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April 6, 2023

Environment Act Proposal for Treesbank Colony Farms Irrigation Project

FINAL REPORT

PBS Water Engineering

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Quality Assurance

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Executive Summary

Treesbank Colony Farms (the "Proponent") is proposing to develop an agricultural irrigation project (the "Project") north of Wawanesa, MB. The Project will draw surface water from the Assiniboine River and pump water through buried pipelines to centre pivot irrigation systems. The Project will provide irrigation water to approximately 1,256 hectares (3,102 acres) of annual cropland, which will be irrigated in rotation.

As the Project will use more than 200 dam^3 (160 ac-ft) of water annually, it is considered a Class 2 Development under The Environment Act (C.C.S.M. c. E125) and an Environment Act Licence is required for the development.

This report represents the environmental assessment, a part of the Environment Act Proposal (EAP) for the Treesbank Colony Irrigation Project (the Project). This report has been compiled by AgriEarth Consulting Ltd. on behalf of the Proponent, Treesbank Colony Farms in accordance with the guidelines of Manitoba Environment, Climate and Parks. The report was compiled using professional judgment and the information available at the time this assessment was completed.

The development is expected to be consistent with the current land use in the Project development area and will add value to the Proponent's current agricultural crop production operation, and to the local and regional economy. The Project will be developed predominantly on cultivated agricultural land. Minor portions of pipeline routes will traverse permanent grassland, and minor works required for the water intake site are to be located along the riverbank of the Assiniboine River. Based on the evaluations undertaken to date and the commitments made by the Proponent and documented herein, the Project is not anticipated to result in significant or un-mitigable adverse impacts on the local environment.

The following are the primary environmental follow-up and monitoring commitments of the Proponent:

- Implement environmental protection measures and monitoring in compliance with the Environment Act Licence (to be issued) during the construction and operation phases of the Project.
- Follow-through on commitments made within this EAP.
- Ensure that staff and contractors are trained and understand their responsibility in identifying, addressing and reporting potential environmental concerns.
- Monitor the work site (i.e., pump station, irrigation equipment and the fields under irrigation) to ensure effectiveness of measures put in place to protect the environment.
- Maintain all environmental control and protection devices, and other equipment (e.g., regular checks and maintenance of backflow prevention/check valves).
- Take appropriate and timely action (e.g., shut-down pumps) to correct any Project-related deficiencies that may result in an adverse effect to the environment, including infrastructure and human health and safety.

- Report all environmental incidents to Manitoba Environment, Climate and Parks Environmental Emergency Response Program, as soon as possible after they occur.

Additional, specific commitments requiring follow-up and reporting to Manitoba to Environmental Approvals Branch is as follows:

- Completion and submission of Aquatic Habitat Impact Assessment being completed by Toews Environmental.
- Completion and submission of Heritage Resources Impact Assessment being completed for Manitoba Heritage Resources Branch by North Roots Research.

The Proponent also commits to completing the following to satisfy federal regulatory requirements:

- Review the Project relative to habitat protection requirements of the *Fisheries Act*. This review will determine if the Project needs to be submitted to DFO for review.
- Submission of an application for approval, as required, under the Navigation Protection Program (NPP).

Based on the information compiled and presented, and the commitments for additional information to be provided as it becomes available, AgriEarth Consulting Ltd. believes that the conditions and the guidelines for an Environment Act Proposal for this Class 2 Development have been met. The Proponent is committed to meeting all requirements of authorizations, licenses, permits and by-laws that will be granted to them as part of development of this Project or that are otherwise applicable to it.

This report is prepared for the use of Treesbank Colony Farms for submission to Manitoba Environment, Climate and Parks for their review, and for posting to the Public Registry for review by the public. Any third-party use of this report and any reliance or decision made based on it, are the responsibilities of those third parties.

Abbreviations

ADA	Assiniboine Delta Aquifer
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CNWA	*Canadian Navigable Waters Act*
DAP	Development Authorization Permit
DFO	Department of Fisheries and Oceans
EAB	Environmental Approvals Branch
EAL	Environment Act Licence
EAP	Environment Act Proposal
ESEA	*Endangered Species and Ecosystems Act*
GHG	greenhouse gas emissions
HADD	harmful alteration, disruption or destruction (of fish habitat)
HDPE	high-density polyethylene
HRB	Historic Resources Branch
MBCDC	Manitoba Conservation Data Centre
NMZ	Nutrient management zone
NPP	Navigation Protection Program
PDA	Project development area
SARA	*Species at Risk Act*
WRL	Water Rights Licence
WSC	Water Survey of Canada

1.0 INTRODUCTION AND BACKGROUND

Treesbank Colony Farms is proposing to develop an agricultural irrigation project (the "Project") north of Wawanesa, MB. The Project will draw surface water from the Assiniboine River and pump water through buried pipelines to centre pivot irrigation systems. The Project will provide irrigation water to approximately 1,256 hectares (3,102 acres) of annual cropland, which will be irrigated in rotation.

The project will be developed predominantly on cultivated agricultural land. Minor portions of pipeline routes will traverse permanent grassland, and minor works required for the water intake site are to be located along the riverbank of the Assiniboine River.

As the Project will use more than 200 dam^3 (160 ac-ft) of water annually, it is considered a Class 2 Development under The Environment Act (C.C.S.M. c. E125) and an Environment Act Licence is required for the development.

This report presents the environmental assessment for the Project

1.1 THE PROPONENT

For the purposes of the development licensing, the Proponent of the Project is the Treesbank Colony Farms (hereafter "the Proponent").

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2.0 DESCRIPTION OF THE PROPOSED PROJECT

2.1 PROJECT OVERVIEW

The Project is located within the Municipality of Oakland-Wawanesa and the Municipality of Glenboro-South Cypress (**Map 1, Appendix A**). The agricultural irrigation development will withdraw surface water from the Assiniboine River at SE-35-8-7W1 with the use of floating intakes and riverbank mounted electric pumps. The pumps will deliver water through a buried pipeline network to irrigation fields. A total irrigation landbase of approximately 1,256 hectares (3,102 acres) will be developed on lands currently cultivated for dryland crop production. Centre-pivot irrigation units will be used to apply water to annual crops. Pumps and pipelines will be sized assuming that multiple fields will be irrigated in rotation within a growing season. This will allow for a reduction in withdrawal rate and pumping and pipeline infrastructure size/cost. The proponent plans on irrigating up to 1,256 hectares (3,102 acres) annually.

For the purposes of this assessment, the area associated with the "footprint" of the Project, or the area of land directly affected by Project construction and components is termed the "Project development area" or "PDA". The portion of the PDA to be irrigated is termed the "irrigation PDA".

2.2 PURPOSE, NEED AND ALTERNATIVES

Irrigation is a common practice in southern Manitoba, due to crop water deficits in the region. Irrigation provides risk management for a range of annual crops and allows producers to optimize yields by replenishing soil water during deficit conditions. Irrigation provides a means of protecting against drought and building resiliency against predicted climate change scenarios for the region, which are predicted to result in increased summer temperatures and reductions in summer rainfall.

In the Project area, there are no effective alternatives to centre-pivot irrigation for efficiently providing supplemental water to crops. Groundwater (i.e., Assiniboine Delta Aquifer) is a potential alternative water source that was considered by the Proponent. However, it is considered a less favourable alternative to surface water from the Assiniboine River, due to difficulty in developing high-capacity wells as a reliable supply for the Project. The Proponent has indicated that groundwater exploration confirmed that groundwater supply is insufficient for the Project. The Assiniboine River provides a good quality, reliable water source with a favourable withdrawal location to service the Project needs.

2.3 DETAILS OF PROJECT DESCRIPTION

2.3.1 Irrigation fields

A total of 28 irrigation fields are currently proposed for a total of 1,256 hectares (3,102 acres). A summary of irrigation field ID, legal site descriptions and irrigation areas for each field is provided in **Table 2.1**. Planning blocks have been identified to aid in project planning, and development phasing and sequencing. Blocks correspond to each of the two main pipelines (i.e., West main pipeline, South main pipeline) and the proximity of the irrigation fields to the pump withdrawal location. Three planning blocks are identified for the West pipeline (i.e., West-1, West-2, West-3) and two planning blocks are identified for the East pipeline (i.e., South-1, South-2). Planning blocks and irrigation field locations are displayed in **Map 2 (Appendix A)**.

2.3.2 Annual water withdrawal and usage

The Proponent has requested the use of 1,850.23 dam^3 (1,500 ac-ft) annually from the Assiniboine River for the purposes of irrigation. They currently have a Development Authorization Permit (DAP) under *The Water Rights Act* issued on February 7, 2022, for 1,269.26 dam^3 (1,029 ac-ft). An additional 580.97 dam^3 (471 ac-ft) has been applied for by the Proponent and the application is currently on hold.

A groundwater exploration permit the Proponent had been granted has been closed on request of the Proponent. Groundwater exploration did not identify sufficient groundwater capacity for the Project. The Proponent does not plan to further explore, use, or develop groundwater for the Project.

2.3.3 Water storage

No off-stream water storage (i.e., reservoir) is being considered as part of the initial project phases (e.g., Phase I or II).

However, the use of a small, balancing reservoir will most likely be required in conjunction with booster pumping to support the delivery of water to irrigation block West-3 if/when it is developed in the future (e.g., Phase III). The need, location and sizing for this balancing reservoir will be determined at a future date and hence is not included in the Project description at this time. Necessary permits, approvals and licenses will be acquired prior to development of this reservoir as part of Phase III, as needed.

Table 2.1 Summary of irrigation fields

Field ID	Legal Site Description	Ownership	Field Irrigation Area		Planning Block	Planning Block Irrigation Area		Development Phase
			ac	ha		acres	hectares	
1	SE-29-8-17W1	Owned	135	55	West-1	945	382	Phase I
2	NE-19-8-17W1	Owned	135	55				
3	NE-20-8-17W1	Owned	135	55				
4	NW-21-8-17W1	Owned	135	55				
5	NE-21-8-17W1	Owned	135	55				
6	SE-19-8-17W1	Owned	135	55				
7	SW-21-8-17W1	Owned	135	55				
8	SE-13-8-18W1	Owned	76	31	West-2	737	298	Phase I
9	SW-18-8-17W1	Owned	135	55				
10	SE-18-8-17W1	Owned	135	55				
11	N1/2-7-8-17W1	Owned	131	53				
12	7-8-17W1	Owned	199	81				
13	SE-7-8-17W1	Owned	62	25				
16	NE-10-8-17W1	Owned	98	40	South-1	368	149	Phase II
18	SW-11-8-17W1	Owned	135	55				
19	NE-4-8-17W1	Owned	135	55				
20	NW-1-8-17W1	Owned	135	55	South-2	639	258	Phase II
21	NE-1-8-17W1	Owned	135	55				
22	SW-1-8-17W1	Owned	104	42				
23	SE-1-8-17W1	Owned	76	31				
24	S1/2-6-8-16W1	Owned	102	41				
25	N1/2-31-7-16W1	Owned	42	17				
26	SW-5-8-16W1	Owned	45	18				
27	NW-11-8-18W1	Owned	93	38	West-3	412	167	Future (potential)
28	SW-11-8-18W1	Owned	104	42				
29	SE-11-8-18W1	Owned	116	47				
30	NW-2-8-18W1	Owned	53	22				
31	NW-2-8-18W1	Owned	46	19				
			3,102	**1,256**		**3,102**	**1,256**	

2.3.4 Water intake and pumps

Water will be withdrawn from the Assiniboine River at the pump intake site (i.e., withdrawal location) at SE-35-8-17W1 utilizing floating intake systems attached to mobile centrifugal pumps. The Proponent plans to use tandem Riverscreen™ rotating, self-cleaning, floating intakes, like that shown in **Figure 2.1** and **Figure 2.2,** or a similar floating intake system.

Features of the Riverscreen™ intake system include:

1. Extraction of water from the top of the water column, allowing for maximum sweeping velocity.
2. Screen opening (8 mesh) designed to prevent entrainment of small fry. The standard opening on 8 mesh is 2,46 mm (0.097 inch), which meets DFO requirements (i.e., 2.5 mm) for screen opening size.
3. Self-cleaning spray bars to prevent clogging and maintain uniform intake design velocities across the screen.
4. Sufficient screen area in conjunction with rotating self-cleaning screen prevents impingement of fry.
5. Lightweight and non-contact on riverbed (i.e., lifted into floating positions from riverbank)

Intakes will be installed and removed from the Assiniboine River annually, with installation anticipated in May or June and removal in September or October each year.

Additional pertinent design details below are from an engineering pre-design report completed by PBS Water Engineering. Additional design information can be submitted to the EAB on request.

The following are anticipated pumping rates for each of the two main (West and South) pipelines:

- West main pipeline – 252 L/s (0.252 m3/s or 4,000 US gpm)
- South main pipeline – 252 L/s (0.252 m3/s or 4,000 US gpm)

Therefore, a total pumping withdrawal rate for the Project is anticipated to be 504 L/s (0.504 m^3/s or 8,000 US gpm). A small additional amount of water 3.8 L/s (60 US gpm) will be withdrawn for each of the proposed tandem screen units and recirculated to the screen spray bars (**Figure 2.2**).

Centrifugal end-suction pumps are recommended, with 4 pumps located at the river intake site and 4 pumps located at the Booster Station (Option 1 or 2). It is anticipated that an area of approximately 220 to 260 m^2 will be required to accommodate the skid-mounted river pumps along the shoreline of the Assiniboine River. The total river power requirements will range from 400 to 500 HP (300 – 370 KW) and the total Booster Station power requirements will range from 550 to 700 HP (410 – 520 KM).

Centrifugal pumps will be powered by hydro-electricity. I It is anticipated that primary withdrawal/pumps will be used to convey water from the floating intakes to the upland area above the river valley, where booster pumps will provide additional pumping capacity to deliver water to irrigation fields at required pressures. The primary lift/delivery pumps would be skid-mounted, located above the summer high water level, and would be installed and removed annually to protect infrastructure from spring flood conditions. Examples of typical installations are presented in **Figure 2.3**. Two booster pump locations are being considered at alternate sites ns in W-26-8-17W1.

New hydro-electric power lines and transformers will be required for the river pump station (SE-35-8-17W1) and the booster station (W-26-8-17W1). Power supply will be required to the balancing reservoir location near 18-8-17W1 in the future if/when developed in Phase III. Manitoba Hydro has been approached to determine feasibility, cost and timeline of supplying power to the project.

Figure 2.1 Example of Riverscreen™ tandem intake

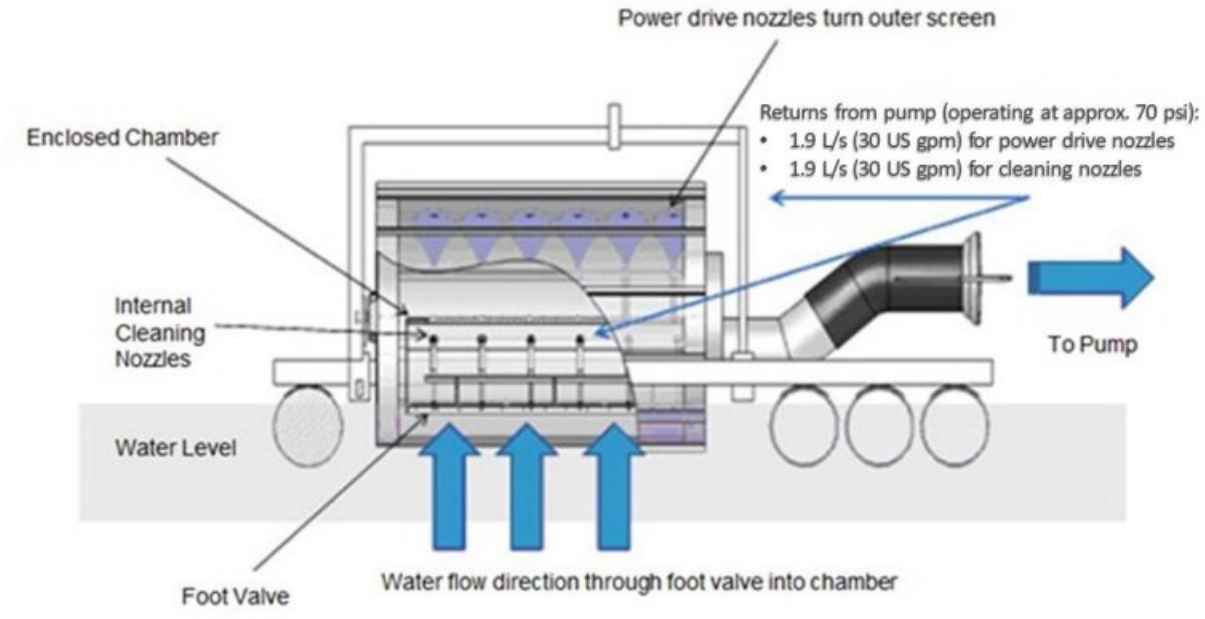


Figure 2.2 Diagram of Riverscreen™ intake system

Figure 2.3 Examples of typical pump installations

2.3.5 Pipelines

Water will be delivered to each irrigation field by means of pressurized pipelines. The pre-design engineering work identified pipeline routes, segments and pipe diameters as shown in **Map 3 (Appendix A)**. These routes, segments and diameters are subject to change through final design. The pipeline system will be constructed of pressure rated PVC pipe, shallow buried using backhoes and chain-trenchers. Turnouts to pipeline laterals and to irrigation fields will consist of galvanized steel pipe fittings.

Two main pipelines from the Assiniboine river are proposed: 1) West main pipeline and 2) South main pipeline. These are anticipated to be 18-inch diameter pipelines which would deliver water to each of the West and South irrigation block areas. Smaller diameter pipes will distribute water to irrigation fields within each irrigation block.

Engineering pre-design (PBS Water Engineering 2023) has confirmed pipeline specifications including pipe diameters and pressure ratings. The pre-design report has been submitted to the Proponent to support their ongoing Project planning. Additional design information can be submitted to the EAB if/as required.

Distribution pipelies will be located within municipal road allowances where feasible, and subject to approval by the municipalities. Pipeline segments not located within municipal road allowances are predominantly located on land owned by the Proponent, with the notable exception of the crossing of NW and SW-26-8-17W1 where the Proponent has negotiated an agreement with the landowner. Pipelines will need to cross Manitoba Transportation and Infrastructure rights-of-way in a few cases, and these crossings are discussed below.

2.3.6 Pipeline crossings

Road crossings will be completed according to the requirements of the appropriate authority. It is planned that all pipeline crossings of roads will include an encasement or liner pipe to protect the road integrity in the event of a pipeline failure or leakage. Nineteen road crossings are anticipated for the Project (**Map 3, Appendix A**), as follows:

- Currently three underground crossings of provincial roads are anticipated to be required, including a crossing of PR 340 and two crossings of PR 453. The Proponent will apply for permission to Manitoba Transportation and Infrastructure prior to undertaking road crossings and will follow requirements for these crossings.
- Currently, 16 underground crossings of municipal roads are anticipated to be required, 15 of which are within the Municipality of Oakland-Wawanesa and one of which is in the Municipality of Glenboro-South Cypress. The Proponent will apply for permission from the respective municipality prior to undertaking road crossings and will follow municipal requirements for these crossings.

There are no wet stream crossings anticipated. Dry stream/surface drains will be crossed using an open cut approach, where feasible.

2.3.7 Irrigation pivots

Irrigation pivots will be used for the application of irrigation water. It is anticipated that all pivots will be fixed units. Pivots will be low-pressure systems with end-guns. Preliminary irrigation pivot sizing and application footprints have been determined to optimize irrigation area relative to soil-landscape and land use constraints.

Irrigation pivot towers utilize small electric motors to power their movement. Additionally small booster pumps are often required for end guns depending on the irrigation system pressure available at the pivot. These booster pumps are also powered by a small electric motor. Where feasible, single-phase power will be trenched to the pivot center points to power the systems. Each pivot requires approximately 9 hp or 7 kW of power for operation. While not planned, if hydro-electric power is not feasible for a pivot or pivots, diesel generators will be utilized.

2.3.8 Agronomic management

The Proponent currently grows cereals and canola and plans to incorporate edible beans and corn into the crop rotation with the addition of irrigation to their crop production system. Potatoes may be incorporated in the future; however, the Proponent indicates there are no plans for potato irrigation in the immediate future.

Livestock manure is applied to cropping fields as a source of supplemental organic fertilizer. Manure applications are done as part of integrated nutrient management according to Manure Management Plans required under the Livestock Manure and Mortalities Management Regulation (M.R. 42/98). The Proponent utilizes a third-party agronomist to support nutrient management and other crop inputs management.

The Proponent intends to develop their Project with the ability to operate up to five irrigation pivots simultaneously within each of the two main pipeline networks (West and South). They intend on rotating fixed pivot operations so that all fields may receive irrigation water in any given growing season, as required.

The Proponent is planning to irrigate all rotational crops (corn, edible beans, cereals, canola). For high-level planning purposes, the Proponent is assuming a typical three-year rotation, resulting in approximately 1/3 of the irrigated landbase being under corn, 1/3 under edible beans and 1/3 under cereals and canola. Using maximum irrigation application depths of 10 in for corn and 5 in for other crops results in an estimated requirement of 1,500 ac-ft (1,850 dam^3) over 2,700 acres of irrigated land annually within the Phase I & II planning blocks (West-1, West-2, South-1, and South-2). These planning estimates are presented in **Table 2.2**. Actual irrigation application depths and land area will vary based on several factors, including soil conditions, weather (precipitation and evapotranspiration), crops being grown each year, and irrigation system capacity, capability, and limits.

Table 2.2 Irrigation depth and volume planning for Phase I and Phase II landbase

Crop	Irrigation application depth	Crop rotation – 3-year	Annual irrigated area	Irrigation volume	
	in	% of irrigated land by crop	ac	ac-ft	dam³
Corn	10	33.3%	900	750	925
Edible beans	5	33.3%	900	375	463
Wheat/canola	5	33.3%	900	375	463
Totals			**2,700**	**1,500**	**1,850**

2.3.9 Land ownership

All proposed irrigation fields listed in **Table 2.1** are owned by the Proponent. Certificates of title can be provided on request.

As noted above, the main pipelines are proposed to cross NW and SW-26-8-17W1, which are not owned by the Proponent. The Proponent has negotiated an agreement with the landowner of these two quarter sections. Distribution pipelines are proposed for installation predominantly within municipal road allowances, with a few crossings of Manitoba Transportation and Infrastructure rights-of-way will be required. The Proponent will follow requirements of the municipalities and Manitoba Transportation and Infrastructure for these installations.

2.4 PROJECT PHASES AND SEQUENCING

2.4.1 Construction

Construction will commence in 2023[1] or as soon as an EAL is issued for development of the Project. The Project will be constructed in phases with Phase I comprising portions of the West main pipeline and irrigation blocks West-1 and West-2. It is anticipated that Phase II will comprise the South main pipeline and irrigation blocks South-1 and South-2. Irrigation block West-3 would be considered for future development (i.e., Phase III) following completion of Phase II. Within each phase, construction of irrigation pivots and pipeline segments will be sequenced in logical order related to distribution network and irrigation rotation considerations.

Construction of improvements to the previously developed pump intake site are anticipated to include improvements to the existing access trail and to the pump pad, and adjacent slope. It is anticipated that an area of approximately 220 to 260 m^2 will be required to accommodate the skid-mounted river pumps. These construction activities are anticipated to occur in Winter 2023 (subject to issuance of an EAL) or late spring or early summer 2023, after spring runoff.

[1] Preliminary construction of pivots and pipeline segments occurred in Summer 2022 in NE-20-8-17W1 and SW-29-8-17W1, under planned activities for irrigation through a temporary pipeline under 160 ac-ft and, therefore, not requiring an EAL. However, irrigation did not occur in 2022.

River withdrawal pumping equipment is portable and will be installed each spring. Two river pumps and two associated Tandem Riverscreen™ floating intakes, or similar, are planned for installation in Summer 2023. River pumping electrical controls will be mounted on the upper bench of the valley adjacent to Road 47 N.

Booster pumps would require construction of a concrete pad or pads, and associated transfer fittings (e.g., galvanized steel pipe, valves, meters) and associated electrical equipment. Phase I would see purchase of two booster pumps for summer 2023. Booster pump electrical controls would be housed in small building adjacent to the pump pad. Temporary diesel boosters may be employed depending on timelines for hydro-electric power supply. Hydro-electric power timelines are dependent on Manitoba Hydro design and construction scheduling and have yet to be confirmed.

The following is a potential Project phasing by irrigation block including required portions of main pipelines and associated pipeline segments:

- Phase I
  - Irrigation block West-1 – 2023-2024
  - Irrigation block West-2 – 2024-2025
- Phase II
  - Irrigation block South-1 – 2025-2026
  - Irrigation block South-2 – 2026-2027
- Future, potential (Phase III)
  - Irrigation block West-3 – to be determined, anticipated to be beyond 2026-2027

2.4.2 Operation and Maintenance

Irrigation activities will occur annually through the growing season, with irrigation typically being conducted between May and September of each year. Maintenance will be performed routinely and as required to ensure operation and maximize life of irrigation infrastructure. This will include replacement of infrastructure and components, as required.

2.4.3 Decommissioning

There are no current plans for decommissioning of the Project, and the Project is expected to be in operation for at least 50 years.

The useful life of main project components is expected to be as follows:

- Pumps, irrigation pivots, steel pipeline network fittings – 20-25 years
- Pipelines (PVC) – 50 years

2.4.4 Funding

The Project is being funded fully by the Proponent.

