waterSMART
Water Management Solutions

Agriculture's Water Future

Final Report: Agriculture's Water Future

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Submitted on:
March 10 2023

This project was supported by:

This report was produced by WaterSMART Solutions Ltd. for Alberta Innovates, Prairies Economic Development Canada, Alberta Irrigation Districts Association, Nutrien, Cavendish Farms, St. Mary River Irrigation District, and the Canadian Agricultural Partnership.

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1. Document Purpose

Water stewardship is essential in a world of increasingly constrained water resources. Previous projects highlighted the value in aligning the efforts of the various players toward implementing water stewardship across the agriculture supply chain. The Agriculture's Water Future (AWF) project piloted this approach across the potato supply chain in southern Alberta, involving a potato producer, processor and irrigation district. The project clearly identified value to the individual operations that implemented water stewardship, and a series of tools were developed to make documenting and implementing water stewardship more accessible for individual agriculture and agri-food operations to ensure that the process provided value for all the operators.

This document is intended to synthesize the learnings from this pilot project and support next steps and future related work by capturing the results in the form of best practices. This report supports promoting water stewardship and using the tools that make implementing water stewardship easier. This report also identifies overarching challenges and opportunities related to water stewardship in the agriculture and agri-food industry in Alberta, and indicates where additional work would be beneficial.

The audience for this final report document is entities that have interest in future opportunities in the agriculture sector, that have influence in agriculture and agri-food sectors, and that are interested in long-term risk management for the sector. The main report summarizes the process and overall learnings. The appendices to this report document best practices and tools from the pilot project to support future water stewardship implementers.

1.1 How to implement water stewardship

Individual agriculture and agri-food operations who are interested in understanding water stewardship will find the following sections of this report of particular interest, in addition to the appendices included:

- 2.1 – Water Stewardship
- 2.2 - Alliance for Water Stewardship Standard
- 3.1 - Implementers
- 4 – Following the Steps of Water Stewardship
- 10 - Deliverable Documents

What should I know to implement water stewardship on my operation?
If you are interested in understanding the principles of water stewardship, please review section 2.1 of this report.
If you would like to understand what is required to follow the international standard of water stewardship (the AWS Standard), please review Appendix F: Framework for the AWS Standard of this report.
If you would like to review an example water stewardship plan, please see Appendix D: Example Plan - SMRID West Water Stewardship Plan of this report.

2. Project Objectives

Water stewardship planning and activities have value for an operation based on mitigating or managing risks and building on opportunities. The project was based on understanding water stewardship for an agriculture or agri-food operation in Southern Alberta by piloting water stewardship planning. The value and benefits from water stewardship were articulated across a supply chain, as well as for individual operations. The project produced tools that make understanding and implementing water stewardship planning more accessible for individual operators in the agriculture and agri-food.

The overarching objective of the project is:

> To develop and pilot water stewardship planning across the potato supply chain in Southern Alberta in a replicable, stepwise process appropriate for agriculture and agri-food, and recognizing the value to implementers in the supply chain, positioning Alberta's agri-food sector as a global leader in water stewardship.

A secondary objective for the project was to develop a set of tools to enable increasing water stewardship activities in the agri-food industry in Alberta and globally for the benefit of all water users.

The goals were articulated as follows:

- Develop a framework for applying water stewardship planning across a full agri-food supply chain
- Achieve water stewardship plan implementation, potentially to the level of certification, across the potato supply chain in southern Alberta
- Validate the benefits of water stewardship planning and implementation across a potato supply chain
- Identify ways to support each level of the supply chain, particularly the producer level, to align with the currently evolving landscape of water-related metrics and reporting in the agriculture and agri-food supply chain.

2.1 Water Stewardship

Water stewardship entails:

- Using water responsibly: environmentally sustainable, socially responsible, and economically beneficial use of water
- Recognizing that local water resources are shared
- Managing a site's water-related risks (water security, regulatory fines, etc.).

Determining how much water use, from which specific source, is environmentally sustainable, is dependent on many local factors about the water supply. Applicable legislation and water governance

systems are specific to the water source and the location of water use; in Alberta this is a provincial government jurisdiction. Defining the socially responsible use of water depends on local watershed and community factors. For all these reasons, water stewardship is rooted in the local context of a site. The correct actions for an operation to implement water stewardship are developed through an intensive process of compiling data, gathering local information, and engaging other water users and stakeholders.

Water stewardship involves looking beyond the fenceline of the operation and understanding the context, options, and concerns of the broader watershed. Water stewardship is a stakeholder-inclusive process; Hearing from other water users and entities in the watershed is part of how water stewardship involves working beyond the operation property line.

2.1.1 Management is a component of stewardship

For this project, the term 'water management' refers to planning, developing, distributing and use of water for operational needs, typically within the operation's footprint. Water management is a component of water stewardship, but there are key differences. Below, Figure 1 represents the difference between water management and water stewardship. The key distinction is that water stewardship extends beyond the boundaries of a specific operation and has additional key benefits, relative to water management. Practicing water stewardship involves recognizing the ways an operation impacts water beyond the facility boundaries, and completing actions that address key local water challenges. Strong water stewards must understand how they fit into the watershed as a whole and engage in a stakeholder-inclusive process that involves both site- and watershed-based actions.

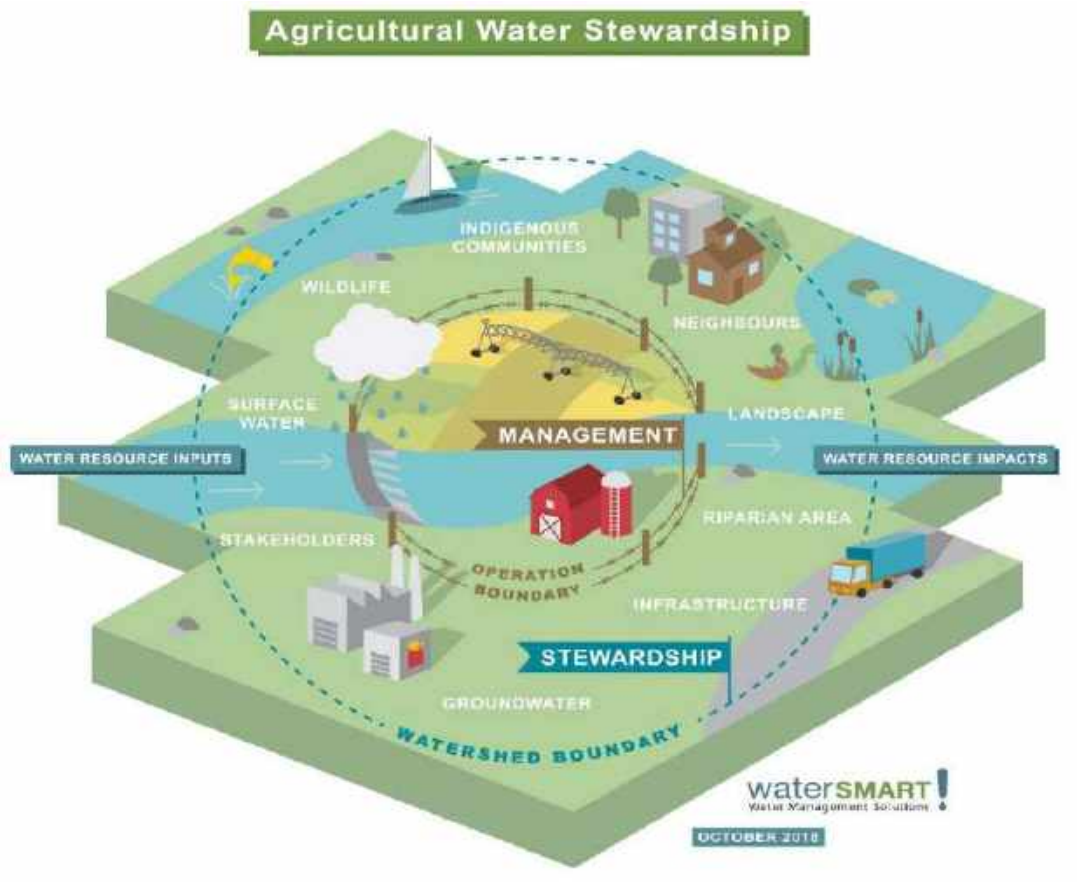

Figure 1 Water management is within the operation boundary and water stewardship includes considering factors out to the watershed boundary.

