertebrate populations • Cover afforded by through aquatic vegetation, overhanging grass/shrubs • Terrestrial input from overhanging grass/shrubs • Low velocity areas
Overwintering	Poor-moderate	• Shallow areas may freeze to bottom • Suitable depths may be present in scour pools
Migration	None-poor	• Upstream movement impeded by stepped spillway structures

4.0 REGULATORY CONTEXT

4.1 ALBERTA *WATER ACT*

The Alberta *Water Act* applies to work undertaken in and around Alberta waterbodies that have the potential to affect the aquatic environment. The purpose of the Alberta *Water Act* is to manage Alberta's water resources, balancing Alberta's economic and social needs while sustaining and conserving Alberta's aquatic environments.

The Project requires review under the Alberta *Water Act* as an activity that "…*may cause or may become capable of causing an effect on the aquatic environment*" (Part 1(1) of the *Water Act*). The *Water Act* specifies certain design requirements for instream structures and includes consideration for the aquatic environment. There is not a Code of Practice that encompasses the work proposed for the Project; however, standard industry practices include implementing the recommendations of a QAES during activities, monitoring instream work, and working outside of the RAP of the watercourse.

4.2 *FISHERIES ACT*

The mandate of the *Fisheries Act* is to provide for the protection of all life stages and species of fish and their habitat (including benthic invertebrates). The *Fisheries Act* includes a prohibition against causing harmful alteration, disruption or destruction (HADD) of fish habitat (Section 25 of the Act, death of fish by means other than fishing (Section 34.4(1) of the Act), provisions for flow and passage (Section 34.3 of the Act), and the introduction of a deleterious substance (Section 36 of the Act) and a framework for regulatory decision-making (Section 34.1 of the Act).

The *Fisheries Act* requires that projects avoid activities that result in a non-compliance of the *Fisheries Act*, unless Authorized by the Minister of DFO. Projects with the potential to obstruct fish passage, modify flow, result in entrapment of fish, or introduce a deleterious substance may also result in a HADD of fish habitat or death of fish. Where an activity that will result in a non-compliance of the *Fisheries Act* cannot be avoided or mitigated, an Authorization under Paragraph 35(2)(b) of the *Fisheries Act* is required. The Fisheries Protection Program, administered by DFO, is responsible for the review of projects to determine if a non-compliance is likely to occur and an Authorization required.

4.3 *CANADIAN NAVIGABLE WATERS ACT*

The *Canadian Navigable Waters Act* (CNWA) applies to waterbodies in Canada that may be used for navigation purposes in order to preserve the right to navigation on Canada's waterbodies. All navigable waters are considered under the CNWA, these include scheduled and unscheduled waters. The minister of Transport has the authority to regulate obstructions on all navigable waters and review works on navigable waters. In addition, the Act requires owners to engage in a public notification period prior to the works beginning.



5.0 SUMMARY

This report documents existing fish and fish habitat conditions within the Oldman River at the confluence with the coulee, the coulee, and the inlets and outlets to Taber Lake and Horsefly Reservoir. Once the design and construction work plans are complete, a QAES assessment will be completed and is intended to support regulatory applications.

6.0 REFERENCES

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APPENDICES

HORSEFLY REGIONAL EMERGENCY SPILLWAY PROJECT
FISH AND FISH HABITAT TECHNICAL REPORT

Appendix A FISH AND FISH HABITAT SUMMARY DATA SHEETS AND HABITAT CODES

The following habitat descriptions and codes, used in the summary data sheet that follows, have been adapted from Alberta Transportation (2001) and RIC (2001).

Table A.1 Substrate Classifications for Stream Bed and Banks

Code	Substrate	Size Range
O	organics	NA
F	fines	<2 mm
SG	small gravel	2-16 mm
LG	large gravel	17-64 mm
C	cobble	65-256 mm
BL	boulder	>256 mm
BD	bedrock	N/A

Table A.2 Embeddedness

Code	Class	Description
N	non-embedded	All rock substrates (i.e., gravel, cobble, boulders), or the absence of rock substrates
L	low embeddedness	<25% embedded
M	medium embeddedness	25-50% embedded
H	high embeddedness	51-75% embedded
VH	very high embeddedness	>75% embedded

Table A.3 Bank Stability

Code	Description
S	Stable (lack of erosion or slumping, banks stabilized by rooted vegetation)
MS	Moderately stable (undercutting or minor slumping occurring, however, rooted vegetation is holding most of the bank material together)
US	Unstable (banks are eroded or currently slumping, rooted vegetation, if present, is likely not able to maintain current bank slope)

Table A.4 Riparian Vegetation

Code	Description
N	none
G	grass
S	shrub
C	coniferous
D	deciduous forest
M	mixed coniferous and deciduous forest
W	wetland (e.g., muskeg, marsh, swamp, or bog)

Table A.5 Instream and Overhead Cover Types

Code	Subtype	Description
Aquatic vegetation		
AV	EM	emergent
	FL	floating leafed
	SB	submergent
	FF	free floating
	FA	filamentous algae
	MA	macrophytic algae
BL		boulders
DC		depth or clarity (turbid) of water
Overhanging Vegetation		
OV	GF	grasses/forbs
	TS	trees/shrubs
UC		undercut bank
WD		woody debris

Table A.6 Stream Channel Pattern

Code	Description
ST	straight
SI	sinuous
IR	irregular, wandering
IM	irregular, meandering
ME	regular meanders
TM	torturous meander

Table A.7 Channel Islands

Code	Type	Description
N	none	No islands in channel
O	occasional	No overlapping islands, average spacing less than 10 channel widths
I	infrequent	Infrequent overlapping, average spacing less than 10 channel widths
F	frequent	Not overlapping, average spacing less than 10 channel widths
S	split	Islands overlap frequently or continuously, usually two or three flow branches
AN	anatomizing	Continuously overlapped islands, with multiple flow branches

Table A.8 Sediment Bars

Code	Type	Description
N	none	No bars present
SD	side bar/point bar	Sediment deposition intermittent along the sides of the stream
DG	diagonal bar	Mid-stream sediment deposition diagonally aligned to stream axis
MD	mid-channel bar	Mid-stream deposition aligned parallel to stream axis
SP	span	Sediment deposition continuous along the sides of the stream
BR	braided	Sediment deposition forms a number of small channels separated by bars

Table A.9 Coupling

Code	Type	Description
DC	decoupled	Sediment mobilized on the hill slope by a land-slide normally would not enter the stream channel
PC	partially coupled	A portion of the sediment mobilized on the hill slope by a landslide enters the stream channel
CO	coupled	Sediment mobilized on the hill slope by landslide activity directly enters the stream channel

Table A.10 Confinement

Code	Type	Description
EN	entrenched	Entrenched channels are confined by fluvial eroded gullies or valleys or bedrock walls
CO	confined	Confined channels are prevented or restricted from lateral migration by the valley walls
FC	frequently confined	Frequently confined channels are restricted from lateral migration by the valley walls, but are able to store sediments on a valley flat (typically < channel width)
OC	occasionally confined	Occasionally confined channels are able to store sediments on a valley flat (typically 1-10 channel widths)
UN	unconfined	Unconfined channels are not restricted from lateral migration by the valley walls
N/A	not applicable	Confinement is not always applicable to every stream reach, such as a channel flowing across a fan or cone onto a valley flat

Table A.11 Flow Stage

Type	Description
Dry	Water not present
Pooled	Water only present as unconnected pools or standing in bottom depressions, no flow
Low	Water flowing as threads within the channel, most bed material is exposed and little of the lower banks are wet
Moderate	Water flowing throughout the normal bed and in contact with the lower portions of banks, some bars are exposed
High	Water fills most of the channel and is in contact with the middle and upper portions of banks
Flood	Water is bankfull or over banks and into the floodplain

Table A.12 Habitat Unit Classification for Small Streams

Habitat Unit	Class	Code	Description
Falls		FA	Highly turbulent whitewater caused by water free-falling over a vertical drop. Falls formed from a full spanning flow obstruction, often bedrock. Slope < 100%.
Cascade		CA	Series of small falls or steps and pools, stepped longitudinal profile. Substrate of bedrock or boulder accumulations. Highly turbulent, high velocity, > 7% slope, mainly whitewater.
Rapid		RA	Steps and pocket pools common, cobble/boulder substrate with some exposed boulders at lower flows. Considerable turbulence, some whitewater, fast velocity (> 0.5 m/s), 4-7% slope.
Chute		CH	Area of channel constriction, usually due to bedrock intrusions, associated with channel deepening and increased velocity.
Riffle		RF	Partially to totally submerged pebble to cobble substrate, causing moderate turbulence and ripples, little to no whitewater (some whitewater at points of constriction), moderate velocity (0.2-0.5 m/s), usually < 0.5 m depth, 1-4% slope.
Run			Runs are typically deep, slow to swift flowing sections (> 0.2 m/s), with gravel to boulder substrate. Defined thalweg, moderate slope and with no surface turbulence. Run units are differentiated into three classes, based on depth.
	1	R1	Deepest run (> 1 m), slow to fast water velocity, coarse substrate (cobble to boulder), high instream cover from substrate and depth.
	2	R2	Moderate depth (0.6-1.0 m), slow to fast water velocity, coarse substrate (cobble to boulder), moderate instream cover from substrate and depth.
	3	R3	Shallowest depth (0.3-0.6 m), slow to fast water velocity, coarse substrate (gravel to cobble), low instream cover.
Glide		GL	Glides are shallow (< 0.3 m deep), wide, slow flowing (< 0.2 m/s), non-turbulent and lack a defined thalweg. Substrate is usually silt/sand but may sometimes consist of gravel to small cobble. Featureless with low instream cover.
Flat		FL	Area characterized by low velocity and near-uniform flow, differentiated from pool habitat by high channel uniformity, more depositional than R3 habitat.
Sheet		ST	Shallow water reach that flows uniformly over smooth bedrock. Non-turbulent.
Pool			Pools are deeper and wider than channel units immediately above or below it and are usually formed by the scouring or plunging action of water. Sub-surface velocities are slow although water surface may be fast. Substrate usually composed of fines or small gravel.
	1	P1	High quality pool habitat based on depth and size. High instream cover from instream features (i.e., logs/boulders) and depth (> 1.2 m) provides overwintering habitat.
	2	P2	Shallower than P1 (0.6-1.2 m deep), moderate to high instream cover, not suitable for overwintering but provides juvenile and adult fish rearing habitat during open water.
	3	P3	Shallow (< 0.6 m deep) and small, low instream cover. Not suitable for overwintering or adult holding habitat but may provide rearing habitat for juvenile fish during open water.

Table A.12 Habitat Unit Classification for Small Streams

Habitat Unit	Class	Code	Description
Step pool		SP	Series of pools separated by short riffles or cascades. Generally found in high gradient, confined mountain streams dominated by boulder substrate. The length of the turbulent water cannot exceed the mean wetted width, otherwise, classify the pools and turbulent water separately.
Impoundment			Includes pools and impoundments formed behind complete or nearly complete channel blockage. Four types of dams are: beaver, debris, landslide, or weir (man-made). Dams tend to accumulate more sediment/organic debris than scour pools. Identify as class 1, 2 or 3 using pool criteria.
	1	IP1	> 1.2 m deep
	2	IP2	0.6-1.2 m deep
	3	IP3	< 0.6 m deep
Dam	beaver	BD	Structures causing complete or nearly complete channel blockage. Three types of dams are: beaver, debris (including landslides), and man-made (including weirs). Dams tend to accumulate more sediment/organic debris than scour pools.
	debris	DD	
	man-made	MD	
Backwater		BW	Shallow pool habitat found along channel margins, caused by eddy scour (exhibits reverse flow direction) around a boulder, root wad, or log obstruction. Substrate is typically small (silt to small cobble) and the velocity slower than the main channel.
Snye		SN	Discrete section of non-flowing water connected to a flowing channel only at its downstream end, generally formed in a side channel or behind a peninsula.
Boulder garden		BG	Substantial occurrence of large boulders providing significant instream cover, always in association with an overall channel unit such as a riffle (RF/BG) or run (e.g., R1/BG).
Swale		SW	Round bottomed drainage, has connectivity upstream and downstream with little to no flow. Bank heights and channel width poorly defined or absent. Large amounts of vegetation sometimes present.
Marshy flat		MF	Wetland-like habitat with connectivity upstream and downstream. Water movement present within habitat unit but to a lesser degree than a swale. Can have high amounts of vegetation such as *Carex* spp and cattails.
Wetland		WL	With respect to fish and fish habitat: no connectivity upstream or downstream. Does not contribute to a fishery.
Dugout		DU	Artificial water body with no connectivity upstream or downstream. Does not contribute to a fishery.
Dry		DR	Area within a watercourse that is dry at the time of assessment.

Appendix B SITE PHOTOGRAPHS OLDMAN RIVER

Photograph 1 **Facing left downstream bank at beaver dam.**



Photograph 2 **Facing upstream at centreline (confluence with coulee) on right downstream bank.**



Photograph 3 **Facing downstream at centreline (confluence with coulee) from right downstream bank.**



Photograph 4 **Facing left downstream bank at centreline (confluence with coulee).**



Photograph 5 **Facing right downstream bank at confluence of coulee with Oldman River.**



Photograph 6 **Facing downstream from right downstream bank at the confluence of the coulee with the Oldman River. Substrate delineation is visible at this location.**



Appendix B Site Photographs Oldman River
December 2021

Appendix C SITE PHOTOGRAPHS COULEE

Photograph 7 Facing upstream within cascade habitat.



Photograph 8 Facing downstream within cascade habitat.



Photograph 9 Left downstream bank within cascade habitat.



Photograph 10 Right downstream bank within cascade habitat.



Photograph 11 Substrate within cascade habitat.



Photograph 12 Facing downstream within riffle habitat at confluence of coulee with Oldman River.



Photograph 13 Facing right downstream bank of Oldman River at confluence with coulee.



Photograph 14 Facing upstream at a step-pool.



Photograph 15 Facing upstream toward top of slope.



Appendix C Site Photographs Coulee
December 2021

Appendix D SITE PHOTOGRAPHS TABER LAKE INLET

Photograph 16 Facing upstream toward canal system.



Photograph 17 Facing north toward Taber Lake.



Photograph 18 Facing west at Taber Lake inlet.



Photograph 19 Facing east at inlet to Taber Lake.



Photograph 20 Substrate at inlet to Taber Lake.



Photograph 21 Facing upstream to culvert outlet which may be a potential fish migration barrier.



Photograph 22 Facing upstream from culvert crossing.



Photograph 23 Facing downstream of culvert. Left downstream bank is comprised of a deep pool with deep and moderate run along right downstream bank.



Appendix E SITE PHOTOGRAPHS TABER LAKE OUTLET

Photograph 24 Isolation barrier at outlet of Taber Lake comprised of a gabion wall.



Photograph 25 Plastic potion of the isolation barrier and location; here it is connected to the gabion wall.



Photograph 26 Facing upstream from canal system toward control structure.



Photograph 27 Facing downstream from Taber Lake toward control structure.



Photograph 28 Facing north, toward canal system from outlet of Taber Lake.



Photograph 29 Facing east at outlet of Taber Lake.



Photograph 30 Facing south across Taber Lake at outlet. Isolation barrier visible.



Photograph 31 Facing west at proposed outlet showing gabion wall portion of isolation barrier.



Photograph 32 Deep pool downstream of control structure.



Photograph 33 Armoring along banks downstream of control structure.



Photograph 34 Deep run downstream of control structure within the canal system.



Appendix F SITE PHOTOGRAPHS HORSEFLY RESERVOIR INLET

Photograph 35 Facing upstream to spillway toward canal system from lake inlet.



Photograph 36 Deep pool habitat upstream of spillway within canal system.



Photograph 37 Bank armouring downstream of spillway.



Photograph 38 Facing downstream from spillway toward lake showing deep pool and deep run habitat.



Photograph 39 Facing east, toward canal system.



Photograph 40 Facing west into Horsefly Reservoir from inlet.



Photograph 41 Facing south from inlet.



Photograph 42 Facing north from inlet.



Photograph 43 Substrate at inlet of Horsefly Reservoir.



Appendix F Site Photographs Horsefly Reservoir Inlet
December 2021

Appendix G SITE PHOTOGRAPHS HORSEFLY RESERVOIR OUTLET

Photograph 44 Facing upstream at culvert crossing toward Horsefly Reservoir Outlet.



Photograph 45 Facing downstream at culvert crossing toward canal system.



Photograph 46 Facing south toward Horsefly Reservoir from outlet.



Photograph 47 Facing north toward culvert crossing from outlet.



Photograph 48 Left downstream bank at outlet.



Photograph 49 Right downstream bank at outlet.



Photograph 50 Substrate at outlet.



Photograph 51 Facing downstream of culvert crossing showing deep run habitat.



Appendix H SITE PHOTOGRAPHS CANAL SYSTEM

Photograph 52 Typical habitat within canal system. Facing upstream.



Photograph 53 Typical habitat within canal system. Facing downstream.



Photograph 54 **Typical bank (left downstream bank) and riparian vegetation within canal system.**



Photograph 55 **Typical bank (right downstream bank) and riparian vegetation within canal system.**



Photograph 56 Typical substrate within canal system.



Photograph 57 Typical stepped spillway barrier within canal system.





APPENDIX H

Greenhouse Gas and Climate Change Reports

H1

Greenhouse Gas Mitigation Assessment

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March 27, 2020

Jeff Hust
MPE Engineering
#300, 714 – 5 Avenue S
Lethbridge, Alberta
Email: jhust@mpe.ca

Re: MPE Engineering LTD. – Horsefly Spillway - Greenhouse Gas Mitigation Assessment
RWDI Reference No. 2002604

Dear Mr. Hust,

MPE Engineering Ltd. and the Southern Regional Drainage Committeeretained RWDI AIR Inc. to provide a greenhouse gas (GHG) mitigation assessment for the Horsefly Spillway Project located near Taber, Alberta. The subject of the assessment was the expected total annual direct and indirect greenhouse gas emissions for each year from the starting year of the Project to both the end of its useful life, and to 2030. The report was prepared in accordance with Climate Lens, General Guidance, Version 1.2, September 6, 2019.

We trust that the information provided in this report meets your requirements for your funding through Investing in Canada Infrastructure Program (ICIP). Should you have any questions, please contact me directly by telephone at (403) 619-3480, or by email at Matthew.Endsin@rwdi.com. We appreciate the opportunity to have worked with you on this assessment.

Yours very truly,

RWDI AIR Inc.



Matthew Endsin, M.Sc., P.Biol.
Project Manager

BEST MANAGED COMPANIES Platinum member

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FINAL REPORT

MUNICIPAL DISTRICT OF TABER – HORSEFLY REGIONAL EMERGENCY SPILLWAY

TABER, ALBERTA

DISASTER MITIGATION AND ADAPTATION FUND
GREENHOUSE GAS MITIGATION ASSESSMENT

RWDI #2002604

MARCH 27, 2020

SUBMITTED TO

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Water Resources Manager | MPE Engineering Ltd.
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ATTESTATION OF COMPLETENESS

I/we the undersigned attest that this GHG Mitigation Assessment was undertaken using recognized assessment tools and approaches (i.e., ISO 14064-2: Specification with guidance at the project level for quantification, monitoring, and reporting of greenhouse gas emissions reductions or removal enhancements and complies with the General Guidance and any relevant sector-specific technical guidance issued by Infrastructure Canada for use under the Climate Lens.

Prepared by: Joyce Funk, P.Eng., M.Sc.
[Name and credentials]



[Signature] March 27, 2020 [Date]

Attested by*: Russ Lewis, M.Eng., P.Eng..
[Name and credentials]



[Signature] March 27, 2020 [Date]

*GHG Mitigation Assessments must be prepared, or at a minimum validated by, a qualified party (e.g., a licensed professional engineer **or** a professional GHG accounting specialist certified under the ISO 14064-3 or 14065 standard).

Document Control for Report Template

CLIMATE LENS MITIGATION ASSESSMENT					
RWDI AIR INC. VVP	DOCUMENT CODE:	TEMPLATE ISSUED:	VERSION:	VERSION ISSUED:	PAGE:
	JOB-FRM-026	2019-10-09	1.0	2019-10-09	n/a

Statement of Limitations

The contents of this report are strictly confidential and are intended solely for the use of the MPE Engineering Ltd. ("the Client") and Municipal District of Taber in connection with the assessment of the greenhouse gas emissions of the Project (as defined herein) during the specified periods and may not be relied upon by any other person or entity for any other purpose whatsoever, without the prior written consent of RWDI AIR Inc. ("RWDI"). This Report is given as of the date hereof, and RWDI disclaims any obligation or undertaking to advise any person of any change in fact or applicable law which may come to our attention after the date hereof.

This Report includes calculations of direct and indirect emissions for Project components that are not yet under construction using limited data provided by the Client. While we have used accepted methodology to limit the number of uncertainties as much as possible in accordance with the Climate Lens General Guidance, ISO 14064-2, and other applicable documents, there are an infinite number of combinations of changes in environmental conditions, regulations, new scientific insights and technologies, and other factors that can occur which can have an impact on GHG emissions; as such, no study or investigation is capable of predicting with full certainty the exact amount of GHG emissions in any given future project.

In relying on the contents of this Report it is understood that the reader does so with complete knowledge and approval of its limitations.