3.0 SCOPE OF THE ASSESSMENT

3.1 REGULATORY AND POLICY SETTING

3.1.1 Provincial

3.1.1.1 *The Environment Act*

The Environment Act outlines the environmental assessment and licensing process for developments in Manitoba that may have potential for significant effects on the environment. Under the Classes of Development Regulation (M.R. 164/88), the Project is considered a Class 2 development as it proposes to withdraw more than 200 cubic decameters of water. The Project requires a valid and subsisting Environment Act Licence from the Environmental Approvals Branch of Manitoba Environment, Climate and Parks. This report forms the basis of the application. A cover letter, Environment Act Proposal Form, and application fee have been submitted separately to satisfy the requirements of a complete Environment Act Proposal (EAP).

3.1.1.2 *The Water Rights Act*

The Proponent requires a Water Use Licence under *The Water Rights Act*, as the Project requires the use of water for irrigation at a rate of more than 25,000 litres per day. The Proponent has applied for a Water Use Licence through Manitoba Environment, Climate and Parks for use of up to 1,850 dam^3 cubic decameters (1,500 acre-feet) annually. The Proponent has been issued a Development Authorization Permit (DAP) for 1,269.26 dam^3 (1,029 ac-ft; issued on February 7, 2022; **Appendix C.1**). The additional 580.97 dam^3 (471 ac-ft), which has been applied for by the Proponent but not yet issued in a DAP, is currently on hold pending resolution of existing groundwater exploration permits and groundwater requests currently on hold (T. Butterfield, personal communication, April 13, 2022). At the time of submission of this EAP, the Proponent had requested closure of groundwater exploration permits and it is understood that these are now closed.

3.1.1.3 *The Water Protection Act*

The Nutrient Management Regulation (M.R. 62/2008) under *The Water Protection Act* is pertinent to nutrient management requirements for the Project. The regulation stipulates residual soil nitrogen limits according to water quality management zones (or nutrient management zones, N1-N5) and limit phosphorus applications based on residual concentrations, which necessitate nutrient management planning and other management practices be employed in growing a crop. The Act also defines the nutrient buffer zones around surface and groundwater features. The buffer applies to any surface water body (e.g., lake, river, creek, drains [Order 3, 4, 5], major wetlands) within or adjacent to fields receiving nitrogen or phosphorus. The Proponent is responsible to adhere to this regulation as part of their operations.

3.1.1.4 The Heritage Resources Act

Under Section 12(2) of *The Heritage Resources Act*, if there is reason to believe that heritage resources or human remains upon or within or beneath lands are likely to be damaged or destroyed by any work, activity, development or project, then the proponent/landowner is required to conduct a heritage resource impact assessment (HRIA) and mitigation. As per sections 46 and 51, there is an obligation to report any heritage resources and a prohibition on destruction, damage or alteration of said resources.

The Proponent requested a review of the proposed Project by the Manitoba Historic Resources Branch (HRB) on June 24, 2022 and received screening results from the HRB on July 11, 2022 (correspondence is presented in **Appendix C.2**). A qualified heritage resources consultant was retained by the Proponent to complete a Heritage Resources Impact Assessment (HRIA) in September 2022. The HRIA will be submitted as supplementary information to this assessment when completed.

3.1.1.5 Manitoba Transportation and Infrastructure Permits

It is anticipated that permits will be required and will be sought from Manitoba Transportation and Infrastructure for proposed pipeline crossings of provincial roads. Proposed crossings include one crossing of Provincial Road 340 (asphalt surface) and two crossings of Provincial Road 453 (gravel surface). It is anticipated these crossings will be completed using directional boring with pipeline installations sleeved. Manitoba Transportation and Infrastructure processes will be followed and requirements met by the Proponent.

3.1.2 Federal

3.1.2.1 Fisheries Act

The *Fisheries Act* (Canada) includes provision for fish and fish habitat protection for projects near water. The Act requires incorporation of measures to avoid causing the death of fish, or the harmful alteration, disruption or destruction (HADD) of fish habitat as a result of Project works, undertakings or activities. The Department of Fisheries and Oceans (DFO) provides a list of measures for implementation, where applicable to project works, undertakings or activities, and also provides standards, codes and practices applicable to some types of projects. If applicable measures and codes of practice can't completely be implemented, a project review by DFO may be required. If a project review is required, DFO will determine:

- whether the project will impact an aquatic species at risk
- if project activity can result in the death of fish and the harmful alteration, disruption or destruction of fish habitat
- if the project will need authorization under the Fisheries Act

If a project authorization is required, the Proponent will have to apply for an authorization. If an authorization is granted, it will include terms and conditions proponents must follow to avoid,

mitigate, offset (counterbalance impacts) and monitor the impacts to fish and fish habitat resulting from the project.

A DFO code of practice applicable to this Project is the "Interim code of practice: end-of-pipe fish protection screens for small water intakes in freshwater" (https://www.dfo-mpo.gc.ca/pnw-ppe/codes/screen-ecran-eng.html). This interim code of practice provides guidance on the design, installation and maintenance of small end-of-pipe water intake fish screens to prevent entrainment and impingement of fish.

A qualified aquatic biologist has been retained by the Proponent to review the Project, complete an environmental site survey, advise on mitigation, and complete an aquatic habitat impact assessment report. This will include collaboration with the Project design team in review and development of the intake site development plan, erosion and sedimentation control measures, and the intake design relative to the applicable code of practice. The impact assessment report will be filed as supplementary information to this assessment when completed.

3.1.2.2 Canadian Navigable Waters Act

The Navigation Protection Program (NPP) is responsible for the administration and enforcement of the *Canadian Navigable Waters Act* (CNWA). The CNWA ensures protections for navigation on all navigable waters in Canada. The NPP includes responsibilities to approve and set terms and conditions for works in navigable waters. Under the CNWA, owners of works who propose to construct, place, alter, rebuild, remove or decommission works that are in, on, over, under, through or across any navigable water may be required to apply for an approval to Transport Canada, or seek authorization through the public resolution process.

The Assiniboine River is considered a scheduled, navigable water under the CNWA.

The Proponent intends to submit an application under the NPP for the installation of temporary, floating screens and connecting piping and proposed activities at the pump intake site.

3.1.3 Species at Risk Act

The purposes of the *Species at Risk Act* (SARA) are to prevent wildlife species in Canada from disappearing, provide for the recovery of wildlife that no longer exist in the area, are endangered or threatened as a result of human activity, and to manage species of special concern to prevent them from becoming endangered or threatened. SARA requires the adherence to recovery plans for certain species concern under the Act.

This Act may apply if a species at risk or their critical habitat is found any time of year on a property which may be subject to construction or development.

To support the review of potential Project effects against SARA, an information request was submitted to Manitoba's Conservation Data Center. The submission included the anticipated

Project footprint including the pump intake location, pipeline network and pivots. Copy of the correspondence is included in **Appendix C.3**.

3.1.3.1 Migratory Birds Convention Act

The purpose of the *Migratory Birds Convention Act* is to protect and conserve migratory bird populations, individuals, and nests. Disturbance or destruction of migratory bird nests or eggs is prohibited pursuant to the Act, and this needs to be considered in relation to construction activities proposed under the Project.

As described above for SARA, the Manitoba's Conservation Data Center review information was intended to support review of the potential Project effects relative to the *Migratory Birds Convention Act*.

3.1.4 Municipal

The Proponent has notified the Municipality of Oakland-Wawanesa and the Municipality of Glenboro-South Cypress of the Project, including proposed pipeline routes as presented in **Map 3 (Appendix A)**. The Proponent intends to follow municipal by-laws, as required. Additional information on engagement with municipalities is discussed below.

3.2 ENGAGEMENT

Targeted engagement was conducted by the Proponent as part of their responsibility to community stakeholders. This included notification of the proposed Project and a brief Project overview via email to:

- Municipality of Oakland – Wawanesa (email sent to CAO on October 21, 2022)
- Municipality of Glenboro – South Cypress (email sent to CAO on October 21, 2022)
- Central Assiniboine Watershed District (email sent to Manager on October 21, 2022)

Acknowledgement of receipt of email transmittals were received by all parties listed above. At the time of submission of this report additional correspondence has been as follows:

- Municipality of Oakland – Wawanesa – an email was received from the Municipality on November 15, 2022, providing copy of a resolution that the Municipality supports in principle the Treesbank Colony Irrigation Project application subject to conditions provided. The Proponent will continue to communicate with the Municipality with respect to conditions. The email including the resolution and conditions is provided in **Appendix B.1**.
- Municipality of Glenboro – South Cypress - The Proponent was invited to present a Project overview to the Council at their Council meeting on November 9, 2022. An overview of the Project was presented by AgriEarth following an open discussion and questions by the Council. The discussion included questions on soil testing/monitoring planned for the Project and whether the Project would affect the operation of the Treesbank Ferry, which

is located on the Assiniboine River approximately 8 km downstream of the Project withdrawal point. Responses were provided by AgriEarth.

- A resolution was passed by the Council at the November 9, 2022 meeting to approve the Project as submitted to the Municipality by AgriEarth via email transmittal on October 21, 2022 subject to the requirement that all work be completed in accordance with the Irrigation Policy and all other applicable municipal policies. A copy of the Irrigation Policy was provided. The resolution and Irrigation Policy is provided in **Appendix B.2**.

In addition to preliminary discussions with Environmental Approvals Branch and Water Rights Licensing The following governmental agencies were contacted for review of the proposed Project description and footprint of proposed Project infrastructure (e.g., pumps, pipelines, pivots)

- Historic Resources Branch (HRB) – a request for review of the proposed Project by the HRB on June 24, 2022, and received screening results from the HRB on July 11, 2022
- Manitoba Conservation Data Centre (MBCDC) – a submission through the online portal was completed and supplemental information submitted by email on July 19, 2022. Results of the search completed by the MBCDC were returned via email on August 2, 2022.

The Proponent understands the Project EAP will be posted on Manitoba's Public Registry as part of the environmental assessment and licensing process. The Proponent welcomes comments and questions from public stakeholders through this process and will respond to comments and questions provided through the review process by Manitoba Environment, Climate and Parks.

4.0 ENVIRONMENTAL AND SOCIO-ECONOMIC SETTING

4.1 SOCIO-ECONOMIC ENVIRONMENT

4.1.1 Land Use

Existing land use within proposed irrigation fields is almost completely agricultural (**Map 4, Appendix A**) and under annual cropping management. Exceptions include minor portions of fields with grassed surface drainage courses, which will be left under grass cover.

Pipeline routes predominantly traverse annual cropping land cover and grassed municipal road allowances. The pipeline crossing of 21-8-17W1 includes some deciduous forest/bush and permanent grassland cover, as well as some hay land. Minimal clearing is anticipated to allow the pipeline to cross through a limited section of trees/bush (approximate 90 m width), however, an existing cut through the tree/bush vegetation will minimize this requirement.

The area along the Assiniboine River at the proposed pump intake location is riparian vegetation including some deciduous forest cover and some permanent grass cover. A previously developed pump intake location and access road (circa 1980's) exists at the site (**Figure 4.1**). Engineering pre-design of the pump intake site and pump infrastructure and facilities has confirmed preliminary pump intake site development requirements. Some re-work of the intake site will be required to accommodate the pump intake site infrastructure. The area of the pump pad at the lower bench of the Assiniboine River is expected to be 220 to 260 m^2 in size and installed in an area of previous disturbance but currently under grass vegetation. The upgrades will likely include limited levelling the lower bench where the river pumps will be located, addition to the existing rip rap for riverbank stabilization/erosion reduction, and replacement of existing 10-inch transfer pipeline with two 18-inch high density polyethylene (HDPE) pipelines. In addition, modifying the access route from the upland to the lower river bench may be required, as well as flattening the slope above the lower bench to improve slope stability. In-river work is anticipated to be limited as the lower bench has been stable since the 1980's, when the existing pump intake site was initially developed (**Figure 4.2**) including installation of rock riprap. A geotechnical engineering evaluation has been recommended to determine whether the existing access trail can be rehabilitated/reconstructed or if a modified access route is required. Geotechnical engineering would also identify the need for additional works to further stabilize the riverbank (e.g., add to the existing rip rap) and to prevent erosion of the lower bench after levelling of the pump site.

Regardless, minimal clearing is anticipated in re-development of this site for the Project as development planning will prioritize utilizing previously disturbed areas to the extent feasible. It is anticipated disturbance for pump intake location development will be limited to areas of grass cover, with clearing of mature trees being limited to the improvements to the access trail, as required.

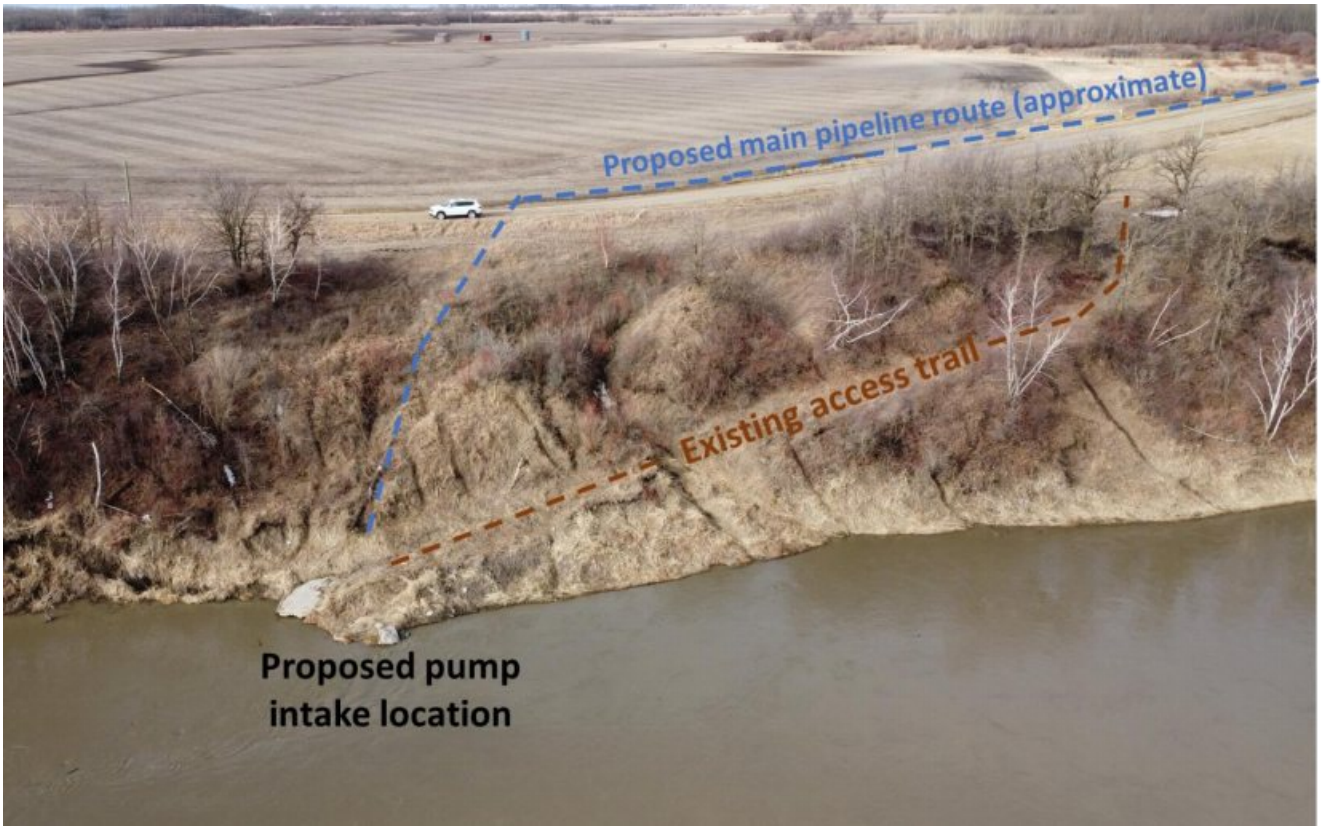


Figure 4.1 Land cover at proposed pump intake location at SE-35-8-17W1

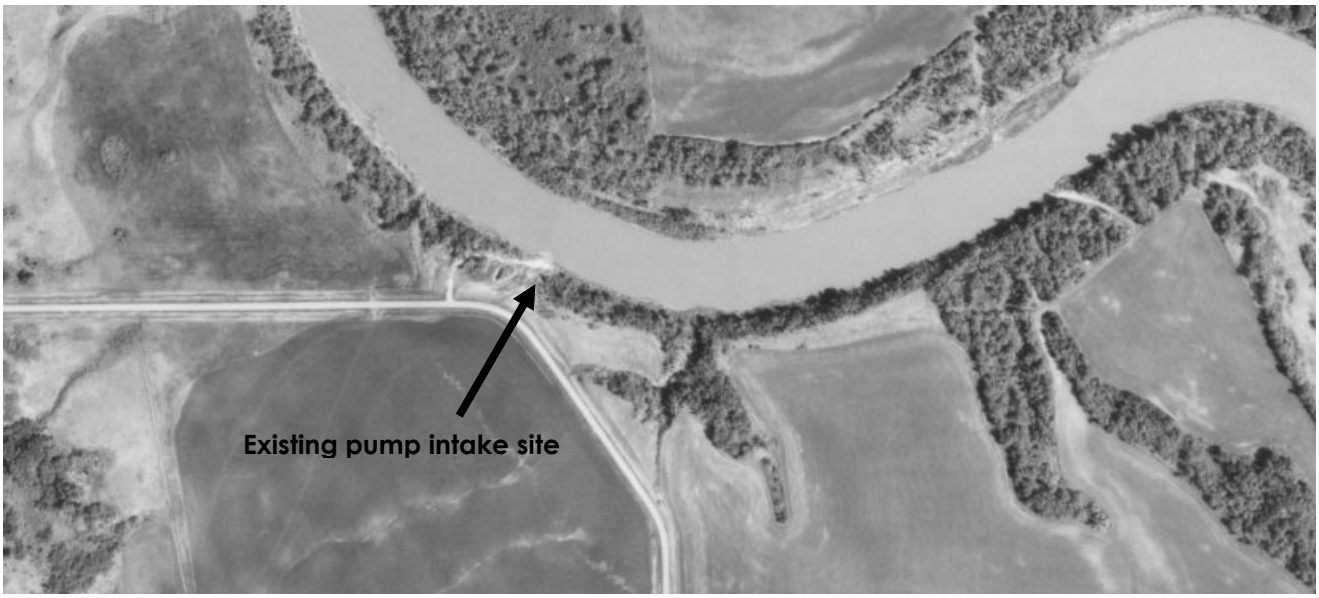


Figure 4.2 Aerial photograph (1986) showing existing pump intake site development

4.1.2 Infrastructure and Services

The Project area is well serviced by existing provincial roads (i.e., PR 340 and PR453) and the existing municipal road network.

Manitoba Hydro provides electrical service to the area, and electrical power is planned for operating pumps and pivots, where feasible.

4.1.3 Indigenous Nations

The Project is located on Treaty 1 land. Swan Lake First Nation is the closest First Nation to the Project, with Swan Lake 7A reserve land located approximately 23 km to the northeast of the Project. Swan Lake 7A consists of residential and commercial development (https://treaty1.ca/swan-lake-first-nation/).

4.1.4 Parks and Protected Areas

The Brandon Hills Wildlife Management Area is located 6 kilometers to the northwest of the Project, and the Assiniboine Corridor Wildlife Management Area is located to the northeast of the project, along the north side of the Assiniboine River (**Map 1, Appendix A**). The Criddle/Vane Homestead Provincial Park is also located northeast of the PDA and is the only Provincial Park in the vicinity of the Project.

4.1.5 Resource Use and Recreation

The Project region is predominantly under agricultural land use for annual crop production. Irrigation development is common in the area. Recreational land use occurs in the region, including use of the Assiniboine River by canoeists and anglers, and use of natural areas by outdoor enthusiasts (e.g., hunters, hikers, naturalists).

4.1.6 Heritage Resources

The proposed Project takes place mainly on cultivated agricultural land. However, pipeline routes traverse limited areas of previously undisturbed land.

The Historic Resources Branch (HRB) was contacted to complete a screening of the proposed Project for potential concerns. Concerns noted by HRB are as follows:

> *"…the Manitoba Historic Resources Branch (HRB) has examined the locations in conjunction with Branch records for areas of potential concern. Notably, the portions of the development footprint are located along the valley margin of the Souris River and Black Creek, near known archaeological sites that are located along the margins of these topographic features. Additionally, portions of the development footprint are situated along the historic Yellowquill Trail and a relict beach ridge. Both of these features commonly have Heritage Resources associated with them. These factors,*

> *although not exclusive to the analysis, indicate a reason to believe that any future planned ground disturbance, activity, and/or development within the area has the potential to impact heritage resources, therefore, the Historic Resources Branch has concerns."*

The HRB has recommended a Heritage Resources Impact Assessment (HRIA) be completed for portions of the pipeline routes within identified quarter sections and in identified irrigation fields, if development of these require ground disturbance. In addition, a heritage resource protection plan (HRPP) is recommended for implementation. A memo provided by the HRB is included in **Appendix C.2**.

A qualified heritage resource consultant has been retained by the Proponent to complete an HRIA and support the proponent in implementing an HRPP. This work will be undertaken in phases aligning to the Project development plan timelines. Field investigations have been completed in SW-26-8-17W1 and SE-29-8-17W1 and no heritage resources or concerns were noted through these investigations (L. Bobbie, personal communication, October 24, 2022).

4.2 PHYSICAL ENVIRONMENT

4.2.1 Physiography

The Project is located in two physiographic areas – the Brandon Lakes Plain for the southwestern portion of the Project area and the Upper Assiniboine Delta for the northwestern portion of the project. According to Ehrlich et al. (1957), these regions are characterized as follows:

- Brandon Lakes Plain - a smooth lacustrine plain bisected by outwash deposits bordering the Assiniboine River. The materials in the southern portion of the plain, where the Project is located, are medium in texture.
- Upper Assiniboine Delta – an area of outwash and lacustrine plains above the Manitoba Escarpment. In the area of the Project, deposits are characterized as coarse textured glacio-fluvial/outwash deposits and coarse textured lacustrine sediments.
- Regional topography is best described as predominantly nearly level to very gently undulating, with predominant slope gradients ranging from 0.5 to 5%.

4.2.2 Geology, Hydrogeology and Groundwater

A summary of geology for the region presented by Ehrlich et al. (1957) is as follows:

> *A surface mantle of unconsolidated rock materials cover the bedrock formations throughout the Carberry map area. These unconsolidated materials are composed of rock fragments derived from bedrock formations through the action of continental ice sheets which completely covered Manitoba in recent geological times. The ice sheets picked up and transported huge quantities of materials from the bedrock formations over which they passed. When the ice sheets melted the rock materials were deposited as glacial drift in*

> *various forms. These drift deposits, along with small areas of recent alluvium, constitute the parent materials from which the soils have been developed.*
>
> *…The Carberry area is underlain by various shales, sandstones and evaporites of the Cretaceous and Jurassic periods…As the continental ice sheets moved in a southerly direction, these rock formations have all contributed materials to the surface deposits of the Carberry area.*

The Project is underlain by shales of the Upper Cretaceous period, including the Riding Mountain and Vermillion River formations.

As described above, the surficial deposits include medium and coarse textured outwash and lacustirne deposits.

The surficial geology of the proposed pump intake site and riverbank at the Assiniboine River at SE-35-8-17W1 will be confirmed through a geotechnical investigation being conducted to support engineering design.

The eastern portion of the Project is located on the Assiniboine Delta Aqufer, while the western portion of the Project is indicated as being underlain by lenses of sand and gravel (**Map 1, Appendix A**).

Several buried valley aquifers are known to exist and have been identified in southwestern Manitoba (**Figure 4.3;** Betcher et al., 2005, Hinton et al. 2007). One of these buried valleys is the Spiritwood Valley, a 15–20 km wide buried bedrock valley in southern Manitoba that runs approximately northwest-southeast near the towns of Killarney and Cartwright in Manitoba and extends through North Dakota and into South Dakota (Oldenborger et al., 2010). While hydrogeological investigations have concentrated in the Killarney and Cartwright area, investigations have extended into the area of the Project (Crow et al., 2012; J. Oosterveen, personal communication, December 2022) and the extent and characteristics of the Spiritwood Valley aquifer in Manitoba are not fully defined (Oldenborger et al., 2010). For example, a geological sequence documented in a well record at SW-26-8-17W (well record 41658, Province of Manitoba GWDRILL database), just southwest of the pump intake site, indicates a sand layer from 115 to 125 feet below ground between an overlying relatively thin layer of clay till (12 feet in thickness from 102 to 115 feet below ground) and an underlying thick blue clay layer (80 feet in thickness from 125 to 205 feet below ground). This may represent the eastern extent of the Spiritwood Aquifer at this location (J. Oosterveen. personal communication, December 2022).