2.2 Alliance for Water Stewardship Standard

The international standard developed by the Alliance for Water Stewardship, known as the AWS Standard, was referenced throughout the project. The AWS Standard was selected as a guide for this project because it:

- is globally recognised and can be internationally certified
- was developed through an extensive and expert process
- can be used as a guide to develop water stewardship plans and implementation plans
- is scalable to the size of the farm, plant or operation, and compatible with existing initiatives such as the Alberta Environmental Farm Plan,
- can be used to work towards certification if that is desired.

The AWS Standard is designed as a five-step process modeled after the environmental management system concept that guides an implementer through a steady process of continuous assessment and

improvement, specifically in water-related impacts and opportunities (Alliance for Water Stewardship, 2022). The AWS Standard is designed and structured for a single site or operation to follow. It is possible for multiple sites to seek group certification to the AWS Standard, but completing all the steps, including planning, implementation, and evaluation processes, would be conducted by each site. The AWS Standard is centred around the watershed scale and recognizing factors beyond the operational boundaries, or fence line.

Throughout this project work, water stewardship itself was the goal. The project was not focused on meeting all the criteria within the AWS Standard, although several of the deliverable documents specifically identify and support an implementer in meeting the AWS Standard criteria. Completing all criteria and pursuing certification may be a direct next step for one or more of the entities that piloted water stewardship planning in this project.

The AWS Standard is designed around five central outcomes (Alliance for Water Stewardship, 2022):

1. Water governance
2. Water use
3. Water quality
4. Sensitive areas (Important Water-related Areas)
5. Safe water sanitation and hygiene

The AWS Standard has five steps of water stewardship, which are cyclical; 1. Gather and Understand, 2. Commit and Plan, 3. Implement, 4. Evaluate, and 5. Communicate and Disclose, leading into Gather and Understand again. See Figure 2 in Section 4 of this report for a visual of these five steps.

3. Description of Project Activities

This part of the report describes the AWF project activities, key organizations involved, critical background information and relevant context. For the results and learnings from the activities described, please see sections 5, 6, and 7.

The AWF project aimed to show how water stewardship can manage operational, regulatory, reputational, and financial risks related to water for an individual operation and throughout an agri-food supply chain. The project engaged an expert Working Group and relevant stakeholders to pilot water stewardship in an agri-food supply chain. The AWF project worked closely with the St. Mary River Irrigation District (water supplier) and Cavendish Farms potato processing facility in Lethbridge (processor) to create specific and actionable water stewardship plans.

A summary of major activities completed for the AWF project is captured in Table 1.

Table 1: Summary of some key activities from the AWF project

Activity	Summary	Date
Site visits	Toured the Cavendish Farms Lethbridge facility, the SMRID office and western part of the canal system, and the engaged potato producer's operation.	July 2021
Working Group #1	Working Group members identified the risks and opportunities related to water at the individual implementer level, and across the whole potato supply chain. The project gathered input from the Working Group on the business case drivers, key messages and project communications, and important water related areas in Southern Alberta.	Oct 26th 2021
Key planning meetings with potato supply chain	Discussed the risks and opportunities to operations and the supply chain, and overall business drivers of water stewardship and with the three members of the potato supply chain (SMRID, Cavendish, and initially a potato producer).	December and January 2021
Working Group #2	Gathered Working Group feedback on the business drivers for implementing water stewardship. Engaged the Working Group in preparing for stakeholder engagement for water stewardship.	Jan 20th 2022
Stakeholder Engagement Meetings	Organized multiple meetings and emails to gather stakeholder input. The sessions provided background understanding for stakeholders to be able to answer questions, invited perspectives of water-related concerns, and captured suggestions for implementable water stewardship actions.	March 2022
Working Group #3	Discussed the results and learnings from stakeholder engagement. Presented and discussed the actions in the water stewardship Implementation Plans. Presented and gathered feedback on the proposed water stewardship framework guidance document.	Apr 12th 2022
Key planning meetings with potato supply chain	Discussed the water stewardship actions and implementation planning with the water provider and potato processor levels of the supply chain.	April – August 2022
Key planning meetings regarding the Environmental Farm Plan	Discussed water stewardship, the AWS Standard, and potential links with the Environmental Farm Plan.	June – November 2022

Working Group #4	Discussed key challenges and points heard from producers regarding water stewardship documentation. Explored the opportunity for the Environmental Farm Plan to be a tool. Discussed the takeaways and next steps from the project overall.	Oct 19th 2022
Producer Workshops and presenting results to irrigation districts and other groups	Presented the project learnings and the key opportunities for going forward.	February - March 2023

3.1 Implementers

Three points of the potato supply chain were involved in the project. The two entities that piloted water stewardship, known as project Implementers, were St. Mary River Irrigation District (SMRID) and Cavendish Farms Lethbridge location (Cavendish). A potato producer was also very heavily involved in the project and provided extensive input and value to the project, but chose not to complete a formal water stewardship plan due to the administrative burden, and they requested to remain anonymous. All three operations are located in the same region of Southern Alberta, and they all rely on the Oldman River Watershed for their water supply.

The representatives from SMRID, Cavendish Farms, and the potato producer operation contributed significant amounts of time to the project for understanding water stewardship, compiling the data and information related to their operation, completing stakeholder engagement, and reviewing final documents.

The two Implementers worked through the first steps of the AWS Standard with the project team, providing a concrete understanding of what water stewardship means for their operations and for the potato supply chain in Southern Alberta.

3.1.1 Stakeholder engagement

Stakeholder engagement is an essential part of water stewardship; it involves reaching beyond the fence line of the site and understanding the concerns, needs and interests of the stakeholders in the area. For water stewardship, stakeholders of the operation are groups or entities of people that can be affected by the Implementer's water-related activities.

The project team supported the Implementers in conducting stakeholder engagement through Working Group meetings, an in-person focus group, an online discussion via Microsoft Teams, and email correspondence. Four Working Group meetings brought together representatives from over 20 organizations with interest in southern Alberta agriculture. The Working Group members contributed to SMRID and Cavendish's water stewardship plans through presentations, breakout group and plenary discussions, as well as discussed watershed context and concerns, water risks, opportunities, and stewardship actions. An in-person focus group and an online discussion brought together smaller groups

of specific stakeholders to identify and discuss water-related concerns. Furthermore, groups who were unable to attend a meeting were invited over email to provide their perspective on water-related concerns.

The objectives of each engagement were to hear stakeholders' perspectives. The sessions started by presenting information so that the stakeholders had a sufficient understanding of the context to be able to contribute to the discovery and discussion. The stakeholders were invited to share their perspectives on water-related concerns and suggestions for implementable water stewardship actions that could mitigate those concerns. Initial questions posed to stakeholders included:

1. What are your water-related concerns?
2. What are the water challenges you face?
3. What suggestions or ideas do you have for mitigation of these water risks and concerns?
4. What water stewardship actions would you like to see in the short-term and long-term?
5. What are the important water-related areas in the catchment?

SMRID and Cavendish used the information to outline their respective water stewardship plans and decide on short-term and long-term stewardship actions that would support their operation and the watershed. Once the water stewardship plans were complete, a final Working Group meeting was held to communicate the results and gather final feedback.