EXECUTIVE SUMMARY

The Horsefly Regional Emergency Spillway project (the Project) is a proposed strategically placed regional emergency spillway to the Oldman River from the St. Mary River Irrigation District (SMRID). The proposed spillway project is 14 km long and located near the midway point of the SMRID Main Canal system to divert water from the SMRID Main Canal and transport via Taber Irrigation District (TID) works to the Oldman River near the Town of Taber, Alberta with an estimated project cost of approximately $47 million. As proposed, the spillway would allow additional drainage to be conveyed in the irrigation system that by its inherent design has less capacity in the downstream portions of the system.

The Municipal District (MD) of Taber has applied for funding through the Green Infrastructure stream of the Investing in Canada Infrastructure Program (ICIP) for the Horsefly Regional Emergency Spillway (the Project). The funding has been approved, however, before the release of funding a Climate Lens assessment is required to be completed. To satisfy this requirement, MPE Engineering has requested RWDI to complete the assessment, including this greenhouse gas (GHG) mitigation assessment. The major components of the proposed Project include the following components:

- Upgrades to the Horsefly turnout on the SMRID main canal.
- Upgrades to 3,500 meters of irrigation canal between the SMRID main canal and Horsefly Reservoir.
- Upgrades to 5,000 meters of irrigation canal between Horsefly Reservoir and Taber Lake.
- Upgrades to 5,500 meters of irrigation canal and drainage ditch between Taber Lake and the Oldman River.
- Upgrades to the existing crossings at Highway 3 and Highway 36.
- Upgrades to the existing Canadian Pacific Rail (CPR) crossing.
- Upgrades to the existing MD of Taber road crossings.
- Construction of 7 concrete drop structures.
- Construction of a concrete spillway outlet structure to the Oldman River.
- Construction of wetlands at Horsefly Reservoir and Taber Lake to improve water quality.
- Automation and controls to monitor flow through the proposed works.

The current operation (baseline) and maintenance activities for the future Horsefly Spillway project are assumed to produce zero baseline emissions. Similarly, the Project emissions are also assumed to exhibit zero emissions for the operation and maintenance activities. There were no confirmed pumps or other equipment that consumed power or fuel for the baseline, project operation, and maintenance emissions. The expected lifespan of the new Project is assumed to be 100 years; therefore, the Project lifespan inclusive of construction is assumed to be 105 years from the start of construction of the Project to the end of the lifespan of the constructed Project in 2126 (estimated in 2026 plus 100 years). The construction phase of the Project is anticipated to occur from September 2021 until approximately April 2025. Thus, the first full year with the Project fully implemented will be 2026.

1 The Total Project cost-per-tonne of CO_2e is based on total Project cost provided by MPE Engineering divided by the project total net change in emissions. Note the Project cost is subject to change and is not a finalized cost estimate.

Cumulative emissions of the baseline scenario are predicted to be 0 tonnes of CO_2e over 105 years. Greenhouse gas emission sources and sinks associated with the Project considered construction activities and operation and maintenance activities. Annual Project emissions in 2030 are predicted to be 0 tonnes CO_2e as all construction will be completed. The cumulative emissions of the Project scenario are predicted to be 5,625 tonnes of CO_2e over 105 years. Annual net increase in emissions between the baseline and Project emissions is predicted to be 0 tonnes of CO_2e in 2030. The net increase in cumulative emissions of the Project is predicted to be 5,625 tonnes of CO_2e over 105 years.

Based on the Project budget supplied by MPE Engineering, the total project cost-per-tonne of CO_2e *increase*[1] is $8,708 over the total Project asset life of 105 years. The federal dollars per GHG emissions[2] in 2030 is $0 per tonne of CO_2e, as there were no baseline or project emissions in 2030.

1 The Total Project cost-per-tonne of CO_2e is based on total Project cost provided by MPE Engineering divided by the project total net change in emissions. Note the Project cost is subject to change and is not a finalized cost estimate.

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1 INTRODUCTION / PROJECT OVERVIEW

1.1 Project Overview

RWDI AIR Inc. ("RWDI") was retained by MPE Engineering Ltd. (referred to herein as "the Client") to provide a greenhouse gas (GHG) mitigation assessment for the Horsefly Regional Emergency Spillway project located near the Town of Taber, Alberta (the "Project"). The purpose of the program is to improve management of water surplus from rainfall and snowmelt that may exceed the capacity of the St. Mary River Irrigation District Main Canal (SMRID). The program increases the flood attenuation capacity of the system and is intended to protect infrastructure from damage due to excess water. This project represents Phase 1 of 7 identified by the Southern Regional Stormwater Management Plan (SRSMP). The project consists of constructing an 14 km long, 55 m^3/s capacity spillway sourced from the SMRID Main Canal and discharging to the Oldman River.

The assessment services are for the Project's useful lifetime from 2021 through 2126 in accordance with Climate Lens, General Guidance, Version 1.2, September 6, 2019 (Infrastructure Canada, 2019) (the "Guidance") and ISO 14064-2. This report provides an assessment of the expected total annual direct and indirect net greenhouse gas emissions for each year from the start year of the Project to the end of its useful life as well as to 2030 and includes an attestation that the assessment conforms to the general and sector-specific technical guidance provided by Infrastructure Canada and aligns with the relevant assessment standard (i.e., ISO 14064-2). Total cost per tonne of CO_2e is based on the eligible cost in connection to the Investing in Canada Infrastructure Program (ICIP) provided by MPE Engineering; all activities included as part of the budget were considered in order to calculate the net GHG emissions associated with the Project.

Background information pertaining to the Project is presented in **Table 1**.

Table 1: Assessment Summary

General Information	
Project Proponent's Name	MPE Engineering Ltd.
Project Proponent's Address	#300, 714 – 5 Avenue S, Lethbridge, Alberta | T1J 0V1
Primary Contact	**Jeff Hust** 403.317.3634 jhust@mpe.ca
Project Title	Municipal District of Taber – Horsefly Regional Emergency Spillway
Project Location(s)	Near the Town of Taber, Alberta. LSD location – Section 21-09-16 W4M Geo-Coordinates – 49º43'0.5.7"N112º03'56.3"W
Project Description	The Project involves the a strategically placed spillway to the Oldman River from the St. Mary River Irrigation District (SMRID) Main Canal. This will provide an increase to the flood attenuation capacity of the system. The Horsefly regional emergency spillway is located near the midway point (and bottleneck) of the 300km long system. This Project is located to protect water/wastewater, transportation, and public infrastructure from repeated damage; it will create a 14 km long emergency spillway to divert water from the SMRID main canal to the Oldman River near the Town of Taber, Alberta.

1.2 Assessor Qualifications

Acceptable mitigation assessments must be conducted by a qualified assessor (i.e., a professional engineer or a GHG accounting professional with suitable GHG quantification training or expertise.

RWDI AIR Inc. is accredited as an ISO 14065 Greenhouse Gas Verification Body by the American National Standards Institute (ANSI), which is a member of the IAF. A copy of our certificate of accreditation can be made available upon request. In addition, several team members have completed ISO 14064-3 training.

An attestation was provided at the beginning of this report by a professional engineer, who has completed ISO 14064-3 training.

1.3 Assessment Team Members

The team for this assessment engagement is summarized in **Table 2**.

Table 2: Assessment Team

Role	Name & Credentials	Title	Email
Project Manager	Matthew Endsin, M.Sc., P.Biol.	Project Manager	Matthew.Endsin@rwdi.com
Team Leader	Christian Reuten, Ph.D., ACM	Technical Director	Christian.Reuten@rwdi.com
Team Member(s)	Joyce Funk, P.Eng., M.Sc. Trudi Trask, P.Eng.	Senior Engineer Air Quality Specialist	Joyce.Funk@rwdi.com Trudi.Trask@rwdi.com
Signing Engineer	Russ Lewis, P.Eng., M.Eng.	Technical Director Principal	Russ.Lewis@rwdi.com
Technical Expert	N/A	N/A	N/A

1.4 Assessment Schedule

This assessment was carried out according to the schedule presented in **Table 3**.

Table 3: Assessment Schedule

Task	Date
Assessment kickoff meeting	February 25th, 2020
Site Visit	N/A
Completion of Assessment Procedures	March 24th, 2020
Signing Engineer Review	March 25th, 2020
Delivery of Draft Assessment Report	March 27th, 2020
Delivery of Final Assessment Report	March 30th, 2020

2 METHODOLOGY

RWDI's quantification process follows the principles outlined in Climate Lens General Guidance (Infrastructure Canada, 2019) identified in both the ISO 14064-2 standard and the GHG Protocol for Project Accounting:

- **Relevance**: The levels of accuracy and uncertainty associated with the quantification process should reflect the intended use of the data and the objectives of a project. As such, projects in the Climate Change Mitigation sub-stream should strive for higher levels of accuracy and lower levels of uncertainty;
- **Completeness**: All primary and all significant secondary effects should be estimated;
- **Transparency**: All assumptions, methods, calculations, and associated uncertainties should be explained;
- **Accuracy**: Estimates and calculations should be unbiased, and uncertainties should be reduced as far as practical. Calculations should be conducted in a manner that minimizes uncertainty;
- **Conservativeness**: Where there are uncertainties, the values used to quantify GHG emissions should err on the side of underestimating potential reductions; and
- **Consistency**: All data, methods, criteria, and assumptions shall be applied consistently to ensure meaningful comparisons between the baseline and project scenario.

Further fundamental information on this assessment is presented in **Table 4**.

Table 4: Assessment Fundamentals

Assessment Fundamentals	
Reporting Program	Infrastructure Canada Climate Lens
Quantification Protocol(s)	Infrastructure Canada Climate Lens General Guidance, Version 1.2 – September 6, 2019
Assessment Objective	Provide an estimation of net increase or reduction of GHG emissions as well as an estimation of cost-per-tonne of CO_2e using the Climate Lens Guidance pertaining to the Project, presented fairly in accordance with program criteria.
Level of Assurance	Achieving the overall objective of this assessment involves executing quantification procedures designed to generate evidence that is sufficient and appropriate to provide a basis for our opinion with a **limited level of assurance**.
Program Criteria	Generating sufficient and appropriate evidence to support our assessment will involve executing quantification procedures in accordance with the following criteria: • Infrastructure Canada Climate Lens; • The Greenhouse Gas Protocol for Project Accounting; and, • ISO 14064-2 Specification with Guidance at the Project Level for Quantification, Monitoring, and Reporting of Greenhouse Gas Emission Reductions or removal Enhancements*. *Should any discrepancies exist between ISO and regulatory criteria, the regulatory criteria shall take precedence.
Assessment Scope	The quantification assesses the baseline and future operations and equipment within the inventory boundary as well as calculations and supporting information used to quantify the greenhouse gas emissions to be reported under the Climate Lens.

2.1 Boundaries of the Assessment

The assessment boundaries are listed in **Table 5**.

Table 5: Boundaries of Assessment

Boundaries of the Assessment	
Project Baseline	Baseline emissions are assumed to be zero
Project Milestone	2030
Project Useful Lifetime	2126
Organizational Boundary	Municipal District of Taber
Geographical Boundary	LSD location – Section 21-09-16 W4M Geo-Coordinates – 49o43'0.5.7"N112o03'56.3"W Municipal District of Taber, Taber, Alberta
Operational Boundary	Direct (scope 1) emissions from the Project case, which includes the construction emissions.

The mitigation assessment assesses the Project components across the construction (excluding supply chain) and operations and maintenance (O&M) phases. Following Climate Lens Guidance (Infrastructure Canada 2019), the assessment does not seek to estimate construction emissions associated with the asset's future major rehabilitative maintenance or decommissioning.

2.2 Greenhouse Gases Considered

Table 6 lists the GHG sources and sinks that were considered in this assessment, including their formulae, global warming potentials from the most recent National Inventory Report (ECCC 2019), and a description of main emission sources or a rationale for excluding the GHG.

Table 6: Greenhouse Gases Considered

Greenhouse Gases Considered			
GHG	**Formula**	**100-Year GWP**	**Description of Sources / Justification for Exclusion**
Carbon Dioxide	CO_2	1	CO_2 emissions are expected from onsite mobile equipment used in the construction phase of the project.
Methane	CH_4	25	CH_4 emissions are expected from onsite mobile equipment used in the construction phase of the project.
Nitrous Oxide	N_2O	298	N_2O emissions are expected from onsite mobile equipment used in the construction phase of the project.
Sulphur Hexafluoride	SF_6	22,800	No significant emissions of SF_6 are expected.
Nitrogen Trifluoride	NF_3	17,200	No significant emissions of NF_3 are expected as part of this Project.
Hydrofluorocarbons	HFCs	-	No significant HFCs emissions are expected as part of this Project.
Perfluorocarbons	PFCs	-	No significant emissions of PFCs are expected as part of this Project.

2.3 Emission Scopes

Table 7 lists the emission scopes that were considered in this assessment and the Project-related sources or changes in GHG emissions.

Table 7: Emission Scopes

Emission Scopes		
Scope	**Source/Sinks of Greenhouse Gas**	**Project-related Sources/Changes**
Scope 1	Construction Project Activities	Diesel fuel~~ed~~ used in on-site mobile equipment, generators, heaters and light plants used for Project construction phase.
Scope 2	Purchased electricity	None expected
	Purchased steam	None expected
	Purchased heat / cooling	None expected
Scope 3	Impacts on land use / population density	Additional capacity of spillway and expansion of wetlands will reduce flooding and impacts to agricultural lands. Not expected to have a significant impact on greenhouse gas emissions.
	Impacts on traffic / personal vehicle travel	No changes expected
	Expected shifts in fuel sources for electricity	No changes expected
	Downstream electricity consumption	No changes expected

2.4 Data Collection and Calculation Procedures

Data was provided to the Assessment Team by MPE Engineering Ltd. upon request in the following documents:

1. Copy of Horsefly Spillway Equipment List.xlsx
2. DMAF-Expression.of.Interest.Form.Horsefly Spillway.2019.pdf
3. EOI Addendum Form.ICIP.HorseflySpillway.pdf
4. Horsefly Emergency Spillway Preliminary Engineering.2018.09.28.pdf
5. HorseflySpillway.Cash Flow Estimate.2019.01.23.pdf
6. ICIP Application Entire Project Buildout.pdf
7. R01 Regional Drainage Implementation Plan 2019 - with Comments.pdf
8. South Region SWMP Study.FINAL.pdf
9. authenticating-professional-work-products.pdf
10. Bylaw No. 1691 - Records Retention & Disposition.pdf
11. ICIP Project Application - Green Stream Feb 4, 2020.docx
12. XCG - Design Storm Development - 2012.pdf
13. RE Horsefly spillway Climate Lens.msg
14. RE MPE Climate Lens assessment - useful life.msg

Additional information based on phone discussions and email correspondence with MPE's project engineer aided in estimating the construction emissions. This included information regarding description of the construction phases and processes, mobile equipment used in various construction activities, estimated operating hours of the mobile equipment and duration of equipment use.

The Assessment Team assumed that all of the above documents:

1. are authentic, accurate, and complete; and
2. where applicable, have been prepared in accordance with applicable laws, regulations, standards, policies, procedures, etc.

Nothing in our review of these documents suggested that the documents did not meet the above assumptions. Data comprised of fuel usage tracking sheets, Project descriptions including budget and timelines, construction drawings, maps, and asset life spans.

Calculations are provided in **Appendix B**. The assessment team calculated construction emissions for the Project components to determine annual CO_2e emissions. A cost per tonne of CO_2e was then calculated based on the provided budgets per Project component.

2.4.1 Uncertainty Assessment

Uncertainties associated with the GHG mitigation assessments were assessed similar to the way that risks are assessed in the context of GHG assertions. The intention of the uncertainty assessment is to provide transparency with respect to potential deviations of the estimated GHG emissions from true (unknown) baseline and Project emissions.

RWDI completed a qualitative uncertainty assessment, which summarizes the parameters used, data acquisition, processing, and emission calculations for each emission source and sink, and comments on the associated uncertainties. The uncertainty assessment is presented in **Table 8**.

Table 8: Qualitative Notes for Data Management Systems and Controls

Emissions Source	Parameters	Data Acquisition Equipment, Sampling Frequency, Analytical Method	Data Processing and Tracking	Emissions Calculations	Management Policies and Practices	Uncertainty / Risk
Construction Sources (Project Emissions)						
Diesel Combustion in on-site mobile equipment, generators, light plant and heaters.	"Volume of diesel fuel combusted by onsite mobile equipment Horse Power Rating of Mobile Equipment Operational Hours of Mobile Equipment Brake-specific fuel consumption (BFSC) Density of Diesel Fuel CO_2, CH_4, N_2O default emission factors for Diesel Fuel. CO_2 default emission factor for Bio-Diesel. Note: Alberta Regulation 19/2010 made effective January 1st, 2012, fuel suppliers were required to incorporate 5% renewable fuel content for gasoline and 2% for diesel. This will be accounted for in RWDI calculations.	"The amount of diesel consumed by onsite mobile equipment in the project case will be estimated based on information provided by MPE Engineering. Information such as details of the construction process and estimate of the number of mobile equipment and hours of operation expected for constructing the project components. Emission factors, assumed Tier 4 (where applicable) off-road diesel equipment in Table A6-13 of Part 2 of the NATIONAL INVENTORY REPORT 1990–2017. Diesel Emission Factors: CO_2 = 2681 g/L CH_4 = 0.073 g/L N_2O = 0.227 g/L (over 19kW); N2O = 0.022 g/L (under 19 kW); Bio Diesel Emission Factor: CO_2 = 2472 g/L BSFC is the in-use adjusted brake-specific fuel consumption. These values were taken from Table A4 in ""https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100UXEN.pdf"""	"An estimate for diesel consumption from on-site equipment during the construction phase is based on knowledge and information provided by MPE. MPE provided an estimate for the number of hours, equipment type, horsepower and number of each type of mobile equipment to be used to perform earth moving, concrete works and road/rail crossings to accommodate the spillway construction. Data provided by MPE were transcribed by RWDI into their calculation spreadsheet to calculate construction emissions for the Project.	"Emissions were calculated in RWDI's in-house calculation spreadsheet. Construction emissions were calculated by taking the diesel fuel used in the mobile equipment and the emission factors. The diesel fuel was determined by applying the BSFC factor, horsepower of mobile equipment, density of Diesel and operating hours. Note that 2% of the biodiesel emissions (CO2 portion only) was excluded from the total emissions. This is consistent with the required regulations for Diesel fuel used in Alberta. "	"RWDI has a robust Management System that includes policies and procedures pertaining to RWDI's GHG Verification and Validation Program (VVP). These policies and procedures can also be applied to GHG assessments. The Management System Policy provides guidelines on roles and responsibilities, quality assurance, the validation / verification process, assessment approach, and document control, amongst other things. Stemming from the guidance in this policy, RWDI has created templates for various aspects of the VVP including information gathering forms, calculation sheets, reports and organizational tools. These templates were used as a basis to complete this assessment."	"The construction emissions are based on information provided by MPE. This information is based on knowledge of the project manager in regard to planned construction activities and processes involved in earth moving, concrete works and road/rail crossings to accommodate the spillway construction. There is some uncertainty in the estimation of the construction emissions since the construction for the project has not occurred. Thus, the estimation of emissions is based on a forecasted assumption."

2.4.2 Site Visit

There are no explicit site-visit requirements in Climate Lens General Guidance (Infrastructure Canada, 2019) or ISO 14064, parts 2 and 3. Project validations may include site visits as part of the validation plan to reduce validation risk as per ISO 14064-3:2019.

For the current Project assessment, the circumstances did not warrant a site visit. RWDI does not expect to reduce the uncertainties associated with the GHG mitigation assessment by visiting the Project site.

2.4.3 System-Level Assessments

2.4.3.1 Primary Data and Records

The team's assessment of primary data and records is detailed in the Quantification Plan in **Appendix A**.

2.4.3.2 Greenhouse Gas Information Management System

MPE Engineering and Municipal District of Taber records are maintained as described in the Data and Record Retention section below. MPE Engineering and Municipal District of Taber appear to have an organized system for filing their GHG related documents and other records pertaining to the planning and construction activities. MPE Engineering was also able to obtain and provide all documents requested by the Assessment Team.

2.4.3.3 Data and Record Retention

Retention of records of the Municipal District of Taber are governed by By-law 1691 which establishes procedures for the management of records for the Municipal District of Taber. The by-law is applicable to all employees of the Municipal District of Taber and requires that records be maintained in accordance with the records management manual, as well as applicable laws and provincial, national, or international standards adopted by the Municipal District of Taber.

Records used for the purpose of the application, the Climate Lens Assessment, and records generated through the construction of the Project will need to be maintained in accordance with the requirements defined through the contract with ICIP.

2.4.4 Quantification Plan and Procedures

Based on the relative contribution of GHG emission sources and sinks, the available information, and the uncertainty assessment, the assessment team designed an initial quantification plan. The initial quantification plan was modified as needed throughout the assessment process when issues were identified, or new information was obtained. The resulting final quantification plan, including details of the quantification procedures carried out, is presented in the Quantification Plan in **Appendix A**.

In summary, quantification procedures consisted of a desktop review of data and documentation to assess the completeness, level of detail, and reliability of primary data; and a determination of appropriate emissions quantification methodologies based on available data and the requirements of the regulation.

Quantification procedures also included interviews with MPE Engineering by phone and email, as well as follow-up requests for clarification or further documentation.

2.4.5 Emissions Calculations

The baseline case was assumed to be zero for this Project. The Project consists of construction emissions associated with the reconstruction and upgrade of the existing Horsefly Regional Emergency Spillway. There were no emissions from operation and maintenance of the Project after completion.