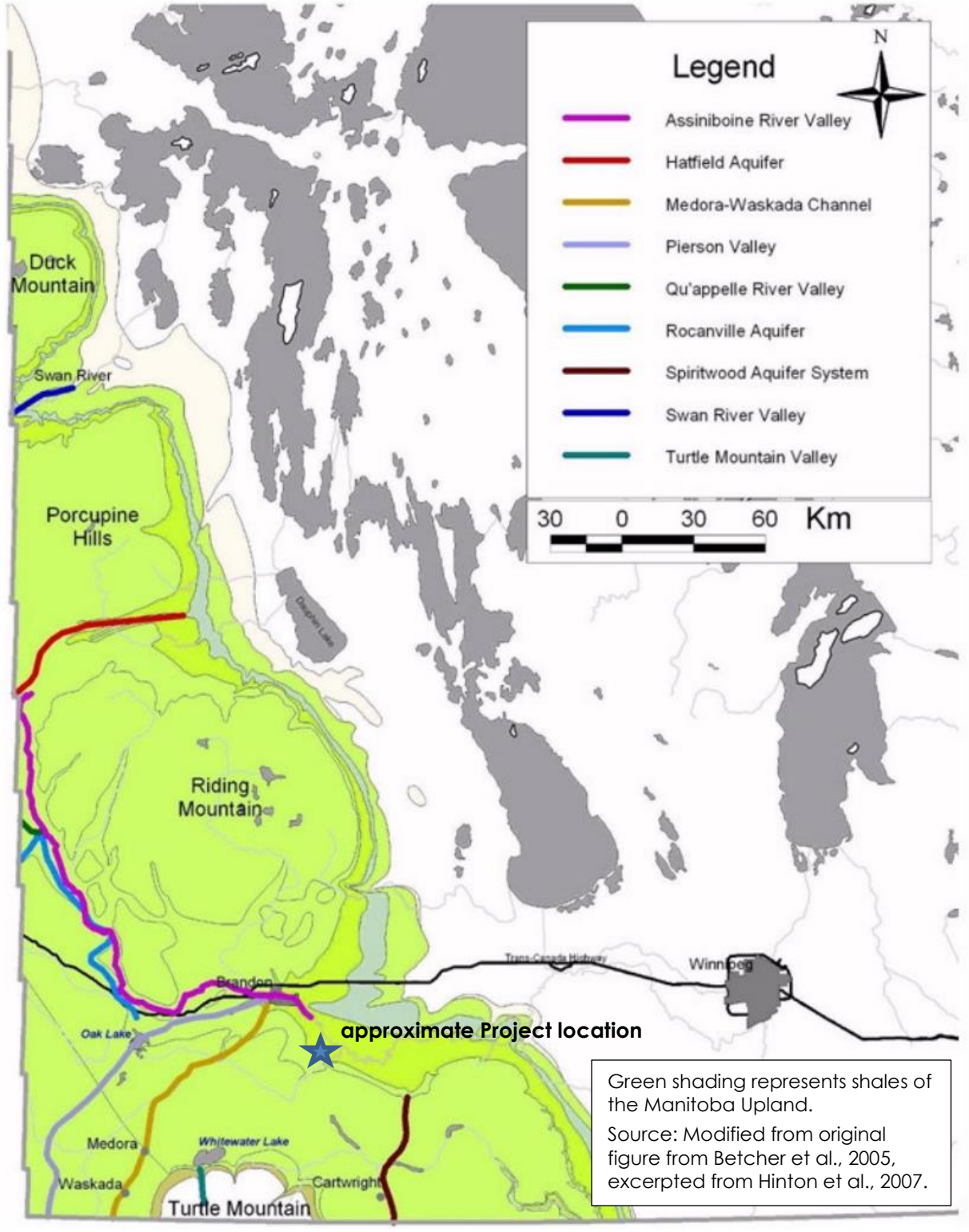


Figure 4.3 Estimated distribution of buried valleys of southwestern Manitoba

4.2.3 Surface Water

The Project is located in the Lower Souris River watershed. The major surface water source to the Project area is the Assiniboine River. The Assiniboine River at this location has a drainage area of slightly more than 94,000 km^2. The Water Survey of Canada (WSC) gauging station Assiniboine River at Brandon (PTH10; 05MH001), 30 km upstream of the PDA, is the nearest active source of measured flow data. The next nearest WSC gauging station is the Assiniboine River Near Holland (05MH005; PTH34), approximately 65 km downstream of the PDA. Gauging station 05MH005 includes an additional 65,000 km^2 drainage area, encompassing the Souris River and the Cypress River. The Assiniboine River flows through the Assiniboine Delta Aquifer (ADA) between these two gauging stations receiving significant inflow from the aquifer. A third historical WSC gauging station, Assiniboine River Near Brandon (05MH013) provides some historical water data, but this station is not currently active.

Danielescu et al. (2021) studied flow and water quality contributions of the ADA to the Assiniboine River, and concluded the ADA contributed 15% of the Assiniboine River flow at Holland in the spring of 2018. During the fall of 2018 the ADA contributed 8% of the Assiniboine River flow at Holland (Danielescu et al., 2021). A simple review of flows on the Assiniboine River during October 12, 2022, shows an increase in flow from WSC 05MH001(at Brandon) at 14.7 m^3/s (520 cfs) to WSC 05MH005[2] (near Holland) at 23.7 m3/s (835 cfs). This local increase in flow can be attributed to approximately 3 m^3/s from the Souris River and the remaining approximately 6 m^3/s from groundwater from the ADA[3]. Of importance in the fall is additional groundwater inflow into the Assiniboine after cessation of irrigation and plant growth (i.e., reduced evapotranspiration).

Render (1988) summarized the impacts of the ADA on the Assiniboine River flow referencing measurements from 1985 and the 1960's.

> *The stream flow monitoring on the Assiniboine River (Harrison, 1986) indicated that the groundwater discharge from the aquifer between Brandon and Holland was in the order of 100 cfs (2.8 m^3/s) during the period September 12 to October 14, 1985. Harrison calculated over this period for the reaches Brandon to Treesbank Ferry, 8.3 cfs (0.25 m^3/s), Treesbank to Stockton Ferry, 5.7cfs (0.16 m^3/s), Stockton Ferry to Province Trunk Highway No 5 Bridge, 28.7 cfs (0.81 m^3/s), and between Province Trunk Highways 5 and 34 Bridges, 57.8 cfs (1.6 m^3/s). Mattick and Wagner (1968) indicate that the groundwater inflow over this reach of the river for the years l963 to 1967 inclusive varied from 100 cfs (2.8 m^3/s) in the autumn to as high as 600 cfs (16.8 m^3/s) in June.*

Render (1988) report suggests only a small (e.g., < 10%) portion of the ADA inflow is upstream of the PDA. So, while neither of the WSC gauging stations is accurate for estimating water available at the Project pump intake location, the WSC 05MH001(at Brandon) station is the most representative of discharge and water level conditions at the site. However, it is a slight

[2] This includes inflow from Souris River (Wawanesa) @ 2.9 m3/s and Oak Creek (Glenboro) @ 0.3 m3/s
[3] Wastewater releases may also contribute to flows, but this was beyond the scope of the study.

underestimation of flow at the Project location. It is impossible to know the increase in flow at the Project location relative to 05MH001 without additional gauging implemented. It would be of value to the Proponent to collect periodic water level and flow information at the PR350 bridge in the future to better understand the actual water availability at the Project pump intake location.

Flows on the Assiniboine River at the Project intake site are highly variable, with peak flows (WSC 05MH001, at Brandon) reaching >1,000 m^3/s, while minimum August flows are recorded below 1-2 m^3/s (WSC 05MH001, at Brandon; 05MH013, near Brandon). Median August minimums at 05MH001 are in the order of 12.5 m^3/s. Since the development of Shellmouth Dam, the Province has capacity to augment low flows with strategic releases. A recent example of this was in August 2021 when staged releases increased WSC 05MH001 (at Brandon) flows from 7.1 m^3/s to 12.8 m^3/s. Minimum August Assiniboine River flows at Brandon have been at or below 5.5 m^3/s eight times since 1971(e.g., ~ 25 % of time).

The minimum instream flow and firm annual yield for the Assiniboine River are set by the Province of Manitoba. The Province regulates Assiniboine River flows with releases from Shellmouth Dam to help maintain minimum stream flows, taking into account contributions from the ADA. The minimum instream flow need is the flow required to sustain environmental needs as well as for assimilation of wastewater. The firm annual yield is the amount of water the Province will allocate for consumptive use.

Peak water levels on the Assinibione River can rise up to 6 m above the minimum water levels (WSC 05MH005, near Holland). Typical (median) August water levels are approximately 0.3 m above minimum water levels (WSC 05MH005, near Holland). Maximum August water levels can be over 2 m above minimum water levels (WSC 05MH005, near Holland).

It is anticipated that the pump pad will be set about 3 m above the minimum water level as determined at the Project pump intake site, subject to further engineering evaluation. A topographic and bathymetric survey of the river bed and bank were completed October 25, 2022, during a relatively low water level situation (05MH001, at Brandon; 356.36 m and 22 m^3/s; upper quartile for October). This data along with other observed water levels and flow frequency (05MH001, at Brandon; May 3, 2022 am; 357.08 m and 210 m^3/s; upper quartile for May) will be used to advise pump site development and operational plans related to the bench that the pumps will rest on (e.g., suction head requirement, flood frequency). The recorded water level at the pump intake site was 337.65 m on October 25, 2022, approximately 2 m below the existing concrete pad (339.7 m). The pre-design report has established a target of 340.0 to 340.25 for the new pump pad(s).

4.2.4 Soil-Landscape

The soil-landscape has been characterized using digital soil database information provided by Manitoba Agriculture, including published data for the Municipality of Glenboro-South Cypress and unpublished data for the Municipality of Oakland-Wawanesa (Manitoba Agriculture, 2022).

Soil resource information for both municipalities is at a detailed survey intensity level 2 (SIL2) at a scale of 1:20,000.

The soil-landscape is dominated by soils of the Clementi association, which are developed on moderately fine textured lacustrine sediments overlying moderately fine textured till. This includes the well-drained Clementi (CLN) series (32% of irrigation PDA), well drained Chambers (CBS) series (7% of irrigation PDA), the imperfectly drained Beresford (BSF) series (11% of irrigation PDA, and the imperfectly drained Cobfield (CBF) series (5% of irrigation PDA).

A significant portion of the irrigation PDA is characterized as the well-drained Ramada (RAM) series (24% of the irrigation PDA), developed on moderately fine textured lacustrine sediments.

A minor portion of the irrigation PDA is characterized as the well-drained Newdale (NDL) series (7% of the irrigation PDA), developed on moderately fine textured till.

The remainder of the irrigation PDA is characterized by 8 different soil series which each occupy 1 to 3% of the irrigation PDA, and 7 different soil series and eroded slopes complexes associated with stream channels which each occupy less than 1% of the irrigation PDA.

Soil materials are fairly uniform across the PDA, with moderately fine (i.e., clay loam [CL], sandy clay loam [SCL]) surface textures mapped across 98% of the irrigation PDA. The remaining 2% of the irrigation PDA is characterized as having coarse (LFS) surface textures.

Soil salinity is not indicated to be a significant limitation in fields proposed for irrigation based on existing soil resource information. However, limited areas throughout the PDA (~3% of the irrigation PDA) are mapped as slightly saline. For the most part, the proposed irrigation configuration avoids saline soils in the Project area. Regardless, areas soil salinity in low-lying areas where there are crop productivity limitations should be monitored following the implementation of irrigation.

The landscape is characterized as level to very gently undulating, with slope gradients predominantly less than 5%.

4.2.4.1 Drainage

Internal drainage of soils across the PDA are variable but are predominantly considered to be well drained (75% of the irrigation PDA) (**Map 5, Appendix A**; **Table 4.1**). A significant portion of the irrigation PDA (22%) is considered imperfectly drained due to the combination of variable topography limiting surface runoff and moderately fine textured soils. The remaining 2% of the irrigation PDA is considered poorly drained.

Well drained soils are generally well suited to irrigation. Imperfectly drained soils typically do not require as much irrigation as the near-surface water tables can supply the rooting zone with water for crop needs through capillary action. However, crop production in imperfectly drained soils may benefit from drainage improvements, which should be designed to limit drainage of water to only what is necessary for crop growth and trafficability objectives.

Table 4.1 Drainage classes within the irrigation PDA

Dominant Drainage Class	Areal Extent		Proportion of Irrigation PDA (%)
	hectares (ha)	acres (ac)	
Very Rapid			
Rapid	1	2	0.1%
Well	947	2,339	75.4%
Moderately Well			
Imperfect	279	688	22.2%
Poor	30	74	2.4%
Very Poor			
Totals:	**1,256**	**3,101**	**100%**

4.2.4.2 Agricultural Capability

The soil-landscape across the PDA is generally considered well suited to annual crop production, with 95% of the irrigation PDA considered "prime" agricultural soils (Class 1, 2 and 3), while the remaining 5% is considered "marginal" (Class 4 and 5) with more severe production limitations (**Table 4.2**). The primary limitations to dryland agricultural capability include excess water ("W") and topography ("T").

Table 4.2 Agricultural capability classes within the irrigation PDA

Dominant Agricultural Capability Class	Areal Extent		Proportion of Irrigation PDA (%)
	hectares (ha)	acres (ac)	
1	623	1,539	49.6%
2	394	973	31.4%
3	178	439	14.2%
4	31	76	2.5%
5	30	74	2.3%
6	1	2	0.1%
7			
Totals:	**1,256**	**3,102**	**100%**

4.2.4.3 Irrigation Suitability

General irrigation suitability ratings are based on guidelines published by AAFC (Working Group on Irrigation Suitability Classification 1987) and provide an indication of suitability of the soil-landscape for irrigated crop production of a range of crops. The ratings are developed based

on consideration of a range of soil and landscape characteristics and limitations to irrigated crop production. Soils are rated as Excellent, Good, Fair or Poor.

Soils within the irrigation PDA are generally suited for irrigation without significant limitations, as indicated by predominantly Good ratings (68% of irrigation PDA; **Table 4.3**; **Map 6, Appendix A**). These soils are considered to have slight to no limitations for general irrigation suitability. Approximately 29% of the soils are rated as Fair for general irrigation, while the remaining 2-3% are considered Poor.

Primary limitations for irrigation include wetness ("w" limitation; imperfect drainage class) and restricted soil water movement ("k" limitation; low hydraulic conductivity). The restricted water movement limitation is due to the moderately fine soil textures. As discussed previously in the drainage section, soils with a "w" limitation (due to limited internal drainage) will require less supplemental irrigation water, particularly if drainage improvements are not undertaken. Care should be taken to avoid raising the water table through excess irrigation water application as this could negatively impact production in the short-term and lead to salinity development over the long-term.

Soil textures are relatively uniform throughout the Project landbase so dealing with highly variable infiltration and percolation rates due to highly variable soil textures is not a management issue on this Project. However, the variable landscape results in a topography limitation ("t2" limitation; complex topography) across a about a quarter of the irrigation PDA – care will have to be taken in areas of complex topography to ensure uniform infiltration or irrigation water and to prevent surface runoff.

Drainage improvements, particularly tile drainage, may be used to reduce the limitations associated with drainage. However, drainage improvements will not improve the rate at which water movement through the soil profile, which is inherently limited by the moderately fine soil textures.

Table 4.3 Irrigation suitability rating within the irrigation area

Dominant Irrigation Suitability Rating	Areal Extent		Proportion of Irrigation PDA (%)
	hectares (ha)	acres (ac)	
Excellent			
Good	858	2,120	68.4%
Fair	367	907	29.2%
Poor	30	75	2.4%
Totals:	**1,256**	**3,102**	**100.0%**

4.2.4.4 Land Suitability for Irrigated Potato Production

The soils of the Project area have been reviewed for land suitability for irrigated potato production in accordance with Manitoba Agriculture (1999). This system provides ratings for the production of irrigated potatoes based on soil and landscape limitations, and rates soils from Class 1 (most desirable characteristics) to Class 5 (least desirable characteristics).

Soil landscapes rated as Class 1 – 3 are well suited for potato production. Approximately 46% of the soils in the proposed irrigated areas are predominantly Class 1 to 3 (**Map 7, Appendix A**; **Table 4.4**). Over half (51% of irrigation PDA) are rated as Class 4, primarily due to the occurrence of imperfect drainage and soil textures. The remaining 2-3% of soils are rated as Class 5.

While not planned at this time, if Project soils are used for irrigated potato production in the future, drainage limitations can be managed through drainage improvements (imperfectly drained soils) and careful management of irrigation applications (i.e., matching application rate to soil infiltration and percolation rate). However, the predominantly clay loam textures can be a major limitation to the harvestability of potatoes and is a soil factor that cannot be changed or improved.

Table 4.4 Land suitability for irrigated potato production within the irrigation area

Dominant Land Suitability for Irrigated Potato Production	Areal Extent		Proportion of Irrigation PDA (%)
	hectares (ha)	acres (ac)	
1	4	11	0.4%
2	361	893	28.7%
3	216	534	17.2%
4	643	1,589	51.3%
5	30	75	2.4%
Totals:	**1,256**	**3,102**	**100.0%**

4.2.4.5 Soil Water and Nutrient Holding Capacity

The ability of soils to hold water and nutrients with the soil matrix allows the plant to draw on these as needed for growth and determines, in part, the environmental risk associated with the potential for nutrient loss. Individual soil-landscape units have specific water holding capacities that relate to soil structure and texture. Water holding capacity can be utilized to determine the frequency and amount of irrigation required to maintain optimum crop growth. Generally, the higher the water holding capacity in a given soil, the higher the nutrient holding capacity and lower the risk of soluble nutrient (i.e., nitrogen) leaching losses.

The predominantly moderately fine textured soils in the irrigation PDA are expected to have water holding capacities of approximately 19 to 25% (1.9 to 2.5 mm/cm or 2.2 to 2.9 in/ft). Soil water holding capacity should be considered in relation to irrigation management.

Irrigation volumes should be tailored to how much water soils within a given soil management unit or field can hold considering water holding capacity and residual soil water content.

The Nutrient Management Regulation (M.R. 62/2008) makes use of basic soil information (including soil water holding capacity/soil moisture limitations accounted for in agricultural capability ratings and classes) to determine allowable soil nutrient residual concentrations for nitrogen and nutrient application rates for phosphorus. Management practices should be tailored as appropriate considering nutrient management zones (NMZ) within each field. Soil-landscapes in the irrigation PDA are predominantly in NMZ N1, with some areas in the southeastern portion rated N2 (**Map 8, Appendix A**) owing to the soil and topographic factors favourable for annual cropping and nutrient management. A minor portion of the irrigation PDA is rated as N3 due to wetness/poor drainage limitations (i.e., fields 7, 9, 20 and 21). Soils rated as N4 are avoided by the irrigation footprint (e.g., fields 22, 23 and 24).

4.2.5 Climate and Agri-Climate

The Project region is characterized as having a cool, subhumid, Boreal soil climate. Annual and growing season climatic data for the Project region are provided in **Figure 4.4**.

Figure 4.4 Climatic statistics for the Project region (Smith et al. 2001)

Selected Climate Data[1] for Cypress River

	Year	June-Aug	May-Sept	July	Jan
Temperature °C	2.7	18.2	15.7	19.5	-17.3
Precip. mm (equiv.)	525.8	234.3	342.9	77.4	25.8
Rain/Snow (mm/cm)	399.6/125.8	234.3	340.9/1.8	77.4/0.0	0.0T/25.7
Growing degree-days >5°C	1785.0	1211.8	1645.3	449.0	0.0

[1] Canadian Climate Normals, 1961-1990. Atmospheric Environment Service, Environment Canada.

While potatoes aren't planned as part of irrigated crop production under this Project, regional crop water demand and deficit values for potato production is informative for planning for irrigation of crops with relative high water uses. The data available from Manitoba Agriculture (**Table 4.5**) demonstrates that during the growing season potato crop evapotranspiration exceeds available precipitation. The water deficit ranges from as little as 75 mm (3 in) or less in half of the years (i.e., 50% risk level) to 150 mm (6 in) or more in 1 year out of 10 (i.e., 10% risk level).

For spring wheat in the region, the average crop water demand, which represents the 50% risk level or the total crop water demand that would be expected to be exceeded in 1 out of 2 years), is approximately 275 to 300 mm (10.8 to 11.8 in). The average plant moisture stress at the soft dough stage for spring wheat (the stage at which moisture stress largely determines yield) is approximately 40 to 45 mm (1.6 to 1.8 in) and would be higher at the 25% and 10% risk levels.

For corn, which has a longer growing season than annual crops common in the region, such as wheat and canola, crop water demand at a 50% risk level is 400 to 425 mm (15.7 to 16.7 in) and plant moisture stress at the grain stage at a 50% level is 130 to 140 mm (5.1 to 5.5 in). Again, these deficit levels would be higher at the 25% and 10% risk levels.

Table 4.5 Growing season precipitation, potato water demand and water deficit

Parameter	Risk Level (%)	Description	Water (in [mm])
Growing Season Precipitation	50	In 1 of 2 years precipitation will be less than given values	9.5-10.5 (240 to 270)
	25	In 1 of 4 years precipitation will be less than given values	7.1-7.5 (180 to 190)
	10	In 1 of 10 years precipitation will be less than given values	4.6-5.5 (115 to 140)
Potato Water Demand	50	In 1 of 2 years water demand for potatoes at maturity will exceed the given value	14.6 – 15.5 (370 to 395)
	20	In 1 of 4 years water demand for potatoes at maturity will exceed the given values	16.1 – 17.0 (410 to 430)
	10	In 1 of 10 years water demand for potatoes at maturity will exceed the given values	17.1 – 18.0 (435 to 460)
Potato Water Deficit	50	In 1 of 2 years water deficit will be exceed the given values	3.1 – 4.0 (80 to 100)
	25	In 1 of 4 years water deficit will exceed the given values	4.1 – 5.0 (105 to 125)
	10	In 1 of 10 years water deficit will be exceed the given values	5.1 – 6.0 (130 to 150)
Source: Manitoba Agriculture - http://www.gov.mb.ca/agriculture/weather/climatic-information-for-potatoes-in-mb.html			

The Proponent is planning to irrigate corn and edible beans in rotation with cereals and canola. For planning purposes, the Proponent is assuming a three-year rotation, resulting in 1/3 of the irrigated landbase being under corn, 1/3 under edible beans and 1/3 under cereals and canola. For planning purposes, irrigation depths of 10 in for corn and 5 in for other crops results in an estimated requirement of 1,500 ac-ft over 2,700 acres of irrigation annually within the Phase I & II planning blocks (West-1, West-2, South-1, and South-2), as previously summarized in **Table 2.2**. Actual irrigation application depths and land area will vary based on several factors, including soil conditions, weather (precipitation and evapotranspiration), crops being grown each year, and irrigation system capacity, capability and limits.

4.3 TERRESTRIAL ENVIRONMENT

The Project is located mainly within the Stockton Ecodistrict, with the western portion of the proposed irrigation fields in the Hilton Ecodistrict (**Map 1, Appendix A**), both of which are in the Aspen Parkland Ecoregion.

Much of the Stockton Ecodistrict and Hilton Ecodistrict are cultivated for the production of annual crops, with irrigation for potatoes and other crops common. However, large areas of natural vegetation remain in areas of the regional landscape not suited to agriculture, particularly along the Assiniboine River to the northeast of the Project, the Souris River to the southeast of the Project, and the Brandon Hills further afield to the northwest. Other remnants of natural vegetation occur mainly associated with lesser streams and surface drainages. Natural vegetation within the Stockton Ecodistrict is described by Smith et al. (1998) as follows:

> *The vegetation varies with soil texture, drainage, aspect and slope. The duned area has vegetation very similar to that described for part of the Shilo Ecodistrict. Thus, the vegetation on rapidly drained and well drained sites is generally a grassland with hazel, common and horizontal juniper, white spruce, scrub trembling aspen and sometimes scrub bur oak. North facing slopes generally support heavier forest cover with less grass and no juniper. Imperfectly drained sites commonly have trembling aspen and balsam poplar and dense alder and dogwood. Poorly drained sites have willow, alder and dogwood with grass and sedge groundcover.*
>
> *The vegetation in the Assiniboine River Valley varies considerably. Alluvial floodplains have natural vegetation of deciduous forest with white elm, green ash, Manitoba maple, balsam poplar and an understory of alder, dog- wood and high bush cranberry. Most higher terraces are currently cultivated but supported deciduous forest in the past. The highest and driest terraces also have mixed deciduous forest including bur oak.*
>
> *The valley portion within the Spruce Woods Provincial Park contains shallow and deep sloping peatlands developed on seepage slopes. Vegetation on these organic de- posits varies from willow, dogwood, sedges and reed to tamarack, stunted black spruce and sedges in fens to green ash, Manitoba maple, white elm, alder, high bush cranberry, dogwood and ferns in swamps.*
>
> *The natural vegetation in the remainder of the ecodistrict has for a large part been replaced by cultivated fields, but once consisted of aspen and balsam polar groves interspersed with areas of mixed-grass prairie vegetation.*

While no clearing is anticipated for the purposes of developing irrigation fields, as they are already under dryland crop production, some minimal clearing and/or disturbance of remnant vegetation areas is anticipated for the purposes of installing buried irrigation pipelines and developing the pump intake location along the Assiniboine River.

4.3.1 Vegetation

Areas of remnant vegetation are important features of biodiversity and preservation of native species. A list of vegetation species of conservation concern with historic observations in the Project area was provided by the MBCDC, following a request by the Proponent. Correspondence from MBCDC staff is provided in **Appendix C.3**. A summary of these species, including their conservation ranks and classifications and the locations of historic observations relative to the PDA is provided in **Table 4.6**.