3.2 Working Group member organizations

The purpose of the Working Group was to advise and support planning and implementation of water stewardship plans. The Working Group members were regional representatives and individuals who have water stewardship expertise and are interested in being supportive. The Working Group meetings were held on October 26th 2021, January 20th 2022, April 12th 2022, and October 19th 2022, with participants from the following organizations;

- Ag for Life
- Agriculture and Agri-Food Canada
- Agriculture Research Extension Council of Alberta (ARECA)
- Alberta Agriculture and Irrigation (AAI)
- Alberta Innovates
- Alberta Irrigation Districts Association
- Canola Council of Canada
- Cavendish Farms
- City of Lethbridge
- Crop Sustainability Working Group
- Ducks Unlimited
- Eastern Irrigation District
- Lethbridge College

- Lethbridge Economic Development
- Nutrien
- Oldman Watershed Council
- Perry Farms
- Potato Growers of Alberta
- Potato Sustainability Alliance
- Prairies Economic Development Canada
- SCS Global Services
- SMRID
- University of Lethbridge
- Quattro Ventures (Farm)

3.3 Producer and key perspectives interviews

Through the early stages of this project, it became clear that the approach for implementing water stewardship for a smaller size producer operation (e.g., family farms) would be different than for other operations in the supply chain. This difference is largely driven by the lack of resources to dedicate to the administrative effort, the variation of requirements from different buyers and for different crops and the already high amount of paperwork and documentation. To achieve the project's objective of making water stewardship planning accessible and valuable to all points in the supply chain, the project team needed to hear producers' perspectives. Therefore, seven interviews were conducted with producers and individuals in the agriculture industry who work directly with producers. During the conversations interviewees were asked about their perspective on water stewardship documentation and more generally documentation of sustainability. They were asked about their familiarity with the Environmental Farm Plan (EFP) and their perspective on using it for reporting water stewardship. Interviewees were asked about the best type of organization to coordinate the data requirements of the buyers and the needs of the producers, with an ability to manage the overall administrative burden for producers, among other topics of discussion.

The main points heard, and the outcomes from these interviews, see section 7.4 of this report.

3.4 Alignment with the Environmental Farm Plan

The project explored the alignment between the Environmental Farm Plan (EFP) and water stewardship. The goal of this work was to determine if farms that have an EFP would already meet some or all of the criteria of water stewardship.

The EFP programming began in Canada in the 1990's in Ontario, and subsequently programming was established in other provinces (Statistics Canada, 2015). Government funding through Agriculture and Agri-Food Canada supported EFP programming across Canada in the early 2000's. In Alberta, the Agriculture Research and Extension Council of Alberta (ARECA) is the group that currently administers and supports the EFP (Alberta Environmental Farm Plan, 2023).

The EFP is a voluntary, whole-farm, self-assessment tool that focuses on assessing and understanding environmental risks on the farm operation. The producer uses the online workbook and the support of a technician to review their operation and develop a plan to address risks that are identified. Creating an EFP is voluntary, and the information is not shared with any other parties as it is confidential to the farm.

In addition to the benefits to the producer and the farm, having an EFP makes a producer eligible for certain cost-share funding programs under the Canadian Agricultural Partnership.

3.4.1 What is the EFP Plus?

A new optional addition to the EFP program has been developed called the EFP+. The EFP+ workbook is identical to the standard EFP workbook with one additional chapter. The EFP+ provides the farmer with an official equivalency score with the internationally recognized Farm Sustainability Assessment, which is administered by the Sustainable Agriculture Initiative Program (Alberta EFP, 2023). The Farm Sustainability Assessment (FSA) is designed as an international, industry-wide reference for sustainable farming, and it has several levels of certification (Sustainable Agriculture Initiative, 2023). Through completing an EFP+, famers can receive credit for all questions in the Silver-level FSA. Accreditation to the FSA is directed by the Sustainable Agriculture Initiative Program using the EFP+ documentation. An FSA audit would be conducted by a designated auditing body prior to receiving the credits and being certified to FSA Silver.

3.4.2 Alignment between the EFP and water stewardship

The project team worked with ARECA to understand the EFP and EFP + programs. The project team reviewed and assessed the questions of the EFP and the EFP+ to see how many of the criteria of the AWS Standard are in the EFP, as well as to determine if the principles of water stewardship are followed through creating an EFP. The project team determined that the process of developing an EFP is well aligned with creating a water stewardship plan, in the spirit of the AWS Standard. Many of the chapters in the EFP deal with risks to water supply and natural water bodies on a farm. The EFP is designed as a risk assessment tool and managing water-related risks is one of the main benefits of doing water stewardship.

Good water stewardship practice includes disclosure of one's progress against the actions identified in the water stewardship plan (see section 4). While the EFP program does not have a disclosure component, the EFP+ program can be part of disclosure if a producer management group is maintaining the FSA certification through audits of their EFP+ compliance.

3.5 Alignment with the work of the Potato Sustainability Alliance

The project explored the alignment between the work being conducted by the Potato Sustainability Alliance (PSA) and water stewardship. The goal of this work was to identify opportunities for the PSA to include water stewardship in their work on demonstrating sustainable potato production North America. Water is an essential input for growing and processing potatoes and being able to show

sustainable use of water resources is increasingly important.

The PSA is a North American wide organization that is focused on sustainability in potato production (Potato Sustainability Alliance, 2022). The PSA is a collaboration across the potato supply chain, bringing together producers, processors, marketers, buyers, academics, and environmental non-governmental organizations (NGOs) to protect the environment while improving productivity and profitability of potato production. The PSA collects information on a number of agricultural inputs and outputs including, but not limited to, fertilizer use, irrigation use, GHG emissions, pesticides, safety, and recycling (Potato Sustainability Alliance, 2022).

The PSA has developed an annual survey of sustainable practices that all their member producers complete. There are over 300 survey questions covering a wide range of on-farm practices and equipment. The current PSA survey questions (2021) were reviewed and assessed for alignment with water stewardship principles as well as with specific criteria in the AWS Standard. The project team worked with members of the PSA to understand what their current goals and activities are and to communicate project learnings and potential synergies.

3.6 Workshop with Small to Medium Enterprises in Agriculture

The project results were presented to a number of groups of people representing different corporations and organizations in the agriculture and agri-food sector, including the Potato Growers of Alberta (PGA) and the Alberta Irrigation Districts Association (AIDA).

The AIDA supports water management in Southern Alberta through promotion of efficient irrigation practices, participation in research and monitoring projects, and advocacy for the irrigation sector (Alberta Irrigation District Association, 2023). The AIDA works closely with 12 Irrigation Districts:

1. Aetna Irrigation District
2. Bow River Irrigation District
3. Eastern Irrigation District
4. Leavitt Irrigation District
5. Lethbridge Northern Irrigation District
6. Magrath Irrigation District
7. Mountain View Irrigation District
8. Raymond Irrigation District
9. Ross Creek Irrigation District
10. St. Mary River Irrigation District
11. United Irrigation District
12. Western Irrigation District

The 2023 AIDA annual conference was held on February 6-8, 2023, to bring together the Irrigation Districts and other collaborators. The conference included sessions on water management, building

capacity and growth, sustainable agriculture, technology, and water quality (Alberta Irrigation Districts Association, 2023). As part of the sustainable agriculture session, SMRID, Cavendish, PGA, and WaterSMART were hosted in a panel discussion of water stewardship across the agri-food supply chain. The panel presented the results and learnings from the AWF project work.

Founded in 1966, the PGA is a not-for-profit organization which focuses on increasing success of Alberta's potato industry through education, marketing, and research (Potato Growers of Alberta, 2018). Through newsletters, conferences, and bulletins, the PGA helps growers gain access to the latest information and technology, while promoting the industry to consumers, retailers, and international markets. The PGA funds various research projects and aims to educate the public and children on the benefits of potatoes and agriculture (Potato Growers of Alberta, 2018).

The PGA invited members of the project team to present key learnings from the AWF project to their membership (potato producers) at meetings held on March 7th and March 22nd, 2023.

4. Following the Steps of Water Stewardship

This pilot project followed the five steps of water stewardship in the AWS Standard, shown in Figure 2 below. The numerous criteria defined for each step were used as a guide for the pilot project work, and the water stewardship plans developed through the project work are written to align with the criteria.