2.4.5.1 Construction

Construction emissions consists of diesel fuel combustion in on-site mobile equipment, generators, heaters and light plants. Various types of mobile equipment are used for different construction activities, such as site clearing, earth moving and concrete work. Mobile equipment includes excavators, rock movers, graders, packers, dozer, haul dump trucks, zoom-boom, concrete trucks and tunnel casing pullers. Other diesel-powered equipment included generators, light plants and in-line heaters. RWDI discussed and obtained information from MPE Engineering regarding the construction process, type of mobile equipment used and estimate for mobile equipment operational hours, which were used in estimating the construction emissions. The diesel fuel volume consumption was based on the BSFC (brake-specific fuel consumption), density of diesel fuel, horsepower rating for mobile equipment and the estimated operating hours. The construction emissions were then calculated using the diesel volume, corresponding diesel and bio-diesel default emission factors and global warming potentials.

Note that as of January 2012, fuel suppliers in Alberta are required to incorporate 5% renewable fuel content for gasoline and 2% for diesel. Thus, 2% of the biodiesel emissions (CO_2 portion only) were excluded from the total construction emissions.

Emission factors for diesel and biodiesel consumption were obtained from Table A6-13 of Part 2 of the National Inventory Report 1990-2017. Emission factors were assumed to be Advanced Control (Tier 4 and above) and based on Off-road Diesel Vehicles. Detailed sample calculations are provided in **Appendix B**.

2.4.5.2 Operations & Maintenance

Greenhouse gas emissions from operations and maintenance of the Horsefly Regional Emergency Spillway Project were assumed to be zero for the baseline and Project case. There was no equipment used (i.e. pumps, powered equipment) in the baseline or project case based on the preliminary data provided.

2.5 Exclusions from the Assessment

Emissions attributable to sources that will not be altered as part of the Project have not been included in the baseline scenario or Project scenario. For example, road traffic emissions have not been included because they are not expected to change significantly due to the implementation of the Project components. Other emissions that were not included are as follows:

- Land use changes include Canal excavation, raising of the canal bank and wetland creation. The land use changes were considered; however, a quantitative analysis of the emission impact of the land use impact was not performed due to the following reasons:

- The overall GHG balance associated with changes in vegetation tends to be smaller than the uncertainties associated with estimation of other emissions, particularly from construction emissions. That observation holds even when the construction emissions are spread over several decades and conservatively high estimates of GHG emissions from vegetation changes are assumed.
- Uncertainties for estimating GHG emissions or uptake from land-use changes are expected to be particularly large for this proposed project. The uncertainties lie mainly around the emission factors and the management of the wetlands.
- Very detailed spatial and temporal information would be needed and is not available.

2.6 Assumptions

The following assumptions were made regarding future operations:

- Some of the Project structures may have electrically actuated gates that are likely solar powered as part of the spillway. This information was provided by MPE Engineering. Thus, it was assumed that no emissions would be produced from this component.
- The construction phase associated with upgrading the canal was assumed to be about one month of construction for every kilometer, as suggested by MPE Engineering. For example, the upgrade of the SMRID main canal to the Horsefly reservoir consists of an additional extension of 3.5 kilometers. Thus, it was assumed that this would result in 3.5 months of work.
- Estimated construction emissions associated with the concrete work was based on an estimate for the construction of a concrete drop structure. The work associated with the construction of the concrete spillway structure to the Oldman river was assumed equal to about 1.5 times the work of a concrete drop structure. This was suggested by MPE Engineering.

3 BASELINE SCENARIO

The baseline scenario was assumed to be zero. The assessment did not identify any equipment or operations that resulted in the production of emissions.

4 ESTIMATED PROJECT EMISSIONS

The Project scenario considers an emissions trajectory based on the construction phase and expected start-up of the Project. For this assessment, only emissions that are projected to change due to the Project relative to the baseline have been considered. The Project emissions include emissions from diesel consumed in on-site mobile equipment, generators, heaters and light plants during the construction phase of the Project.

RWDI discussed and obtained information from the MPE Engineering regarding the construction process, types of mobile equipment used and estimates for mobile equipment operational hours, which were used in estimating the construction emissions. Construction of the new project is planned to commence in 2021 and expected to finish by the end of 2025. Construction emission calculations were previously described in Section 2.4.5.1. and these emissions were allocated based on the proposed timeline. **Table 9** provides annual and cumulative construction emissions over the Project lifetime

Table 9: Estimated Project Scenario Annual and Cumulative Construction Emissions (in tonnes CO_2e) over the Project Lifetime

Year	Annual Emissions	Cumulative Total Emissions
2021	-	-
2022	200	200
2023	2,029	2,229
2024	2,041	4,270
2025	1,355	5,625
2026	-	5,625
2027	-	5,625
...	-	5,625
2126	-	5,625
Lifetime Annual Average / Cumulative	53.6	5,625

5 ESTIMATED NET INCREASE OR REDUCTION IN EMISSIONS

The assessment team predicted the net change in GHG emissions based on the calculations described in the preceding report sections. **Table 10** presents the net change for the Project annually over the asset life of the Project.

Table 10: Net Change in Emissions and Reductions/Removals (in tonnes CO_2e)

Year	Total Net Project Scenario Emissions and Removals (A)	Total Net Baseline Scenario Emissions and Removals (B)	Total Net Change in Emissions and Removals (A-B)
2021	-	-	-
2022	200	-	200
2023	2,029	-	2,029
2024	2,041	-	2,041
2025	1,355	-	1,355
2026	-	-	-
2027	-	-	-
...	-	-	-
2126	-	-	-
Lifespan Totals	5,625	-	5,625

6 OTHER POTENTIAL MITIGATION MEASURES

6.1 Options for Avoidance of Impacts

This is an optional component that was not completed for this assessment.

6.2 Options for Mitigation of Impacts

This is an optional component that was not completed for this assessment.

7 ESTIMATED COST-PER-TONNE

A project cost per tonne of CO_2e emitted was calculated based on the net difference in emissions between the baseline scenario and Project scenario. The cost considered was tabulated based on the Project budget provided by MPE Engineering. It is estimated that this Project will cost $8,708 / tonne CO_2e of GHG emissions. This large value reflects the relatively low GHG emission emissions compared to the extent of the infrastructure costs. It should be kept in mind that the intent of this Project is not to minimize the cost of GHG mitigation. The federal dollars per GHG emissions in 2030 is $0 per tonne of CO_2e.

8 CONCLUSIONS

The purpose of the program is to improve management of water surplus from rainfall and snow melt that may exceed the capacity of the St. Mary River Irrigation District Main Canal. The program increases the flood attenuation capacity of the system and is intended to protect infrastructure from damage due to excess water. This project represents Phase 1 of 7 identified by the Southern Regional Stormwater Management Plan. The project consists of constructing an 14 km long, 55 m3/s capacity spillway sourced from the SMRID Main Canal and discharging to the Oldman River

Annual Project emissions associated with construction activities in 2030 were predicted to be 0 tonnes CO_2e. Cumulative emissions of the Project scenario associated with construction activities were predicted to be 5,625 tonnes of CO_2e over the 105-year Project lifetime. Annual net increase in emissions between the baseline and Project emissions was predicted to be 0 tonnes of CO_2e in 2030, and the net increase in cumulative emissions from the Project was predicted to be 5,625 tonnes of CO_2e over the 105-year Project lifetime.

A net increase of GHG emissions is expected from the Project over its lifespan. The main reason for the net increase of emission was due to the fact that there were no baseline emissions. Based on the Project budget supplied by MPE Engineering, the cost-per-tonne of CO_2e *increase* is $8,708 over the total Project asset life of 105 years. The federal dollars per GHG reductions in 2030 is $0 per tonne of CO_2e.

This assessment is based on the data provided for the Project scheduled to be constructed over the 2021 thru 2025-year period. It is our opinion that the estimated baseline and Project emissions demonstrate that the expected net increase in cumulative emissions from the Project are due to the construction phase and that there were no baseline emissions.

9 BIBLIOGRAPHY / REFERENCES

9.1 Global Warming Potentials

Table 91: GWP from National Inventory Report 1990-2017 (ECCC 2019), Part 1, Table 1-1.

GHG	Formula	100-Year GWP
Carbon Dioxide	CO_2	1
Methane	CH_4	25
Nitrous Oxide	N_2O	298
Sulphur Hexafluoride	SF_6	22,800
Nitrogen Trifluoride	NF_3	17,200
Hydrofluorocarbons (HFCs)		
HFC-23	CHF_3	14,800
HFC-32	CH_2F_2	675
HFC-41	CH_3F	92
HFC-43-10mee	$CF_3CHFCHFCF_2CF_3$	1,640
HFC-125	CHF_2CF_3	3,500
HFC-134	CHF_2CHF_2	1,100
HFC-134a	CH_2FCF_3	1,430
HFC-143	CH_2FCHF_2	353
HFC-143a	CH_3CF_3	4,470
HFC-152	CH_2FCH_2F	53
HFC-152a	CH_3CHF_2	124
HFC-161	CH_3CH_2F	12
HFC-227ea	CF_3CHFCF_3	3,220
HFC-236cb	$CH_2FCF_2CF_3$	1,340
HFC-236ea	CHF_2CHFCF_3	1,370
HFC-236fa	$CF_3CH_2CF_3$	9,810
HFC-245ca	$CH_2FCF_2CHF_2$	693
HFC-245fa	$CHF_2CH_2CF_3$	1,030
HFC-365mfc	$CH_3CF_2CH_2CF_3$	794
Perfluorocarbons (PFCs)		
Perfluoromethane	CF_4	7,390
Perfluoroethane	C_2F_6	12,200
Perfluoropropane	C_3F_8	8,830
Perfluorobutane	C_4F_{10}	8,860
Perfluorocyclobutane	$c\text{-}C_4F_8$	10,300
Perfluoropentane	C_5F_{12}	9,160
Perfluorohexane	C_6F_{14}	9,300
Perfluorodecalin	$C_{10}F_{18}$	7,500
Perfluorocyclopropane	$c\text{-}C_3F_6$	17,340

9.2 References

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2. GHG Protocol Initiative Team, 2005: The GHG Protocol for Project Accounting. World Resources Institute and World Business Council for Sustainable Development, November 2005. Accessible at: http://www.ghgprotocol.org/sites/default/files/ghgp/standards/ghg_project_accounting.pdf

3. Province of Albera, 2020: Emissions Management and Climate Resilience Act: Renewable Fuels Standard Regulation. Alberta Regulation 29/2010 with amendments up to and including Alberata Regulation 211/2019. Current as of January 1, 2020.

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APPENDIX A:
FINAL QUANTIFICATION PLAN

Appendix A: Quantification Plan

The quantification plan and procedures are presented for each source in **Table A.1**

Table A.1: Quantification Plan and Procedures

Emissions Source	Scope	Emissions Sub-Source	Quantification Uncertainty	ID	Quantification Procedures		
					Baseline	2030	Annual Cost
Construction	Scope 1	Onsite mobile diesel equipment	Will there be a change in emissions from onsite mobile equipment during the construction phase of the Project?	1.1	Confirm that no activities would take place onsite in the baseline scenario.	The construction Emissions will be estimated based on information provided by the MPE. Information such as details of the construction process and estimate of the number of mobile equipment and hours of operation expected for constructing the project components. Calculate associated annual CO_2e emissions as of 2030.	Using data provided by MPE., predict diesel consumption by onsite mobile equipment during the construction phase of for the project phase. Calculate associated annual CO_2e emissions for the asset life of the project.
	Scope 2	Purchased electricity	Will there be a change in emissions from purchased electricity during the construction phase of the Project?	2.1	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.
	Scope 3	Impacts on traffic / personal vehicle travel	Will there be a change in emissions from traffic during the construction phase of the Project?	3.1	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.
		Expected shifts in fuel sources for electricity	Will there be a change in emissions from changing sources for electricity during the construction phase of the Project?	3.2	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.
Operational and Maintenance	Scope 1	Carbon Sequestration	Will there be a change in emissions from planting trees and other vegetation in the Project?	4.1	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.
	Scope 2	Purchased electricity	Will there be a change in emissions from purchased electricity during the O&M phase of the Project?	4.2	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.
		Purchased steam	Will there be a change in emissions from purchased electricity during the O&M phase of the Project?	5.1	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.
		Purchased heat / cooling	Will there be a change in emissions from purchased steam during the O&M phase of each Project component?	5.2	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.
		Purchased heat / cooling	Will there be a change in emissions from purchased heating/cooling during the O&M phase of each Project component?	5.3	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.
	Scope 3	Impacts on land use / population density	Will there be a change in emissions from impacts on land use or population density during the O&M phase of each Project component?	6.1	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.
		Impacts on traffic / personal vehicle travel	Will there be a change in emissions from impacts on traffic during the O&M phase of each Project component?	6.2	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.
		Expected shifts in fuel sources for electricity	Will there be a change in emissions from shifts in fuel sources during the O&M phase of each Project component?	6.3	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.
		Downstream electricity consumption	Will there be a change in emissions from shifts in downstream electricity consumption during the O&M phase of each Project component?	6.4	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.	None expected - confirm assumption based on information provided by MPE.

APPENDIX B:
DETAILED EMISSIONS CALCULATIONS

Appendix B.1 Construction Information Received

Table B.1.1 Equipment - EPA Description

Equipment Type	Model	EPA Equipment Description[1]	Load Factor [1]
Concrete Pump		Diesel Pumps	0.43
Concrete Trucks		Diesel Cement and Mortar Mixers	0.43
Dozer	Cat D6	Diesel Crawler Tractor/Dozers	0.59
Excavator1	Cat 349 Excavator	Diesel Excavators	0.59
Excavator2	John Deere 300 LC	Diesel Excavators	0.59
Generator	Cat XQ20	Diesel Generator Sets	0.43
Graders	Cat 120 Motor Grader	Diesel Graders	0.59
Heaters	Flagro 400	Diesel Other Construction Equipment	0.59
Light Plant		Diesel Signal Boards/Light Plants	0.43
Packer	Cat CS64B	Diesel Rollers	0.59
Rock Movers	Volvo A30G	Diesel Off-Highway Trucks	0.59
Side Dump Haul Trucks		Diesel Dumpers/Tenders	0.21
Tunnel Casing Puller		Diesel Other Construction Equipment	0.59
Zoom-boom	Cat TL943D	Diesel Rough Terrain Forklifts	0.59

Notes:

[1] EPA descriptions and Load Factors taken from Appendix A in "https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10081RV.pdf"

Table B.1.2 Horsefly Spillway Earth moving - Equipment Specifications and Operational Factors

Equipment Type	Model	Power (kW)[1]	Horse Power [1]	Number of Equipment [1]	Load Factor [2]	Duration (Months) [1]	Working Days/Month (Days) [1], [3]	Hours per day [1]	Total Hours
Excavator1	Cat 349 Excavator	302	405.0	3	0.43	1	21	9	567
Rock Movers	Volvo A30G	265	355.4	9	0.43	1	21	9	1,701
Graders	Cat 120 Motor Grader	93	124.7	1	0.59	1	21	9	189
Packer	Cat CS64B	98	131.4	1	0.59	1	21	9	189
Dozer	Cat D6	161	215.9	2	0.43	1	21	9	378
Side Dump Haul Trucks		260	348.7	4	0.59	1	21	9	756

Notes:

[1] Power rating, number of equipment, duration (months, days/month, and hours per day) provided by MPE in Copy of Horsefly Spillway Equiptment List.xlsx

[2] Load Factor assumed equal to EPA defaults, taken from Appendix A in "https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10081RV.pdf"

[3] This is equipment required for 1 month of work equal to 1 kilometer

Table B.1.3 Horsefly Spillway Concrete work - Equipment Specifications and Operational Factors

Equipment Type	Model	Power (kW)[1]	Horse Power [1]	Number of Equipment [1]	Load Factor [2]	Duration (Months) [1]	Working Days/Month (Days) [1]	Hours per day [1]	Total Hours
Excavator2	John Deere 300 LC	166	222.6	2	0.59	1.5	21	9	567
Rock Movers	Volvo A30G	265	355.4	1	0.59	2	21	9	378
Packer	Cat CS64B	98	131.4	1	0.59	2	21	9	378
Zoom-boom	Cat TL943D	82	110.0	1	0.59	2	21	9	378
Generator	Cat XQ20	20	26.8	1	0.43	3	21	9	567
Light Plant		10	13.4	2	0.43	3	21	9	1,134
Heaters	Flagro 400	1.725	2.3	2	0.59	1	21	9	378
Concrete Trucks		260	348.7	1	0.43	-	10	9	90
Concrete Pump		260	348.7	1	0.43	-	10	9	90

Notes:

[1] Power rating, number of equipment, duration (months, days/month, and hours per day) provided by MPE in Copy of Horsefly Spillway Equiptment List.xlsx

[2] Load Factor assumed equal to EPA defaults, taken from Appendix A in "https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10081RV.pdf"

Table B.1.4 Horsefly Spillway Country Road Crossings - Equipment Specifications and Operational Factors per Crossing

Equipment Type	Model	Power (kW)	Horse Power [1]	Number of Equipment [2]	Load Factor [4]	Working Days/Month (Days) [2]	Hours per day [2]	Total Hours
Excavator2	John Deere 300 LC	166	222.6	1	0.59	4	9	36
Packer	Cat CS64B	98	455	1	0.59	4	9	36

Notes:

[1] Power rating, number of equipment, duration (months, days/month, and hours per day) provided by MPE in Copy of Horsefly Spillway Equiptment List.xlsx

[2] Load Factor assumed equal to EPA defaults, taken from Appendix A in "https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10081RV.pdf"

Table B.1.5 Horsefly Spillway Highway/Railway Crossings - Equipment Specifications and Operational Factors per Crossing

Equipment Type	Model	Power (kW)[1]	Horse Power [1]	Number of Equipment [1]	Load Factor [2]	Duration (Months) [1]	Working Days/Month (Days) [1]	Hours per day [1]	Total Hours
Excavator2	John Deere 300 LC	166	222.6	1	0.59	1.0	21	9	189
Packer	Cat CS64B	98	455	1	0.59	1.0	21	9	189
Tunnel Casing Puller		160	14.1	1	0.43	0.5	21	9	95

Notes:

[1] Power rating, number of equipment, duration (months, days/month, and hours per day) provided by MPE in Copy of Horsefly Spillway Equiptment List.xlsx

[2] Load Factor assumed equal to EPA defaults, taken from Appendix A in "https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10081RV.pdf"

Table B.1.6 Equipment Factor and Fuel Consumption Data

Horsepower Range (hp)	BSFC [1] (Lb/hp-hr)	BSFC (grams/hp-hr)
0-100	0.408	185
101-750	0.367	166

[1] BSFC is the in-use adjusted brake-specific fuel consumption. These values were taken from Table A4 in "https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100UXEN.pdf"

Table B.1.7 Horsefly Spillway Earth moving - Equipment Fuel Use

Equipment Type	Horse Power [1]	Load Factor [2]	Total Equipment-Hours	BSFC (g/hp-h)[3]	Fuel Consumption (g)[4]	Fuel Consumption (L) [5]	
Excavator1	405.0	0.43	567	166	16,437,138	19,568	19568.0211
Rock Movers	355.4	0.43	1,701	166	43,269,949	51,512	51511.84361
Graders	124.7	0.59	189	166	2,315,072	2,756	2756.038086
Packer	131.4	0.59	189	166	2,439,538	2,904	2904.212177
Dozer	215.9	0.43	378	166	5,841,897	6,955	6954.638844
Side Dump Haul Trucks	348.7	0.59	756	166	25,888,977	30,820	30820.21085

Notes:

[1] Power rating, number of equipment, duration (months, days/month, and hours per day) provided by MPE in Copy of Horsefly Spillway Equiptment List.xlsx

[2] Load Factor assumed equal to EPA defaults, taken from Appendix A in "https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10081RV.pdf"

[3] BSFC is the in-use adjusted brake-specific fuel consumption. These values were taken from Table A4 in "https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100UXEN.pdf"

[4] Diesel Density was assumed to be 840 g/L at 15C. See reference "https://www.ic.gc.ca/eic/site/mc-mc.nsf/eng/lm00127.html".

[5] Diesel Density was assumed to be 840 g/L at 15C. See reference "https://www.ic.gc.ca/eic/site/mc-mc.nsf/eng/lm00127.html".

Table B.1.8 Horsefly Spillway Concrete work - Equipment Fuel Use

Equipment Type	Horse Power [1]	Load Factor [2]	Total Equipment-Hours	BSFC (g/hp-h)[3]	Fuel Consumption (g)	Fuel Consumption (L) [4]
Excavator2	222.6	0.59	567	166	12,396,837	14,758
Rock Movers	355.4	0.59	378	166	13,193,421	15,706
Packer	131.4	0.59	378	166	4,879,076	5,808
Zoom-boom	110.0	0.59	378	166	4,082,493	4,860
Generator	26.8	0.43	567	185	1,210,162	1,441
Light Plant	13.4	0.43	1,134	185	1,210,162	1,441
Heaters	2.3	0.59	378	185	95,476	114
Concrete Trucks	348.7	0.43	90	166	2,246,219	2,674
Concrete Pump	348.7	0.43	90	166	2,246,219	2,674

Notes:

[1] Power rating, number of equipment, duration (months, days/month, and hours per day) provided by MPE in Copy of Horsefly Spillway Equiptment List.xlsx

[2] Load Factor assumed equal to EPA defaults, taken from Appendix A in "https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10081RV.pdf"

[3] BSFC is the in-use adjusted brake-specific fuel consumption. These values were taken from Table A4 in "https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100UXEN.pdf"

[4] Diesel Density was assumed to be 840 g/L at 15C. See reference "https://www.ic.gc.ca/eic/site/mc-mc.nsf/eng/lm00127.html".