No species occurrences are on record within the PDA, but observations have been made within close proximity to irrigation fields and pipeline segments. For species identified, the conservation status ranks (i.e., S-rank) indicate these species are of conservation concern at a sub-national or provincial level with rankings indicating they are considered Imperiled (i.e., S2), or at high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors, and Vulnerable (S3), or at moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

Two vegetation species historically identified in the vicinity of the PDA are considered Endangered under Manitoba's Endangered Species and Ecosystems Act (ESEA), including the Small White Lady's-slipper and the Rough Agalinis, which is also considered endangered under Canada's Species at Risk Act (SARA) and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The Small White Lady's-slipper is an orchid which grows in clumps in calcareous or alkaline soils in prairie openings in wooded grasslands or undisturbed grasslands and in disturbed sites such as roadside ditches. The Rough Agalinis is a small flowering plant known to occupy low, wet meadows where vegetation is sparse and the soil is alkaline.

4.3.2 Wildlife and Wildlife Habitat

Areas of remnant vegetation are important natural habitat features and support a range of terrestrial wildlife. A list of terrestrial wildlife species of conservation concern with historic observations in the Project area was provided by MBCDC is summarized in **Table 4.7**, and includes their conservation ranks and classifications and the locations of historic observations relative to the PDA.

There are two species with historic observations in the vicinity of the PDA with a conservation status ranking of Critically Imperiled (i.e., S1), or considered at very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors, and one species considered unrankable (i.e., SU) due to lack of information about status and trends. These species include:

- Burrowing Owl – this owl species is considered SARA, ESEA and COSEWIC. These small, burrowing owls are found in the open prairie, typically permanent grasslands, in association with burrowing mammals such as badgers, ground squirrels, prairie dogs and foxes. They overwinter in warmer climates in the US, return to Canada to breed through

April and May, typically lay their eggs in May and disperse in late August, before migrating south in September and October. There is no critical habitat identified under SARA in Manitoba; however critical habitat is difficult to identify as these species are generalists and are flexible in their environmental requirements.

- Dusky Dune Moth – this moth species is considered Endangered under SARA, ESEA and COSEWIC. They are considered a sand dune specialist and are associated with sparsely vegetated active sand dunes and sand blowouts that occur in southern Manitoba (and Saskatchewan and Alberta). Critical habitat identified in Manitoba is located approximately 25 km to the east of the PDA, around the border between the Canadian Forces Base Shilo and Spruce Woods Provincial Park.
- Aweme Borer Moth – this moth species is considered Endangered under SARA. In Manitoba, they were last identified in 1931. There is no critical habitat identified in Manitoba, but they were first identified at Aweme, MB in the area of what is now known as Criddle/Vane Homestead Provincial Park approximately 5 km northeast of the PDA.

Other terrestrial wildlife species identified within the vicinity of the PDA with conservation status rankings indicating they are considered lower ranks including Imperiled (i.e., S2), Vulnerable (i.e., S3), or Apparently Secure (i.e., S4), or considered at a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.

Four species of concern have been historically identified within the PDA, including one bird species, the Bobolink (considered Threatened under SARA and COSEWIC), and three insect species, the Manitoba Oakworm Moth (considered Special Concern under COSEWIC), Nine-spotted Lady Beetle (considered Endangered under COSEWIC) and the Ottoe Skipper (considered Threatened under ESEA and Endangered under SARA and COSEWIC).

Table 4.6 Terrestrial plant species of conservation concern in the Project development area

Common Name	Scientific Name	S-rank	ESEA	SARA	COSEWIC	Occurrence location relative to Project footprint			
						Irrigation fields		Pipeline segment[1]	
						Within	Within 1 km	Within 100 m	Between 100 m and 1 km
Golden Bean	Thermopsis rhombifolia	S2S3							1
Hairy Prairie-clover	Dalea villosa var. villosa	S2S3	Threatened	Special Concern	Special Concern		NE-1-8-17W1 SE-6-8-16W1 SW-5-8-16W1		10
Rough Agalinis	Agalinis aspera	S2S3	Endangered	Endangered	Endangered		SE-11-8-18W1 SW-7-8-17W1		
Sand Bluestem	Andropogon hallii	S2					NE-1-8-17W1		
Silky Townsend-daisy	Townsendia exscapa	S2							1
Small White Lady's-slipper	Cypripedium candidum	S2	Endangered	Threatened	Threatened		NW-2-8-18W1 NW-11-8-18W1 SE-11-8-18W1 SW-7-8-17W1 SW-11-8-18W1		9, 10
Tall Lungwort	Mertensia lanceolata var. lanceolata	S2							1

Notes:
Species observation, rank, classification, and location information provided by Manitoba Conservation Data Centre (August 2022).
S-rank = Subnational (provincial) conservation status ranks. Ranks provide an indication of the species' rarity on a scale of 1 (rare) to 5 (common).
ESEA = Manitoba's Endangered Species and Ecosystems Act
SARA = Canada's Species at Risk Act
COSEWIC = Committee on the Status of Endangered Wildlife in Canada
1. Pipeline segment numbers are shown in Appendix C.3.

Table 4.7 Terrestrial animal species of conservation concern in the Project development area

Common Name	Scientific Name	S RANK	ESEA	SARA	COSEWIC	Occurrence location relative to Project footprint			
						Irrigation fields		Pipeline segment[1]	
						Within	Within 1 km	Within 100 m	Between 100 m and 1 km
Northern Leopard Frog	Lithobates pipiens	S4		Special Concern	Special Concern		NW-2-8-18W1 NW-11-8-18W1 SE-11-8-18W1 SE-13-8-18W1 SW-7-8-17W1 SW-11-8-18W1		9, 10
Barred Owl	Strix varia	S3S4					SE-6-8-16W1 SW-5-8-16W1		
Bobolink	Dolichonyx oryzivorus	S3S4B		Threatened	Threatened	NE-4-8-17W1 NW-2-8-18W1 SE-11-8-18W1 SW-11-8-18W1	NE-21-8-17W1 NW-7-8-17W1 NW-1-8-17W1 NW-11-8-18W1 NW-31-7-16W1 SE-10-8-17W1 SE-13-8-18W1 SW-7-8-17W1 SW-21-8-17W1	14	8, 9, 10, 14, 25
Burrowing Owl	Athene cunicularia	S1B	Endangered	Endangered	Endangered		NE-1-8-17W1 NW-1-8-17W1		16
Aweme Borer Moth	Papaipema aweme	SU		Endangered					1
Dusky Dune Moth	Copablepharon longipenne	S1	Endangered	Endangered	Endangered				1
Manitoba Oakworm Moth	Anisota manitobensis	S2			Special Concern	NE-1-8-17W1 NE-31-7-16W1 NW-1-8-17W1 NW-31-7-16W1 SE-1-8-17W1 SE-6-8-16W1 SW-1-8-17W1 SW-5-8-16W1 SW-6-8-16W1	SW-11-8-17W1	15, 16, 17, 18, 19	1, 15, 16, 17, 18, 19
Monarch	Danaus plexippus	S3S4B		Special Concern	Endangered		NW-2-8-18W1 SE-11-8-18W1 SW-11-8-18W1		10

Common Name	Scientific Name	S RANK	ESEA	SARA	COSEWIC	Occurrence location relative to Project footprint			
						Irrigation fields		Pipeline segment[1]	
						Within	Within 1 km	Within 100 m	Between 100 m and 1 km
Nine-spotted Lady Beetle	Coccinella novemnotata	S2S4			Endangered	NE-1-8-17W1 NE-31-7-16W1 NW-1-8-17W1 NW-31-7-16W1 SE-1-8-17W1 SE-6-8-16W1 SW-1-8-17W1 SW-5-8-16W1 SW-6-8-16W1	SW-11-8-17W1	15, 16, 17, 18, 19	1, 15, 16, 17, 18, 19
Ottoe Skipper	Hesperia ottoe	S1	Threatened	Endangered	Endangered	NE-7-8-17W1 NE-19-8-17W1 NE-20-8-17W1 NW-7-8-17W1 NW-11-8-18W1 SE-7-8-17W1 SE-11-8-18W1 SE-13-8-18W1 SE-18-8-17W1 SE-19-8-17W1 SE-29-8-17W1 SW-7-8-17W1 SW-11-8-18W1 SW-18-8-17W1	NW-2-8-18W1 NW-21-8-17W1 SW-21-8-17W1	6, 7, 8, 9, 10, 11, 12, 13, 20, 21, 22, 25	1, 4, 6, 7, 8, 9, 10, 11, 12, 13, 20, 21, 22,23, 24, 25
Pale Yellow Dune Moth	Copablepharon grandis	S1	Endangered	Special Concern	Special Concern				1
Sage Grasshopper	Hypochlora alba	S2S3		Special Concern	Special Concern				1
Golden Bean	Thermopsis rhombifolia	S2S3							1

Notes:
Species observation, rank, classification, and location information provided by Manitoba Conservation Data Centre (August 2022).
S Rank = Subnational (provincial) conservation status ranks. Ranks provide an indication of the species' rarity on a scale of 1 (rare) to 5 (common).
ESEA = Manitoba's Endangered Species and Ecosystems Act
SARA = Canada's Species at Risk Act
COSEWIC = Committee on the Status of Endangered Wildlife in Canada
1. Pipeline segment numbers are shown in Appendix C.3.

4.4 AQUATIC ENVIRONMENT

The Project will withdraw water from the Assiniboine River at SE-35-8-17W1. The aquatic environment at the withdrawal location, including the riparian habitat along the riverbank, is being assessed by Toews Environmental to support the effects assessment and pump intake location design. An overview of the aquatic environment is provided below.

The PDA is situated south and west of the confluence of the Assiniboine River and the Souris River. The Assiniboine River at the pump intake site is a natural waterway. A major downstream barrier is the Portage Diversion which includes a river control structure that acts as a dam and spillway.

The Central Assiniboine and Lower Souris Integrated Watershed Management Plan (Assiniboine Hills Conservation District, no date) provide a useful overview of the fisheries Assiniboine River and Souris River at the confluence of which the Project is located:

> *The Assiniboine River is home to a wide array of aquatic species and ecosystems. Fish species found within the Assiniboine River include lake sturgeon, walleye, yellow perch, northern pike, mooneye, burbot, channel catfish, brown bullhead, rock bass, white sucker and common carp. The main stem of the Souris River contains a high diversity of fish species and is the most popular fishing spot for local fishermen. Tributaries of the Assiniboine River and the Souris River include white suckers, fathead minnows, darters, sticklebacks, shiners, yellow perch, walleye and northern pike. Those provide a large biomass of forage fish upon which the predacious fish within the Assiniboine River depend.*

4.4.1 Species of Conservation Concern

The aquatic species of conservation concern with historic observations in the vicinity of the PDA, including their conservation ranks and classifications and the locations of historic observations relative to the PDA was provided by MBCDC and is summarized in **Table 4.8**. This includes three species of mollusks found within the Souris River in the vicinity of the irrigation field in SW-5-8-16W1. A Project interaction with the Souris River is not anticipated.

The Mapleleaf mussel is a freshwater bivalve that is a species of conservation concern and is considered Endangered under ESEA and Threatened under SARA. It occurs in a variety of habitats ranging from medium to large rivers with slow to moderate current, lakes and reservoirs in mud, sand, or gravel substrates. In Manitoba, they are most typically recovered from medium to large rivers in firmly packed coarse gravel and sand to firmly packed clay/mud substrate. While it was not identified in the MBCDC search, it is considered in this assessment as it is known to occur in the reach of Assiniboine River where the Project will withdraw water for irrigation.

Riparian vegetation at the pump consists predominantly of grasses and small bushes (Dogwood species), with some mature deciduous trees (Bur oak, Balsam poplar, etc.). Minimal clearing and disturbance of the pump station location is anticipated. The area to be disturbed is anticipated to be approximately 220 to 260 m^2, confirmed through engineering pre-design activities.

Table 4.8 Aquatic species of conservation concern in the Project development area

Common Name	Scientific Name	S RANK	ESEA	SARA	COSEWIC	Occurrence location relative to Project footprint			
						Irrigation fields		Pipeline segment[1]	
						Within	Within 1 km	Within 100 m	Between 100 m and 1 km
Black Sandshell	Ligumia recta	S3					SW-5-8-16W1		
Creeper	Strophitus undulatus	S5					SW-5-8-16W1		1
Threeridge	Amblema plicata	S3					SW-5-8-16W1		
White Heelsplitter	Lasmigona complanata	S3					SW-5-8-16W1		

Notes:
Species observation, rank, classification, and location information provided by Manitoba Conservation Data Centre (August 2022).
S Rank = Subnational (provincial) conservation status ranks. Ranks provide an indication of the species' rarity on a scale of 1 (rare) to 5 (common).
ESEA = Manitoba's Endangered Species and Ecosystems Act
SARA = Canada's Species at Risk Act
COSEWIC = Committee on the Status of Endangered Wildlife in Canada
1. Pipeline segment numbers are shown in Appendix C.3.

4.4.2 DFO Habitat Classification

The Manitoba Drain Maintenance Committee, a collaboration between the federal and provincial governments, convened to better understand the nature of agricultural drains and rivers in supporting fish communities. Subsequently, the Department of Fisheries and Oceans (DFO) developed a first iteration of fish habitat classifications of drains and streams throughout Manitoba which are summarized by Milani (2013). Drains and streams are classified into 5 habitat types (A, B, C, D or E), based fish habitat complexity and the type of fish that habitat supports, as presented in **Figure 4.5**.

As provided in **Figure 4.6**, the Assiniboine River adjacent to the PDA is considered to be Class A habitat, while some ephemeral surface drainage courses throughout the PDA are considered Class E habitat. The planning blocks overlaid on the DFO classifications provide an indication of the approximate locations of the PDA relative to classified streams and drains.

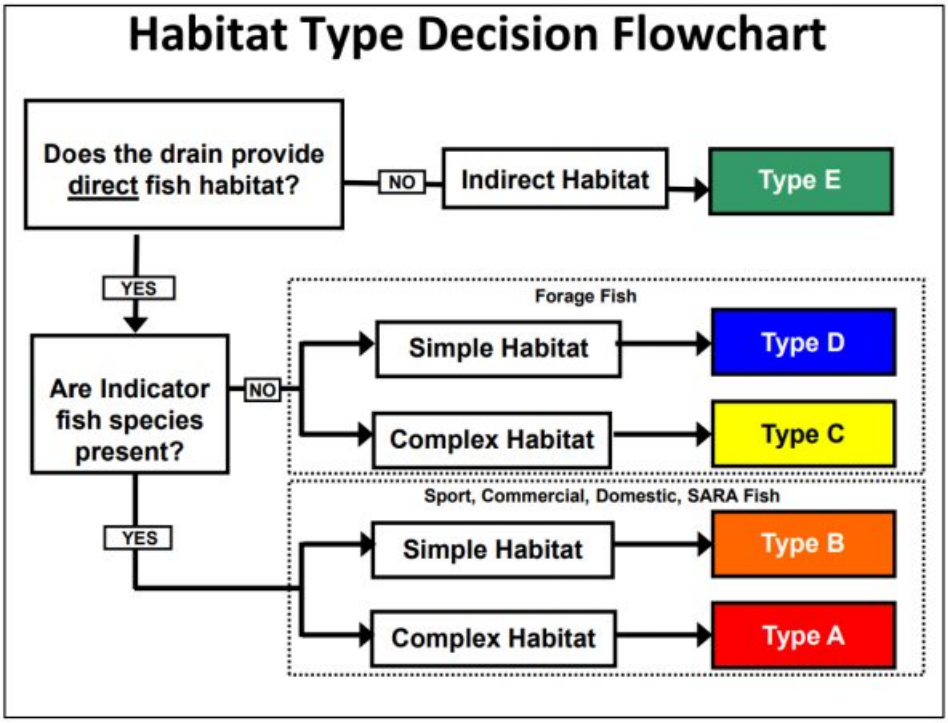


Figure 4.5 Fish habitat classification flowchart for streams and drains (excerpt from Milani, 2013)

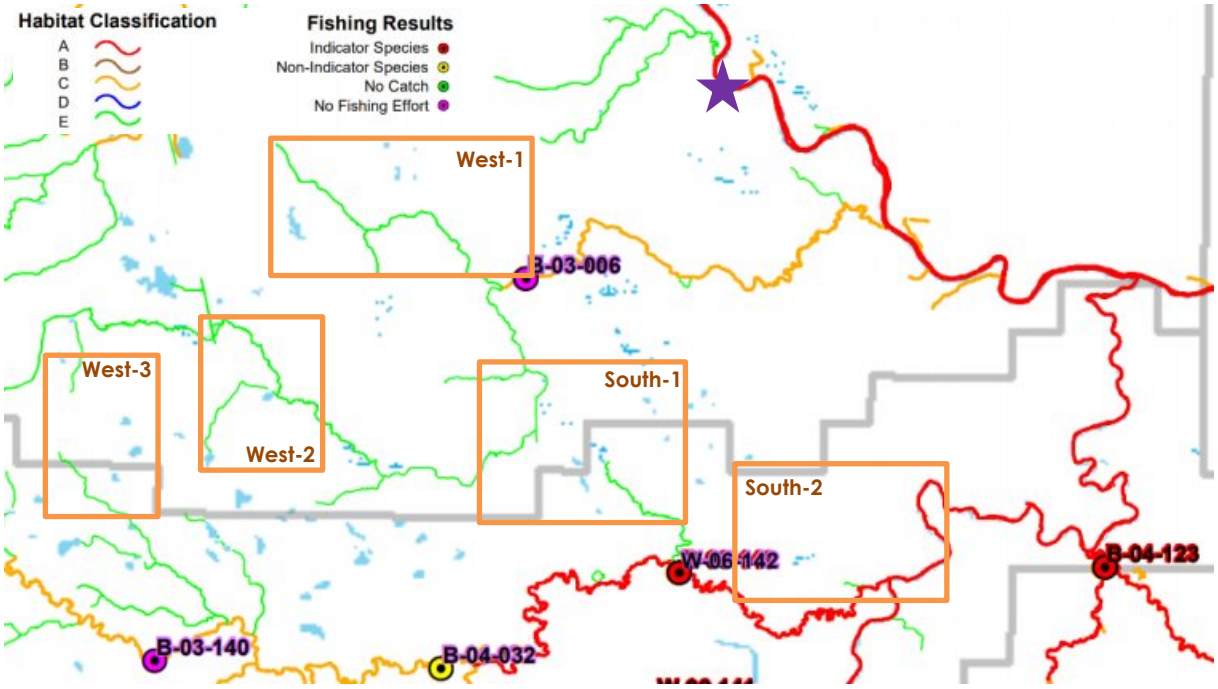


Figure 4.6 Fish habitat classes in proximity to the PDA (excerpt from Milani, 2013)

4.5 GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

4.5.1 Agriculture and Greenhous Gas Emissions

Agriculture is a major industry and key driver of the Canadian economy and Manitoba's economy alike. The agriculture sector is also a major contributor to greenhouse gas (GHG) emissions, representing approximately 10% of total emissions in Canada (Fouli et al., 2021).

The main GHGs emitted from agricultural activities are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Of agricultural emissions, Fouli et al., (2021) note:

- Methane represents about 38% of the total and originate from livestock activities (enteric fermentation and manure management).
- Nitrous oxide represents about 36% of the total and come from direct emissions from agricultural soils (24.5%), manure management (6.5%) and indirect emissions agricultural soils (5.0%).
- Carbon dioxide represents the remaining 26% of the total and come from fertilizer supply (8.6%), field work (6.8%), machinery supply (4.7%), on-farm transport (2.1%), electricity supply (2.0%) and heating fuel (1.7%).

Agricultural soil is considered both a source and a sink of GHGs. The primary source mechanism is N_2O emission because of nitrogen fertilizer application and decomposition of biomass. Wet soil conditions can exacerbate N_2O losses. Agricultural soils can also be a sink (i.e., net reduction of GHG) through carbon sequestration or the removal of atmospheric CO_2 by soils. This can be a

significant mechanism and resulted in a decline in net GHG emissions (emissions minus removals by soil) between 1981 and 2011, a trend largely the result of the adoption of beneficial management practices in the Canadian prairies (Fouli et al., 2021). These BMPs include reduced tillage, decreased summerfallow, and the inclusion of cover crops and perennial forages into the annual crop rotation. While carbon sequestration can result in a reduction of GHG emissions, it is a reversible process whereby land use changes or changes in management practices can result in desequestration or the loss of CO_2 from soils.

4.5.2 Climate Change Implications for Agriculture

Climate change is expected to bring both challenges and opportunities to Canada's agricultural sector because of increased temperatures, longer growing seasons, shifting precipitation patterns and an increase in frequency and intensity of extreme weather events. Agriculture and Agri-Food Canada (AAFC, 2020) provides a summary of predicted trends from climate change for the Prairie region, as follows:

- Increased frost-free periods may provide opportunities for the expansion of warm weather crops such as corn and soybeans as well as a potential northwards expansion of agricultural production where soils permit.
- Reduced precipitation later in the growing season, coupled with increased heat will cause stress to plants and may have a negative impact on yields.
- More frequent spring flooding, summer droughts and extreme weather events are expected.
- Reduced streamflow, less snowmelt to recharge rivers and earlier peak flows could lead to reduced access to water for irrigation during the summer and greater competition for groundwater reserves.
- A warmer climate may bring new pests and diseases.
- Increased temperatures could affect livestock health, resulting in reduced milk, egg and meat production and even fatalities, and increased cooling costs for producers.
- Higher CO_2 levels may result in greater productivity from crops such as wheat, barley, canola, soybeans, and potatoes.

From an opportunities perspective, the climate change projections summarized above suggest the potential for a more diversified cropping system across the Prairie region, including the incorporation of crops requiring a longer growing season and higher crop heat units. However, projections also suggest that crop water may become more limiting with reduced precipitation later in the growing season in combination with higher temperatures (i.e., increased evaporation and evapotranspiration). This, coupled with more extreme events (e.g., higher proportion of growing season precipitation in fewer, larger rainfall events and more frequent drought) provide an argument for the potential for increased crop water demand and increased crop water deficits across the region. The benefits associated with supplemental irrigation should, therefore, increase over time. The predicted trends and irrigation needs discussed above also suggest irrigation water storage needs will increase over time.

5.0 ENVIRONMENTAL AND SOCIO-ECONOMIC EFFECTS AND MITIGATION

Project components and activities have the potential to interact with the socio-economic, physical, terrestrial and aquatic environmental components. Of interest to this assessment are those interactions with the potential to cause adverse effects, in other words, those Project components or activities that will result in a worsening of the condition of one or more of the identified environmental components. The Project components and activities identified as having interactions with the potential for adverse effects are summarized in **Table 5.1**.

5.1 SOCIO-ECONOMIC ENVIRONMENT

Generally, the Project is anticipated to have positive effects to the socio-economic environment. The Project will generate economy for the local region through the construction and operation phases, including the use of contractors and consultants. A discussion of potential adverse effects to the socio-economic environment is presented below.

5.1.1 Land Use

The development of the Project does not represent a substantial change in land use in the PDA. The Project will convert existing dryland agricultural production to irrigated crop production, which represents a modification of the existing agricultural land use within fields that will be irrigated. The installation of pipelines and electrical lines to services irrigation pivots will not result in land use changes. The pump station development will result in a very small change (<0.05 ha) in land use within the riparian area along the Assiniboine River in SE-35-8-17W1; a change from grassland to built-up (i.e., gravel pad or similar).

Adverse effects to Land Use are not anticipated because of Project components or activities.

Table 5.1 Interactions between the Project and the environment with potential for adverse environmental effects

Project phase and activity	Socio-economic environment						Physical environment			Terrestrial environment		Aquatic environment	
	Land use	Infrastructure and services	Indigenous Nations	Parks and protected areas	Resource use and recreation	Heritage resources	Geology, hydrogeology and groundwater	Surface water	Soil-landscape	Vegetation	Wildlife	In-stream habitat	Riparian habitat
Construction													
Pipeline and electrical line installation		x			x	x				x	x		
Irrigation fields (pivot installation)		x			x								
Pump station development	x	x			x	x		x		x		x	x
Operation													
Irrigation operation					x		x	x	x			x	

Notes:
"x" = potential for interaction that might cause an adverse environmental effect

5.1.2 Infrastructure and Services

Utilities

Existing utilities will not be interrupted because of the construction or operation of the Project.

Utilities will be located prior to Project related activities requiring ground disturbance, such as drilling and excavation for Project installations. Underground facilities such as telecom (Bell MTS), electrical and gas (Manitoba Hydro), and municipal utilities (e.g., water lines) will be avoided by pipeline routing, as feasible. There are no planned oil or gas pipeline crossings.

Where crossings of existing buried facilities are required, the Proponent will notify utility owners and complete crossings as required.

Manitoba Hydro will be approached regarding provision of three phase power to the pump intake site at SE-35-08-17W1, the booster pump site proposed in W-28-8-17W1 and the future balancing reservoir and pump station in or near SE-18-8-17W1.

Highways, roads and rail

Pipeline installation for the Project will require crossings for Provincial Roads and municipal roads (**Map 3, Appendix A**). The Proponent intends to line all road crossings to prevent piping of the roadway in the case of pipeline failure.

There will be no rail crossings required as there are no active rail lines within the PDA.

The Proponent has engaged the municipalities of Oakland-Wawanesa and Glenboro-South Cypress regarding the Project and will complete municipal road and other infrastructure crossings according to policies and municipal by-laws. The Proponent will apply for permits for Provincial Road crossings.

Traffic

Agricultural production operations by the Proponent already generate traffic within the Project area. The Project is expected to result in a small, short-term, incremental increase in traffic during the construction phase. Negligible changes during the operation phase. The Project area is serviced by Provincial Roads (i.e., 340, 453, 530; **Map 2, Appendix A**) and the municipal road networks within the municipalities of Oakland-Wawanesa and Glenboro-South Cypress.