Figure 2. The Alliance for Water Stewardship Standard defined five steps of water stewardship, represented in a circle as a process of continuous improvement. Image source: Alliance for Water Stewardship https://a4ws.org/the-aws-standard-2-0/)

The project team created a visual of the sequential steps, and key activities within each step, for water stewardship, Figure 3 below. The output from step 1 "Gather and Understand" and step 2 "Commit and Plan" is a complete water stewardship plan for the operation. Cavendish and SMRID completed both of these steps in the pilot project, and as a result each has a water stewardship plan for their site (see Appendix D: Example Plan - SMRID West Water Stewardship Plan and Appendix E: Example plan - Cavendish Farms Lethbridge Site Water Stewardship Plan). The water stewardship plan captures all the information gathered in step 1, and the commitments and the specific actions identified through step 2. Step 3 is implementing the specific water stewardship actions identified, which may require considerable time. Over the timeframe of this pilot project, short term implementation actions in the plans were started (and in some cases completed) by Cavendish and SMRID.

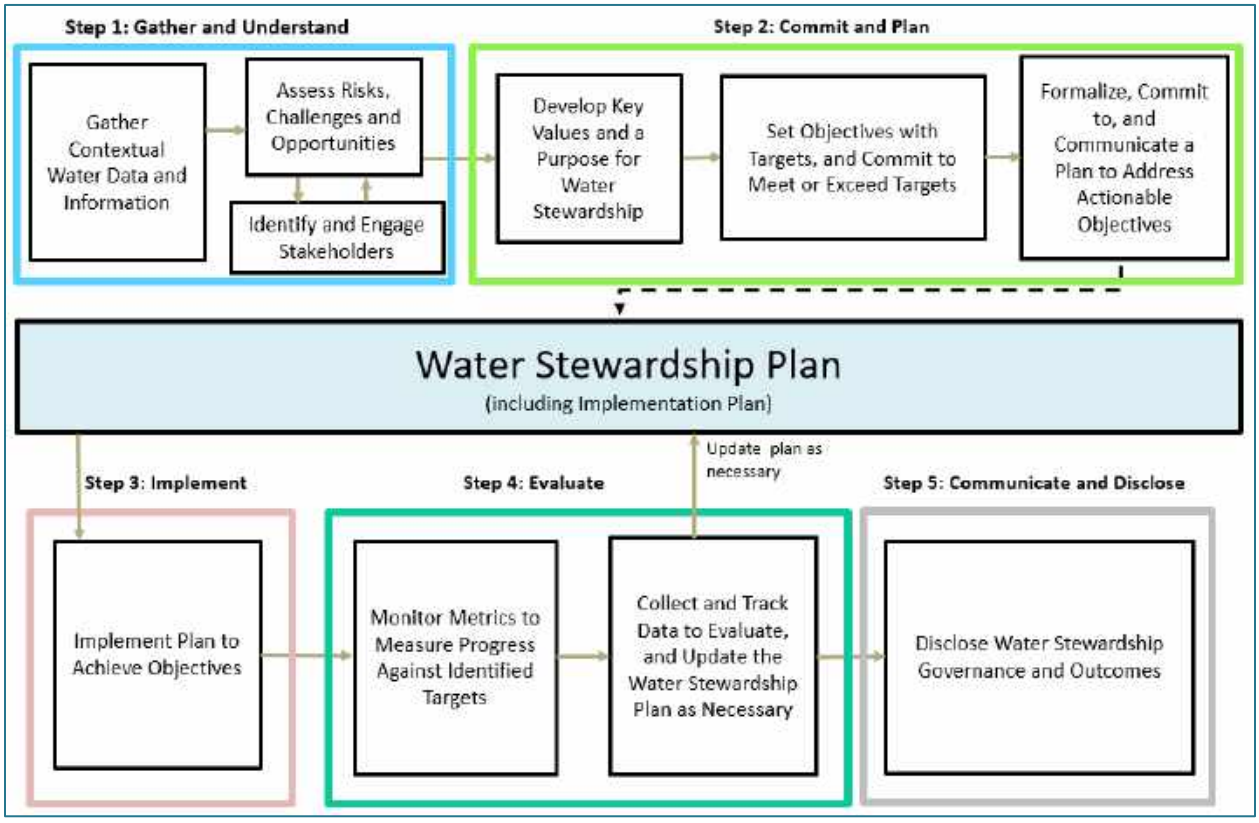

Figure 3. A visual representation of the sequence of activities for implementing water stewardship.

Step 3 requires implementing the actions identified in the water stewardship plan. Each action will have one or more metrics associated with it to gauge the success of implementation. This step can occur over an extended duration depending on the nature of the action, the cost to implement or organizational process. Step 4. "Evaluate," can occur over an extended duration as monitoring the progress for some of the metrics may require a significant period for measurement. Step 5, "Communicate and Disclose," is about building trust and relationships through communicating both positive and negative results of the water stewardship work. There is no specific format or audience, and it can be done in parallel to the other steps.

Following this pilot project SMRID and Cavendish will determine internally if they will continue working through steps 3, 4 and 5 of the water stewardship process. As discussed in section 2.2 of this document, an operation can choose to apply for certification to the internationally recognized AWS Standard if they complete the required criteria within the five steps. SMRID and Cavendish will conform to the AWS Standard if they complete the remaining steps following this project, and they will be able to choose if applying for and achieving certification through the audit process will be valuable for them.

5. The Business Drivers of Water Stewardship

One of the key questions that this project sought to answer is "what motivates an agriculture or agri-

food operation to do water stewardship?" A separate but related question is "what motivates an operation to complete formal documentation of their water stewardship work?"

In the following Section 5.1 the responses and information gathered related to the first question are summarized. The answer to the second question, "what motivates an operation to complete formal documentation of their water stewardship work?" often comes down to the specific risks that the operation faces. The details around the answer to that question are in Section 6.2.

5.1 Business Drivers

As with all businesses, operations in the agriculture and agri-food supply chain will not continue if they are not profitable. Understanding the drivers for each business to implement, water stewardship is vital. Two types of drivers were articulated by the water supplier, the processor and the potato producer engaged in this project:

- their values drive their commitment to stewardship (including water stewardship)
- they want to be able to sell their product

These drivers impact each level of the supply chain in slightly different ways. The potato processor may be expected to demonstrate sustainable inputs to their product to sell to their buyers. The potato processor may have contractual requirements of the farmers they purchase potatoes from, and if those requirements included a water stewardship practice, then the producers are motivated to comply or they will not be able to sell their crop. The water supplier's business is based on providing water and therefore confidence in the source of water supply and a public mandate is key to their operation. Each operation will determine for themselves if water stewardship is motivated by their buyers and other external pressures.

5.1.1 Demonstrating action through the supply chain

A key learning throughout the project was the system of pressure through the supply chain to demonstrate action related to sustainability. Figure 4 shows a simplification of this system of pressure through an agri-food supply chain.

Terms such as sustainability, sustainable sourcing, regenerative agriculture, and several others are being used in agri-food to refer to demonstrating responsible on-farm management practices in a variety of areas (e.g., GHG emission, social responsibility, water use), and which have to be based on good agronomy. For consumer-facing companies such as retailers, this requires knowing and documenting practices from throughout one's supply chain. The industry and subject matter experts involved in the AWF project observed increasing scrutiny and focus on sustainable sourcing in the past few years, and many different project participants noted the importance of getting ahead of more specific requirements being imposed in the future.