Table B.1.9 Horsefly Spillway Country Road Crossings - Equipment Fuel Use

Equipment Type	Horse Power [1]	Load Factor [2]	Total Equipment-Hours	BSFC (g/hp-h)[3]	Fuel Consumption (g)	Fuel Consumption (L) [4]
Excavator2	222.6	0.59	36	166	787,101	937
Packer	455.0	0.59	36	166	1,608,784	1,915

Notes:

[1] Power rating, number of equipment, duration (months, days/month, and hours per day) provided by MPE in Copy of Horsefly Spillway Equiptment List.xlsx

[2] Load Factor assumed equal to EPA defaults, taken from Appendix A in "https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10081RV.pdf"

[3] BSFC is the in-use adjusted brake-specific fuel consumption. These values were taken from Table A4 in "https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100UXEN.pdf"

[4] Diesel Density was assumed to be 840 g/L at 15C. See reference "https://www.ic.gc.ca/eic/site/mc-mc.nsf/eng/lm00127.html".

Table B.1.10 Horsefly Spillway Highway/Railway Crossings - Equipment Fuel Use

Equipment Type	Horse Power [1]	Load Factor [2]	Total Equipment-Hours	BSFC (g/hp-h)[3]	Fuel Consumption (g)	Fuel Consumption (L) [4]
Excavator2	222.6	0.59	189	166	4,132,279	4,919
Packer	455.0	0.59	189	166	8,446,116	10,055
Tunnel Casing Puller	14.1	0.43	95	185	106,034	126

Notes:

[1] Power rating, number of equipment, duration (months, days/month, and hours per day) provided by MPE in Copy of Horsefly Spillway Equiptment List.xlsx

[2] Load Factor assumed equal to EPA defaults, taken from Appendix A in "https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10081RV.pdf"

[3] BSFC is the in-use adjusted brake-specific fuel consumption. These values were taken from Table A4 in "https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100UXEN.pdf"

[4] Diesel Density was assumed to be 840 g/L at 15C. See reference "https://www.ic.gc.ca/eic/site/mc-mc.nsf/eng/lm00127.html".

Table B.2.1 Construction Emissions Factors

Equipment Type	Diesel Emission Factors (g/L)[1]			Biodiesel Emission Factors (g/L)[1]	Biodiesel Percentage
	Diesel CO_2	CH_4	N_2O	Biodiesel CO_2	(%)
	1	25	298		
Off-road diesel <19kW	2681	0.073	0.022	2472	2%
Off-road diesel >=19kW, Tier 1-3	2681	0.073	0.022	2472	2%
Off-road diesel >=19kW, Tier 4	2681	0.073	0.227	2472	2%

Notes:

[1] Emission factors, assumed Advanced Control (Tier 4 and above) in Table A6-13 of Part 2 of the NATIONAL INVENTORY REPORT 1990–2017.

Table B.2.2 Construction Emissions Factors

Equipment Type	Horse Power [1]	Emission Factors (g/L)			
		Diesel CO_2	CH_4	N_2O	Biodiesel CO_2
Concrete Pump	349	2681	0.073	0.227	2472
Concrete Trucks	349	2681	0.073	0.227	2472
Dozer	216	2681	0.073	0.227	2472
Excavator1	405	2681	0.073	0.227	2472
Excavator2	223	2681	0.073	0.227	2472
Generator	27	2681	0.073	0.227	2472
Graders	125	2681	0.073	0.227	2472
Heaters	2	2681	0.073	0.022	2472
Light Plant	13	2681	0.073	0.022	2472
Packer	131	2681	0.073	0.227	2472
Rock Movers	355	2681	0.073	0.227	2472
Side Dump Haul Trucks	349	2681	0.073	0.227	2472
Tunnel Casing Puller	14	2681	0.073	0.022	2472
Zoom-boom	110	2681	0.073	0.227	2472

Notes:

[1] Power rating provided by MPE.

Table B.2.3 Horsefly Spillway Earth moving - Monthly Emissions

Equipment Type	Fuel Consumption (L)	Emission Factors (g/L)				Monthly Emissions (tonnes/month)[1]			
		Diesel CO_2	CH_4	N_2O	Biodiesel CO_2	Diesel CO_2	CH_4	N_2O	Biodiesel CO_2
Excavator1	19,568	2681	0.073	0.227	2472	51.41	0.0014	0.0044	0.97
Rock Movers	51,512	2681	0.073	0.227	2472	135.34	0.0038	0.0117	2.55
Graders	2,756	2681	0.073	0.227	2472	7.24	0.0002	0.0006	0.14
Packer	2,904	2681	0.073	0.227	2472	7.63	0.0002	0.0007	0.14
Dozer	6,955	2681	0.073	0.227	2472	18.27	0.0005	0.0016	0.34
Side Dump Haul Trucks	30,820	2681	0.073	0.227	2472	80.98	0.0022	0.0070	1.52
Total						**300.87**	**0.01**	**0.03**	**5.66**

Notes:

[1] This is equipment required for 1 month of work equal to 1 kilometre

Table B.2.4 Horsefly Spillway Earth moving - Total Emissions

Project Component	Length (km)	# of months[1]	Total Emissions (tonnes/month)				
			Diesel CO_2	CH_4	N_2O	Biodiesel CO_2	Total GHG Emissions (t CO_2e)
SMRID Main Canal to Horsefly Reservoir	3.5	3.5	1,053.06	0.03	0.09	19.82	1080.90
Horsefly Reservoir to Taber Lake	5	5.0	1,504.37	0.04	0.13	28.31	1544.15
Taber Lake to Oldman River	5.5	5.5	1,654.81	0.05	0.14	31.14	1698.56
Total	**14**	**14**	**4,212.24**	**0.12**	**0.36**	**79.26**	**4,323.62**

Notes:

[1] 1 month of work equal to 1 kilometre

Table B.2.5 Horsefly Spillway Concrete work - Emissions per structure

Equipment Type	Fuel Consumption (L)	Emission Factors (g/L)				Emissions per structure (tonnes)[1]			
		Diesel CO_2	CH_4	N_2O	Biodiesel CO_2	Diesel CO_2	CH_4	N_2O	Biodiesel CO_2
Excavator2	14,758	2681	0.073	0.227	2472	38.78	0.0011	0.0034	0.73
Rock Movers	15,706	2681	0.073	0.227	2472	41.27	0.0011	0.0036	0.78
Packer	5,808	2681	0.073	0.227	2472	15.26	0.0004	0.0013	0.29
Zoom-boom	4,860	2681	0.073	0.227	2472	12.77	0.0004	0.0011	0.24
Generator	1,441	2681	0.073	0.227	2472	3.79	0.0001	0.0003	0.07
Light Plant	1,441	2681	0.073	0.022	2472	3.79	0.0001	0.0000	0.07
Heaters	114	2681	0.073	0.022	2472	0.30	0.0000	0.0000	0.01
Concrete Trucks	2,674	2681	0.073	0.227	2472	7.03	0.0002	0.0006	0.13
Concrete Pump	2,674	2681	0.073	0.227	2472	7.03	0.0002	0.0006	0.13
Total						**129.99**	**0.00**	**0.01**	**2.45**

Notes:

[1] This is equipment required for 1 concrete drop structure or 1/2 the concrete spillway

Table B.2.6 Horsefly Spillway Concrete work - Total Emissions

Project Component	Number (km)	Equivalent Number[1]	Total Emissions (tonnes/month)				
			Diesel CO_2	CH_4	N_2O	Biodiesel CO_2	Total GHG Emissions (t CO_2e)
Install 3.5 m Concrete Drop Structure							
SMRID Main Canal to Horsefly Reservoir	2	2	259.99	0.01	0.02	4.89	266.67
Horsefly Reservoir to Taber Lake	2	2	259.99	0.01	0.02	4.89	266.67
Taber Lake to Oldman River	2	2	259.99	0.01	0.02	4.89	266.67
Install 5.0 m Concrete Drop Structure							
Horsefly Reservoir to Taber Lake	1	1	129.99	0.00	0.01	2.45	133.34
Concrete Spillway Structure to Oldman River	1	1.5	194.99	0.01	0.02	3.67	200.00
Total	**8**	**9**	**1,104.94**	**0.03**	**0.09**	**20.79**	**1,133.35**

Notes:

[1] As per Equipment list provided by MPE, equipment times were provided per concrete drop structure, with Oldman River spillway to require 1.5 time the equipment use and twice as long to complete. (Coms with T. Guan March 12, 2020)

Table B.2.7 Horsefly Spillway Country Road Crossings - Emissions per Crossing

Equipment Type	Fuel Consumption (L)	Emission Factors (g/L)				Emissions (tonnes)			
		Diesel CO_2	CH_4	N_2O	Biodiesel CO_2	Diesel CO_2	CH_4	N_2O	Biodiesel CO_2
Excavator2	937	2681	0.073	0.227	2472	2.46	0.0001	0.0002	0.05
Packer	1,915	2681	0.073	0.227	2472	5.03	0.0001	0.0004	0.09
Total						**7.49**	**0.00**	**0.00**	**0.14**

Table B.2.8 Horsefly Spillway Country Road Crossings - Total Emissions

Project Component	Number	Total Emissions (tonnes/month)				
		Diesel CO_2	CH_4	N_2O	Biodiesel CO_2	Total GHG Emissions (t CO_2e)
M.D. of Taber Road Crossings	6	44.96	0.00	0.00	0.85	46.15
Total	**6.0**	**44.96**	**0.00**	**0.00**	**0.85**	**46.15**

Table B.2.9 Horsefly Spillway Highway/Railway Crossings - Emissions per Crossing

Equipment Type	Fuel Consumption (L)	Emission Factors (g/L)				Emissions (tonnes)			
		Diesel CO_2	CH_4	N_2O	Biodiesel CO_2	Diesel CO_2	CH_4	N_2O	Biodiesel CO_2
Excavator2	4,919	2681	0.073	0.227	2472	12.93	0.0004	0.0011	0.24
Packer	10,055	2681	0.073	0.227	2472	26.42	0.0007	0.0023	0.50
Tunnel Casing Puller	126	2681	0.073	0.022	2472	0.33	0.0000	0.0000	0.01
Total						**39.67**	**0.00**	**0.00**	**0.75**

Table B.2.10 Horsefly Spillway Highway/Railway Crossings - Total Emissions

Project Component	Number	Total Emissions (tonnes/month)				
		Diesel CO_2	CH_4	N_2O	Biodiesel CO_2	Total GHG Emissions (t CO_2e)
Highway 3 Crossing	1	39.67	0.00	0.00	0.75	40.72
Highway 36 Crossing	1	39.67	0.00	0.00	0.75	40.72
CP Rail Crossing	1	39.67	0.00	0.00	0.75	40.72
Total		**119.02**	**0.00**	**0.01**	**2.24**	**122.15**

Table B.3.1 Project Emissions

Project Component		Total Emissions (tonnes/month)				
		Diesel CO_2	CH_4	N_2O	Biodiesel CO_2	Total GHG Emissions (t CO_2e)
Earth moving	SMRID Main Canal to Horsefly Reservoir	1,053.06	0.03	0.09	19.82	1,080.90
	Horsefly Reservoir to Taber Lake	1,504.37	0.04	0.13	28.31	1,544.15
	Taber Lake to Oldman River	1,654.81	0.05	0.14	31.14	1,698.56
Concrete work	SMRID Main Canal to Horsefly Reservoir	259.99	0.01	0.02	4.89	266.67
	Horsefly Reservoir to Taber Lake	389.98	0.01	0.03	7.34	400.01
	Taber Lake to Oldman River	259.99	0.01	0.02	4.89	266.67
	Taber Lake Outlet Structure	194.99	0.01	0.02	3.67	200.00
Highway/Railway Crossings		119.02	0.00	0.01	2.24	122.15
Country Road Crossings		44.96	0.00	0.00	0.85	46.15
Total		**5,481.17**	**0.15**	**0.47**	**103.14**	**5,625.27**

Appendix B.4 Anticipated Project Construction Timeline [1]

Project	Total Cost ($)	Cash flow cost per year for all phases											
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
Construction													
SMRID Main Canal to Horsefly Reservoir	$ 6,607,000					$ 6,607,000							$ 6,607,000
Horsefly Reservoir to Taber Lake	$ 9,557,000				$ 9,557,000								$ 9,557,000
Taber Lake to Oldman River	$ 8,173,000			$ 8,173,000									$ 8,173,000
Highway and Rail Crossings	$ 1,567,000			$ 522,333	$ 1,044,667								$ 1,567,000
M.D. of Taber Road Crossings	$ 1,253,000			$ 626,500	$ 417,667	$ 208,833							$ 1,253,000
Taber Lake Outlet Structure	$ 7,312,000		$ 7,312,000										$ 7,312,000
Other Project Costs (no emissions)	$ 14,516,000	$ 6,458,000	$ 2,040,600	$ 1,988,400	$ 1,988,400	$ 2,040,600							$ 14,516,000
Total Project	$ 48,985,000	**$ 6,458,000**	**$ 9,352,600**	**$ 11,310,233**	**$ 13,007,734**	**$ 8,856,433**	$ -	$ -	$ -	$ -	$ -	$ -	**$ 48,985,000**

Notes

[1]As per Table 20: Phase 1 (2020-2030) Cash Flow Breaksown in 2020 Dollars, MPE Engineering Ltd., "Muncipal District of Taber - Southern Regional Stormwater Management Plan - Project Implementation Plan", Oct 2019 with dates adjusteed by 1 year as guided by MPE.

Project	Construction Start	Construction End	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total	Baseline Emissions (t CO_2e)	Project Emissions (t CO_2e)
Construction																
SMRID Main Canal to Horsefly Reservoir	2025	2025	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	n/a	1,347.57
Horsefly Reservoir to Taber Lake	2024	2024	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	n/a	1,944.15
Taber Lake to Oldman River	2023	2023	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	n/a	1,965.23
Highway and Rail Crossings	2023	2024	0%	0%	33%	67%	0%	0%	0%	0%	0%	0%	0%	100%	n/a	122.15
M.D. of Taber Road Crossings	2023	2025	0%	0%	50%	33%	17%	0%	0%	0%	0%	0%	0%	100%	n/a	46.15
Taber Lake Outlet Structure	2022	2022	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	n/a	200.00
Total			**0.00**	**200.00**	**2,029.03**	**2,040.97**	**1,355.27**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5,625.27**	**0.00**	**5,625.27**

Project Construction Emission Calculations:

A. GHG Emissions from Mobile Equipment (tonnes CO_2e) =

$$Diesel\ Fuel\ Consumption\ (kL) \times \left[\left(Diesel\ CO_2\ Emission\ Factor\ \left(\frac{kg}{kL}\right) \times CO_2\ GWP\right) + \left(Diesel\ CH_4\ Emission\ Factor\ \left(\frac{kg}{kL}\right) \times CH_4\ GWP\right) + \left(Diesel\ N_2O\ Emission\ Factor\ \left(\frac{kg}{kL}\right) \times N_2O\ GWP\right)\right]$$

where Diesel Fuel Consumption (Liters) =

$$Brake\ Specific\ Fuel\ Consumption\ \left(\frac{lb}{hp.hr}\right) \times \frac{453.6\ grams}{lb} \times Diesel\ Density\left(\frac{liter}{840\ gram}\right)$$

$$\times horse\ power\ of\ Equipment\ \times Operating\ Hours\ of\ Mobile\ Equipment$$

$$\times Equipment\ Load\ Factor$$

$B.$ $GHG\ Emission\ Reduction\ from\ Planting\ Trees\ \ (\ tonnes\ CO_2e) =$

$Assumptions\ made\ were\ as\ follows$:

- 50% of the dry mass of a tree is carbon
- 20% of tree biomass is below ground level in roots (120% is used)
- Plant Areas estimated based on information provided by McElhanney (Project 12462 Phibbs Transit Exchange-Landscaping-IFT BCBid.pdf)

$$GHG\ Emission\ Reduction\ per\ Tree\ (tonnes\ CO_2e)$$

$$= Tree\ Dry\ Biomass\ (kg) \times 50\%\ (Carbon\ \%) \times \frac{44.01\ \frac{Gram\ CO_2}{Gram\ mole\ CO_2}}{12.01\ \frac{Gram\ C}{Gram\ Mole\ C}} \times 120\%$$

$$\times\ Number\ of\ trees$$

Where, Tree dry biomass (kg)

$$= \left(Coefficient\ a\ \times Diameter\ Breast\ Height\ (cm^3)\right)^{coefficient\ b}$$

$Sample\ Calculation\ for\ Western\ Red\ Cedar$:

$$= 119\ kg \times 0.50 \times 3.664 \times 1.2\ \times 21\ trees\ \times \frac{tons}{1000\ kg}$$

$$= 5.5\ CO_2\ Tonnes$$

$$Annual\ Emission\ Reduction = 5.5\ CO_2\ Tonnes\ \div 30\ Years\ (Project\ life\ Span)$$

$$= 0.18\ \ CO_2\ Tonnes\ \ per\ year$$

$C.$ $GHG\ Emission\ Reduction\ from\ Planting\ Other\ Vegetation\ \ (\ tonnes\ CO_2e) =$

$Assumptions\ made\ were\ as\ follows$:

- 35% of the green mass of a tree is water and 65% is solid dry mass
- 50% of the dry mass of a tree is carbon

- Plant Load was taken from Table 26 from "'FLL_greenroofguidelines_2018.pdf' and assumed to be 10.0 kg/m^2.
- Plant Areas estimated based on information provided by McElhanney (Project 12462 Phibbs Transit Exchange-Landscaping-IFT BCBid.pdf)

$$GHG\ Emission\ Reduction\ from\ Other\ Vegetaion\ in\ Project\ case\ (tonnes\ CO_2e)$$
$$= Load\ \left(\frac{kg}{m^2}\right) \times Plant\ Area\ (m^2) \times \frac{Tonnes}{1000\ kg} \times 65\%\ (dry\ mass)$$
$$\times 50\%\ (Carbon\ \%) \times \frac{44.01\ \frac{Gram\ CO_2}{Gram\ mole\ CO_2}}{12.01\ \frac{Gram\ C}{Gram\ Mole\ C}}$$

$$= 10.0\ \left(\frac{kg}{m^2}\right) \times 586\ m^2 \times \frac{Tonnes}{1000\ kg} \times 0.65 \times 0.50 \times 3.664 = 6.98\ CO_2\ Tonnes$$

$\boldsymbol{D.\ Traffic\ Emissions\ (tonnes\ CO_2e) =}$

$$Bus\ Emission\ in\ the\ Project\ Case\ (tonnes\ CO_2e)$$
$$= Annual\ Estimated\ Bus\ Passengers\ \times Transit\ Emission\ Factor$$

$$= 738{,}866\ Annual\ bus\ passenger\ \times \frac{320\ gram\ CO2e}{Boarded\ Bus\ Passenger} \times \frac{kg}{1000\ grams} \times \frac{Tons}{1000\ kg}$$
$$= 236.4\ CO_2\ Tonnes$$

$$Personal\ Vehicle\ Emissions\ in\ the\ Baseline\ Case\ (tonnes\ CO_2e)$$

$$= Annual\ Estimated\ Single\ Occupant\ Drivers\ \times Trip\ Distance\ (round\ trip) \times Fuel\ Economy$$
$$\times Light\ duty\ Vechicle\ (Gasoline\ Fueled)\ Emission\ Factor$$

Personal Vehicle Emissions in the Baseline Case ($tonnes\ CO_2e$) =

$$= 507{,}815\ Annual\ Single\ Occupant\ Drivers\ \times \frac{24.81\ kilometers}{Trip} \times \frac{9.2\ Liters}{100\ kilometer} \times \frac{2317\ grams}{Liter}$$
$$\times \frac{kilograms}{1000\ grams} \times \frac{Tons}{1000\ kg} = 2865\ CO_2e\ Tonnes$$

H2

Climate Change Resiliency Assessment

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March 27, 2020

Jeff Hust
MPE Engineering
#300, 714 – 5 Avenue S
Lethbridge, Alberta
Email: jhust@mpe.ca

Re: MPE Engineering LTD. – Horsefly Regional Emergency Spillway - Climate Change Resiliency Assessment
RWDI Reference No. 2002604

Dear Mr. Hust,

MPE Engineering Ltd (MPE) and the Southern Regional Drainage Committee retained RWDI AIR Inc. (RWDI) to provide a Climate Change Resiliency Assessment for the Horsefly Spillway Project (the Project) located near Taber, Alberta. The subject of the assessment included a study of likely climate risks, an analysis of possible vulnerabilities and impact scenarios from such climate risks, an assessment and ranking of the resulting consequences, and finally, an exploration of adaptation measures to help ameliorate vulnerabilities and negative consequences. In addition, a cost-benefit analysis to motivate the adoption of the identified measures was performed. The report was prepared in accordance with Climate Lens, General Guidance, Version 1.2, September 6, 2019.

We trust that the information provided in this report meets your requirements for Climate Lens. Should you have any questions, please contact me directly by telephone at (403) 619-3480 or by email at matthew.endsin@rwdi.com. We appreciate the opportunity to have worked with you on this assessment.