The Proponent intends to implement traffic safety controls, as required by provincial regulations and municipal by-laws for any road crossings or other Project activities requiring such.

With the implementation of the commitments described above, there are no adverse effects to Infrastructure and Services anticipated because of the Project.

5.1.3 Indigenous Nations

Project components and activities are not expected to interact directly with Indigenous communities, or resource use or cultural and traditional activities.

Therefore, no adverse effects on Indigenous Nations are anticipated because of the Project.

5.1.4 Parks and Protected Areas

Interactions between the Project components and activities, and Parks and Protected Areas are not anticipated.

As there is no anticipated interaction, no adverse effects on Parks and Protected Areas are anticipated because of the Project.

5.1.5 Resource Use and Recreation

During operation, floating pumps will be placed in the Assiniboine River during the crop growing season, typically between May/June and September, annually. The Assiniboine River is used for recreational activities such as canoeing. As the Assiniboine River is considered a navigable water under the *Canadian Navigable Waters Act* (CNWA), an application for screening and approval under the Navigation Protection Program (NPP) will be submitted by the Proponent. The Proponent will address requirements of the NPP process.

A Snoman Inc. snowmobile trail (PT21) traverses NW and NE-1-8-17W1 (irrigation pivots 20 and 21, **Map 2, Appendix A**) along an abandoned rail right-of-way now owned by the Proponent. Snoman Inc. is a non-profit organization which represents clubs that maintain and groom trails for snowmobiling. The Proponent will communicate with Snowman Inc. prior to construction of the Project to discuss potential interactions between the Project and the safe use of trails during construction and through Project operation. It is anticipated that the Proponent and Snowman Inc. will work cooperatively to address any concerns raised.

With the implementation of any requirements of the NPP process and coordination with Snowman Inc., no significant adverse effects to Resource Use and Recreation are anticipated.

5.1.6 Heritage Resources

The proposed Project takes place mainly on cultivated agricultural land. However, pipeline routes traverse limited areas of previously undisturbed land and buried electrical lines will be installed to service irrigation pivots. An HRIA is being undertaken by North Roots Research, a qualified heritage resources consultant. The HRIA is being completed in phases, with the field investigations for the Project components associated with Phase I being completed in Fall 2022. These included investigations along proposed pipeline routes in SW-26-8-17W1 and SE-29-8-17W1. No heritage resources or concerns were noted through these investigations (L. Bobbie, personal

communication, October 24, 2022). An HRIA for the Phase I components will be submitted to HRB prior to construction of the pipeline segments.

A subsequent HRIA will be completed for Phase II components of concern at a future date to be determined, but prior to construction of these components.

The Proponent intends to follow recommendations and requirements to protect heritage resources. This will include following the requirements of a Heritage Resources Protection Plan (HRPP) to be developed by North Roots Research.

With the implementation of the HRPP and any other recommended mitigation through the HRIA, adverse effects to the Heritage Resources environment are not anticipated.

5.2 PHYSICAL ENVIRONMENT

5.2.1 Geology, Hydrogeology and Groundwater

The eastern portion of the Project occurs over the Assiniboine Delta Aquifer (ADA; **Map 1, Appendix A**), an extensive unconfined sand and gravel aquifer. Groundwater is not planned for use by the Project. Agricultural cropping activities have the potential to adversely affect the water quality of the aquifer, particularly through downward leaching of mobile crop inputs, such as nitrogen. Irrigation can incrementally increase the magnitude of these effects. Mitigation includes the implementation of sound agronomic management, including 4R nutrient stewardship (i.e., Right source, Right rate, Right time, Right place) and irrigation management. The Proponent uses an independent agronomist to support nutrient management decisions, and intends to utilize fertigation, environmental slow-release nitrogen (ESN), and split applications to reduce the potential for leaching losses of nutrients. In addition, the Proponent intends to set irrigation application volumes according to soil water holding capacity and conduct irrigation scheduling to reduce the potential for leaching events.

In addition, the Spiritwood Valley, an extensive buried valley aquifer extending from South Dakota through North Dakota and into southwestern Manitoba, may be found in the Project area. However, the extent and characteristics of the Spiritwood Valley aquifer in Manitoba are not fully defined (Oldenborger et al., 2010). A drill record in the area of the PDA suggests the Project may be located over the northeastern extent of the Spiritwood Valley (**Section 4.2.2**). The 10 foot thick sand layer that may be part of the aquifer was found at 115 ft below ground at the drill site at SW-26-8-17W1 (well record 41658, Province of Manitoba GWDRILL database), immediately below a 13 foot thick clay till layer, above which materials are predominantly sand. Similar to described above in relation to the ADA, groundwater is not planned for use by the Project, and, while Project activities associated with the addition of irrigation to existing cropping activities, the depth of the potential Spiritwood Valley occurrence and the existence of clay till above the sand layer minimize the potential for interaction with and adverse effects to the Spiritwood Valley aquifer, if present.

The Project is not anticipated to result in significant adverse effects to the Geology, Hydrogeology and Groundwater environment.

5.2.2 Surface Water

Surface Water Quantity

The Project will draw water from the Assiniboine River. The allocation of water from the Assiniboine River is managed by Manitoba Environment, Climate and Parks. This includes accounting for allocated flow volumes and instream flow needs.

The Proponent has been issued a Development Authorization Permit (DAP) under *The Water Rights Act* for 1,269.26 dam^3 (1,029 ac-ft). An additional 580.97 dam^3 (471 ac-ft) has been applied for by the Proponent and the application is currently on hold. It is anticipated that the Proponent will be issued a DAP for the additional application and that a Water Rights Licence (WRL) will be issued for the requested 1,850.23 dam^3 (1,500 ac-ft).

The Project is expected to have a negligible effect on the large channel forming flows on the Assiniboine River as it meanders to the Red River, with maximum diversion rates at less than 2.8% to 4 % of observed median August daily flows of 12.5 m^3/s at Brandon (05MH001) and 18 m3/s near Brandon (05MH013), respectively. The maximum diversion rate (0.5 m^3/s) is less than 0.05% of peak flows during major flood events (i.e., 1000 m^3/s).

Minimum instream flows will be maintained in accordance with the EAL and WRL issued. Observed minimum flows at Brandon vary by period of record with minimum August flow at 05MH013 at 2 m^3/s and minimum post Shellmouth August flow at 05MH001 at 1.9 m^3/s. Obviously, the proposed withdrawal (e.g., 0.5 m^3/s) is significant in relation to these minimums and hence will require monitoring by the Province. The Province's ability to increase flows in August was demonstrated in August, 2021 by close to 5.7 m^3/s release from Shellmouth (WSC 05MH001 records). The influence of inflow from the ADA to these minimum flows from Brandon to PR 350 are known to be significant; however, have not been quantified to any predictable degree.

The Proponent intends on following requirements of the DAP and WRL. The Proponent can use irrigation scheduling (e.g., reduction in number of pivots operating) and variable rate pumping to maintain minimum instream flow needs downstream of the Project on request from Province.

As such, the usage of allocated water for the Project is not anticipated to adversely affect downstream surface water users/uses. The Proponent has been advised to consider establishing flow (e.g., periodic) and/or water level (e.g., continuous) monitoring at PR 350 bridge to supplement the WSC gauging stations and ensure that they can meet any future licensing requirements during low water periods.

Surface Water Quality

The primary potential interaction between the Project and surface water quality is from construction and operation activities at the pump intake site. Construction activities, unmitigated, have the potential to create opportunity for soil erosion and sedimentation in the Assiniboine River. Major in-water work is not anticipated in the development of the Project. However, there is potential for a recommendation of the addition to the existing rip-rap already in place at the pump intake site. This would have the potential for a minor, short-term effect on water quality from sedimentation. An erosion and sediment control plan will be developed prior to construction of the pump intake site to minimize the potential for adverse effects to surface water quality during construction. Any disturbances to be proposed pumping pad and adjacent valley slope will be carefully engineered to include erosion control products and revegetation plans.

During operation, the primary mechanism of potential effects to surface water is through backflow of irrigation lines, which may contain fertilizer from injection at the pivot point, in the event of power outages or pump failures. Backflow prevention will be included on all pipelines and at fertigation points to prevent backflow of fertilizer into the distribution pipelines. Discharge from irrigation pipeline to waste (e.g., ditches) will be controlled and only undertaken during filling, commissioning, and annual draining of the pipelines for winterizing.

With the proposed mitigation, the Project is not anticipated to adversely affect downstream surface water users/uses.

5.2.3 Soil-Landscape

Soil-landscape suitability is a critical component of sustainable irrigation development. Field-specific evaluations were completed considering soil-landscape suitability and the Proponent's current and proposed agronomic management practices. The field-specific evaluations consist of a review of soil-landscape limitations following the guidelines for assessing the suitability of soil-landscapes for irrigated crop production in Manitoba established by Stantec (2011).

An irrigation suitability recommendation is made for each field, consisting of one of the following five possible recommendations (Stantec 2011):

1. **Recommended:** the field has no significant soil or landscape limitations for irrigated crop production, based on a desktop assessment of detailed soil resource information, and is therefore recommended for irrigation development.
2. **Recommended Precautionary:** the soil or landscape limitations associated with the field (e.g., erosion, stoniness, salinity, topography or moisture) require special soil management considerations, beneficial management practices and other mitigation, and/or monitoring, but do not preclude the land from irrigation development.
3. **Recommended Restricted Area:** the significant soil or landscape limitations associated with the field are confined to a specific area that can be removed from the irrigated land base through irrigation system or activity design (e.g. variable rate irrigation in a system designed to turn off or reduce application of water or meter nutrients over a portion of the field,

commonly referred to as partial pivot), thereby resulting in remaining areas of the field with no significant limitations to irrigation development being recommended for irrigation development.

4. **Phase II Investigation Required:** there is uncertainty regarding the reliability of SRI available or limitations to certain aspects of the SRI that preclude a suitability determination for the field or specific areas of the field being made. A Phase II Investigation is required to gather the deficient information, prior to making a determination regarding irrigation suitability.
5. **Not Recommended**: the field has significant (i.e., >10-15%) soil and/or landscape limitations which cannot be managed through mitigation or monitoring, and therefore precludes the land from irrigation development.

The land suitability assessment, certification of irrigation suitability and recommendation of Best Management Practices was completed by a qualified Professional Agrologist (AgriEarth). A summary of the field-specific evaluations and recommendations for irrigation suitability is provided in **Table 5.2**.

Industry-accepted, standard beneficial management practices (BMPs) will allow for a sustainable irrigation Project in most of the fields proposed for irrigation (i.e., those considered "Recommended"). These BMPs include:

- 4R Nutrient Stewardship – Right source, Right rate, Right time, Right place, to limit the potential for nutrient losses via runoff and/or leaching.
- Irrigation management – irrigation scheduling and appropriate application volumes and rates to match applications with available soil water holding capacity and infiltration/percolation rates.
- Soil residue management – maintenance of adequate soil cover (i.e., soil armour) to protect the soil surface from soil erosion losses, including such activities as residue management/maintenance, reduced tillage and cover cropping.

Irrigation fields 5 (NE-21-8-17W1 and 21 (NE-18—17W1) have "Recommended, precautionary" irrigability recommendations and have associated specific recommendations for sustainable irrigation development.

With the proposed recommendations, the Project is not anticipated to adversely affect the soil-landscape.

Table 5.2 Field-specific irrigation suitability comments and recommendations

Irrigated field ID	Legal Description	Area		Significant soil-landscape limitation[1]								Field-specific irrigation suitability comments and recommendations		
		ac	ha	Topography	Salinity	Stoniness	Water holding capacity	Drainage	Infiltration & drainability	Irrigation suitability rating	Irrigated potato production rating	Field-specific irrigation limitation comment	Field irrigability recommendation	Field-specific recommendations for irrigation
1	SE-29-8-17W1	135	55										Recommended	
2	NE-19-8-17W1	135	55										Recommended	
3	NE-20-8-17W1	135	55										Recommended	
4	NW-21-8-17W1	135	55										Recommended	
5	NE-21-8-17W1	135	55		x							A significant portion of this field is indicated as being impacted by soil salinity.	Recommended, precautionary	Pre-development salinity assessment. Salinity monitoring during irrigation, if developed.
6	SE-19-8-17W1	135	55										Recommended	
7	SW-21-8-17W1	135	55										Recommended	
8	SE-13-8-18W1	93	38										Recommended	
9	SW-18-8-17W1	135	55										Recommended	
10	SE-18-8-17W1	135	55										Recommended	
11	NW-7-8-17W1	109	44										Recommended	
12	NE-7-8-17W1	108	44										Recommended	
13	SW-7-8-17W1	135	55										Recommended	
16	NE-10-8-17W1	107	43										Recommended	
18	SW-11-8-17W1	135	55										Recommended	
19	NE-4-8-17W1	135	55										Recommended	
20	NW-1-8-17W1	135	55										Recommended	
21	NE-1-8-17W1	135	55					x		x	x	Poor drainage and agricultural capability class 5W (20% of field).	Recommended, precautionary	Surface and subsurface drainage improvements.
22	SW-1-8-17W1	104	42										Recommended	
23	SE-1-8-17W1	76	31										Recommended	
24	SW-6-8-16W1	102	41										Recommended	
25	N-31-7-16W1	42	17										Recommended	
26	SW-5-8-16W1	45	18										Recommended	
27	NW-11-8-18W1	93	38										Recommended	
28	SW-11-8-18W1	104	42										Recommended	
29	SE-11-8-18W1	116	47										Recommended	
30	NW-2-8-18W1	53	21										Recommended	
31	NW-2-8-18W1	46	19										Recommended	

Notes:
1. A significant soil-landscape limitation is generally indicated where 15% or more of the irrigated field area has a major limitation.
2. Field-specific irrigation limitation comments are made for fields where a significant soil-landscape limitation has been indicated.
3. Field irrigability recommendation categories:
   Recommended - field is recommended as suitable for irrigation without any special considerations.
   Recommended, precautionary - field is recommended as suitable for irrigation development with implementation of field-specific recommendations.
   Investigation required - additional information is required through a field investigation before a suitability recommendation can be made.
   Not recommended - field is not recommended for irrigation development due to significant soil-landscape limitations and/or other serious concerns.

5.3 TERRESTRIAL ENVIRONMENT

The Project will result not result in land use or land cover changes, except for a small area associated with the pump intake site. The development plan described within the engineering pre-design report completed by PBS Water Engineering indicates an area of approximately 220 to 260 m^2 will be required to accommodate the four river pumps in the riparian area along the shoreline of the Assiniboine River at the pump site at SE-35-8-17W1. This area has been previously disturbed (circa 1980's) for access to the shoreline and installation of irrigation pumping. The existing area of the proposed pump pad includes an existing concrete pad, existing rip-rap and grass vegetation. No mature trees are expected to be cleared as part of the intake site development.

Some vegetation disturbance will be required for buried pipeline and electrical service line installations. Much of the pipeline network is planned for installation in existing, grassed municipal right-of-ways. An approximate 90 m crossing of natural vegetation is required in W1/2-26-8-17W1 and will likely require some clearing of bush but is not anticipated to result in clearing of trees. The land use in this area will not change and will remain in natural vegetation land use following construction.

Similarly, some dry stream or surface drainages under natural grassed vegetation cover will be crossed by pipelines but these will remain in natural vegetation land use following construction.

There is not anticipated to be an interaction between the Project and the terrestrial environment through Project operation.

The adverse effects on vegetation and wildlife and wildlife habitat are expected to be short-term in duration (limited to the construction phase and less than one year in duration for any given phased construction area) and of low magnitude. Significant adverse effects to the terrestrial environment are not anticipated because of the Project.

5.4 AQUATIC ENVIRONMENT

5.4.1 Fish and fish habitat

There is expected to be interaction between the Project and the aquatic environment during construction and operation phases. During construction, clearing and site preparation and development work will be required for pump intake site establishment. The primary concern to the aquatic environment, namely fish and fish habitat, is the potential for erosion and sedimentation during any clearing, excavation and grading work required. Construction activities will be completed following standard construction practices and will follow a sediment and erosion control plan currently under development. This will minimize the potential for adverse effects from soil erosion into the Assiniboine River at SE-35-8-17W1.

No in-water work is currently anticipated during construction, so direct effects to fish and fish habitat are not anticipated. The exception to this would be if additional rip-rap protection of the

existing lower riverbank is required to provide additional erosion protection. If this is required, review and appropriate authorization will be sought from DFO, as required.

During operation, floating intakes will be installed annually during the growing season. Rotating, self-cleaning mesh screens will minimize or eliminate the potential for fish impingement and entrainment. Pump and intake installation in the spring and removal in the fall and intake operations are not anticipated to disturb the aquatic environment.

Effects to the aquatic environment are being assessed separately through an aquatic habitat impact assessment being completed by a qualified aquatic biologist (Toews Environmental).

5.4.2 Riparian habitat

As discussed above for the terrestrial environment, while the pump site development plan for the Project has not yet been completed, the area of riparian habitat anticipated to be disturbed is anticipated to be small (i.e., < 500 m^2). Currently, no mature trees are expected to be cleared as part of the intake site development.

There is not anticipated to be an interaction between the Project and riparian habitat through Project operation.

The adverse effects on riparian habitat are expected to be limited to a small area (i.e., < 500 m^2) and of low magnitude. Significant adverse effects to the riparian habitat portion of the aquatic environment are not anticipated because of the Project.

5.5 HUMAN HEALTH AND SAFETY

Interactions between the Project components and activities and human health and safety are expected to be primarily limited to worker safety. However, there is limited potential for interactions with public safety as well as with the potential release of pollutants and hazardous materials.

Worker safety

The Project will require pre-construction investigations (e.g., geotechnical drilling) and construction of infrastructure and facilities, including pump intake station components, buried pipelines and electrical service lines, irrigation pivot units, and associated components. During operation, typical farming operations will be undertaken, including the addition of operating irrigation equipment. The use of qualified contractors and worker training (e.g., safe use of irrigation equipment) will provide assurance of worker safety during Project construction and operation.

The Proponent will take reasonable and practical action to comply with requirements of *The Workplace Safety and Health Act* and safety and health guidelines provided for Manitoba farms (Safe Work Manitoba, 2018).

Public safety

Potential public safety concerns are related primarily to construction activities on public roadways, including road crossing activities and other construction activities that may affect traffic on roads, and typical farming activities during operation. Traffic safety controls, as described above, will be implemented as required and will provide protection for the public and workers during construction activities on or around roadways.

The Project will require limited aboveground facilities in municipal and/or provincial road allowances, such as pipeline risers. These facilities will be marked according to provincial and/or municipal requirements to notify the public of these potential safety hazards.

Pollutants and hazardous materials

The following provides a summary of potential pollutants and hazardous materials associated with the Project:

- Project activities during construction and operation will result in exhaust emissions from equipment usage.
- Fuel will be used for equipment during construction and operation and will be stored in existing fuel storage facilities.
- Pumps and irrigation pivots are planned to be run on hydro-electric power, in which case diesel fuel would not have to be stored within irrigation fields. However, diesel generators (Gensets) may be used to power irrigation pivots temporarily if hydro-electric power isn't available at the time of initial pivot development, or may be used if hydro-electric power to some irrigation pivots isn't feasible. If diesel Gensets are required temporarily or permanently, diesel will be stored in appropriate storage.
- Fertigation, or the application of fertilizer through irrigation delivery systems, is planned and fertilizer will be stored in application tanks within irrigation fields. Fertilizer will be injected into the irrigation water at the pivot point to prevent the potential for backflow of irrigation water with fertilizer into the pipeline system in the event of a pump failure.
- Crop inputs including fertilizers and pesticides will be applied using conventional practices.

Standard operating procedures will be employed by the Proponent to minimize the potential for fugitive emissions or accidental releases of pollutants and/or hazardous materials. These include:

- Operators will be trained by the Proponent on the safe operation of pumps, pipelines and irrigation systems, and on the proper transport, storage and use of fuel and chemical products.
- Irrigation systems utilizing fertigation will employ backflow prevention and fertilizer will be injected into irrigation water after the pivot point to prevent the backflow of irrigation water with fertilizer from entering pipelines in the event of a pump failure.
- Potentially hazardous materials will be labelled, stored, contained and handled in accordance with applicable regulatory requirements.
- Hazardous materials will be transported in accordance with the *Dangerous Goods Handling and Transportation Act*.

- Fuel storage on sites will meet Manitoba regulations (e.g., double wall, anti-syphon).
- Spill response will be developed, around any potential for accidental releases on land or the Assiniboine River.
- Farm operations are subject to standard farm practices, such as safe handling of fuel and chemicals (fertilizers, pesticides).
- Construction sites will be COR certified (Certification of Recognition) or equivalent (Construction Safety Association of Manitoba, 2022) and construction and operation activities will be conducted in accordance *The Workplace Safety and Health Act* and safety and health guidelines provided for Manitoba farms (Safe Work Manitoba, 2018).

The Proponent intends to follow requirements of the Environment Act and conditions prescribed in the Environment Act License related to spills, leaks or discharges of pollutants or contaminants.

5.6 GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

5.6.1 Greenhouse Gas Emissions from the Project

As the Project landbase is already under annual crop production, the Project will not result in a major land use change or significant change in crop production systems beyond the addition of supplemental water. However, the Project will result in greenhouse gas emissions during construction and operation phases.

During construction, there will be a small, incremental increase in CO_2 emissions due to construction equipment usage. These emissions will be similar to the types of CO_2 emissions from other machinery used in agricultural operations.

During operations, the Project may result in increased greenhouse emissions, however, quantifying the changes in greenhouse gas emissions over the current dryland farming operation is not practically feasible. However, the implementation of mitigation and beneficial practices can reduce GHG emissions from the Project, and in some cases may result in fewer GHG emissions than the current dryland crop production operation.

Key mitigation measures to reduce GHG emissions from Project activities include:

- Minimize idling of construction equipment to reduce fuel usage and associated CO_2 emissions.
- Use of hydro-electric power for pumps and pivots, as feasible, to reduce CO_2 emissions relative to the alternative diesel power generators (GenSets).
- Use of 4R nutrient stewardship to reduce N_2O emissions. For example, the implementation of irrigation allows for the integration of split application of nitrogen fertilizer through in-crop fertigation, which can mitigate N_2O emissions.
- Use of irrigation scheduling and management to reduce the potential for saturated soil conditions, which favour direct N_2O emissions from soil.
- Inclusion of low input crops (e.g., legumes such as soybeans) to reduce fertilizer requirements and associated N_2O emissions.

5.6.2 Climate Change Implications for the Project

As previously presented, climate change predictions for the Prairie region suggest that crop water may become more limiting with reduced growing season precipitation and higher temperatures. The supplemental irrigation proposed under this Project will provide an improved resilience to climate change for the crop production operation.

However, the changing environment may affect the Project in the future as the same environmental factors resulting in increased benefit of irrigation over time may result in lower flows and water availability in the Assiniboine River. This may result in more imposed in-season limits to withdrawals rates and may increase the need for off-stream water storage (i.e., irrigation reservoir[s]).

While there is uncertainty related to the effect the Project will have on net GHG emissions, it is anticipated that the change will be minor and incremental in nature relative to the current GHG emissions from the existing dryland crop production operation.

5.7 ACCIDENTS AND MALFUNCTIONS

The effects of accidents and malfunctions for the Project are primarily related to the potential for accidental power outages, pump and pipe failure, and fuel and/or chemical (fertilizer, pesticide) spills. Given the seasonal-based operational nature of this project, such malfunctions would be limited to the cropping and season (typically May/June to September). The following provides a summary of potential accidents and malfunctions:

- Pump or power failure – in the event of such a failure, mechanical check valves/backflow preventers will automatically prevent backflow into the pipeline from the pivots and into the Assiniboine River from the pipeline(s). Check valves and manual gate or butterfly valves will be located strategically throughout the pump-pipe network (i.e., at river pumps, booster pumps and aboveground connection points [e.g., lateral pipeline connection to mainlines, pivot points]). Maintenance checks on equipment including pumps and pipes will be conducted regularly to minimize the risk of breakdowns and accidents associated with pump/pipe failures.
- Pipeline failure – in the event of a pipeline failure (break), pumps will be shut-down as soon as possible to limit overland flow, sedimentation and erosion. Pump shut down for pipeline failures will be based on low pressure/high flow rates and will be automated. In the event of a pipeline failure at a road crossing or other infrastructure crossings, installed encasement pipe liners will prevent damage to infrastructure. It is recommended that automated, solenoid valves be used to regulate pipeline flow and allow for automated and/or remote monitoring and shutdown.
- Accidental release of pollutant or hazardous materials – measures to prevent accidental releases are described above. In the unlikely event a release does occur, the Proponent will initiation spill response action as required under The Environment Act and according to conditions prescribed in the Environment Act License. This will include action to safely minimize and contain the spill and report the spill to Manitoba Environment, Climate and Parks Environmental Emergency Response Program.

6.0 FOLLOW-UP AND MONITORING

The following are the primary environmental follow-up and monitoring commitments of the Proponent:

- Implement environmental protection measures and monitoring in compliance with the Environment Act Licence (to be issued) during the construction and operation phases of the Project.
- Follow-through on commitments made within this EAP.
- Ensure that staff and contractors are trained and understand their responsibility in identifying, addressing and reporting potential environmental concerns.
- Monitor the work site (i.e., pump station, irrigation equipment and the fields under irrigation) to ensure effectiveness of measures put in place to protect the environment.
- Maintain all environmental control and protection devices, and other equipment (e.g., regular checks and maintenance of backflow prevention/check valves).
- Take appropriate and timely action (e.g., shut-down pumps) to correct any Project-related deficiencies that may result in an adverse effect to the environment, including infrastructure and human health and safety.
- Report all environmental incidents to Manitoba Environment, Climate and Parks Environmental Emergency Response Program, as soon as possible after they occur.