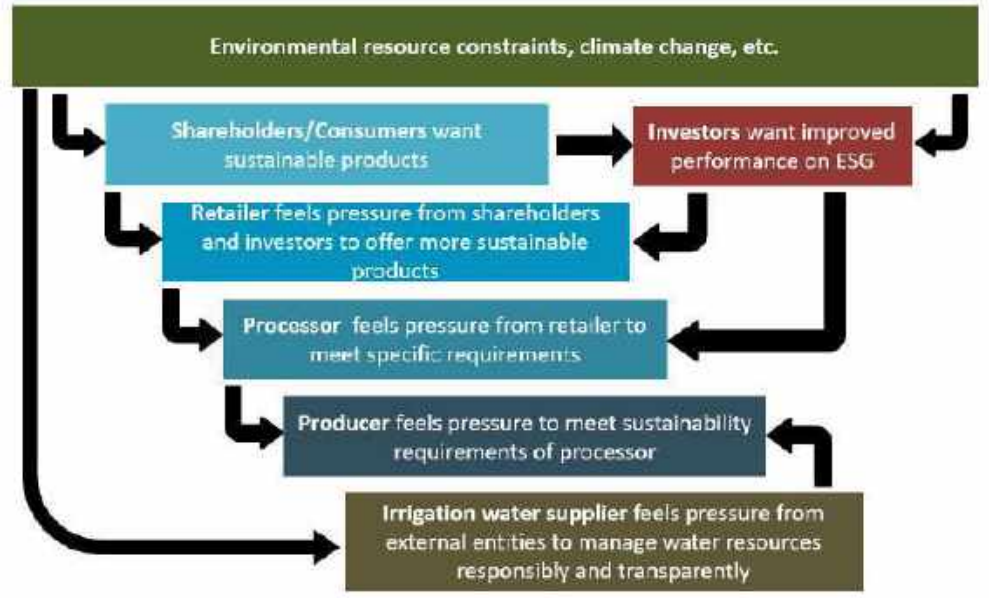

Figure 4. Pressure through the agri-food supply chain to demonstrate sustainable practices.

It is important to note that the producer is at the center of ensuring that the sustainable practices, which are grounded in good agronomy, are demonstrated. This project also found, during conversations with producers, the pressure through the supply chain is amplified at the individual farm operation because most producers grow multiple crops in rotation and could be facing differing standards and requirements from each crop sector. As Figure 5 shows, if each supply chain has a separate set of required sustainable farming practices, and a separate set of paperwork, the administrative burden to a single producer operation will be unmanageable, and the investment required will impact long-term business viability.

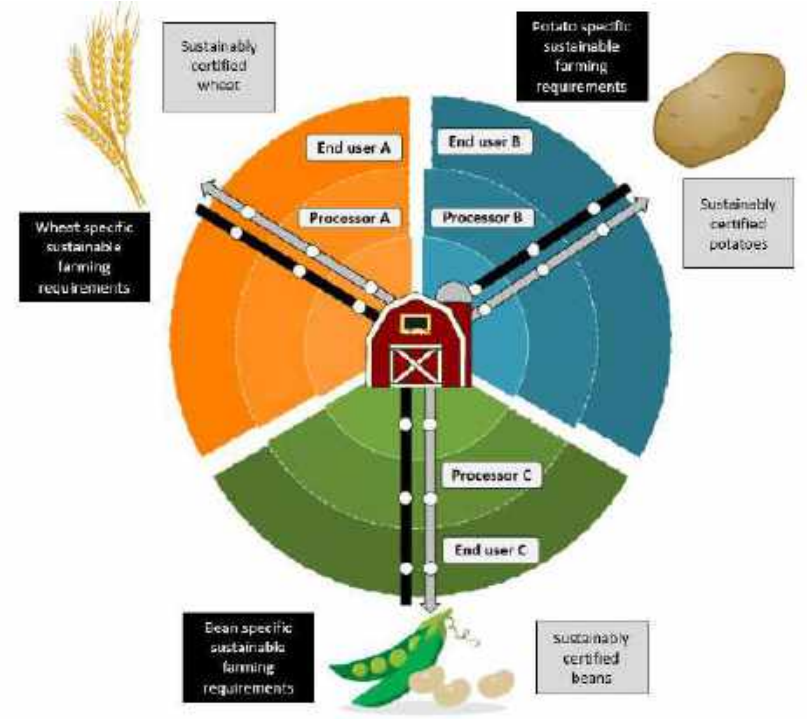

Figure 5. Crop rotation means the burden of demonstrating sustainability for multiple supply chains is on the farmer.

5.1.2 Learnings about the business drivers of water stewardship

Water stewardship is significantly more involved than doing a water use assessment for an operation, followed by implementing water efficiency and reporting a volume of water (and cost) saved on an annual basis. Despite this, water stewardship can result in much more significant benefits to the operation than water cost savings, such as being prepared for a major flood event. However, many of the specific benefits to one's business will not be possible to estimate in advance of starting the water stewardship process. It is challenging for many agriculture and agri-food businesses, particularly small operations, to justify the investment of effort and expense in water stewardship with no guaranteed minimum benefit.

5.2 Business Case

This project explored the business case for implementing water stewardship. The business case is directly related to a cost-benefit analysis of implementing an action. Compared to quantifying the business driver for water stewardship, the business case for a specific water stewardship action is a much easier calculation, and it can be done on a case-by-case basis. For example, a producer would recognize if the investment required to change to more efficient irrigation equipment is going to be earned back through cost savings by considering the total upfront cost, the changes in operating costs, and the volume of water saved.

In the project work, a high-level business case including some of the expected costs and benefits, was included with each water stewardship action listed in the final water stewardship plans developed by each of the Implementers, for example see pages 45-48 of Appendix D: Example Plan - SMRID West Water Stewardship Plan. These high-level business case factors were part of considering which actions would be short term versus long term, and these preliminary estimates of the business case for each action will help each Implementer start a more detailed evaluation of the potential costs and benefits from each action.

5.2.1 Learnings about the business cases of water stewardship actions

- **Company-specific:** The business case for each specific water stewardship action will be determined by many factors specific to the operation and the company.
- **Pre-emptive action**: The business case for proactively working towards sustainability market requirements is not easily quantified, but it is a risk-related decision to implement water stewardship.
- **Quantifying cost-avoidance**: Mitigating a risk through action or strategic planning is often cost-avoidance, creating a less tangible business case. The risk that is being avoided may never occur, making it difficult to confirm the investment paid off.
- **Value not directly related to costs**: Many of the intangible benefits of specific water stewardship actions identified throughout the project are not easy to quantify in a business case.

6. Identified Value and Benefits of Water Stewardship

Water stewardship can directly benefit the implementer through reducing costs by efficiency gains, increasing sales, improved product quality, investment commitments, or other direct benefits. Some benefits will come from specific implementation actions, while others arise from some aspect of the overall process of water stewardship. The following subsections describe the value and benefits that were identified in this project process.

Piloting water stewardship work simultaneously for multiple levels of the supply chain in one watershed was a valuable methodology for this project.

6.1 Value of Joint Implementation of Water Stewardship

The decision by the implementer participants to pursue joint implementation on this project was made because of the perceived value of this joint implementation. The following were value outcomes identified through the project work.

Stakeholders are engaged automatically: Suppliers and buyers are inherently considered stakeholder of an operation, therefore by completing the project simultaneously across multiple levels of the supply chain some of the stakeholders for each operation are automatically engaged. The stakeholder

engagement and consideration of water beyond the fence-line is a natural outcome of working with other operations.

Joint water stewardship actions can be identified: Opportunities for joint water stewardship actions can be more easily identified and action plans can be developed between implementers. This highlights one of the keys behind the AWS Standard, as mentioned above, that stakeholder engagement and thinking beyond the fence-line of the operation leads to more opportunities for success. For example, this project resulted in a specific water stewardship opportunity for Cavendish to use irrigation water sourced from the SMRID to irrigate the lawn at their facility. This action is specifically between the two project implementers and may not have been identified or actionable if the entities were not doing joint water stewardship planning.

Strong understanding of each other: If more than one implementer in a supply chain is working on water stewardship at the same time and jointly with each other, they will gain a very strong understanding of each others' operations, specifically in terms of their water related concerns and their opportunities in water stewardship. This will result in opportunities for future collaboration between the implementers on both water stewardship and other issues, due to strengthened relationships and an understanding of the ties between operations.

Sharing stakeholder engagement effort: Multiple implementers working together means the effort involved in doing stakeholder engagement is shared and therefor easier for each individual implementer compared to if they were doing it on their own. For this to be viable, the implementers must be in the same watershed area and share some of the same stakeholders. It is important to note that each implementer may have additional specific engagement to do for stakeholders that are not common.