Yours very truly,

RWDI Air Inc



Matt Endsin, P. Biol., M.Sc.
Project Manager

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FINAL REPORT

HORSEFLY SPILLWAY PROJECT
MPE ENGINEERING LTD.
LETHBRIDGE, AB

CLIMATE CHANGE RESILIENCY ASSESSMENT
RWDI #2002604
MARCH 27, 2020

SUBMITTED TO

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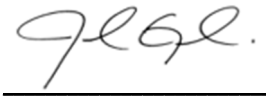
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ATTESTATION OF COMPLETENESS

I/we the undersigned attest that this Resilience Assessment was undertaken using recognized assessment tools and approaches (i.e., ISO 31000:2009 Risk Management-Principles and Guidelines) and complies with the General Guidance and any relevant sector-specific technical guidance issued by Infrastructure Canada for use under the Climate Lens.

Prepared by: Joel Good, P.Eng., M.A.Sc.
[Name and credentials]



[Signature] March 27, 2020 [Date]

Attested by*: Russ Lewis, M.Eng., P.Eng..
[Name and credentials]



[Signature] March 27, 2020 [Date]

*Resilience Assessments must be prepared, or at a minimum validated by, a licensed professional engineer, certified planner, or appropriately specialized biologist or hydrologist.

EXECUTIVE SUMMARY

A climate change resiliency assessment was conducted as part of the larger Climate Lens initiative for the Horsefly Spillway Project near Taber, Alberta. The project is designed to allow excess flows to be diverted from the Saint Mary's River Irrigation District (SMRID) Main Canal to the Oldman River via the Horsefly Reservoir and Taber Lake as the first phase of a masterplan of flood improvements within the Southern Regional Drainage Committee (SRDC) area. This assessment involved four primary aspects, which include: a study of likely climate risks, an analysis of possible vulnerabilities and impact scenarios from such climate risks, an assessment and ranking of the resulting consequences, and finally, an exploration of mitigation measures to help ameliorate vulnerabilities and negative consequences, coupled with a cost-benefit analysis to motivate their adoption. The assets under review include upgrades to turnouts, enlargement of 14 km of existing canals, 7 new drop structures, 2 constructed wetlands, upgrades to outlet structures, and 9 highway/county road/railway crossings. The analyses were conducted assuming a 50 to 100-year asset lifespan and with the information provided in the Preliminary Engineering package by MPE.

The climate analysis revealed four primary climate risks that are anticipated to impact the assets. The first climate risk is increases in both summer and winter temperatures, in addition to increases in periods of prolonged extreme heat. The second risk relates to changes in precipitation, which includes overall annual increases in precipitation (with the majority of the overall increase being experienced in individual events), with general increases in the winter and spring and decreases in the summer. The third risk is an increase in summer drought conditions due to an increase in heat wave intensities and duration. The final risk includes an increase in local, and regional, wildfires and the associated decrease in air quality that is a result.

Results from this risk assessment were then used to predict possible impact scenarios to the main project assets. These climate risk-induced impact scenarios were then assessed in terms of possible consequences related to people, the economy, and the environment; as experienced by both the assets and the public. A risk factor, combining likelihood of the event occurring and severity of consequence, ranging from "Very Low" to "Very High" was determined for each climate risk. Risk scores of "Moderate" and above were further analyzed since these risks warrant controls to mitigate the likelihood of occurrence and negative consequence as per Climate Lens guidance. As the flow of water through the spillway will be tightly controlled, even during peak expected runoff periods the risk of flooding to the Horsefly Spillway itself is very limited. The priority risk was the possibility that drought would damage the two constructed wetlands with potential to negatively impact their functions (water retention & water filtering) in the overall spillway design.

Measures to mitigate these unwanted consequences and further improve asset resilience were then determined and referenced to the received design documents. Continuous spillway flow during irrigation & drought seasons, drought-resistant plantings, and an on-going maintenance plan have been specified to mitigate wetland degradation. A cost-benefit analysis of these measures outlines the financial investment made throughout the project to ensure a resilient design.

The mitigation measures in place, and highlighted in this report, have been deemed effective at lowering the risk scores to acceptable levels under the Climate Lens guidance.

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1 INTRODUCTION / PROJECT OVERVIEW

1.1 Project Overview

RWDI was retained by MPE Engineering Ltd. to provide a climate resiliency assessment for the Horsefly Spillway Project in Southern Alberta. The resiliency assessment was completed in accordance with the Climate Lens, General Guidance, Version 1.2, and ISO 31000:2018 as part of the submission to the Investing in Canada Infrastructure Program (ICIP).

The Horsefly Spillway project is a proposed strategically placed regional emergency spillway to the Oldman River from the St. Mary River Irrigation District (SMRID). The Horsefly Spillway is located near the midway point, and major capacity reduction point, on the 300 km long SMRID Main Canal system which receives stormwater runoff from approximately 565,000 ha of land in Southern Alberta. The proposed spillway project is 14 km long and located near the midway point of the SMRID Main Canal system to divert water from the SMRID Main Canal and transport it via Taber Irrigation District (TID) works to the Oldman River near the Town of Taber, Alberta with an estimated project cost of approximately $47 million. As proposed, the spillway would divert excess flood flows from the Main Canal to reduce flood damages in the SRDC area.

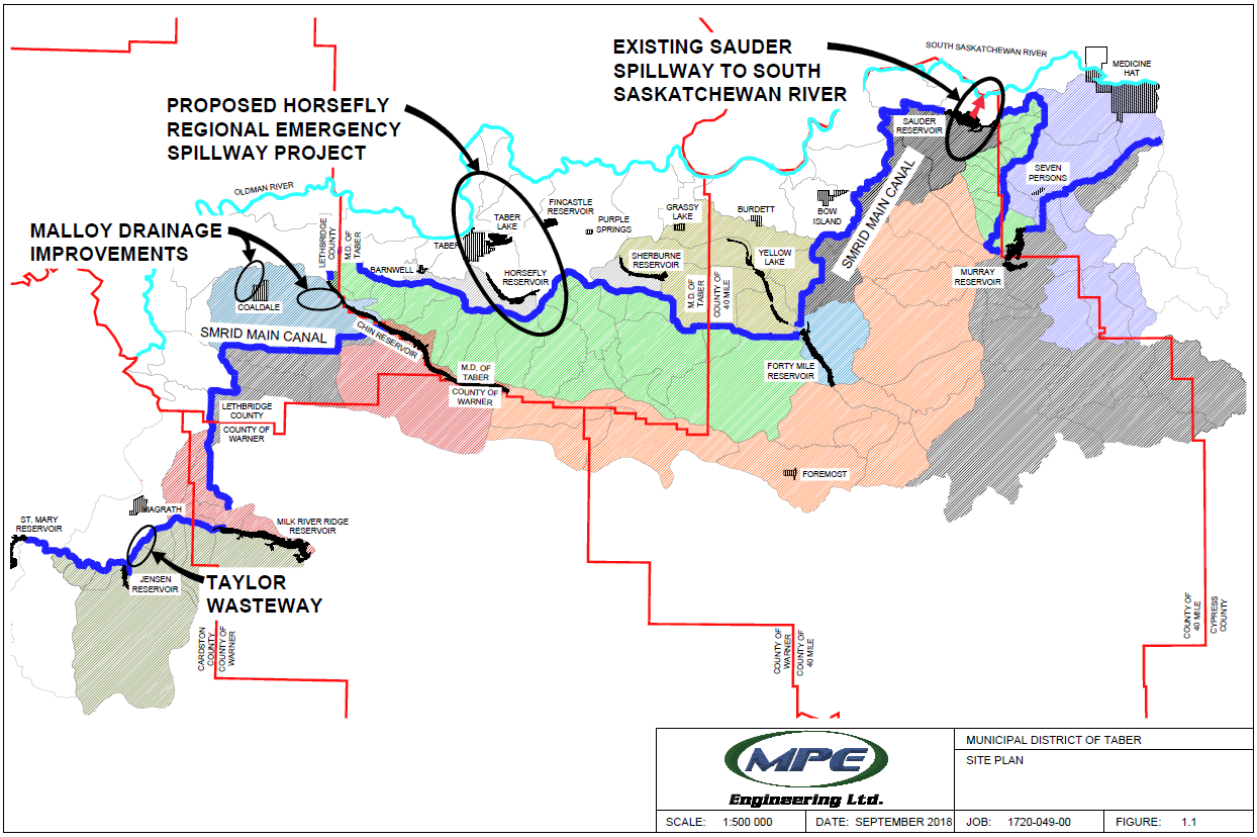


Figure 1: The Horsefly Spillway Project in context of larger SRDC project plan [MPE, 2018].

The Horsefly Spillway is the first of a seven phase, $151 million project to increase the capacity of the SMRID canal system to reduce the occurrence of flooding and the negative impact it has on people, property, economic loss, and agricultural production within the SRDC area. The overall project includes adding stormwater flow and storage capacity through reservoir expansions, additional spillways, a dry dam, and pumping stations, as shown previously in **Figure 1**.

The assessment was a collaborative effort from the design team and RWDI (Section 1.2), with contributions from:

- MPE Engineering Ltd. (Jeff Hust and Tim Guan);
- Municipal District of Taber (Craig Pittman);

RWDI drew on the following evidence base to complete the resiliency assessment:

- Local future climate predictions, for the nearby Municipal District of Taber, from Canada Climate Atlas [Climate Atlas, 2019];
- Regional future climate predictions (i.e. Hayhoe & Stoner [2019], Martz et al. [2007], Lapp et al. [2009], Sauchyn [2013]);
- Stormwater Management Plans for the South Regional District (MPE [2014, 2016, & 2019]);
- Project Engineering Reports (Preliminary Engineering Report [MPE, 2018], Design Storm Report [XCG, 2012]),
- Project drawings (Concept Drawing Set w/ Representative Details)
- Resiliency assessment guidelines (Public Infrastructure Engineering Vulnerability Committee, Infrastructure Canada Climate Lens); and
- The project experience and knowledge of the design team.

This report provides an assessment of the future climate risk to the project and outlines resiliency measures to ensure the project can adapt to a changing climate. The report includes an attestation that the assessment conforms to the general and sector-specific technical guidance provided by Infrastructure Canada and aligns with the requirements of their Climate Lens.

1.2 Assessment Team Members & Qualifications

Acceptable climate change resiliency assessments must be conducted, or at a minimum validated, by a qualified party (i.e., a professional engineer, registered professional planner, or appropriately specialized biologist or hydrologist) who will provide an attestation that the climate change resiliency assessment was carried out according to Infrastructure Canada's Climate Lens guidance.

An attestation was provided at the beginning of this report by a professional engineer, experienced in Climate Resiliency Assessment projects. The team for this assessment engagement is summarized in **Table 1**.

Table 1: Assessment Team

Role	Name & Credentials	Title	Email
Project Manager	Matthew Endsin, M.Sc., P.Biol.	Project Manager	Matthew.Endsin@rwdi.com
Team Leader	Joel Good, P.Eng., M.A.Sc.	Principal / Senior Engineer	Joel.Good@rwdi.com
Team Member(s)	Sandra Dedesko, EIT, M.A.Sc. Jaret Fattori, M.Eng.	Sustainability / Resiliency Consultant Sustainability / Resiliency Consultant	Sandra.Dedesko@rwdi.com Jaret.Fattori@rwdi.com
Signing Engineer	Russ Lewis, P.Eng., M.Eng.	Principal / Senior Consultant	Russ.Lewis@rwdi.com
Technical Expert(s)	Russ Lewis, P.Eng., M.Eng. Joel Good, P.Eng., M.A.Sc. Sandra Dedesko, EIT, M.A.Sc.	Principal / Senior Consultant Principal / Senior Engineer Sustainability / Resiliency Consultant	Russ.Lewis@rwdi.com Joel.Good@rwdi.com Sandra.Dedesko@rwdi.com

2 METHODOLOGY & CONTEXT

The objective of this resiliency assessment is to review the possible climate change impacts over the intended life of the project and outline resiliency measures where warranted to reduce identified risks. This review was completed in accordance with the Infrastructure Canada's Climate Lens General Guidance document, Annex G [Climate Lens, 2019] and ISO 31000:2018 Risk Management – Guidelines [ISO 31000, 2018]. The analysis methodology was supported in part by the Public Infrastructure Engineering Vulnerability Committee (PIEVC) Engineering Protocol [PIEVC, 2017].

The following provides broad guidance for the steps typically included when conducting Risk Management:

1) Establishing the Context
2) Risk Identification
3) Risk Analysis
4) Risk Evaluation
5) Risk Mitigation

This step-by-step guidance can be scaled up or down based on the complexity of the assessment. These steps are adapted from those published in the Canadian Climate Change Risk Assessment Guide – A Strategic Overview of Climate Risks and Their Impact on Organizations [Summit, 2014].

2.1 Scope and Timescale

The Horsefly Spillway project consists of the following 22 assets, grouped into 6 common categories for the purpose of this climate change resiliency assessment.

1. Upgrades to Horsefly Turnout
    a. Upgrade Horsefly Canal Turnout Structure (on the SMRID Main Canal)
2. Enlargement of Existing Canals

   a. Upgrade 14 km of canal and drains to 55 m^3/s
3. Canal Drop Structures
   a. 6 New 3.5m Concrete Drop Structures
   b. 1 New 5.0m Concrete Drop Structure
4. Constructed Wetlands
   a. 2 New constructed wetlands
5. Upgrades to Outlet Structures
   a. Upgrade Horsefly Reservoir Outlet
   b. New Taber Lake Concrete Outlet Structure
   c. New Concrete Spillway to Oldman River
6. Highway, Rail & Road Crossings (x9)
   a. Upgrade 3 Highway/Railway Crossings
   b. Upgrade 6 County Road Crossings

Preliminary drawings plans and design documents [MPE, 2018] offering further description of the proposed spillway have been included in Appendix A (Section 6.1) for reference.

The climate resiliency assessment has been completed for the intended lifespan of the project, 50 years for the road and highway crossings, and 100 years for the drop structures and other concrete structures, canal upgrades and constructed wetlands, and thus the future climate assessment has considered predicted climate in that timeframe. The project is scheduled to begin in 2021 with completion by 2025.

Table 2: Asset Intended Life

Asset	Intended Life
Upgrades to Horsefly Turnout	100 yrs
Enlargement of Existing Canals (14km)	100 yrs
Canal Drop Structures	100 yrs
Constructed Wetlands	100 yrs
Upgrades to Outlet Structures	100 yrs
Highway, Rail & Road Crossings (x9)	50 yrs

Important Note on Project Scope:

It is important to note a noteworthy distinction in the scope of this project and assessment—as stated previously, the Horsefly Spillway Project is the first phase of a three-phase SRDC masterplan [MPE, 2019] designed to abate canal flooding, as evident by recent well-documented events [MPE, 2014]. The overall SRDC masterplan considers excess flow scenarios and provides a series of design elements to divert and control flows in the Main Canal. The Horsefly Spillway is only one such measure.

The SRDC masterplan has reviewed past flooding events and, based on future water supply and demand reductions, set a flow design criterion to consider a 1:100 yr storm event. This event considers the rainfall values of 125mm and 136mm as the 48 and 72 hr rainfall depths coinciding with early spring ground and snow-cover conditions [MPE, 2014 & XCG, 2012].

Accordingly, as part of the overall masterplan, the Horsefly Spillway has been designed to contribute to excess flow scenarios by diverting up to a maximum of 55 m^3/s capacity of flow from the main SMRID canal to the Oldman River. This flowrate will be controlled with gates at the turnout structure from the Main Canal. The flow will be limited by the following means (as described by project engineers [MPE, 2020]):

> *"On the turnout structure itself, there will be a radial gate with a breast wall above the gate that extends to the Main Canal's top of bank. This limits flow to the square orifice between the turnout structure's headblock slab and the bottom of the breast wall, the size of the orifice can then be fully controlled using the radial gate. The radial gate will also have automatic operations managed by a SCADA system (though someone will be onsite during a major storm event)."*

Therefore**, the climate change resiliency study for the Horsefly Spillway Project does not consider a scenario in which flow from the Main Canal could exceed the design flow rate (55 m3/s) as a result of upstream supply flow impacts from climate change** (i.e. precipitation, snow melt). **The climate change impacts considered in this study are those local to the Horsefly Spillway Project**, such as the effect of increased precipitation causing local run-off directly to the Spillway canals, wetlands, and reservoirs. Overall climate change impact to the SRDC masterplan will be considered for the sections of the SMRID Main Canal that will be subject to uncontrolled flow rates, and outside of the scope of this study.

2.2 Determining Level of Risk Analysis

To determine the level of risk analysis required for the project, Infrastructure Canada offers the following four questions to assess depth of study:

- Is the preliminary outcome of your project to enhance the resilience of built or natural infrastructure?
- Are you building or retrofitting an asset in an area that has already been impacted by a natural hazard or other climate risk (e.g. near a body of water with potential for flooding, near a potential wildfire-urban interface?)
- Is the asset you are building or retrofitting of critical importance to the community it serves?
  Is your project of national significance e.g. a project that could benefit more than one province or territory, a project that would mitigate a significant economic loss in case of disaster, or a project that could mitigate loss of life?

Responses to these four defining questions for this project are detailed in the following table:

Table 3: Level of Risk Analysis

Questions to Assess Depth of Study	Level of Risk
Is the preliminary outcome of your project to enhance the resilience of built or natural infrastructure?	**Yes.** The Horsefly Spillway is the first phase of the Southern Regional Drainage plan to increase capacity of the irrigation system to reduce the likelihood of damage from flood events.
Are you building or retrofitting an asset in an area that has already been impacted by a natural hazard or other climate risk?	**Yes.** Recent precipitation and snow melt events (2010, 2011, 2013, 2018) in the region have led to the SMRID Main Canal exceeding flow capacity and flooding agricultural land, roads, and property.
Is the asset you are building or retrofitting of critical importance to the community it serves?	**Yes.** The SMRID Main Canal supplies water to over 200,000 ha of irrigated farmland in Southern Alberta generating economic value estimated in the hundreds of millions of dollars.
Is your project of national significance?	**Yes.** For the economic reasons above, the project is not of national significance

As the project is designed for resiliency, has previously been impacted by a climate risk, is of critical importance to the community it serves, and has national significance a more detailed resilience assessment is warranted.

2.3 Identification and Assessment of Climate Change Risks

RWDI performed a future climate risk assessment following the procedures of the Climate Lens General Guidance guide [Climate Lens, 2019] looking at regional climate predictions from Climate Atlas for the Municipal District of Taber [Climate Atlas, 2019] and other regional studies. This report primarily uses downscaled projections of daily temperature and precipitation data provided by the Pacific Climate Impacts Consortium [PCIC, 2014]. The projections were assessed from 12 global climate models (GCMs) using different carbon emission scenarios, including the high-emission (business as usual) RCP8.5 scenario and a stabilized GHG emission scenario (RCP4.5). Although models are run with many climate scenarios in order to achieve a higher degree of accuracy, there remains a level uncertainty in predicting future climate characteristics such as precipitation, temperature, and extreme weather.

The four site-specific risks for the Horsefly Spillway project were found to be:

1. Increased temperature medians and extremes.
2. Increased precipitation median and extremes.
3. Increased risk of drought.
4. Increased risk of wildfires.

These forecasted trends were quantified in order to assess future design criteria and develop adaptive measures for the project. Based on the projected lifespan of 50 to 100 years, longer term forecasted climate risks are prioritized. Accordingly, climate variability within the region should be considered when evaluating these trends.

2.3.1 Increased Temperature Median and Extremes

Climate Atlas uses Global Climate Models (GCM's) in order to run different climate scenarios for the region and normalize the results. This data is collected from the Pacific Climate Impacts Consortium (PCIC), which updates their models on an on-going basis. The most recent data from the PCIC indicates that the median annual temperature for Taber is expected to increase from 5.9 ºC to 10ºC by 2080's compared to the 1980's baseline, with a predicted increase in the summer of 4.5ºC and 4.4ºC in the winter [Climate Atlas, 2019].

Temperature extremes during the summer will also become more prevalent. The average number of hot summer days (above 30ºC) is expected to rise from 20 to 59 days a year by 2080. Further, tropical nights (nights above 30ºC) will increase from 0 to 4 by this time.

These comparisons are between current mean values and predicted mean values of temperatures. Models run many different scenarios for predictive analysis; the mean of this window is used for comparison as it represents the most statistically likely scenario.

Table 4: Summary of Climate Change Projections for Taber, Alberta [Climate Atlas, 2019]

Index	Period	Current Mean	2080's Prediction Range		
			Low	Mean	High
Mean Temperature (°C)	**Annual**	5.9	8	10	12
Mean Temperature (°C)	**Spring**	5.6	6.2	9.3	12.3
Mean Temperature (°C)	**Summer**	17.8	20	22.3	24.5
Mean Temperature (°C)	**Fall**	6.5	8	10.4	12.9
Mean Temperature (°C)	**Winter**	-6.7	-6.8	-2.3	2.1
Tropical Nights	**Annual**	0	0	4	13
Very hot days (+30°C)	**Annual**	20	34	59	82
Very cold days (-30°C)	**Annual**	4	0	1	3
Frost-Free Season (days)	**Annual**	139	145	174	203
Freeze-Thaw Cycles	**Annual**	99.4	49.1	67.6	88.2

A secondary impact of increased winter temperatures is a lower snowpack, during winter and spring months. This can impact local ecosystems and runoff. The warmer winters are also expected to result in 39% less frost days, adding to the risk of pests and invasive species, as well as reducing the number of typical freeze/thaw cycles (from 99 to 68 per year) [Climate Atlas, 2019].