Additional, specific commitments requiring follow-up and reporting to the Environmental Approvals Branch are as follows:

- Completion and submission of Aquatic Habitat Impact Assessment being completed by Toews Environmental.
- Completion and submission of Heritage Resources Impact Assessment being completed for Manitoba Heritage Resources Branch by North Roots Research.

The Proponent also commits to completing the following to satisfy federal regulatory requirements:

- Review the Project relative to habitat protection requirements of the *Fisheries Act*. This review will determine if the Project needs to be submitted to DFO for review.
- Submission of an application for screening and approval, as required, under the Navigation Protection Program (NPP).

7.0 SUMMARY

This report represents the environmental assessment, a part of the Environment Act Proposal (EAP) for the Treesbank Colony Irrigation Project (the Project). This report has been compiled by AgriEarth Consulting Ltd. on behalf of the Proponent, Treesbank Colony Farms in accordance with the guidelines of Manitoba Environment, Climate and Parks. The report was compiled using professional judgment and the information available at the time this assessment was completed.

The development is expected to be consistent with the current land use in the Project development area and will add value to the Proponent's current agricultural crop production operation, and to the local and regional economy. Based on the evaluations undertaken to date and the commitments made by the Proponent and documented herein, the Project is not anticipated to result in significant or un-mitigable adverse impacts on the local environment.

Based on the information compiled and presented, and the commitments for additional information to be provided as it becomes available, AgriEarth Consulting Ltd. believes that the conditions and the guidelines for an Environment Act Proposal for this Class 2 Development have been met. The Proponent is committed to meeting all requirements of authorizations, licenses, permits and by-laws that will be granted to them as part of development of this Project or that are otherwise applicable to it.

This report is prepared for the use of Treesbank Colony Farms for submission to Manitoba Environment, Climate and Parks for their review, and for posting to the Public Registry for review by the public. Any third-party use of this report and any reliance or decision made based on it, are the responsibilities of those third parties.

8.0 REFERENCES

AAFC (Agriculture and Agri-Food Canada), 2020. Climate Change Impacts on Agriculture. Accessed January 2022 at: https://agriculture.canada.ca/en/agriculture-and-environment/climate-change-and-air-quality/climate-scenarios-agriculture

Assiniboine Hills Conservation district, no date. The Central and Lower Souris Watershed Management Plan. Accessed December 2022 at: https://www.gov.mb.ca/sd/water/watershed/iwmp/central_assiniboine/central_assiniboine.html

Betcher, R. N., Matile, G., and Keller, G. 2005. Yes Virginia, there are buried valley aquifers in Manitoba. In: Proceedings of the 58th Canadian Geotechnical Conference and 6th Joint CGS and IAH-CNC Groundwater Specialty Conference, September 18-21, 2005, Saskatoon, Saskatchewan, Canada.

Construction Safety Association of Manitoba, 2022. COR® Program. Accessed December 2022 at: https://www.constructionsafety.ca/cor-program/

Crow, H.L., K.D. Brewer, A.J.-M. Pugin, , and H.A.J. Russell, 2012. Downhole geophysical data from boreholes along the Spiritwood buried valley aquifer near Cartwright, Killarney, and southeast of Brandon, Manitoba; Geological Survey of Canada, Open File 7080, 31 p.

Danielescu, S., F. Barbecot and V. Morand, 2021. Groundwater Contributions to Surface Water in the Assiniboine Delta Aquifer (ADA): A Water Quantity and Quality Perspective. Journal of Great Lakes Research, 47(3), p. 788-797.

Ehrlich, W.A., E.A. Poyser and L.E. Pratt, 1957. Report of Reconnaissance Soil Survey of Carberry Map Sheet Area. Manitoba Soil Survey. Soils Report No. 7.

Fouli, Y., M. Hurlbert and R. Kröbel, 2021. Greenhouse Gas Emissions From Canadian Agriculture: Estimates and Measurements. SPP Briefing Paper, Volume 14:35, November 2021.

Hinton, M.J., A.J.-M. Pugin, S.E. Pullan and R.N. Betcher, 2007. Insights into the Medora-Waskada buried valley aquifer from geophysical surveys, southwestern Manitoba. In 60th Canadian Geotechnical Conference and 8th Join CGS/IAH-CNC Groundwater Conference, OttawaGeo2007. Ottawa, Ontario, Canada. October 21-24, 2007. P. 515-522.

Manitoba Agriculture, 2022. Soils of the Municipality of Oakland-Wawanesa (unpublished; 1:20,000 scale). Provided to AgriEarth Consulting Ltd. by M. Westphal via email in June 2022.

Manitoba Agriculture, 1999. Suitability of Land for Irrigated Potato Production in Selected Areas of Southern Manitoba. Manitoba Agriculture, Soil Resource Section, in cooperation with Manitoba Land Resource Unit, Agriculture and Agri-Food Canada and Department of Soil Science, University of Manitoba.

Milani, D.W. 2013. Fish community and fish habitat inventory of streams and constructed drains throughout agricultural areas of Manitoba (2002-2006). Can. Data Rep. Fish. Aquat. Sci. 1247.

Oldenborger, G.A., A.J.-M. Pugin, M.J. Hinton, S.E. Pullan, H.A.J. Russell, and Sharpe, D.R., 2010. Airborne time-domain electromagnetic data for mapping and characterization of the Spiritwood Valley aquifer, Manitoba, Canada; Geological Survey of Canada, Current Research 2010-11, 13 p.

PBS Water Engineering, 2023. Pre-Design Report for Treesbank Colony Farms Assiniboine River Irrigation Project. January 2023.

Render, F.W., 1988. Water Supply Capacity of the Assiniboine Delta Aquifer. Canadian Water Resources Journal, 13(4), p. 16-34.

Safe Work Manitoba, 2018. Safety & Health Guide for Manitoba Farms. Safe Work Manitoba, February 2018. Accessed November 2022 at: https://www.safemanitoba.com/Industries/Pages/Agriculture.aspx

Smith, R.E., H. Veldhuis, G.F. Mills, R.G. Eilers, W.R. Fraser, and G.W. Lelyk. 1998. Terrestrial Ecozones, Ecoregions, and Ecodistricts, An Ecological Stratification of Manitoba's Landscapes. Technical Bulletin 98-9E. Land Resource Unit, Brandon Research Centre, Research Branch, Agriculture and Agri-Food Canada, Winnipeg, Manitoba.

Stantec Consulting Ltd., 2011. Guideline for Assessment of Land Suitability for Irrigated Crop Production in Manitoba. DRAFT Version 1. March 31, 2011. Winnipeg, Manitoba.

Working Group on Irrigation Suitability Classification, 1987. An Irrigation Suitability Classification System for the Canadian Prairies. Land Resource Research Centre, Agriculture Canada, Ottawa. LRRC Contribution No. 87-83.

APPENDICES

Appendix A MAPS

MAP 1 REGIONAL CONTEXT

MAP 2 PROJECT OVERVIEW

MAP 3 PROJECT INFRASTRUCTURE

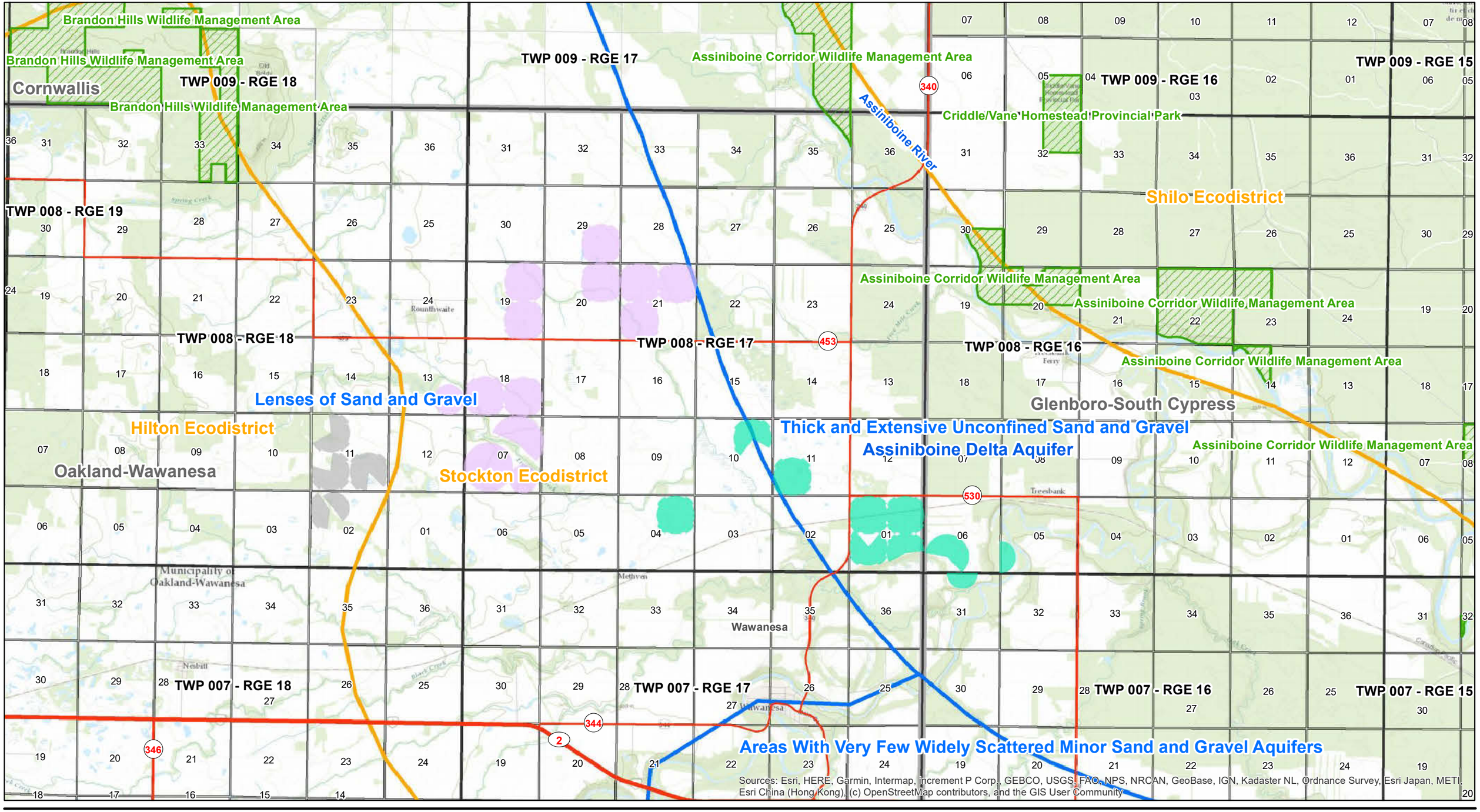
MAP 4 LAND COVER CLASSES

MAP 5 SOILS & DRAINAGE CLASS

MAP 6 GENERAL IRRIGATION SUITABILITY

MAP 7 LAND SUITABILITY FOR IRRIGATED POTATO PRODUCTION

MAP 8 NUTRIENT MANAGEMENT ZONE



Map Name

Regional Context

Map Number

1

Project Name

Treesbank Colony Irrigation Project

NORTH

0 0.5 1 2 3 4 5 6

Kilometers

1:75,000

Date: 2023-04-06

Drawn by - D. Whetter

Acknowledgements:
Original drawing by AgriEarth Consulting Ltd.
Data accessed from Manitoba Land Initiative, Province of Manitoba.

Legend

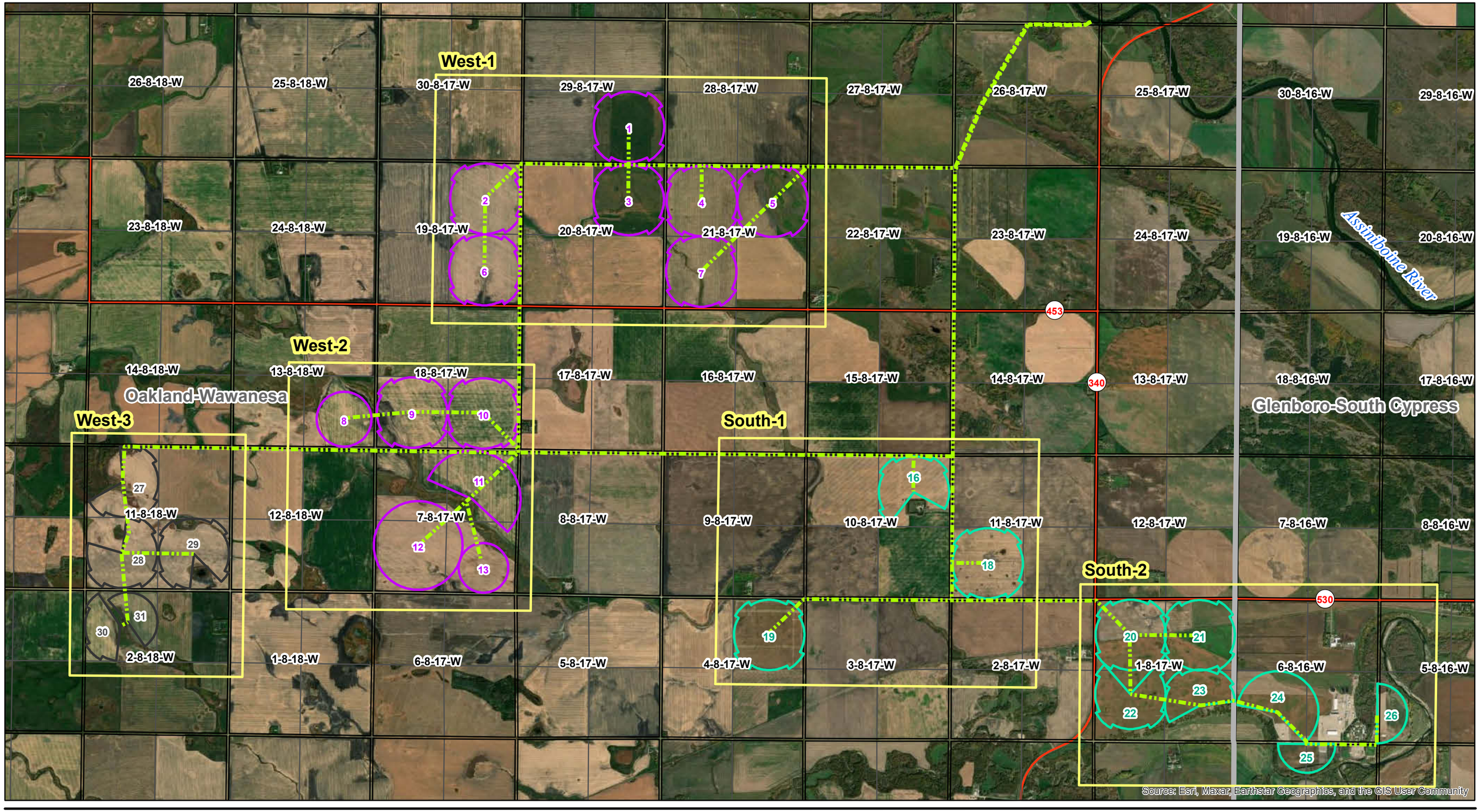
Irrigation fields
- Phase I
- Phase II
- Future (potential)

- Provincial roads
- Provincial highways

- Protected areas
- Aquifers
- Ecodistricts

Prepared by

agriearth consulting ltd.



Map Name

Project Overview

Map Number

2

Project Name

Treesbank Colony Irrigation Project

NORTH

Date: 2023-04-06

Drawn by - D. Whetter

0 0.5 1 2 3

Kilometers

1:40,000

Acknowledgements:
Original drawing by AgriEarth Consulting Ltd.
Data accessed from Manitoba Land Initiative, Province of Manitoba.

Legend

- Planning block
- Pipelines
- Provincial roads
- Provincial highways

Irrigation pivots

- Phase I
- Phase II
- Future (potential)

Prepared by

agriearth consulting ltd.

West-1
West-2
West-3
South-1
South-2
Oakland-Wawanesa
pump station at balancing reservoir
Option 1
Option 2
Assiniboine River
1 (135ac)
2 (135ac)
3 (135ac)
4 (135ac)
5 (135ac)
6 (135ac)
7 (135ac)
8 (76ac)
9 (135ac)
10 (135ac)
11 (131ac)
12 (199ac)
13 (62ac)
16 (98ac)
18 (135ac)
19 (135ac)
20 (135ac)
21 (135ac)
22 (104ac)
23 (76ac)
24 (102ac)
25 (42ac)
26 (45ac)
27 (93ac)
28 (104ac)
29 (116ac)
30 (53ac)
31 (46ac)
453
340
530

Inset: Pump intake location
Assiniboine River
SE-35-008-17W1
Access trail (existing)
Potential access trail
West main pipeline
South main pipeline
NE-26-008-17W1
1:2,000
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Map Name
Project Infrastructure

Map Number
3

Project Name
Treesbank Colony Irrigation Project

NORTH

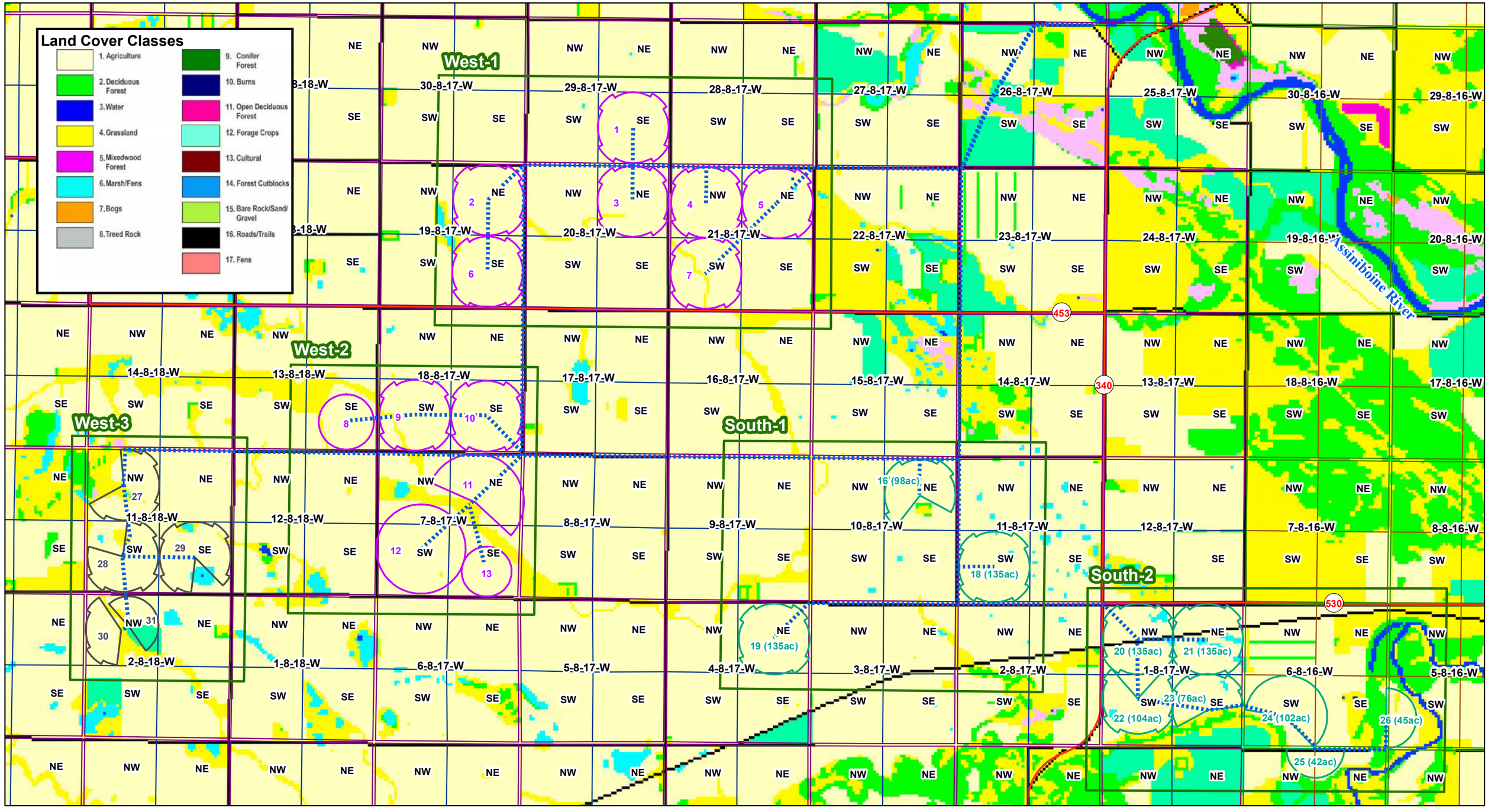
0 0.5 1 2 3
Kilometers
1:40,000

Date: 2023-04-06
Drawn by - D. Whetter

Acknowledgements:
Original drawing by AgriEarth Consulting Ltd.
Data accessed from Manitoba Land Initiative, Province of Manitoba.

Legend
- Planning block
- **Irrigation pivot**
  - Phase I
  - Phase II
  - Future (potential)
- **Reservoir**
  - Balancing reservoir (potential)
- **Pipeline (in)**
  - 18
  - 15
  - 12
  - 10
  - 8
- **Road crossing**
  - Municipal
  - Provincial
- **Pumps**
  - Distribution pumps
  - Booster pumps
  - Distribution/transfer pumps

Prepared by
agriearth consulting ltd.



Map Name

Land Cover Classes

Map Number

4

Project Name

Treesbank Colony Irrigation Project

NORTH

0 0.5 1 2 3

Kilometers

1:40,000

Date: 2023-04-06

Drawn by - D. Whetter

Acknowledgements:
Original drawing by AgriEarth Consulting Ltd.
Data accessed from Manitoba Land Initiative, Province of Manitoba.

Legend

- Planning block
- Pipelines

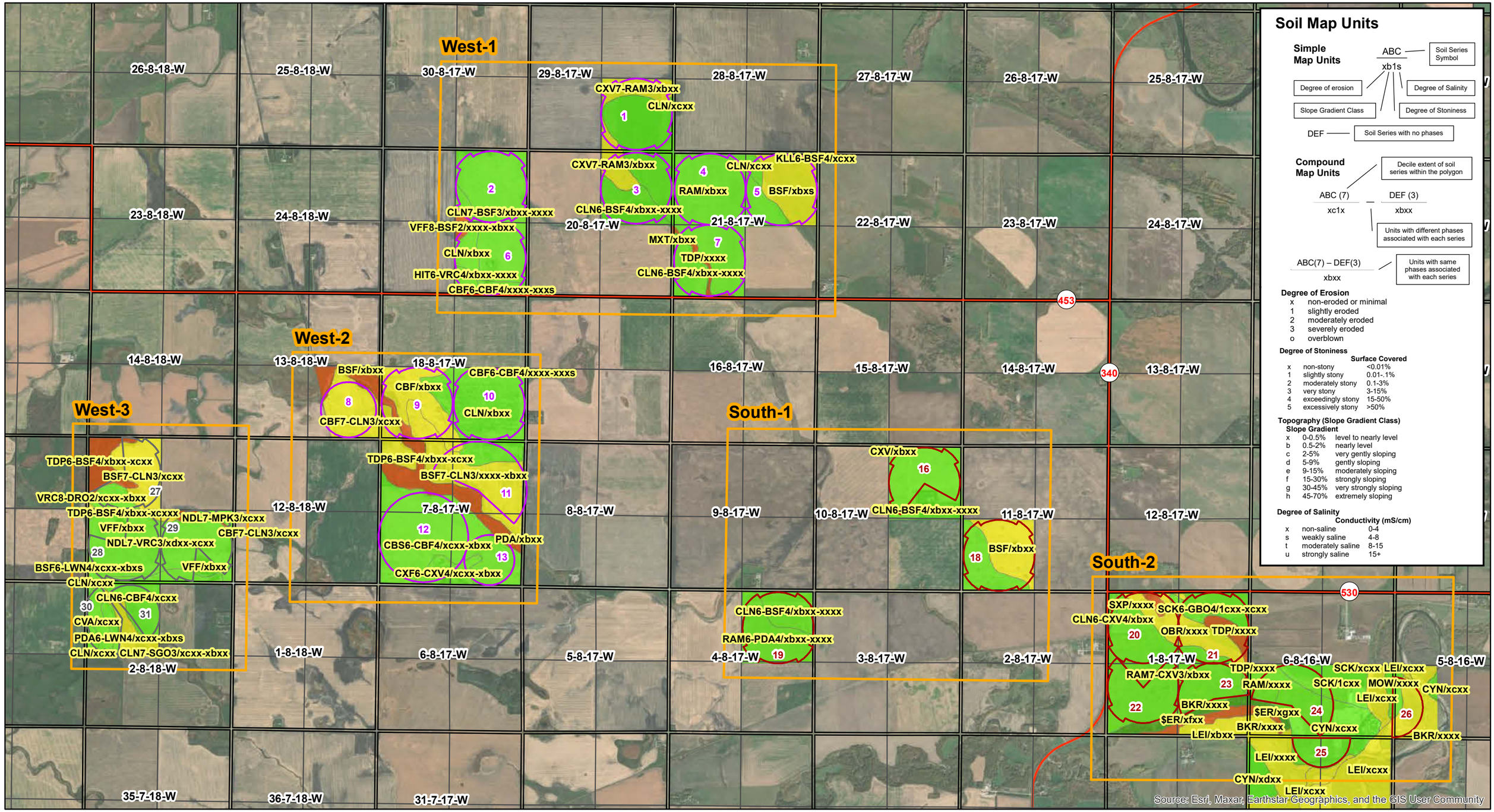
Irrigation pivots

- Phase I
- Phase II
- Future (potential)

- Provincial roads
- Provincial highways

Prepared by

agriearth consulting ltd.