Public communication and sector messaging: Multiple implementers working together can coordinate public communication to reach audiences more effectively. Coordination would create a clear and cohesive message of water stewardship that is representative of all implementers. The ability for each implementer to utilize their existing networks to communicate joint messages allows for a broader dissemination of the information.

Sustainable sourcing ties to joint effort across the supply chain: Sustainable sourcing inherently involves multiple levels of the supply chain. In order for distributors to sell products to buyers with the claim that they are sustainably sourced, it must be verified at all levels of the supply chain that feed up. This push within the industry more broadly offers opportunities for an entire agri-food supply-chain to work together to achieve better results. Collaboration allows for implementers to align and implement goals for a verifiable sustainable sourcing method.

Overcoming limited capacity through joint work ("Economy of scale"): Joint implementation of water stewardship allows for increased collaboration to overcome limited time and workforce capacity. This is highlighted above regarding stakeholder engagement and public communications, however in addition there are entities within the supply chain that naturally link to a number of other potential

implementers. In other words, an entity such as the water supplier or the processor (e.g., Cavendish Farms) may be able to support many producers together. For example, a producer in the same watershed could benefit from an Irrigation District or processor's watershed context document and stakeholder engagement results to support their own water stewardship plan.

6.2 The Value from Assessing and Managing Risks

A key benefit to going through the detailed process of water stewardship is identifying, assessing and managing risks to the operation. An operation's risks related to water can be regulatory, financial, operational or reputational. The water stewardship planning process invites the implementer to identify and assess all the risk for their operation, and then consider actions that will help manage some of the risks. Managing risks has direct and indirect value for an implementer, and may also benefit the local environment, the supply chain and other water users. See Appendix I: Risks and Opportunities Assessment Template, for guidance on identifying and assessing water-related risks and opportunities, and to see an example risk matrix.

The detailed documentation of water stewardship, in alignment with the AWS Standard, can itself be risk mitigation. Where an operation has risks related to public trust or social licence to operate, having a third party verified certification (AWS Standard), or publicly disclosing some documentation of water stewardship work and ongoing commitment, may help the organization manage that risk. Part of the rationale for the fifth step in the water stewardship process, "Communicate and Disclose," is to help build trust; by providing transparent, public disclosure, the organization will be able to build trust within the community and amongst is customer base.

The water stewardship process also enables addressing risks that are not directly within the operator's control, such as the risk of water shortage due to drought. The water stewardship process can lead the operator to form relationships with other water users and understand local water management, which may help them take practical action in preparation for drought. The operator will be able to participate in projects that are beyond their control through collaborative means based on the established relationships. For example, a collaborative watershed project in the South Saskatchewan River Basin confirmed that the expansion of one of the SMRID water reservoir is an effective way of increasing their resilience to drought.

7. Learnings and Recommendations for Water Stewardship in Agriculture in Alberta

As three levels of the potato supply chain completed their water stewardship planning and worked towards the project goals, several learnings, challenges, and solutions were identified. They have been outlined through this section of the report. In particular, the producer level of the supply chain provided many learnings and highlighted future recommendations relevant for water stewardship planning, and sustainability reporting in general, at the producer level of the supply chain.

This section of the report is organized with the overall learnings (7.1) and overall recommendations (7.2) at the beginning, and subsequent section providing further detail and categorization of where the learnings and recommendations came from within the project work. This structure is easier for a reader to find the key takeaways.

7.1 Overall Learnings

Overall, the project learnings about water stewardship in Alberta are summarized as:

1. **Following an organized process for water stewardship is helpful**. The project piloted water stewardship with the AWS Standard as a reference and guide. The organized process from the AWS Standard was very helpful for working through the complexity of water stewardship planning. This pilot project demonstrated that following the water stewardship process offers many benefits to the implementer and the watershed, including when certification is not the goal.
2. **Producers are the foundation of the agri-food supply chain**. If the pressures producers are facing are addressed, producers could support the sustainability reporting requirements for the whole supply chain and be fairly compensated for it.
3. **Balancing recognition of effort, incenting improvement, and support for reporting**. The Alberta agriculture industry has an opportunity to promote and celebrate their current water stewardship because much of operational work is already being done. However, it is necessary to ensure the effort of any related reporting is compensated for and the benefits are shared across the supply chain, not solely at the consumer-facing level (retailers).

Overall, the project learnings about implementing the AWS Standard are summarized as:

1. Conforming to the AWS Standard is not practical for producer operations due to time and resources required.
2. Certification to the Standard can be valuable, e.g., for international credibility, for the purpose of marketing.
3. The time required to complete all five steps may be several years.
4. Template documents are helpful for following the process due to the amount of detailed documentation, planning work, and external engagement.
5. One or more staff members with direct work at the facility and authority, or connection to decision-makers, is needed to complete all criteria.
6. A team of dedicated staff or supporting consultants would help to enable completion of the work.

7.2 Overall Recommendations

The recommendations start with those that will move the agriculture and agri-food industry in Alberta forward in reporting and celebrating sustainability activities, including water stewardship work. After

the list of four core recommendations, there is a list of three recommendations specifically for increasing water stewardship by members of various levels of the agriculture and agri-food supply chain.

The core recommendations coming out of this project overall are:

1. **Regular Watershed Meetings**: The Implementers and Working Group participants identified value from getting to hear each-other's perspectives, building relationships, and discussing the challenges and opportunities in the Oldman watershed through the collaborative process of the meetings held for the AWF project. Similar meetings of multisector representatives from the watershed can be held regularly, even outside of a project format. An annual meeting to present water stewardship work of all kinds would have multiple benefits. Collaborative planning for managing water in the region more broadly is recommended.
2. **Cost recovery.** The concept of cost recovery allows for recognition that a producer takes on costs associated with any new reporting requirement or sustainability practices. Throughout this project, cost recovery was identified as a solution to key producer barriers for water stewardship documentation, and sustainability-related reporting more broadly. It was not determined what entity bears the responsibility to pay for this, but it is a core recommendation from the project that this be pursued further. There is interest, and some examples of established precedent, for cost-recovery, or compensation, through the supply chain for a verified sustainable practice. The Canadian Roundtable for Sustainable Beef (CRSB) and Rahr Malting are two examples of supply chains and buyers that provide a financial incentive (in the form of premiums) for beef and grain producers meeting the operation and reporting requirements that demonstrate sustainable sourcing. This can be an example for the potato supply chain, and other sectors to establish mechanisms for cost recovery or compensation through the supply chain. The financial incentive does not need to be directly tied to the specific producer's costs for completing the paperwork or for changing their operational practices but could be applied through price adjustment for verified sustainable products to help offset capital and operations costs over time.
3. **Combine reporting requirements.** Current reporting requirements are already numerous and demanding for producers. To decrease this burden, annual reporting requirements of sustainability-related data, including water stewardship should be combined where possible. The recommendation is for buyers and crops sectors to work together and combine their sustainability reporting requirements. It is reasonable to see benefits to all members of the supply chain by combining reporting, particularly where the reporting is related to the same types of objectives and requesting similar information.
4. **Build understanding of the EFP+**: Many agricultural NGOs, crop sector groups, industry groups and other organizations related to agri-food supply chains are interested in finding a way to support producers and find a credible, measurable, and verifiable way to report their practices, and which does not place an unreasonable burden on the producer. The EFP+ is a potential solution identified through this work. Therefore, a key recommendation coming out of the project is to communicate it to many more entities in the industry and hear their perspective of

the potential opportunity and how it can be coordinated among the different agriculture sectors.