Lastly, the Growing Degree Days (GDD) are expected to increase from their 1980 baseline of 981 to 1680 by the 2080's. GDD is the annual sum of the number of degrees Celsius that each day's mean temperature is above 10 ºC, and is used to measure the heat available for mature plant growth.

2.3.2 Increased Precipitation Median and Extremes

The PCIC future climate predictions [Climate Atlas, 2019] estimate that the total annual precipitation is predicted to increase, as is the number of heavy precipitation days and maximum 1-day precipitation events within the Municipal District of Taber. The average annual precipitation is expected to increase by 11%; with a substantial increase in the spring that accounts for much of the total increase. Dry days, or those without precipitation, are expected to be unchanged, decreasing by less than one day per year. During the colder months, the anticipated increase in precipitation is expected to occur in short periods, resulting in more extreme precipitation events, with heavy precipitation days (10mm or more) increasing from 7.3 to 8.5 days per year.

Table 5: Climate Projections for Municipal District of Taber: Precipitation Median Change

Period	Past (mm)	2080's Change		
		Low	Mean	High
Annual	358	263	398	547
Spring	94	59	117	186
Summer	141	60	142	252
Fall	69	32	75	138
Winter	53	34	64	97

Precipitation that falls during winter months is sequestered as snowpack at higher elevations, which eventually melts and is distributed to aquifers and local streams. However, as discussed in the previous section, temperature increases are expected which are predicted to reduce snowpack dramatically.

2.3.3 Increased Risk of Drought

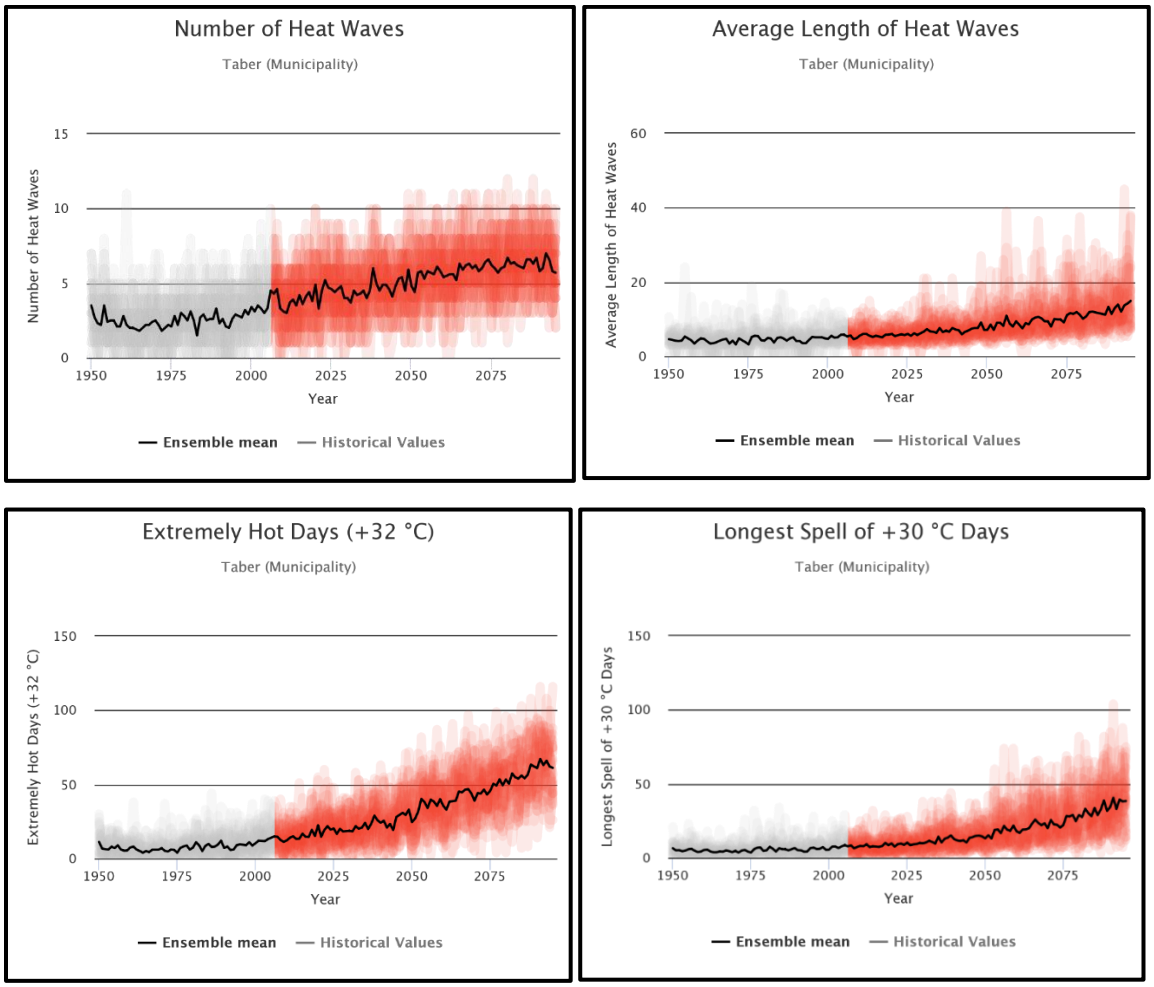
Yearly precipitation and temperature means are helpful for outlining potential drought risks; however, these two elements also compound each other. Therefore, other metrics—such as heat waves, dry spells, and on-going high degree days—are better at outlining drought risk.

The number of heat waves (three or more days of consecutive temperature greater than 30 ºC) in the region is expected to increase from 2.8 to 5.9 per year, with their length increasing from 4.6 to 9.8 days. Similarly, the number of extremely hot days (those over 32 ºC) will increase from 9.1 to 41.8. Lastly, the longest spell of above 30 ºC days increasing from 6.1 to 21.5 days. Although maximum temperatures do pose climate risks, droughts are characterized by prolonged dry and hot periods.

Table 6: Climate Projections for Municipal District of Taber: Drought Conditions

Variable	Past	2080's Change		
		Low	Mean	High
Number of Heat Waves	2.8	3.1	5.9	8.7
Length of Heat Waves (days)	4.8	5.2	9.6	16.3
Number of Extreme Heat Days (+32 ºC)	9.1	18.8	41.8	65.3
Longest Spell above 30 ºC (days)	6.1	7.6	21.5	42.0

Figure 2: Future Predicted Trends of Increased Temperature and Drought for Taber, AB [Climate Atlas, 2019]



2.3.4 Increased Risk of Wildfire

Western Canada has seen a significant increase in wildfires, both in their area impacted as well as their frequency [Hanes, 2018]. This is partially caused by hotter, drier summers, as well as changing vegetation structure, pattern and composition [Wang, 2017]. Wildfires risk destroying forests, infrastructure and ecosystems; additionally, they risk the air quality for surrounding communities. The number of fire spread days (days of increasing fire growth) are expected to increase by 50% by the end of the century in Western Canada [Wang, 2017]. Smoke from wildfires also poses serious health risks, and can travel significant distances, affecting large swaths of land. For example, in 2019, several townships within province of Alberta were put on Air Quality Advisory due to smoke from British Columbia fires. During these fires, Environment Canada wrote "Thick smoke persists in the southwestern corn of Alberta this (Saturday) morning. As westerly flow develops across the province, smoke will spread eastward from British Columbia wildfires" [Stroobant, 2019].

The conditions that increase the risk of drought also increase the risk of wildfires. As such, increased length and severity of heat waves, increased number of dry days, and more frequent extreme heat days may all contribute to the danger of wildfires in the region.

Figure 3: Recent Wildfire Burn Areas in British Columbia [BC Wildlife Services, 2018]

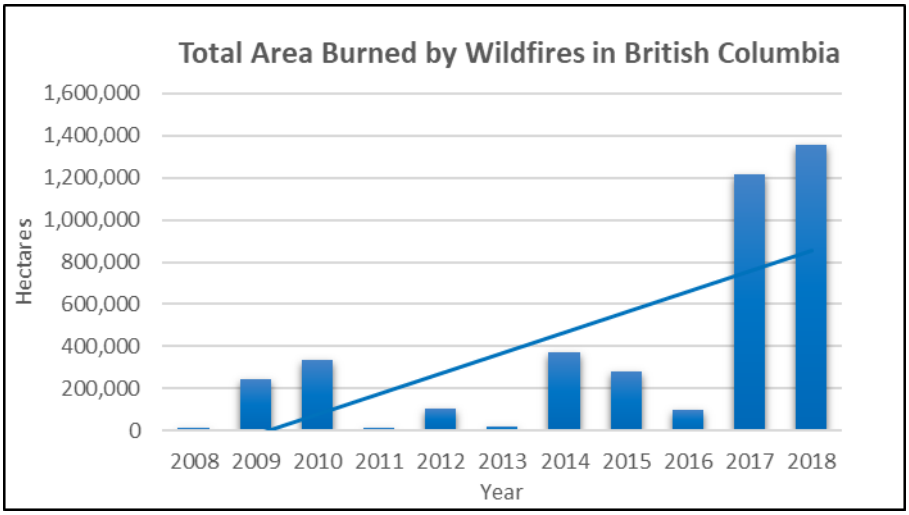
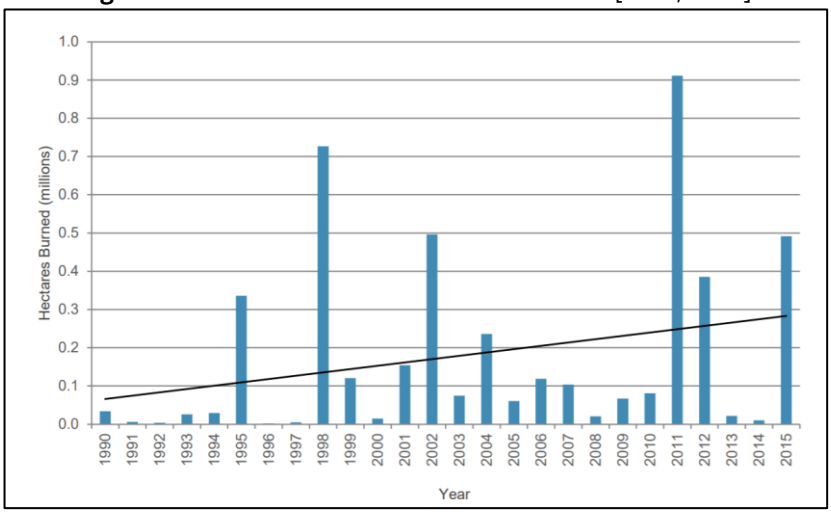


Figure 4: Recent Wildfire Burn Areas in Alberta [MNP, 2016]



2.4 Impact on Asset – Climate Vulnerability

Building upon the predicted climate change risks outlined in the previous section, this section assesses how these changes could impact the assets of this project. The consequences and risks of these potential vulnerabilities will be outlined and quantified in the following section, along with potential mitigation opportunities that could reduce the severity and frequency of the projected consequences.

2.4.1 Temperature Changes

The anticipated changes to temperature are unlikely to impact the project assets in a substantial manner. As the assets are intended to manage large amounts of water, changes in temperature are unlikely to impede this primary service. The anticipated increases in temperature (i.e., magnitude of increase and duration) are small enough that they should also not pose a significant durability issue to the concrete structures and features on this site [Naus, 2005]. Moreover, the anticipated decrease in freeze-thaw cycles will reduce the resulting damage, such as spalling, efflorescence, and internal osmotic pressures, to the concrete structures. The noticeable impacts from anticipated temperature increases that are most probable include a lower water quantity to manage due to additional evaporation and a longer growing season and drier conditions on landscaped and soil terrain.

2.4.2 Increased Precipitation Means and Extremes

Canal, Drop and Outlet Structures

Increases in mean annual precipitation and short-term extremes each carry unique risks to the asset components. The anticipated increase in mean annual precipitation, combined with the large scale of the asset, provide several impact scenarios which merit assessment. As the Horsefly Spillway is a large concrete structure, the perviousness of the soil would be reduced. This, however, is a very minor impact due to the comparative size of the irrigation network. Another consideration is the increase of precipitation falling as rain instead of snow. This will cause bigger spikes in stormwater run-off volume, as rain does not follow the same delayed release into stormwater systems as snowpack. [Hayhoe & Stoner, 2019].

As stated previously, the flow through the Horsefly Spillway will be controlled to 55 m^3/s by the upgraded canal turnout system with excess flows being remaining in the Main Canal system. This flow control negates any impact on the spillway system from upstream flow changes due to increases in run-off from future climate events. As such, the only increased flow scenarios to be considered are those as a result of precipitation impacts local to the Horsefly Spillway itself.

Under a scenario where the Horsefly Spillway has inflow from the Main Canal at its design capacity of 55 m^3/s, increases in local precipitation extremes have some potential to exceed the flow for which the spillway is designed. The future projections of surface water drainage local to the Horsefly Spillway (Oldman River Sub-Basin) are minimal, with a projected annual average reduction anticipated (-4%) compared to historic values [Martz et al., 2007, AMEC, 2009]. This projected negative change is the result of summer reductions, similar spring rates, and some winter increases in surface water availability. The projected increases in 1-day and 5-day maximum precipitation pose a small risk of overfilling the 55 m^3/s threshold for the three spillway sections, as well as the connective outlet structures [MPE, 2018]. The potential result could be localized overspill and minor flooding scenarios. Greater flows, and additional turbulence, at the drop structures that reduce kinetic energy could increase erosion near these structures and potentially reduce their stability.

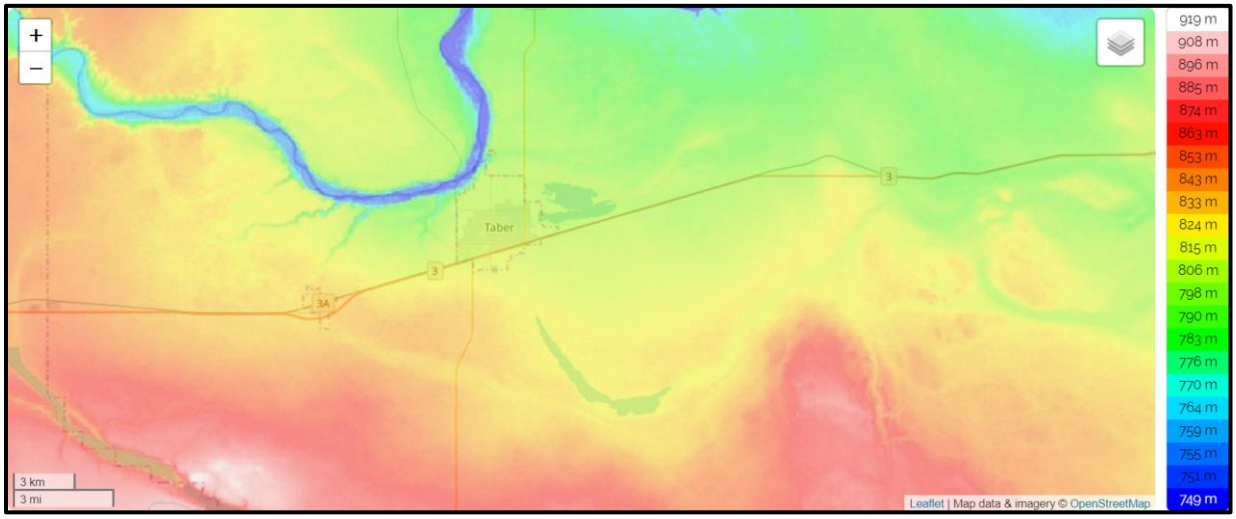
Wetlands

Increased precipitation means and extremes have the potential to subject the proposed wetlands adjacent to the Taber and Horsefly Reservoirs to flooding and ecological changes. These wetlands risk having their banks exceeded if the precipitation cannot be handled by the nearby stormwater system. Floods which occurred in 1995, 2003, 2005, 2010, 2011, and 2017 demonstrate the relatively flat topography of the region and potential for these events [AMEC, 2014]. The soil composition and structure could potentially be impacted, making the wetland more susceptible to future flood events. Furthermore, flooding and precipitation extremes may disrupt the wildlife and ecology of the system: this will affect the wetland's natural filtering processes, as well as its environmental health.

Railway & Highway Crossings

The upgrading of three highway and railway crossings and six county road crossings will potentially be subject to similar flooding and erosion risks as described above for the drop structures. Precipitation exceeding what the local stormwater drainage system can handle will pose some risk of flooding at these crossings, impeding rail and vehicle traffic. Furthermore, extreme precipitation events may potentially erode bridge structures.

Figure 5: Elevation of Surrounding Region of Taber, Alberta



2.4.3 Increased Risk of Drought

Climate change has already begun to increase the frequency and severity of droughts in Southern Alberta. Several droughts have occurred since the Dust Bowl – including those during 1980, 1984, 1988 and 2002, seriously affecting the ecology and economy of the region.

While dryland farming is much more affected, the ability of irrigation works to provide reliable water supply will be stressed as the climate changes. Along with the general warming trend and increased heat waves, the strain on water resources will be exacerbated by greater irrigation demands [AMEC, 2009].

Drought conditions will have a significant impact on the two proposed wetland areas. Research has shown that various future climate scenarios will result in reduction of water level and vegetation [Poiani & Johnson, 1993]. Wetlands play an important role in flood mitigation by retaining flood waters, reducing flood water speed, and reducing erosion from these events [U.S. EPA, 2017]. Drought conditions hinder a wetland's ability to handle future flood volumes: the loss of necessary moisture can eliminate vegetation and reduce soil structure which, when subjected to floods, will not have the same capacity to help control flood water. As a result, maintaining required water levels is necessary to prevent future erosion of the wetland area.

1.1.4 Increased Risk of Wildfires

One of the primary results of increased wildfires is degraded air quality, which has concerning human health impacts. However, since this site is not intended to serve human occupants, the potential air quality related impacts are additional particulate settlement on the assets. Degraded outdoor air quality could negatively impact plants and animals that exist on the project site, but these considerations will not be examined further as they are not related to the project assets. The wildfires and associated heat do also pose a threat of potential damage to some of the assets. If temperatures become high enough and wildfires reach some of the assets, there could be potential damage to concrete structures, with loss of compressive strength and spalling being most likely [Fletcher et al., 2007]. However, since reinforced concrete structures are comprised of multiple components with unique structural properties, they generally perform well when subjected to fire [Fletcher et al., 2007], and so the impacts from an increased threat of wildfires and the associated heat are not anticipated to be significant. In general, the lack of humans and presence of water on the project site will aid in minimizing the impacts of wildfires on the assets.

2.5 Consequence(s) of Impact

In this section, the aforementioned potential impacts associated with the different climate threat-asset scenarios are evaluated in terms of the overall risk of potential consequences. In the below table, the climate threat-asset scenarios are listed, along with an evaluation of the likelihood that these impacts will occur, the consequence of said impact, and finally, the overall risk to the assets. The likelihood ratings are defined by the September 2019 Climate Lens General Guidance document as follows.

Table 7: Climate Lens Risk Assessment Likelihood Rating

Likelihood Rating	Climate Lens General Guidance Definition
Very Low	Not likely to occur/be relevant
Low	Likely to occur/be relevant between 30 and 50 years
Moderate	Likely to occur/be relevant once between 10 and 30 years
High	Likely to occur/be relevant once a decade
Very High	Likely to occur/be relevant at least once annually

The estimated consequences of these risks are also then ranked as “Very Low”, “Low”, “Moderate”, “High”, and “Very High” based on the combined consequences in various categories related to people, economics, and the environment. Individual factors under these categories are as follows.

- **People:** Health and safety, displacement, loss of livelihood, reputation.
- **Economic:** Infrastructure damage, financial impact on proponent, financial impact on stakeholders.
- **Environment:** Air, water, land, ecosystems.

The overall risk rankings are determined by considering both the likelihood of occurrence of the climate change event and the consequences of the event on the project asset, following Climate Lens General Guidance. The formal combined risks are defined and outlined in the tables below.

Table 8: Climate Lens Risk Assessment Overall Risk Rating

Risk Rating	Climate Lens General Guidance Definition
Negligible	Risk events do not require further consideration
Low	Controls likely not required
Moderate	Some controls required to reduce risks to lower levels
High	High priority control measures required
Extreme	Immediate controls required

Table 9: Summary of Potential Climate Risk-Induced Impact Scenarios

Climate Risk	Asset	Potential Impact	Likelihood	Consequence	Risk
Temperature	Hardscape / Structure	Loss of durability due to lower flow conditions	Very Low	Very Low	Negligible
Precipitation	Canal, Drop and Outlet Structure	Increased local precipitation at peak flow causing flooding in canal structures	Low	Moderate	Low Risk
	Canal, Drop and Outlet Structure	Increased local precipitation at peak flow causing erosion of concrete channel, drop and outlet structures	Very Low	Moderate	Low Risk
	Wetlands	Extreme local precipitation overfilling wetlands leading to flooding and erosion	Low	Low	Low Risk
	Railway and Highway Crossings	Extreme local precipitation leading to flooding of crossings and destabilizing their foundation	Low	Low	Low Risk
Drought	Wetlands	Increased drought conditions deteriorating wetland elements	High	Low	Moderate
Wildfires	All	Excessive particulate deposition on surfaces (e.g., concrete structures, vegetation, etc.).	Low	Very Low	Negligible
	All	Damage to structural components (e.g., metal, concrete).	Low	Low	Low Risk

The combined risks that are estimated to be moderate, high, and extreme require controls, and accordingly, are analyzed further in the following subsections. While there are many consequences that could occur from each risk scenario, the below section focuses on the priority consequences that mandate controls. Less consequential impacts that do not warrant controls are not discussed. The only risk scenario qualifying for further analysis is:

- Increased Drought Conditions Deteriorating Wetland Elements.