Soil Map Units

Simple Map Units

ABC — Soil Series Symbol

xb1s

- Degree of erosion
- Degree of Salinity
- Slope Gradient Class
- Degree of Stoniness

DEF — Soil Series with no phases

Compound Map Units

Decile extent of soil series within the polygon

ABC (7) – DEF (3)

xc1x – xbxx

Units with different phases associated with each series

ABC(7) – DEF(3) / xbxx

Units with same phases associated with each series

Degree of Erosion

x	non-eroded or minimal
1	slightly eroded
2	moderately eroded
3	severely eroded
o	overblown

Degree of Stoniness

		Surface Covered
x	non-stony	<0.01%
1	slightly stony	0.01-.1%
2	moderately stony	0.1-3%
3	very stony	3-15%
4	exceedingly stony	15-50%
5	excessively stony	>50%

Topography (Slope Gradient Class)

Slope Gradient

x	0-0.5%	level to nearly level
b	0.5-2%	nearly level
c	2-5%	very gently sloping
d	5-9%	gently sloping
e	9-15%	moderately sloping
f	15-30%	strongly sloping
g	30-45%	very strongly sloping
h	45-70%	extremely sloping

Degree of Salinity

		Conductivity (mS/cm)
x	non-saline	0-4
s	weakly saline	4-8
t	moderately saline	8-15
u	strongly saline	15+

Map Name

Soils & Drainage Class

Map Number

5

Project Name

Treesbank Colony Irrigation Project

NORTH

Date: 2023-04-06

Drawn by - D. Whetter

0 0.5 1 2 3

Kilometers

1:40,000

Acknowledgements:
Original drawing by AgriEarth Consulting Ltd.
Data accessed from Manitoba Land Initiative, Province of Manitoba.

Legend

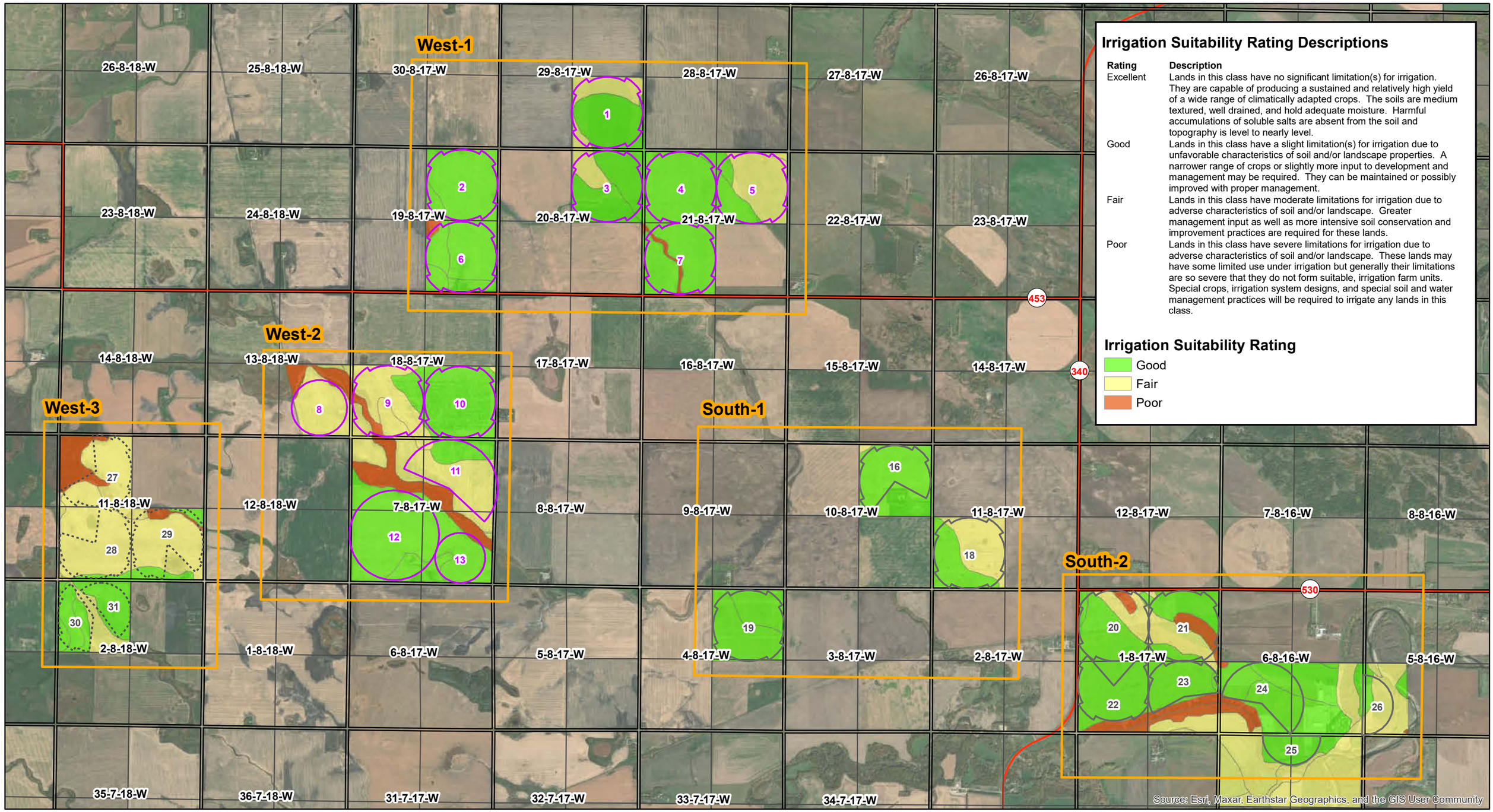
- Planning block
- **Irrigation pivots**
  - Phase I
  - Phase II
  - Future (potential)
- Provincial roads
- Provincial highways

Drainage Class

- Rapid
- Well
- Imperfect
- Poor
- Very poor

Prepared by

agriearth consulting ltd.



Irrigation Suitability Rating Descriptions

Rating	Description
Excellent	Lands in this class have no significant limitation(s) for irrigation. They are capable of producing a sustained and relatively high yield of a wide range of climatically adapted crops. The soils are medium textured, well drained, and hold adequate moisture. Harmful accumulations of soluble salts are absent from the soil and topography is level to nearly level.
Good	Lands in this class have a slight limitation(s) for irrigation due to unfavorable characteristics of soil and/or landscape properties. A narrower range of crops or slightly more input to development and management may be required. They can be maintained or possibly improved with proper management.
Fair	Lands in this class have moderate limitations for irrigation due to adverse characteristics of soil and/or landscape. Greater management input as well as more intensive soil conservation and improvement practices are required for these lands.
Poor	Lands in this class have severe limitations for irrigation due to adverse characteristics of soil and/or landscape. These lands may have some limited use under irrigation but generally their limitations are so severe that they do not form suitable, irrigation farm units. Special crops, irrigation system designs, and special soil and water management practices will be required to irrigate any lands in this class.

Irrigation Suitability Rating

- Good
- Fair
- Poor

Map Name

General Irrigation Suitability

Map Number

6

Project Name

Treesbank Colony Irrigation Project

NORTH

Date: 2023-04-06

Drawn by - D. Whetter

0 0.5 1 2 3

Kilometers

1:40,000

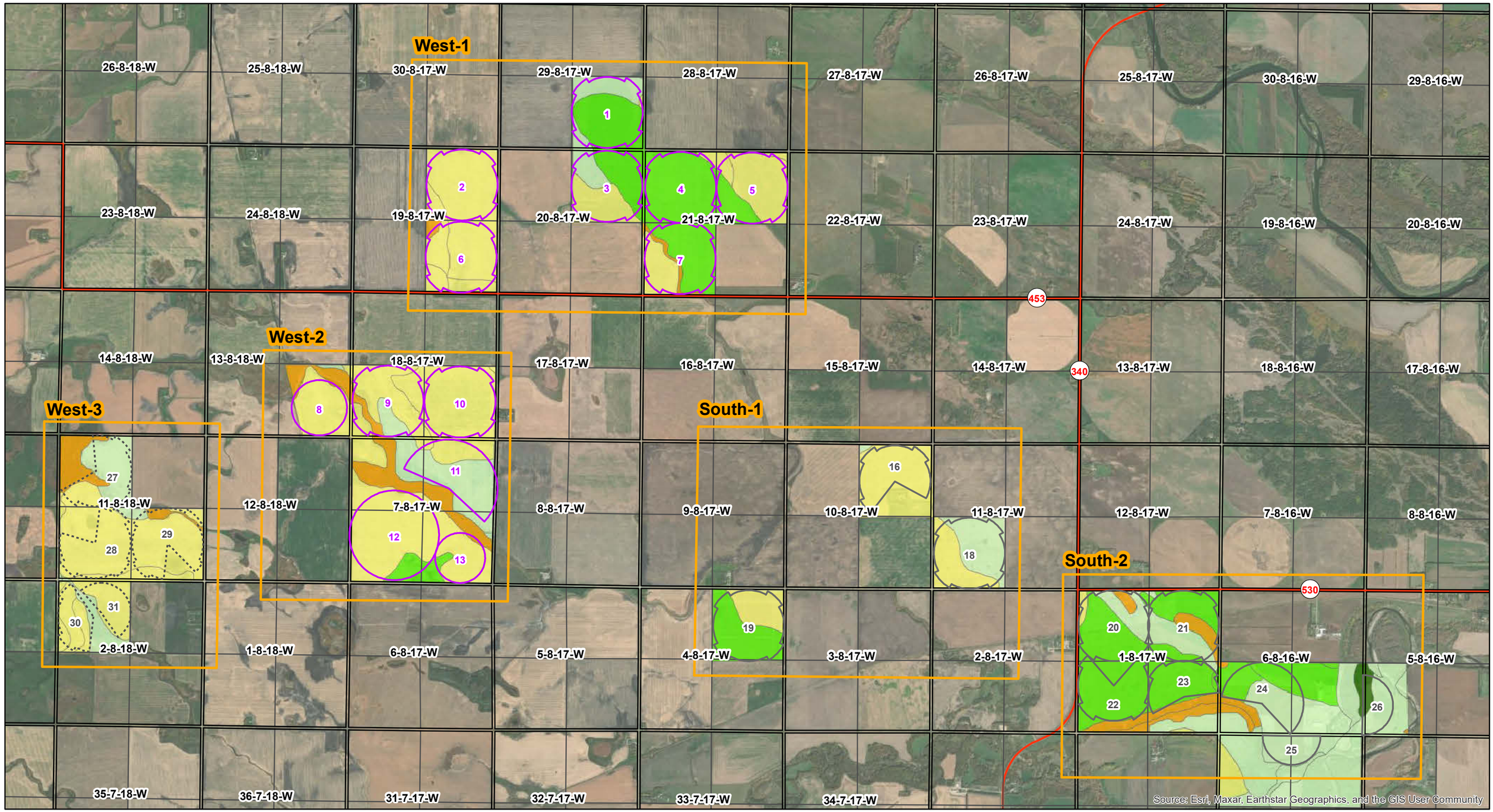
Acknowledgements:
Original drawing by AgriEarth Consulting Ltd.
Data accessed from Manitoba Land Initiative, Province of Manitoba.

Legend

- Planning block
- **Irrigation pivots**
- Phase I
- Phase II
- Future (potential)
- Provincial roads
- Provincial highways

Prepared by

agriearth consulting ltd.



Map Name

Land Suitability for Irrigated Potato Production

Map Number

7

Project Name

Treesbank Colony Irrigation Project

Date: 2023-04-06

Drawn by - D. Whetter

NORTH

0 0.5 1 2 3

Kilometers

1:40,000

Acknowledgements:
Original drawing by AgriEarth Consulting Ltd.
Data accessed from Manitoba Land Initiative, Province of Manitoba.

Legend

Planning block

Irrigation pivots

Phase I

Phase II

Future (potential)

Potato Suitability Rating

Class 1 (Most Suitable)

Class 2

Class 3

Class 4

Class 5 (Least Suitable)

Prepared by

agriearth consulting ltd.

Nutrient Management Zone Descriptions

Nutrient Management Regulation (M.R. 62/2008)

Nitrogen Limits		
	Residual NO_3-N within 0.6 m	
Nutrient Management Zone	kg/ha	lb/ac
N1	157	140
N2	101	90
N3	33	30
N4	0	0
Phosphorus Limits (within N1 to N3)		
Soil Test Phosphorus (Olsen)	**P Application Rate**	
< 120 ppm	2x crop removal	
120-<180 ppm	1x crop removal	

Notes:

Agricultural Capability Classes for each nutrient management zone:
N1 - 1, 2 or 3, other than 3M, 3ME, 3MI, 3MN, 3MP, 3MT, 3MW
N2 - 3M, 3ME, 3MI, 3MN, 3MP, 3MT, 3MW or any other subclass of soil class 3 having an "M" subclass designation, 4, 5M if irrigated
N3 - 5 (except 5M if irrigated)
N4 - 6, 7, unimproved organic soils
No nitrogen application is permitted in nutrient management zone N4, unless these substances were being applied prior to the Nutrient Management Regulation (62/2008) coming into force on November 8, 2006, in which case these applications can continue but only in accordance with a registered plan.
No phosphorus application is permitted in nutrient management zone N4, unless these substances were being applied prior to the Nutrient Management Regulation (62/2008) coming into force on November 8, 2006, in which case these applications can continue but only in accordance with a registered plan.

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Map Name

Nutrient Management Zone

Map Number

8

Project Name

Treesbank Colony Irrigation Project

NORTH

0 0.5 1 2 3

Kilometers

1:40,000

Date: 2023-04-06

Drawn by - D. Whetter

Acknowledgements:
Original drawing by AgriEarth Consulting Ltd.
Data accessed from Manitoba Land Initiative, Province of Manitoba.

Legend

- Planning block
- **Irrigation pivots**
  - Phase I
  - Phase II
  - Future (potential)

NMZ Rating

- N1
- N2
- N3
- N4

- Provincial roads
- Provincial highways

Prepared by

agriearth consulting ltd.

Appendix B MUNICIPAL CORRESPONDENCE AND DOCUMENTATION

B.1 MUNICPALITY OF OAKLAND-WAWANESA

David Whetter

From: Joni Swidnicki <cao@oakland-wawanesa.ca>
Sent: November 15, 2022 3:42 PM
To: David Whetter
Cc: Bruce Shewfelt; 'jacob maendel'
Subject: RE: Treesbank Colony Irrigation Project

Follow Up Flag: Flag for follow up
Flag Status: Flagged

Good Afternoon,

This is to advise that Council, at its meeting held this morning, considered your correspondence with respect to the above and adopted the following resolution:

BE IT RESOLVED that the Municipality supports in principle the Treesbank Colony Irrigation Project application subject to:

1. installations being 9' off property line;
2. installations being 8' in depth;
3. final location of the lines, particularly in the vicinity of tile drainage being provided in advance to the Public Works Manager for review; and
4. restoration of lands to their former state whereby a second review shall be undertaken in year 2 to address any ground settling issues.

I trust this is the information you require.

From: David Whetter <david.whetter@agriearth.ca>
Sent: Friday, October 21, 2022 3:17 PM
To: Joni Swidnicki <cao@oakland-wawanesa.ca>
Cc: Bruce Shewfelt <shewfelt@mymts.net>; 'jacob maendel' <jsmaendel@gmail.com>
Subject: Treesbank Colony Irrigation Project

Dear CAO, Municipality of Oakland-Wawanesa,

Further to correspondence with the Municipality this past spring regarding the irrigation plans for the 2022 season, I would like to follow-up with you regarding the proposed Treesbank Colony Irrigation Project. We are preparing to submit an Environment Act Proposal for the project as it is considered a Class 2 Development under Manitoba's *The Environment Act*, and **we are seeking any comments, questions, concerns or requirements the Municipality may have regarding the proposed project**. I have copied Treesbank Colony (project representative Jacob Maendel), as well as PBS Water Engineering (Bruce Shewfelt, P.Eng.), who is providing support on the preliminary engineering planning for the project. I am providing the information below to inform the Municipality of the Colony's plans to develop the irrigation project once necessary approvals, permits and licences are in place.

The irrigation project will draw water from the Assiniboine River at SE-35-8-W1 and will deliver water through buried pipelines to up to 3,000 acres of land within, predominantly within the Municipality of Oakland-Wawanesa but with a few fields in the Municipality of Glenboro-South Cypress. The proposed pipeline routes and irrigated fields are presented in attached maps (Map 2 and Map 3). Note these routes and fields are subject to minor change as project planning and engineering design progresses. The Colony's plan is to commence construction once all permits and

licences are in place. The project will be built out in phases, with components indicated as “Phase I” in attached maps to be built out likely over 2-3 years, and “ Phase II” following. Prior to construction and operation, the project requires a provincial Environment Act License, provincial Water Use License, as well as other provincial and federal reviews and approvals (i.e., Heritage Resources, Department of Fisheries and Oceans, Navigable Waters, provincial road crossing, etc.). We have previously met with the environmental licensing (Bruce Webb) and water rights licensing (Tamara Butterfield) departments to initiate discussions on the project.

The Colony has a Development Authorization Permit (DAP) under the Water Rights Act to allow them to use water from the Assiniboine River for irrigation. The DAP is for a maximum of 1,029 acre-feet of annually (see attached).

We will keep you up to date on any substantial changes to the project proposal.

We are happy to meet with the Municipality to discuss the project, if that is helpful to you. We look forward to hearing back from you.

Thanks,

David Whetter, P.Ag.
e. david.whetter@agriearth.ca
c. 204-799-4877

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Winnipeg, MB R3M 3N6
www.agriearth.ca

B.2 MUNICPALITY OF GLENBORO – SOUTH CYPRESS

MUNICIPALITY OF GLENBORO SOUTH CYPRESS
Established 2015

P.O. Box 219 618 Railway Avenue
Phone (204) 827-2252 GLENBORO, MANITOBA ROK OXO Fax (204) 827-2123

RESOLUTION

November 9, 2022

#2022-209 R.J. Hunt - D.L. Fisher

RESOLVED that Council approve the Treesbank Colony Irrigation Project, submitted by Agriearth Consulting Ltd. on October 21, 2022, subject to the following requirements:

- **That all work be completed in accordance with the Irrigation Policy and all other applicable municipal policies.**

"carried"

I, Darren J. Myers, Chief Administrative Officer of the Municipality of Glenboro South Cypress do hereby certify that the above is a true and correct copy of Resolution #2022-209, which was passed by the Council of the Municipality of Glenboro South Cypress at a meeting held Wednesday, November 9, 2022.

[redacted]

Darren J. Myers, CAO

Municipality of Glenboro South Cypress

Irrigation Policy

INTRODUCTION

The Municipality of Glenboro South Cypress is predominantly located over the Assiniboine Delta Aquifer and therefore the installation of irrigation wells and facilities for agricultural use has become common place. With the increased use of irrigation and more extensive farming practices, along with requests for using or crossing municipal right or ways/roads, the Municipality of Glenboro South Cypress is creating this policy to ensure compliance with zoning requirements and to provide irrigators with clear direction as to their responsibilities when new or expanded irrigation development is proposed.

ZONING BYLAW

Development in the Municipality of Glenboro South Cypress is regulated by the requirements of the Rural Municipality of South Cypress Zoning By-law No 1485 and various amendments that occur from time to time. Part IV of the By-law, "**Agricultural Zoning Districts**", deals with the normal types of development related to agricultural activities and provides both "Use" and "Bulk" requirements for these types of activities. Part IV, Section 6(4)(c) of the By-law deals with "**Accessory Uses, Buildings and Structures in the Agricultural Zoning District(s)"** and indicates,

> **"Buildings and structures for the operation and maintenance of an agricultural activity, including approved irrigation wells, domestic wells, and private wind or solar energy generation facilities, subject to any provincial approvals that may be required",**

are approved Accessory Uses.

The term "buildings and structures is used in the By-law. Under Part I (Definitions), Section 3(20), building has a broad meaning**. "A 'building' means a building as defined in the (Planning) Act."**

The Planning Act contains the definition of building as, **"includes a well, pipeline, conduit, cut, excavation…etc"**. The Planning Act also defines construction as "**includes (a) excavating, removing, filling and backfilling for the purpose of preparing or maintaining a site in respect of a building or proposed building.",** and development as **"the construction of a building on, over or under land."**

Through these definitions, it appears clear that irrigation activities are to be considered as development and construction, and would, therefore, need to be consistent with the requirements of the By-law. Under Part II (Administration), Section 9(2) it is indicated that a Development Permit is required for "**the erection or construction or placement of any building, structure…etc".**

SECTION I: DEVELOPMENT PERMIT

1.1 The installation of all new irrigation "works, buildings and structures' and the modification, expansion and removal of existing irrigation facilities shall be considered as development and an approved Development Permit is required for each installation.

1.2 Application for a Development Permit shall include a description of the proposed installation and a map/plan of the proposed installation route. Application shall also include:

- Pipe size
- Location of wells, pivots, risers, etc. and approximate distances from property lines.
- Locations of electrical service facilities and indication whether they will be located on the municipal right of way in a location approved by Manitoba Hydro, or on private property. If on private property, then setback distances to the property line will be required.
- If an electrical service building is proposed include size and setback distances and indicate if the building is to be installed on a permanent foundation.
- Indicate approximate road or road allowance crossing location(s), if proposed.

1.3 If irrigation "work, building and structure" are located adjacent to a Provincial Highway or Road, and are located within the Highway Control Zone, or crossing of the Highway or Road is proposed, then confirmation of approval of the proposed installation by Highways/Highway Traffic Board is required as a condition of the Development Permit approval.

1.4 If subterranean irrigation lines and/or associated electrical service lines are proposed to cross pipeline right of ways or to cross water bodies, then permits or agreements must be obtained by/with the appropriate authority.

1.5 When required by Water Stewardship, the applicant must obtain all necessary permits or licenses for the proposed installation as a condition of the Development Permit approval.

1.6 If any proposed location or setback distances are non-compliant with the bulk requirements of the Zoning By-Law, an approved Variation Order(s) will be required **before** the Development Permit can be completed.

SECTION 2: ROAD CROSSINGS

2.1 All Road Crossing Applications are to be presented to the Cypress Planning District Development Office and are to include the following information:

- Approximate location of the crossing(s), including the number/name of the Road or Road Allowance being crossed.

- Legal land location that the crossing originates from, including the name of the property owner.
- Legal land location that the crossing terminates in, including the name of the property owner.
- Type of crossing: water, electrical or both. If water, indicate size and type of pipe.
- Direction of crossing and indicate if crossing is perpendicular to the road or angled.

Please note: Multiple crossing sites may be accepted under one application.

2.2 In certain cases, Council may delegate the Development Officer to approve Crossing Applications if they appear, in his/her opinion, to be simple and straightforward. This approval may be written or verbal and is to be formalized via a council resolution.

2.3 If in the opinion of the Development Officer, the crossing application appears complex or unusual, the applications may be referred to Council for its consideration for approval or rejection. Council may wish to add conditions to any approval as it considers necessary.

2.4 Any water lines included in a crossing shall be done with HDPE (high density polyethenel) pipe with no seams under the roadbed or be fully enclosed in a sleeve for the full width of the crossing of the Road or Road Allowance. Installation of any pipe under the road crossing shall be done via directional boring method with excavations required on each side of the road bed within the municipal row to allow for the boring machine to allow for the connections.

2.5 Water and electrical lines shall be buried a minimum 3 feet below the lowest point of the crossing to the top of the pipe or wire. This usually means the lowest point of the ditch at the side of a built up road. It is strongly recommended that this depth be used for the full width of the crossing.

When crossing a relatively unimproved Road Allowance, it is strongly suggested that the installer bury any pipes/wires greater than 3 feet below the crossing site to allow for possible future shaping/construction of road beds and ditches. Otherwise the applicant/owner may be required to remove and reinstall the pipe/wire if future road development occurs.

2.6 The applicant will enter into a Road Crossing Easement Agreement with the Municipality of Glenboro South Cypress. The Agreement is to be signed by the applicant (or authorized representative), by the Mayor and CAO and by any third party landowners involved.

2.7 Once available, the applicant will include the GPS location(s) of the crossing(s) on the Easement Agreement. These locations are to be:

- Center of the road for a straight crossing
- Entry and exit locations of the Municipal Right of Way for angled crossings.

2.8 For the purpose of road crossing approval, at the point a subterranean pipe or electrical service line enters the Municipal Right of Way, it will be deemed to have zero setback and a Variation Order will not be required (as per Zoning By-law).

SECTION 3: MUNICIPAL RIGHT OF WAY

3.1 When possible, all subterranean irrigation pipes and electrical service line will be installed on the applicant's property or on private third party lands, except for approved road crossings. When this is not possible, Council may grant permission for buried utilities to be installed within the Municipal Right of Way, or Road Allowance. These installations will usually be done close to one side of the Right of Way. On a developed municipal road, the installation will normally be in the center of the municipal ditch.