The recommendations from this project, specifically for increasing water stewardship by members of various levels of the agriculture and agri-food supply chain are:

1. Encourage and enable conversations relating to water among users in the watershed, including water suppliers, producers, processors and NGOs that support water management.
    a. Incentivize involvement, particularly for producers, and ensure the timing is aligned with the seasonality of farming operations.
    b. Link regular (annual) watershed conversations to a topic of common interest or concern (such as water quality) where there is potential for collective benefit (such as not increasing water utility cost).
2. Offer financial incentives to make appropriate operational changes in response to local water challenges and agriculture practices, and ensure the compensation is adequate to cover administrative costs. It was not possible to determine the entity responsible for offering these incentives, but some possibilities discussed include retailers or processors within the supply chain, and provincial or federal government economic development programs. Eventually the costs for these incentives will likely be incorporated in the price to the ultimate consumer.
3. Communicate the investment and work already being undertaken, with opportunities for involvement and economic value to be highlighted. This requires committed resources and expertise for successfully determining the audience, collaborating to identify key messages, and execution of the campaign.

7.3 Learnings and Success in Meeting Project Objectives

Some specific learnings were associated with each of the four identified project objectives, as described in Table 2.

Table 2: Learnings directly related to the objectives of the project

Objective	Success and Learnings
Develop an approach and framework for applying water stewardship planning across a full agri-food supply chain.	• This objective was achieved through a year of water stewardship planning done with an irrigation district, a producer, and a processor. • Separate approaches and frameworks are required for producers, compared to other entities in the supply chain such as ID's and processors.
Achieve water stewardship plan implementation, potentially to the level of certification, across the potato supply chain in southern Alberta.	• This objective was achieved, with two levels of the potato supply chain in Southern Alberta completing their water stewardship planning and implementation documents.

	• Implementation of short-term actions was feasible within the timeframe of the project. • A learning came through the engaged potato producer choosing not to complete a water stewardship plan due to administrative burden. A direct link between the work and economic value to the operation may have incentivized the producer.
Validate the benefits of water stewardship planning and implementation across a potato supply chain.	• This objective was achieved and several specific benefits were identified, as discussed in section 6 of this report. • Cavendish's interest in pursuing AWS Standard certification indicates recognition of value associated with third-party accreditation. • SMRID's water stewardship plan has been recognized to provide value for internal and external communication. • A learning from Cavendish identifying actions in partnership with SMRID shows value for coordinated planning as a supply chain. • A learning came from SMRID's implementation actions, many were already planned and underway prior to the project, showing water stewardship is already seen as valuable, but not formally documented.
Identify ways to support each level of the supply chain, particularly the producer level, in the currently evolving landscape of water-related metrics and reporting in the agriculture and agri-food supply chain.	• This objective was achieved, and several specific benefits were identified, as discussed in section 7.2 and 9 of this report. • An associated learning was the overarching challenge of reporting and data related to sustainability as a broader concept.

7.4 Learnings from the Producer Level of the Supply Chain

The project team worked to invite and capture perspectives from producers, particularly because it was recognized that water stewardship looks different for a farm operation, compared to an operation at another point in the supply chain. Several learnings and key themes were identified through hearing from producers.

Producers are committed to stewardship of their land and resources: A key motivation for practicing water stewardship and implementing water stewardship actions, is to pass on healthy and productive land to one's descendants. Producers are generally very connected to the land and aware of water-related challenges in their area. Therefore, producers are often already doing many aspects of water

stewardship without documenting it in a way that would align with the AWS Standard (see Figure 6). For the engaged producer in this project, significant investment in water management had been made prior to the project. Cost recovery opportunities are key for producers to see benefit of documentation.

Annual documentation is a burden: Documentation to meet sustainability-related reporting requirements for buyers is already onerous, particularly for potato producers. The reporting currently being required in order for a producer to sell their product is an administrative burden, and additional reporting may impact business viability.

Water stewardship is based on understanding your own water use and impact in the context of the larger watershed, and monitoring and making efforts toward continuous improvement, therefore documentation is required. This documentation becomes a barrier for future implementers (Figure 6).

Figure 6: Increasing sustainability-related documentation is an unreasonable burden for producers

There is a lack of recognition of the stewardship, sustainability and Best Management Practices (BMPs) producers are already doing. Producers in Alberta have made significant changes in their operations, they have invested in efficient and technologically advanced equipment, and much of this has benefited the environment and the community. However, generally all of this past work is not celebrated or recognized by the government, the general public, or the media, and instead farmers feel that they are being told that their operations need to change. The lack of recognition is also felt financially because the changes to operations and equipment may have cost a significant amount, but there is little or no compensation being offered to recognize that past investment.

Confusing terminology complicates messaging: Terms such as "sustainable," "sustainable sourcing" and "regenerative farming" are being used by many different entities (e.g., media, government, academia, retailers, public) to mean many things. They often are referring to environmental sustainability or specific types of farming practises that store carbon. The terms not only are not used consistently, but they are often used without understanding what that means in practice on a farm, and they disregard economic sustainability (that the farm business must remain viable).

Government lacks an understanding of agriculture: Policy decisions and communication by the Provincial and Federal governments often demonstrate a lack of understanding agricultural practice. An example of this lack of understanding is the fertilizer GHG emissions reduction plan, where the Federal government targets 30% reduction in fertilizer application emissions by 2030[1]. There is also potential unfairness from some types of benchmarking across the industry and across different geographies. Producers identified that demonstrating a 5% improvement from 'today' in a specific metric could be quite costly for an operation that has voluntarily made significant advances previously. The cost for incremental improvement would be much higher if the 'quick wins' have already been done, pointing to context around benchmarking.

The public lacks an understanding of agriculture: The public is generally not aware or connected to agriculture enough to understand and recognize when they are being told biased or incorrect information through media, marketing or other messaging. Producers also expressed the recognition that "if we don't tell our story someone else will tell it for us." The public is generally seeking cheap and healthy food and with growing awareness of environmental resource constraints and climate change, this creates a marketing arena that can take advantage of the public's lack of understanding of agriculture operations and put administrative burden on producers without increasing compensation.

Misleading language and messaging in the industry: Agricultural producers have expressed frustration around retailer messaging and optics of some sustainability marketing. Specifically, where the retailer messaging implies that producers don't know what they are doing, and the company or government is helping them do better.

Potential for data misuse: Producers expressed concerns about how data and information reported from the farm regarding water stewardship or sustainability could be used. Farmland is private and producer operations are proprietary, therefor data is considered private. Depending on what the information is used for, and if it is published, there can be risks to an operation in terms of competitive advantage.

Selecting appropriate metrics and measurements: Agriculture supply chains often span entire continents, or the entire world, with one retailer sourcing from many regions. However, farming practices are location-specific, based on the soil, climate, elevation, and many other factors. What is considered a sustainable farming practice in one region might be completely unfeasible or inappropriate in another. Therefore, sustainability reporting must be context-based. For example, water metrics cannot be simplified to the total volume of water used per kg of end product because producing the same crop in one region may use more water than another. A higher "crop per drop" does not directly relate to how sustainably or responsibly water is being utilized in that region. Some types of metrics will pit one region or producers against another with no benefit to the industry or the respective

[1] U of S researcher questions feds' fertilizer targets | The Western Producer

watersheds.

7.5 Learnings from Pilot Project Implementers

The pilot project Implementers, SMRID and Cavendish, identified several key learnings throughout the project around collaboration, leadership, identification of good work, and added value.

Key Themes	Learnings
Collaboration	• Collaboration between the Implementers and with stakeholders is key to understanding the watershed context. • A strong relationship is valuable to continue work and engagement in the watershed. • In PEI, Cavendish participates in a yearly meeting with government, environmental groups, and industry to ask and answer questions. This is an example of the type of event that could enhance collaboration in Southern Alberta.
Identification of Good Stewardship	• The project identified what the Implementers are already doing well. • Having the project align with the AWS Standard was helpful to benchmark current activities against international standards.
Added Value	• Water is more than a cost, and there is value in sharing how and how much water is used. • As a water supplier, SMRID would like to provide an affordable service, however infrastructure maintenance, optimization and expansion costs must be considered. • The project was helpful in identifying risks, which will be used for internal strategic planning to understand priorities.
Leadership	• By implementing water stewardship, other individuals or organizations may follow the lead. For example, other Irrigation Districts may want to develop a water stewardship plan.