2.5.1 Risk Scenario #1 - Increased Drought Conditions Deteriorating Wetland Elements

Wetland features offer several benefits such as water retention, water filtration, wildlife habitat protection and erosion and sediment control. Inclusion of natural water management elements are important for large infrastructures projects that affect local hydrogeological conditions. However, as drought conditions are expected to increase in severity and occurrence within the next few decades, the risk-level to the wetlands of this project was deemed to be moderate, with a high likelihood of occurrence and low consequence.

As wetlands desiccate, their ability to function properly as flood mitigation measures decrease. Ideally, wetlands serve as natural retention bodies, soaking up excess water and slowly allowing this volume to infiltrate into the groundwater system. However, if the water level in these wetlands recedes, then the underlying conditions become less able to handle influxes of water [U.S. EPA, 2017]. Additionally, drought periods can put the vegetation within the area at risk, vegetation which aids soil stability and water infiltration. Healthy vegetation and soil structure also support the wetlands ability to minimize erosion of its soil. Therefore, exposing the wetlands to drought conditions may also increase their susceptibility to erosion from heavy precipitation events.

3 ANALYSIS OF RESILIENCE ADAPTATION MEASURES

In the previous section, a risk analysis was performed on the consequence of climate change hazards on the project assets. Increased drought conditions deteriorating wetland elements was the only risk scenario scored as having Moderate potential risk, requiring “some controls required to reduce risks to lower levels”.

The following section outlines the planned adaptation measures in place to reduce this climate risk to an acceptable level.

3.1 Resilience Measures Identified for Each Impact

3.1.1 Increased Drought Conditions Deteriorating Wetland Elements

The Horsefly Spillway project consists of two proposed wetlands, located where flow enters the Horsefly Reservoir and then again at Taber Lake. The preliminary engineering report [MPE, 2018] shows the wetland construction will be altering existing wetland areas to extend their limits, installing a deep sediment forebay, and installing deep flow distribution channels. The current conceptual design of the two wetlands will be fully developed by a landscape architect / environmental engineer.

To mitigate the negative impacts that prolonged droughts would have on the wetland and spillway performance the design team has instituted several conceptual design measures. Firstly, the spillway will always be at least partially full of water during the irrigation season (April to October) reducing the potential for ground desiccation. As well, additional water can be drawn from the two associated reservoirs into the wetlands if drought conditions are shown to have any negative impacts on the wetland performance. Secondly, it will be recommended that the final design of the wetlands include drought-resistant plants to minimize plant death and the subsequent risk to wetland performance and erosion. Thirdly, following design, the ongoing maintenance measures outlined in the Southern Regional Storm Water Management Plan [MPE, 2014] will serve to mitigate drought-induced failures. These include:

- Yearly inspections for erosion, bank stability, vegetation degradation, and sediment build-up
- Replacing of dying vegetation with drought-resistant plants
- Remove sediment build-up from any outlet or inlet structures
- Maintain filter bed height and composition through yearly testing and measurement

The risks from drought conditions to wetlands would be partially mitigated through these routine maintenance tasks. Similarly, these would also mitigate flood risks for the wetlands as well. We would therefore like to highlight these recommendations and outline the risks that will be mitigated through their adoption and implementation.

Table 10: Adaptation Measures for: Increased Drought Conditions Deteriorating Wetland Elements

Adaptation Measure	Timeframe	Cost	Co-benefits	Included in Project Scope
Maintain water in wetlands during irrigation season (April to October) to reduce ground desiccation	2025 – 2125	negligible	n/a	**Yes:** Preliminary design documentation calls for the spillway to always be partially full during drought season.
Drought resistant wetland plants to reduce plant death and subsequent erosion	2025 – 2125	negligible	n/a	**Recommended:** To be included in ongoing design development of wetlands
Ongoing maintenance measures to monitor and mitigate drought impacts on wetlands	2025 – 2125	$30,500/yr [1]	n/a	**Yes:** Recommendations included in storm water management plan to be included in ongoing design development of wetlands

[1] Maintenance cost based on estimates for annual inspection ($3,500 salary + $2,000 vehicle) and maintenance ($25,000 for 2 weeks of equipment and manpower).

3.2 Cost/Benefit

The SMRID Main Canal supplies irrigation to approximately 200,000 ha of high value specialty crops (e.g. potatoes, sugar beets, sweet corn, canola, sunflower seeds) in Southern Alberta. Failure of the canal would be economically devastating, with direct farm losses estimated at $230M and indirect losses to the Alberta economy of $585M [MPE, 2018].

The Horsefly Regional Emergency Spillway project (phase 1 of the SRDC masterplan) is estimated to cost $47.1M to complete. A cost benefit analysis of the three spillway projects in the masterplan (Horsefly, Sherburne, and Sauder) are estimated to yield a net economic benefit of $16.6M ($94.8M benefits less $78.2M costs) [MPE, 2016] with additional (non-quantifiable) benefits such as improved water quality, decreased traffic disruption, reduced environmental damage, protection of vital water management infrastructure, and emergency personnel response time.

When considering the potential climate change resiliency costs of the Horsefly Spillway project itself, it is important to note that the turnout will be able to control flow levels from the SMRID Main Canal. This ensures the design flow (55 m^3/s) is not exceeded from the Main Canal, limiting the potential impacts associated with excess flow rates. Increased temperatures and rates of wildfire show little impact on the infrastructure of the spillway. The highest risk, with a moderate rating, was found to be the deterioration of wetland elements from increased drought conditions.

A number of design choices have been implemented to reduce the risk of wetland damage. Maintaining spillway flows through the irrigation (and coinciding drought) season, specifying drought resistant plant selection both have negligible cost implications. As well, an ongoing maintenance plan has been recommended to perform annual inspections, replace compromised plants, and perform sediment control. The estimated costs of the annual inspection is estimated at $5,500/year ($3,500 in salary and $2,500 in equipment/vehicle costs). The ongoing maintenance (plant replacement, sediment control, etc.) are estimated to take approximately 2 weeks of manpower and equipment time per year, totaling roughly $25,000. Overall inspection and maintenance costs are therefore expected to be $30,500/yr.

The benefit of implementing these mitigation strategies is to ensure the health of the wetlands, ensuring they continue to perform the necessary retention role planned as a part of the Horsefly Spillway to protect the valuable public and private assets within the SMRID from flood damage. The economic risk of not performing these mitigation tasks could be compromised performance of the wetlands, leading to an in-ability of the Horsefly Spillway to handle design flow rates, and potential flooding along the SMRID main canal, threatening the valuable assets listed above.

4 CONCLUSION

A climate change resiliency assessment was conducted as part of the larger Climate Lens initiative for the Horsefly Spillway Project. The project is the first phase of a seven-phase upgrade to the SMRID drainage and storage infrastructure within the SRDC area with the goal to reduce the occurrence of flooding and the negative impact it has on people, property, economic loss, and agricultural production. As part of this overall plan, the Horsefly Spillway is designed to divert up to 55 m^3/s of flow from the SMRID Main Canal.

The first component of this assessment involved investigating future climate risks, which revealed priority climate threats as being: increases in temperature, increases in precipitation, increases in risk of drought, and increase in risk of wildfire.

An overall risk assessment was then performed with respect to climate change events impact on the main project assets. Based on an evaluation of both the likelihood of an impact occurring and the intensity of the entailed consequences (i.e., with respect to people, the economy, and the environment), the priority risk scenarios were identified. As exceedance of design flow rates is largely governed by the control turnout off the SMRID Main Canal, the only priority risk scenario identified is the potential deterioration of wetland elements due to increased drought conditions.

Measures to mitigate against these unwanted consequences and further improve asset resilience were then explored. Maintaining spillway flow throughout the irrigation (and drought) season, planting the wetlands with drought-resistant species, and ongoing maintenance measures were the mitigation measures indicated. A cost-benefit discussion has been included to outline the financial investment made throughout the project to ensure a resilient design in the face of climate change.

This report outlines the future climate risks for the project and has highlighted one climate risk-induced impact scenario that was deemed “moderate” or above, therefore warranting mitigation. The mitigation measures in place, and highlighted in this report, have been deemed effective at lowering the risk to acceptable levels under the Climate Lens guidance.

5 DESCRIPTION OF EVIDENCE BASE

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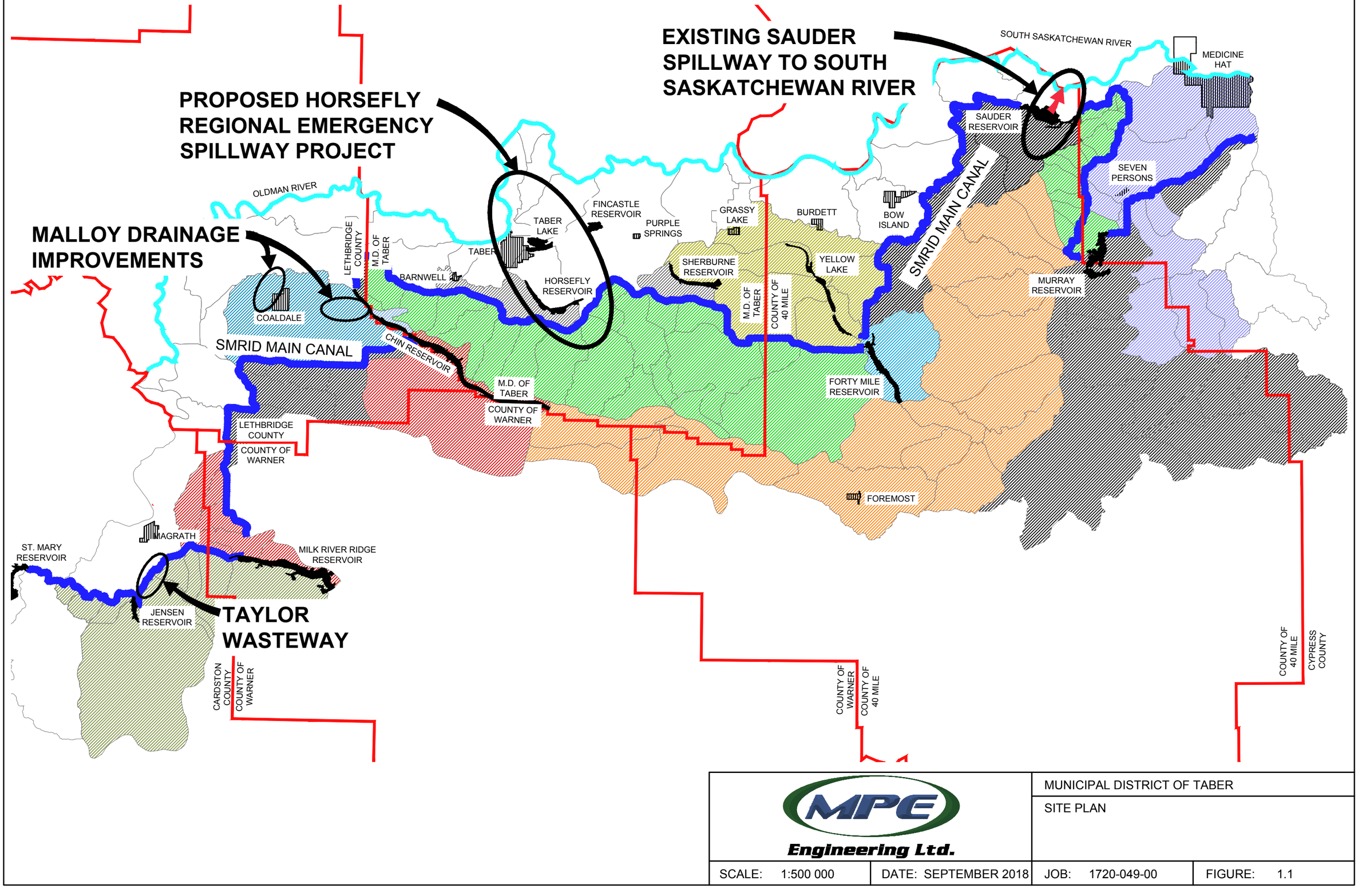
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APPENDIX A

Preliminary Engineering Drawings [MPE, 2018]

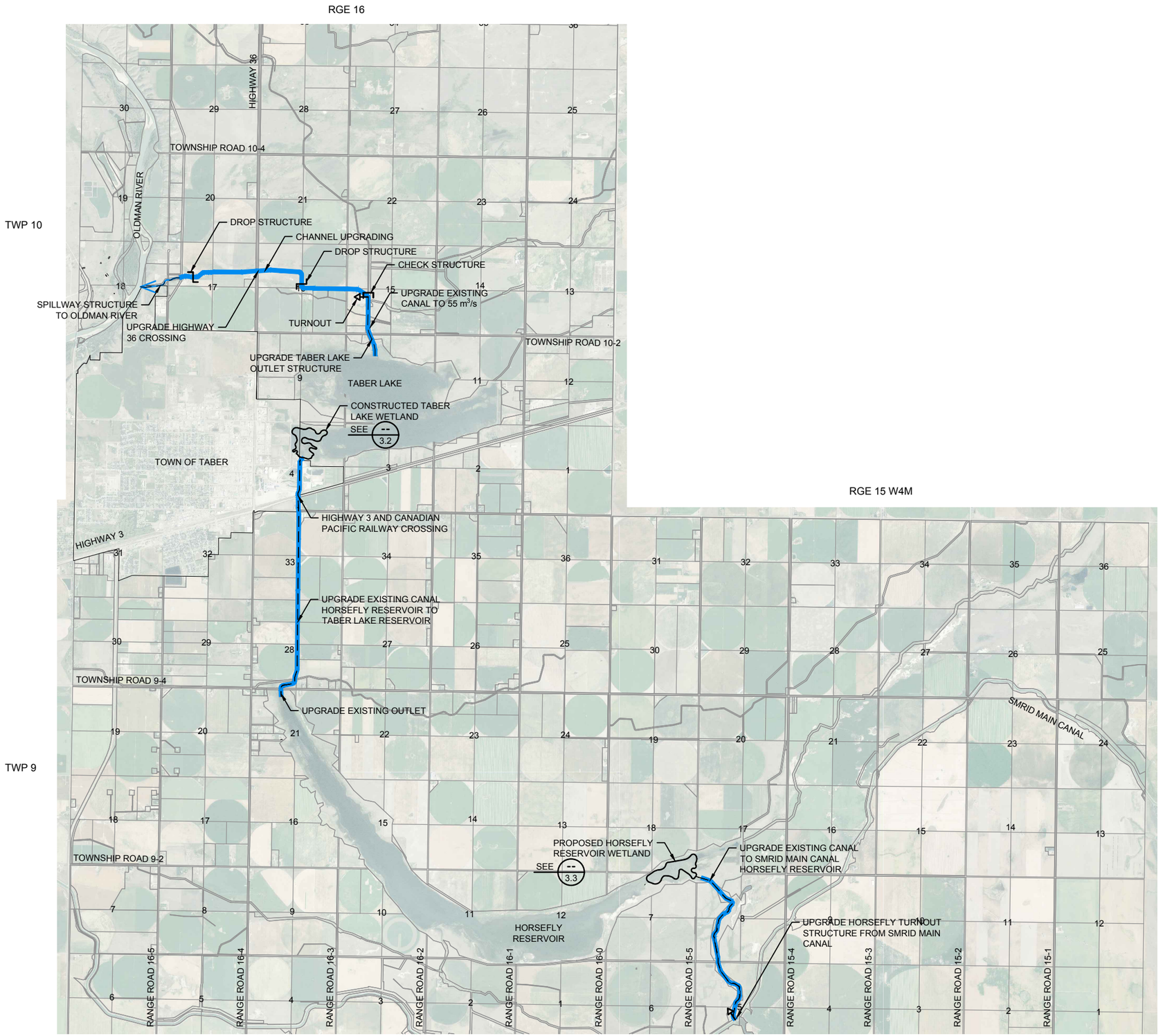


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MUNICIPAL DISTRICT OF TABER

SITE PLAN

SCALE: 1:500 000	DATE: SEPTEMBER 2018	JOB: 1720-049-00	FIGURE: 1.1



NOTES:

1. SPILLWAY ALIGNMENT IS BASED ON CURRENT CANAL ALIGNMENTS AND MAY CHANGE DURING DESIGN.
2. HIGHWAY 3 WILL BE RELOCATED IN THE FUTURE. THE EXISTING LOCATION HAS BEEN ASSUMED FOR THIS REPORT.

THIS DRAWING MAY HAVE BEEN MODIFIED FROM ITS ORIGINAL SIZE. ALL SCALE NOTATIONS INDICATED ARE BASED ON 11"x17" FORMAT DRAWINGS

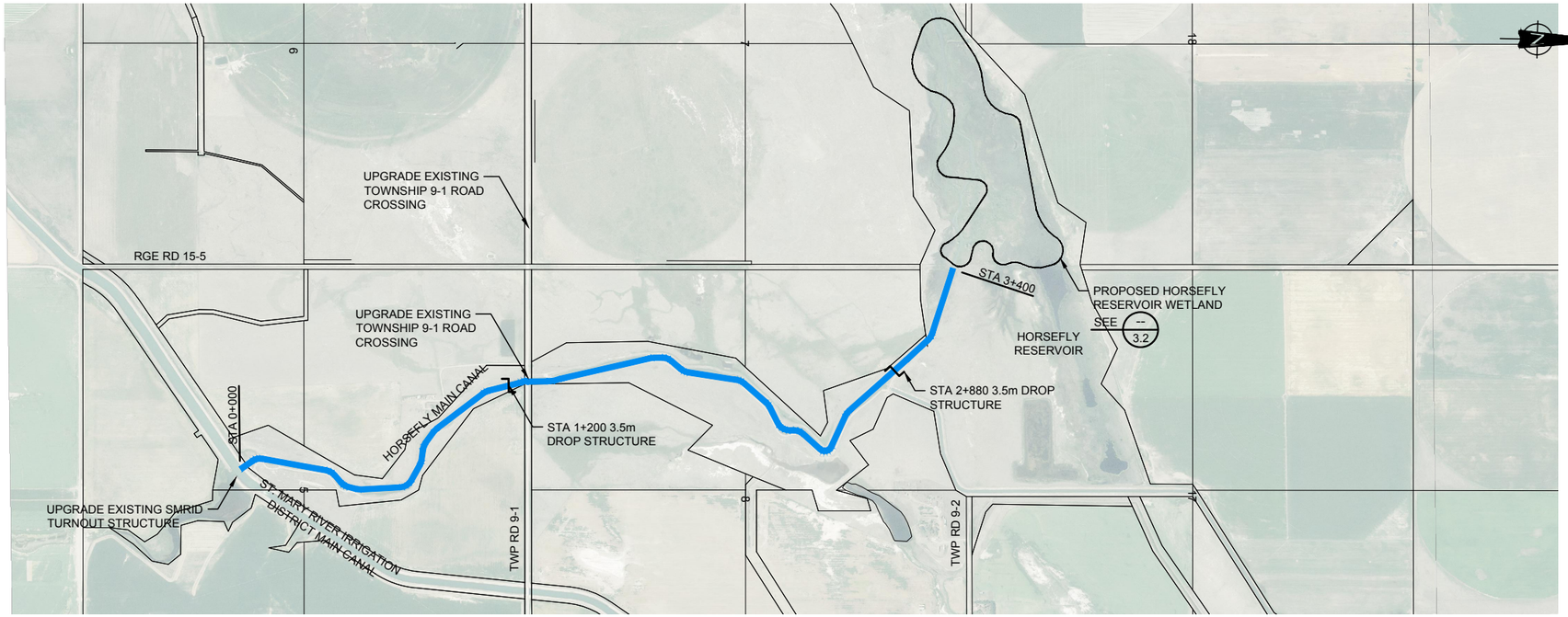
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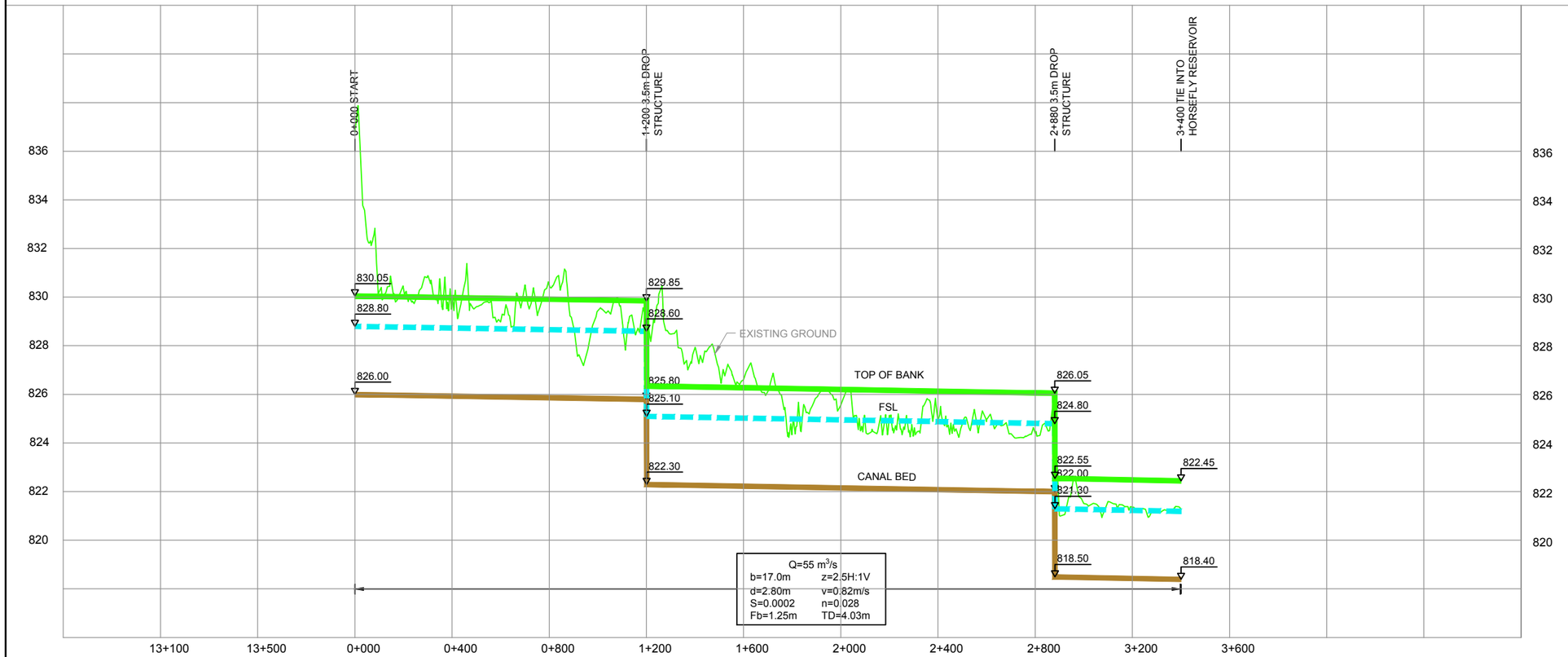
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MUNICIPAL DISTRICT OF TABER