3.2 Application for installation of a subterranean irrigation pipe and/or electrical service line in a Municipal Right of Way will be made to the Cypress Planning District Development Officer and will include:

- A map showing the approximate location of the installation.
- Number or name of Municipal Road/Road Allowance where an installation is proposed.
- Type of installation: water (indicate size and type of pipe), electrical or both.
- Legal land location that the installation originates from, including name of property owner.
- Legal land location that the installation terminates in, including name of property owner.
- Reason for application, in writing, of why private lands cannot be used.

Application for burial in a Municipal Right of Way may be included as part of the application for a Development Permit, and if road crossings are involved, may also be included as part of a Road Crossing Application.

3.3 An application for burial in a Municipal Right of Way will be forwarded to the Municipal Council for their consideration and approval or rejection. Council may choose to add conditions to any approval as they see fit.

3.4 The subterranean irrigation pipe and/or electrical service line that has been approved for installation in a Municipal Right of Way, may be installed along the bottom of the municipal ditch adjacent to a developed municipal road, or on one side of a municipal road allowance as close to the edge as is reasonably practical for the installation and keeping in mind possible future road development. When installation is on Municipal Right of Way, all landowners must be notified when approaches are going to be cut, inconvenience minimized and approaches must be restored to the original condition.

3.5 Any subterranean irrigation pipe and/or electrical service line approved to be buried in a Municipal Right of Way shall be buried a minimum of three feet to the top of the pipe/wire below the lowest point of the road or road allowance. This will usually mean below the bottom of the ditch on a developed road.

In case of an undeveloped level road allowance, it is strongly recommended that any pipe or wire be buried more than three feet deep to the top of the pipe or wire to allow for possible future shaping and development of the road allowance.

3.6 If the burial of subterranean irrigation pipes and/or electrical service lines is part of a larger project that includes a Road Crossing Application, then this type of development can be included and covered under the associated Road Crossing Easement Agreement. If not, a separate Easement Agreement will be necessary for the portion of the Municipal Right of Way where the pipe/wire is installed.

3.7 When the installation is completed the GPS locations were the subterranean irrigation pipe and/or electrical service line enter and leave the Municipal Right of Way are to be entered on the Easement Agreement.

3.8 When installing subterranean irrigation pipes and/or electrical service lines within a Municipal Right of Way, the applicant/installer is responsible for providing the locations of all buried pipes, wires, etc. Clearances and permits may also be required for the crossing of railways, oil and gas lines, provincial roads and highways and all creeks, streams or river. It is the responsibility of the applicant/installer to obtain any and all clearances and permits.

3.9 When installing irrigation pipes within a Municipal Right of Way, where the pipe crosses under a driveway or permanent approach, the pipe will be sleeved for the width of the approach. Pipe must be installed using the directional boring method.

SECTION 4: LOCATING AND MARKING

4.1 It is the responsibility of the applicant/owner/installer to visibly mark the location of above ground Irrigation Works, Structures, and Buildings in such a manner that they can be readily located and identified when surrounded or covered by snow or foliage. Marking can be accomplished by signs, posts or flags and are mainly required for smaller/lower items that may not always be visible.

SECTION 5: DAMAGE RESULTING FROM IRRIGATION

5.1 Landowners/Irrigators are required to control the output of the irrigation systems at all times to ensure that water does not spray beyond their own property lines and onto the municipal roads. This spray creates a safety issue and can potentially damage municipal infrastructure. Landowners /Irrigators will be responsible for all costs associated with any repairs to infrastructure resulting from such spray.

Passed June 14, 2017

Amended August 12, 2020

Appendix C PROVINCIAL CORRESPONDENCE AND DOCUMENTATION

C.1 DEVELOPMENT AUTHORIZATION PERMIT

DEVELOPMENT
AUTHORIZATION
PERMIT

Manitoba

Issued in accordance with the provisions
The Water Rights Act and regulations made thereunder.

Subject to the terms and conditions contained in this Development Authorization Permit, the Minister charged with administration of the Water Rights Act authorizes:

Treesbank Colony Farms Ltd.

In the **Municipality of Oakland-Wawanesa**, in the province of Manitoba, to establish, operate and maintain an intake, pump(s) and transmittal pipeline(s) (the "WORKS") for **Irrigation** purposes on the following land:

SE 35-8-17 WPM

This Development Authorization Permit allows you to divert, store and use water for **Irrigation** purposes until the expiry date.

The WORKS shall be constructed and operated in accordance with the terms and conditions described as follows:

1. This Permit expires within twenty-four (24) months of the date of issuance. Failure to construct all of the necessary WORKS and use water for **Irrigation** purposes prior to the permit expiry date may result in cancellation of the application for a Water Rights Licence.

2. The maximum quantity of water available for your project from the **Assiniboine River** is **1269.26 cubic decametres (1029.00 acre feet)**. The maximum area of land to be irrigated in any one year shall not exceed **1100.00** acres, based on an application of 12 inches of water on 650 acres of corn and 7 inches of water on 650 acres of other crops under drought conditions.

3. This Permit is not transferable or assignable to any other party.

4. The Permittee must have legal access to all lands occupied by the project.

5. The Permittee must hold and maintain all regulatory approvals and requirements for the construction, operation or maintenance of the WORKS or to divert or use water as provided by this Permit.

6. The Permittee shall assume any liability that may result from the construction of the WORKS.

7. The Province of Manitoba shall hereby be released from any liability or claims for damages whatsoever that may result from the construction of the WORKS.

8. In the event that the rights of others are infringed upon and/or damage to the property of others is sustained as a result of the operation or maintenance of the WORKS and the rights herein granted, the Permittee shall be solely responsible and shall save harmless and fully indemnify Her Majesty the Queen in Right of the Province of Manitoba, from and against any liability to which Her Majesty may become liable by virtue of the issue of this Licence and anything done pursuant hereto.

9. The Minister or Minister's agents have the right of unrestricted access for the purpose of inspection of any WORKS constructed under this Permit.

10. The Minister or Minister's agents, under certain conditions, may instruct the Permittee to reduce or terminate withdrawal of water from the **Assiniboine River** to accommodate existing senior licenced water users, domestic users and environmental needs.

11. The Permittee shall install and maintain, on the water diversion WORKS, a water measuring device acceptable to this Section that will accurately measure the instantaneous water flow and the accumulated volume of water diverted.

12. The Permittee must keep daily and annual water use records to be submitted to the Water Use Licensing Section prior to February 1st of the following year.

13. The issuance of this Permit does not imply that the Department will extend or renew the Permit in subsequent years.

FOR OFFICE USE ONLY

Issued at the City of Winnipeg, in the Province of Manitoba, this _____ day of _____ A.D. 20___.

Print Name

Signature

Signed by the Minister charged with the administration of the Water Rights Act (or her/his designate)

C.2 HISTORIC RESOURCES BRANCH

David Whetter

From: Graham, Reid (SCH) <Reid.Graham@gov.mb.ca>
Sent: July 11, 2022 1:39 PM
To: David Whetter
Subject: RE: Review of proposed irrigation development for Treesbank Colony
Attachments: AAS-22-18995_AgriEarth_Treesbank.pdf; 2022-07-11_HR_Review.zipx; Basic HRPP Guidelines Key Questions and Protocols to Consider_V2.zip; Policy - Human Remains (2006).zipx; HRIA Process Flowchart.pdf; HRB Heritage Consultants List updated March 2022.pdf

Hi David,

Thanks for providing the shapefiles, I've appended specific comments to your shapefiles in regards to our Heritage Resource screening results. If plans change, please let us know as it may affect our assessment.

Please carefully review the attached documents for the results of our review, and let me know if you have any questions.

Reid Graham

Impact Assessment Archaeologist | *Archéologue d'évaluation d'impact*
Archaeological Assessment Services Unit | *Section des services d'évaluation archéologique*
Historic Resources Branch | *Direction des ressources historiques*
Manitoba Sport, Culture and Heritage | *Ministère du Sport, Culture et Patrimoine*
213 Notre Dame Avenue, Main Floor | Winnipeg, MB | R3B 1N3
Reid.Graham@gov.mb.ca
c. 204-451-7034 (0830-1630, M-F)

From: David Whetter <david.whetter@agriearth.ca>
Sent: July 10, 2022 1:52 PM
To: Graham, Reid (SCH) <Reid.Graham@gov.mb.ca>
Subject: [Potentially Malicious Attachment Removed] RE: Review of proposed irrigation development for Treesbank Colony

Hello Graham,

Please find shapefiles attached for preliminary pivots, pipelines, pumps and road crossings. These footprints are subject to change through engineering design. For example, the pump location at the Assiniboine is fixed but the booster pump locations will likely change.

Thanks,
David

David Whetter, P.Ag.
e. david.whetter@agriearth.ca
c. 204-799-4877

From: Graham, Reid (SCH) <Reid.Graham@gov.mb.ca>
Sent: July 4, 2022 9:39 AM
To: David Whetter <david.whetter@agriearth.ca>
Subject: RE: Review of proposed irrigation development for Treesbank Colony

Hi David,

Could you send a shapefile or google earth kml of the pipeline routes, pump station, and the irrigation pivot areas as illustrated in the map? It will help us compare and cross-reference our records if we have the data in a geospatial format

Reid Graham

Impact Assessment Archaeologist | *Archéologue d'évaluation d'impact*
Archaeological Assessment Services Unit | *Section des services d'évaluation archéologique*
Historic Resources Branch | *Direction des ressources historiques*
Manitoba Sport, Culture and Heritage | *Ministère du Sport, Culture et Patrimoine*
213 Notre Dame Avenue, Main Floor | Winnipeg, MB | R3B 1N3
Reid.Graham@gov.mb.ca
c. 204-451-7034 (0830-1630, M-F)

From: David Whetter <david.whetter@agriearth.ca>
Sent: June 24, 2022 1:55 PM
To: +WPG574 - HRB Archaeology (SCH) <HRB.archaeology@gov.mb.ca>
Cc: Graham, Reid (SCH) <Reid.Graham@gov.mb.ca>; Tsukamoto, Suyoko (SCH) <Suyoko.Tsukamoto@gov.mb.ca>; 'jacob maendel' <jsmaendel@gmail.com>; Bruce Shewfelt <shewfelt@mymts.net>; Webb, Bruce (CC) <Bruce.Webb@gov.mb.ca>
Subject: Review of proposed irrigation development for Treesbank Colony

Hello Historic Resources Branch;

AgriEarth Consulting is completing an Environment Act Proposal on behalf of Treesbank Colony for a proposed irrigation development northeast of Wawanesa. I am requesting a review of the proposed Project by the Branch. A brief Project overview is provided below, and a map of proposed project layout is attached.

The irrigation project will draw water from the Assiniboine River at SE-35-8-W1 and will deliver water through buried pipelines to up to 3,000 acres of land predominantly within the RM of Oakland-Wawanesa but with a few fields in the RM of Glenboro-Wawanesa. We are in the planning stages of the project description but have developed initial pipeline routes and potential fields for irrigation (see Map P1 attached). Floating pumps will be used to draw water from the Assiniboine, with buried pipelines delivering water to centre pivot irrigation units on fields currently cultivated for annual crop production. Pipelines are anticipated to be located within existing road allowances for the most part. Minimal to no clearing of undisturbed lands is anticipated at this time. The Colony's plan is to commence construction of the project in Fall 2022, once all permits and licences are in place. The project will be built out in phases, with components indicated as "Phase I" in Map P1 to be built out likely over a few years.

As the Project will be withdrawing more than 200 dam3 of water per year, an Environment Act Licence will be required. The Colony already has a Development Authorization Permit under the Water Rights Act to allow them to use water for irrigation. We have met with the environmental licensing (Bruce Webb) to initiate discussions on the Project.

I have copied the proponent (Jacob Maendel), Bruce Webb (Licensing) and Bruce Shewfelt (PBS Water Engineering).

Please let me know if you have any questions.

Thanks,
David

David Whetter, P.Ag.
e. david.whetter@agriearth.ca
c. 204-799-4877

335 Elm Street
Winnipeg, MB R3M 3N6
www.agriearth.ca

C.3 MANITOBA CONSERVATION DATA CENTRE

Map showing pipeline segments assessed by Manitoba Conservation Data Centre (created by AgriEarth)

David Whetter

From: Murray, Colin <Colin.Murray@gov.mb.ca>
Sent: August 2, 2022 3:59 PM
To: David Whetter
Subject: DR D Whetter AgriEarth 20220719 Treesbank colony irr proj
Attachments: DR D Whetter AgriEarth 20220719 Treesbank colony irr proj.xlsx; Pivot qsects pipelines and buffers.zip

Hi David
Thank you for your information request. I completed a search of the Manitoba Conservation Data Centre's (CDC) rare species database for your area of interest. This includes the quarter sections the pivots are located on and a 1 kilometer radius buffer from the from the footprint boundary. I also conducted a search of the pipeline right of way segments out to 100m and 1 kilometer respectively. I identified each pipeline segment with a unique sequential numerical identifier (Attribute field: ID in the Shapefile) to reference any findings back to each segment.

I am attaching a Microsoft Excel spreadsheet summarizing these occurrences. The spreadsheet includes scientific and common names, the provincial (SRank) rank for each species as well as the Manitoba Endangered Species and Ecosystem Act, and the federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and Species at Risk Act (SARA) designations. I'm also including the ESRI Shapefiles use to fulfill the request.

Further information on this ranking system can be found on our website at: http://www.natureserve.org/conservation-tools/conservation-status-assessment.
These designations can be found at:
http://web2.gov.mb.ca/laws/statutes/ccsm/e111e.php,
https://www.cosewic.ca/index.php/en-ca/ and
http://www.sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1.

Manitoba's recommended setback distances can be found at:
https://www.gov.mb.ca/fish-wildlife/cdc/pubs/mbcdc-bird-setbacks-nov2021.pdf.

The information provided in this letter is based on existing data known to the Manitoba Conservation Data Centre of the Wildlife and Fisheries Branch at the time of the request. These data are dependent on the research and observations of CDC staff and others who have shared their data, and reflect our current state of knowledge. An absence of data does not confirm the absence of any rare or endangered species. Many areas of the province have never been thoroughly surveyed, therefore, the absence of data in any particular geographic area does not necessarily mean that species or ecological communities of concern are not present. The information should not be regarded as a final statement on the occurrence of any species of concern, nor should it substitute for on-site surveys for species or environmental assessments. Also, because our Biotics database is continually updated and because information requests are evaluated by type of action, any given response is only appropriate for its respective request.

Please contact the Manitoba CDC for an update on this natural heritage information if more than six months passes before it is utilized.

Third party requests for products wholly or partially derived from our Biotics database must be approved by the Manitoba CDC before information is released. Once approved, the primary user will identify the Manitoba CDC as data contributors on any map or publication using data from our database, as the Manitoba Conservation Data Centre; Wildlife and Fisheries Branch, Manitoba Sustainable Development.

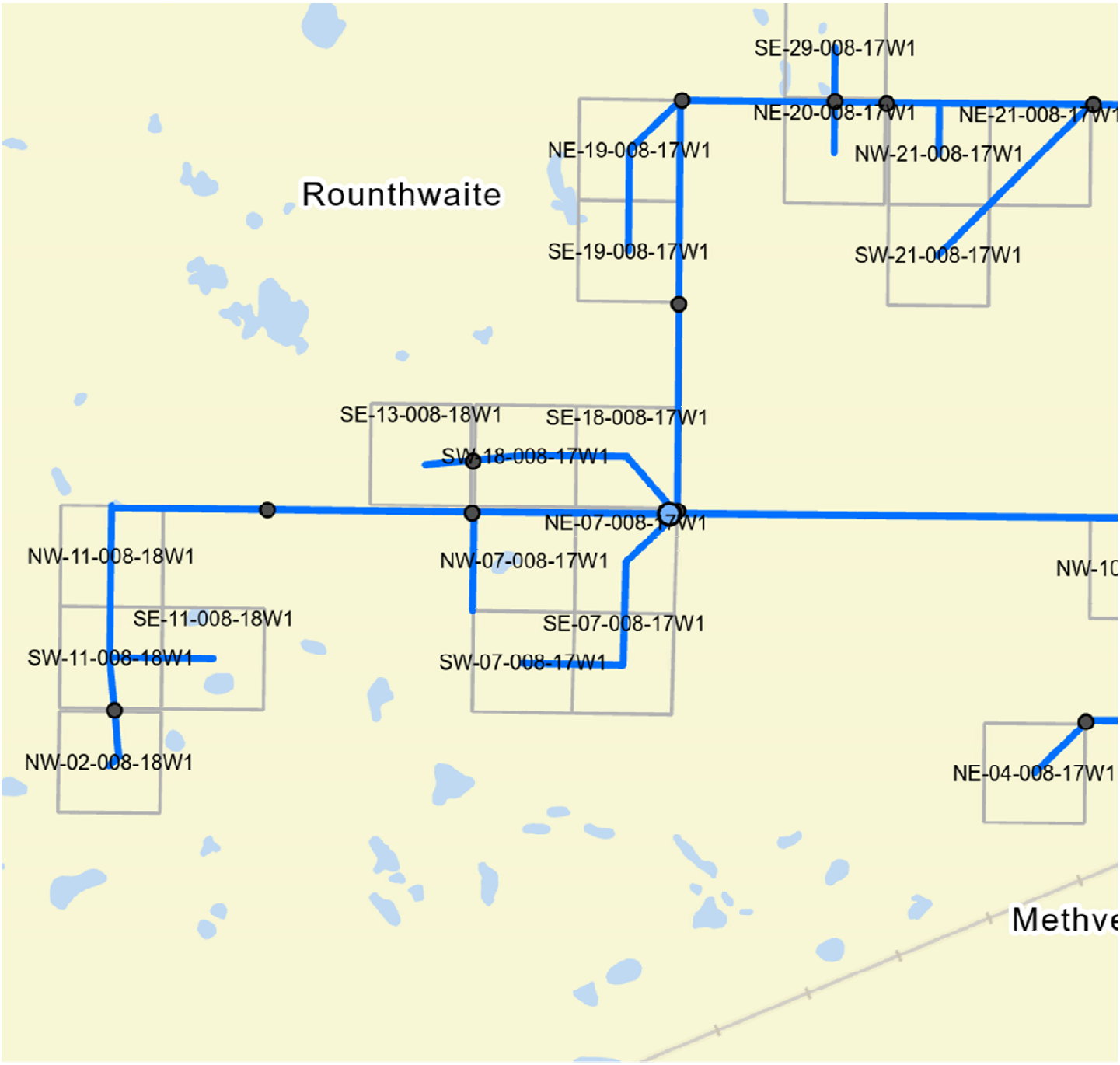
This letter is for information purposes only - it does not constitute consent or approval of the proposed project or activity, nor does it negate the need for any permits or approvals required by the Province of Manitoba.

We would be interested in receiving a copy of the results of any field surveys that you may undertake, to update our database with the most current knowledge of the area.

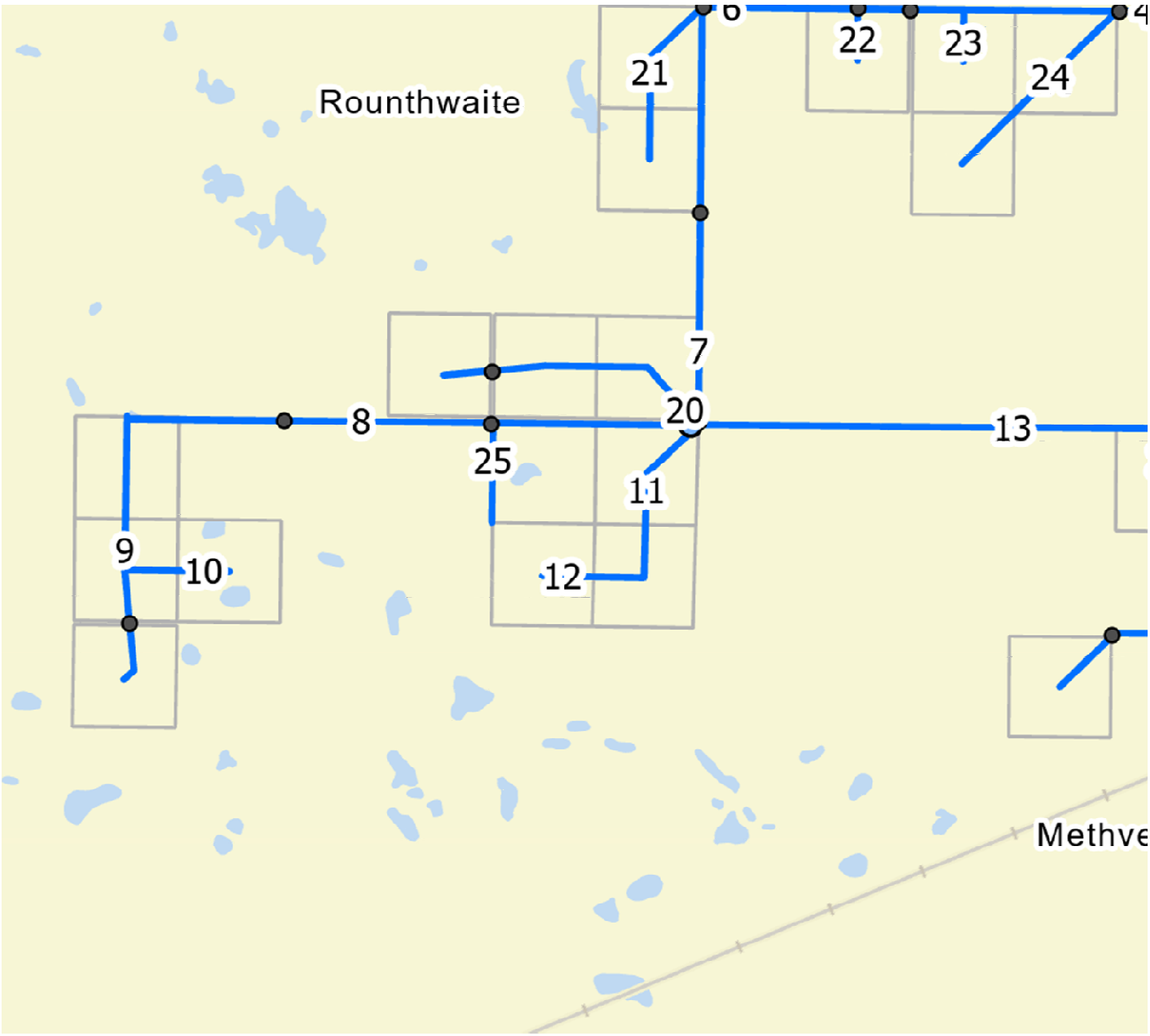
If you have any questions or require further information contact me directly at (204) 945-7760.

Colin

Reference screen clip:
Quarter sections:



Pipeline segments:



Colin Murray
Information Manager- Manitoba Conservation Data Centre
Fish and Wildlife Branch, Natural Resources and Northern Development
200 Saulteaux Crescent, Winnipeg, MB R3J3W3
T: 204-945-7760 F: 204-945-3077

-----Original Message-----
From: Form Submissions <noreply@gov.mb.ca>
Sent: July 19, 2022 9:04 PM
To: Murray, Colin (ARD) <Colin.Murray@gov.mb.ca>
Subject: WWW Form Submission

Below is the result of your feedback form. It was submitted by CDC Information Request () on Tuesday, July 19, 2022 at 21:04:06

DocumentID: Manitoba_Sustainable_Development

Project Title: Treesbank Colony Irrigation Project

Date Needed: 2022-08-5

Name: David Whetter

Company/Organization: AgriEarth Consulting Ltd.

Address: 335 Elm Street

City: Winnipeg

Province/State: MB

Phone: 2047994877

Email: david.whetter@agriearth.ca

Project Description: The irrigation project will draw water from the Assiniboine River at SE-35-8-W1 and will deliver water through buried pipelines to up to 3,000 acres of land predominantly within the RM of Oakland-Wawanesa but with a few fields in the RM of Glenboro-Wawanesa. We are in the planning stages of the project description but have developed initial pipeline routes and potential fields for irrigation. Floating pumps will be used to draw water from the Assiniboine, with buried pipelines delivering water to centre pivot irrigation units on fields currently cultivated for annual crop production. Pipelines are anticipated to be located within existing road allowances for the most part. Minimal clearing of natural vegetation is anticipated at this time. The Colonyâ€™s plan is to commence construction of the project in Fall 2022, once all permits and licences are in place. The project will be built out in phases.

As the Project will be withdrawing more than 200 dam3 of water per year, an Environment Act Licence will be required. The Colony already has a Development Authorization Permit under the Water Rights Act to allow them to use water for irrigation. We have met with the environmental licensing (Bruce Webb) to initiate discussions on the Project.

A map of the project footprint and shapefiles of project components will be forwarded to Colin Murray via email.

Information Requested: Please provide a review of Manitoba Conservation Data Centre (CDC) records of rare species in the project area. This information will be used to support project planning and the development of an EAP for licencing purposes.

Format Requested: An email summary of available information and a shapefile of occurences within the project area is requested.

Location: The project occurs predominantly within the eastern portion of the RM of Oakland-Wawanesa, with a few irrigation fields in the western portion of the RM of Glenboro-South Cypress. The project will draw water from the Assiniboine River at SE-35-8-W1 and will irrigate lands south of the Assiniboine River in the following townships: 7-16W1, 8-16W1, 8-17W1 & 8-18W1. A map and shapefiles sent by email to Colin Murray provide more detailed project footprint information.

action: Submit