HORSEFLY REGIONAL EMERGENCY SPILLWAY SITE PLAN

DESIGNED	J.W.H.	JOB	1720-049-00
DRAWN	K.M.R.	SCALE	1:75 000
DATE	SEPTEMBER 2018	FIGURE	1.2





NOTES:

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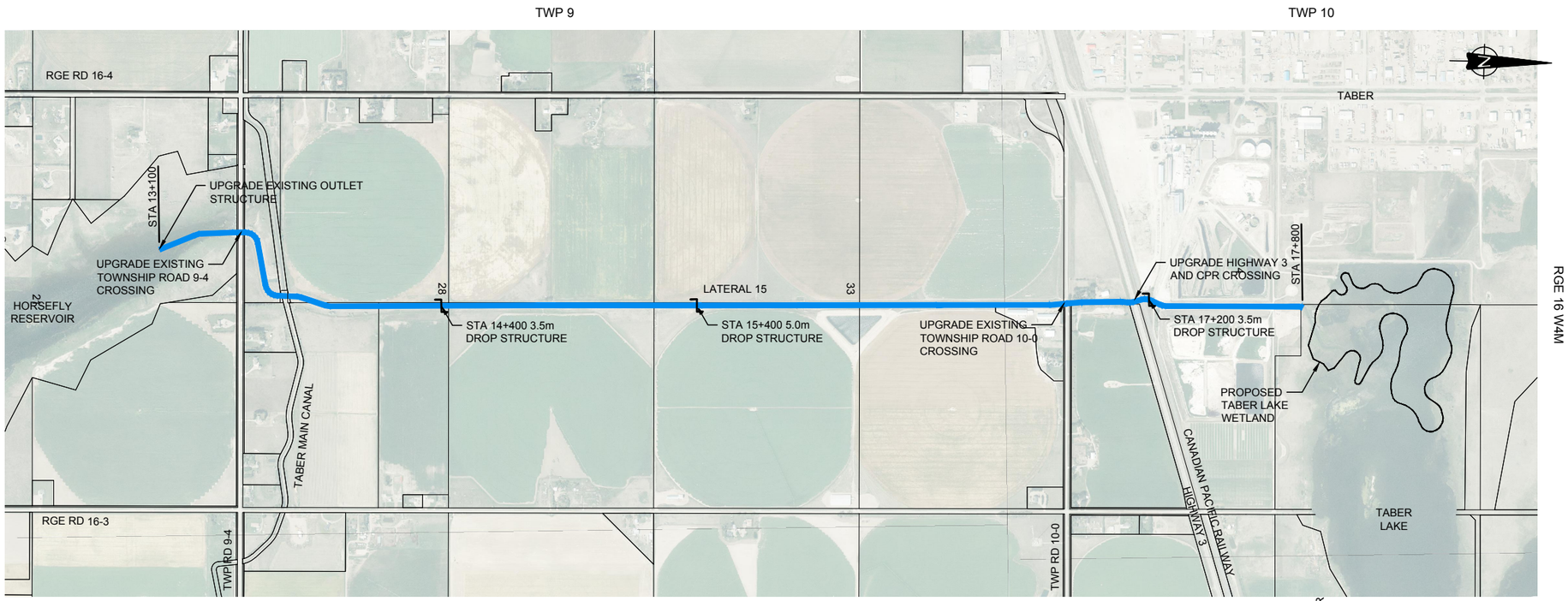
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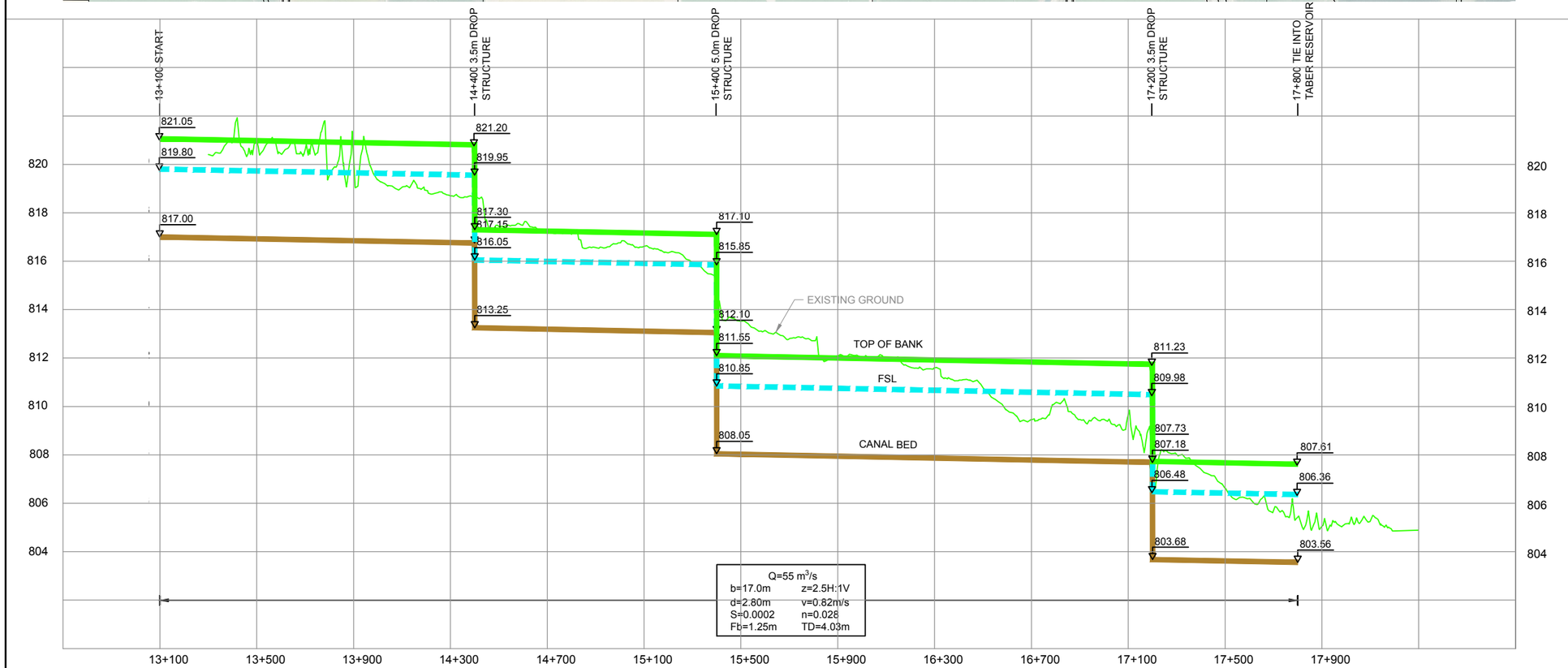
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MUNICIPAL DISTRICT OF TABER

HORSEFLY REGIONAL EMERGENCY SPILLWAY
ACRP APPLICATION PROPOSAL
PLAN PROFILE STA 0+000 TO STA 3+600

DESIGNED	J.W.H.	JOB	1720-049-00
DRAWN	K.M.R.	SCALE	H1:20 000 V1:200
DATE	SEPTEMBER 2018	FIGURE	2.1





NOTES:

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HORSEFLY REGIONAL EMERGENCY SPILLWAY
ACRP APPLICATION PROPOSAL
PLAN PROFILE STA 13+100 TO STA 17+800

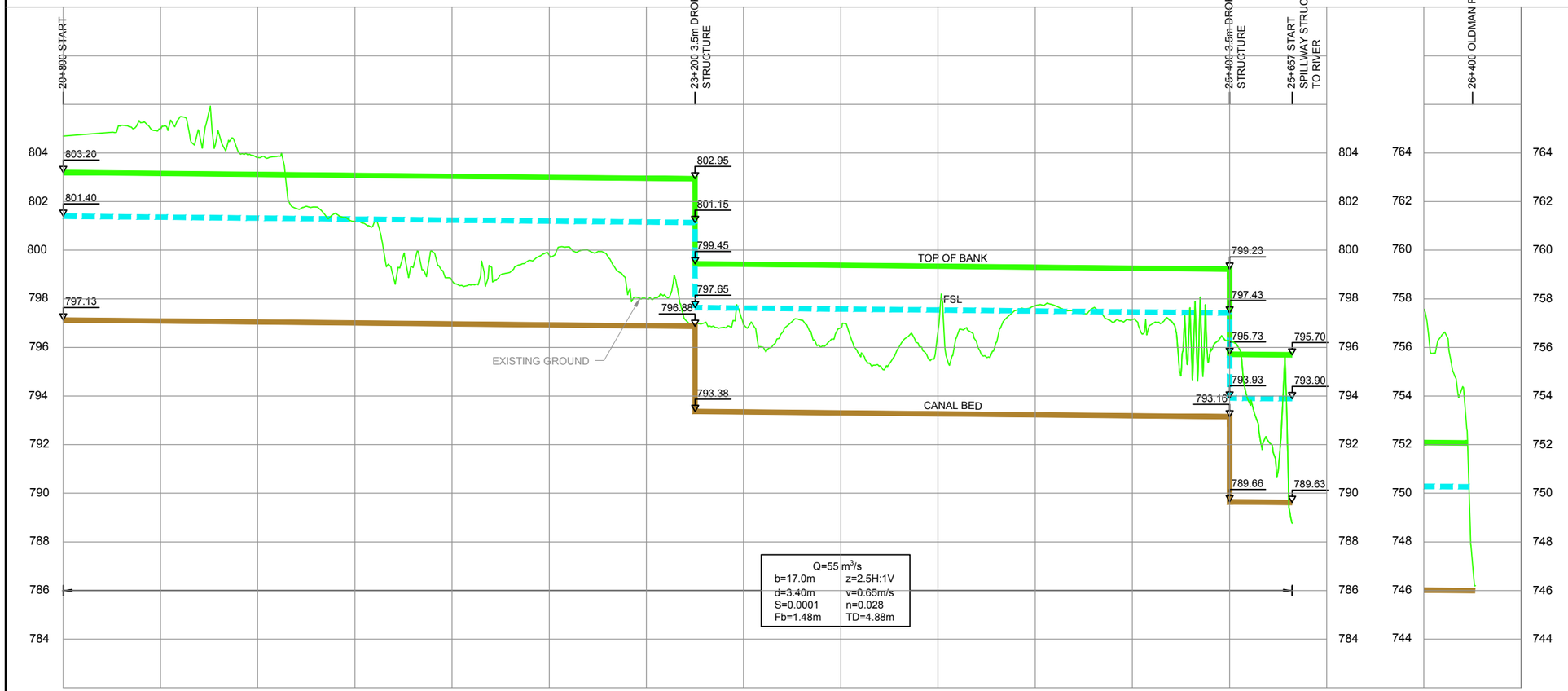
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DATE	SEPTEMBER 2018	FIGURE	2.2

RGE 16 W4M

TWP 9



PROFILE STATIONING
LEFT TO RIGHT



NOTES:

1. SPILLWAY ALIGNMENT IS BASED ON CURRENT CANAL ALIGNMENTS AND MAY CHANGE DURING DESIGN.

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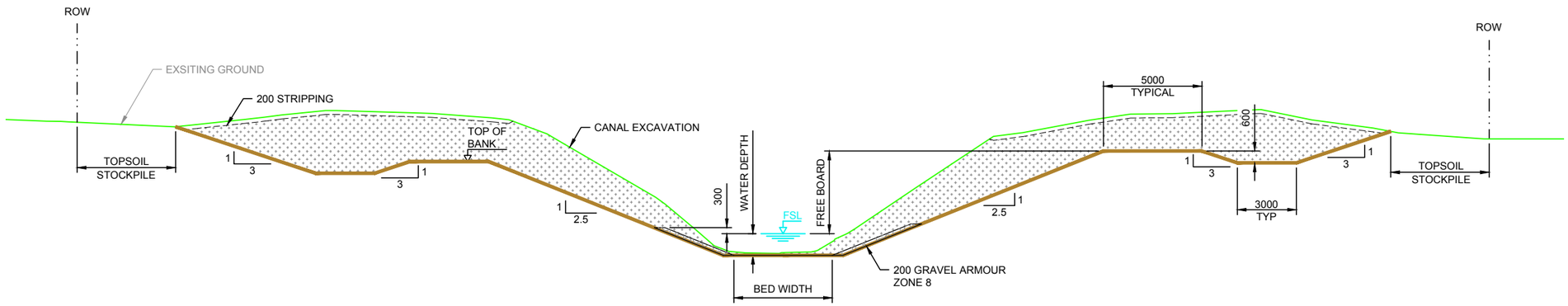
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1	18-09-04	FOR REPORT

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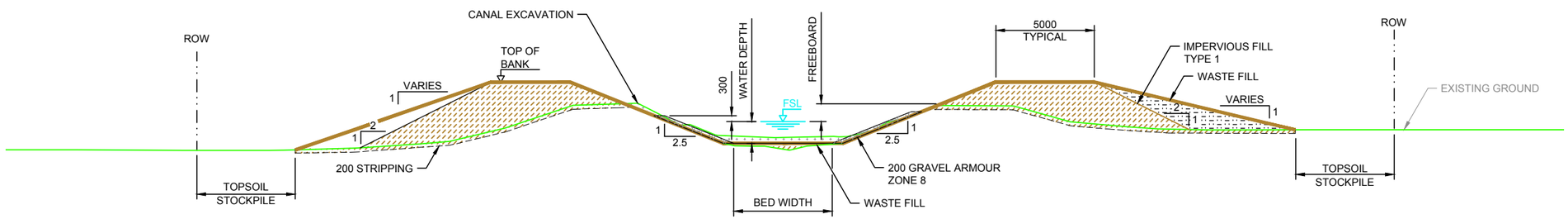
MUNICIPAL DISTRICT OF TABER

HORSEFLY REGIONAL EMERGENCY SPILLWAY
ACRP APPLICATION PROPOSAL
PLAN PROFILE STA 21+900 TO STA 25+657

DESIGNED	J.W.H.	JOB	1720-049-00
DRAWN	K.M.R.	SCALE	H1:20 000 V1:200
DATE	SEPTEMBER 2018	FIGURE	2.3



TYPICAL CUT CROSS SECTION



TYPICAL FILL CROSS SECTION

LEGEND

- EXISTING GROUND
- EXISTING GROUND STRIPPING
- IMPERVIOUS FILL TYPE 1
- WET EXCAVATION
- WASTE FILL
- GRAVEL ARMOUR ZONE 8

NOTES:

1. TOE DRAIN DITCH GRADES TO BE FIELD DETERMINED.
2. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.

THIS DRAWING MAY HAVE BEEN MODIFIED FROM ITS ORIGINAL SIZE. ALL SCALE NOTATIONS INDICATED ARE BASED ON 11"x17" FORMAT DRAWINGS

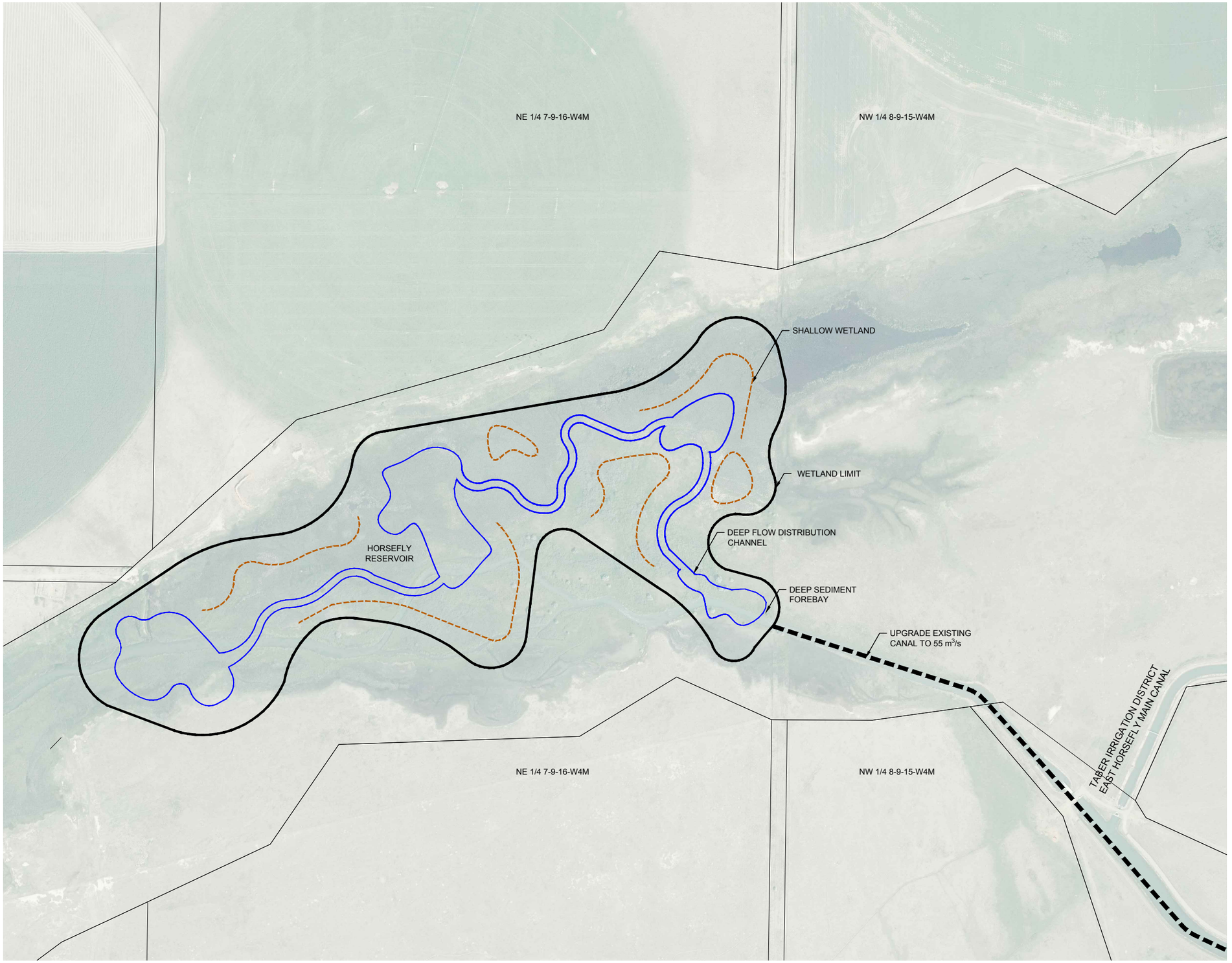
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MUNICIPAL DISTRICT OF TABER

HORSEFLY REGIONAL EMERGENCY SPILLWAY
ACRP APPLICATION PROPOSAL
TYPICAL CROSS SECTIONS

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DATE	SEPTEMBER 2018	FIGURE	3.1



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HORSEFLY REGIONAL EMERGENCY SPILLWAY
ACRP APPLICATION PROPOSAL
HORSEFLY RESERVOIR PROPOSED WETLAND

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DATE	SEPTEMBER 2018	FIGURE	3.2



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MUNICIPAL DISTRICT OF TABER

HORSEFLY REGIONAL EMERGENCY SPILLWAY
ACRP APPLICATION PROPOSAL
TABER LAKE PROPOSED WETLAND

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DRAWN	K.M.R.	SCALE	1:5000
DATE	SEPTEMBER 2018	FIGURE	3.3