8. Project Outcomes and Actions

Key Outcome

The key outcome from the project is that demonstrating water stewardship is an opportunity for both individual operations, and for the agriculture and agri-food industry broadly.

The key barriers to water stewardship in the supply chain appear to be at the producer level and they are much larger than only water, relating to the overall investment required for sustainability reporting. Ideally, producers will have a way to report their sustainability in a credible, measurable, and verifiable way that can be leveraged by the entire supply chain. This reporting would also ideally cover the entire farm, not just one crop, and does not place an unreasonable burden on the producer.

8.1 Water Stewardship Actions

As one of the goals of the AWF project, both SMRID and Cavendish created water stewardship plans, found as appendices to this report. These plans required the Implementers to identify ongoing, short-term, and long-term water stewardship actions while considering the watershed context and potential direct and indirect impacts to the Implementers and other water users (see section 10.3 for further explanation). As an outcome of this process, short-term actions were identified, and the Implementers began to carry out the actions during the project. SMRID's and Cavendish's short-term actions are described in Table 3 and Table 4, respectively.

Table 3: SMRID's short-term water stewardship actions

Action	Status and Benefits
Participate in a collaborative drought simulation exercise with other water users.	• SMRID participated in a drought simulation exercise held on June 10, 2022, with AIDA, other Irrigation Districts, and Municipal Districts. • This action demonstrates commitment to the community and improving water security.
Discuss which water quality parameters to review in particular regarding potential threats to people or the environment.	• SMRID to connect with Janelle Villeneuve and Alberta Agriculture in July 2022 to better understand the water quality data and future issues. • This action is to gain more value and a wider benefit from water quality data that is already being collected. • UPDATE: Meeting with Janelle Villeneuve took place, with discussion focused on ongoing water quality initiatives and evaluating the value provided by them.
Implement riparian care and invest in control structures for stability and planting.	• SMRID committed funding to Alberta Conversation Association, allowing them to apply for additional funding related to riparian care and control structures.

	• The project work includes wetlands, fencing, and other initiatives. • This action demonstrates a commitment to the local aquatic environment and will reduce water quality issues in SMRID-managed water and downstream.

Invest to replace SMRID canals with pipelines to reduce water evaporation and seepage losses.	• Several specific canals have been converted to pipelines in the West portion of SMRID between 2020 and the end of 2022.
	• Benefits include:
	  ○ Reduction in water losses from seepage and evaporation following the transition to pipeline.
	  ○ Reduction of the risk of hazardous materials spilling into the open canal and causing water quality concerns.
	  ○ Water savings and efficiency could lead to irrigation expansion and an increase of irrigable land.
	• UPDATE: 8 pipeline conversion projects and one major flood spillway project were completed over the off water season of 2021 to spring 2022.

Support initiatives with partner entities to plan and invest in stormwater management infrastructure to mitigate the impacts from major stormwater events.	• SMRID is participating in the Horsefly Regional Emergency Spillway Project through buying land and purchasing right-of-way for the project. • UPDATE: Tendering was completed, and construction began in late 2022 on the Horsefly project.

Support research and conversations with irrigation equipment and technology manufacturers (e.g. pivot companies) to potentially improve water use efficiency.	• Potential benefits include:
	  ○ Less water demand, less spill water, and overall less water needing to go through the SMRID system.
	  ○ Ability to have more detailed information about the water in the system.
	  ○ Ability to cut down of 'water poaching'.
	  ○ Ability to demonstrate to the public the collective commitment of irrigators to use water responsibly.

Provide guidance and support specific irrigation representative to the International Joint Commission watershed-level discussions regarding transboundary water management in the St. Mary and Milk Rivers.	• Beginning in July 2022, SMRID began to support participants of stakeholder meetings with the IJC task force. • Benefits of this action include strengthening international relationships, and possibly providing input in decisions about upstream water supply management to mitigate water supply risk.
Develop and roll-out an online system for	• An online system will improve the service to members of SMRID.

SMRID members to order water.	• UPDATE: The online water ordering application was launched during the 2022 irrigation season. They continue to make enhancements on the product over this winter as well.

Table 4: Cavendish's short-term water stewardship actions

Action	Status and Benefits
Build a relationship between Cavendish and the City of Lethbridge around water stewardship interest and collaboration.	• Cavendish and the City had an initial meeting, and discussions will be ongoing. • A relationship will build a positive image as a responsible and good corporate citizen.
Cavendish receives a proposal and supports a local watershed non-profit group to do an upstream watershed stewardship project.	• Supporting a local watershed non-profit will demonstrate a commitment to the aquatic ecosystem and water stewardship overall. • Projects such as riparian restoration will improve water quality in the watershed. • UPDATE: A meeting with the Oldman Watershed Council took place in October 2022.
Designate a staff position at Cavendish Farms Lethbridge that has ownership over actively improving water use efficiency and promote successes.	• The Billion Litre Project will be moving forward with a designated staff position. • Having one individual dedicated to water use efficiency will ensure targets are met and momentum is maintained to drive the associated actions forward.
Switch from municipal water supply to SMRID water to irrigate the Cavendish Farms Lethbridge facility lawn.	• Cavendish is completing preliminary design and pricing for use of SMRID water. • This action will decrease costs because the water per unit volume is cheaper.
Engage in and support discussions regarding watershed stewardship and planning.	• Cavendish will engage in an annual stakeholder meeting and the South Saskatchewan River Operational Model project to demonstrate commitment to the community and water security.

9. Barriers to Implementation of Water Stewardship in Agriculture and Agri-food Supply Chains

Water stewardship has clear value for the operator implementing it, other water users and the watershed where they are located, and other operators in the supply chain. However, there are barriers

to implementation for some operations, particularly producers. The following barriers to implementation of water stewardship were identified throughout this project. Potential solutions have been identified during this project but have not been tested thoroughly and would therefor need further exploration.

Resources required for documentation of water stewardship is not currently economical for producers. Given that potato producers are overburdened with documentation to meet existing buyer and industry requirements, additional water stewardship reporting is unrealistic. Incorporating reporting in something producers already do for documentation, or offering financial compensation for the additional administrative efforts would make it more manageable. As discussed in section 3.4 of this report, the EFP is already used by many farm operations in Alberta. The existing chapters of the Alberta EFP align with many components of water stewardship, with some central aspects of water stewardship that are not currently covered through completing an EFP. Preliminary discussions were held through this project to identify what minor additions to the EFP could be made to encompass those aspects of water stewardship.

Stakeholder engagement and time requirement are key barriers to producer water stewardship planning. The stakeholder engagement component of water stewardship planning was seen as a particular barrier for the producer engaged in this project. See Appendix H: Water Stewardship Facilitation Guide for a deliverable document developed in response to this barrier. Additionally, the time requirement over the course of the project itself was also found to be a barrier for the producer in that the time investment was significant and it was not seen to result in a tangible benefit to the operation.

Across the agri-food supply chain there is a need to focus on all aspects of sustainability rather than specifically on water stewardship. This presents an opportunity to integrate water stewardship into existing sustainability reporting and practices, but also presents a challenge to producers and processors to identify the appropriate tool and set of standards for sustainability reporting. The EFP provides an option for consolidating all sustainability related reporting into a single tool.

The agriculture and agri-food industry across Canada is not aligned on sustainability-related standards and reporting. The EFP explored in this project has been identified as a potential solution at a provincial level. Most other provinces in Canada also have an EFP program, but the EFP varies provincially with different chapters and requirements. A future opportunity is to connect with the organizations that administer the EFP program in each province and present the success of using the EFP in Alberta. If the agriculture and agri-food industry across Canada can align on reporting, the whole industry sector can benefit.

The challenge and opportunity in data consolidation, management, privacy and security: Data is key to meaningful reporting and accountability for water stewardship and demonstrating sustainability. This is the same for a small farm operation and for a large retailer. We learned producers are cautious about

sharing data, particularly when it leaves their control and may be released publicly. This is a barrier to willingness to participate in water stewardship and other disclosure, and it may contribute to the lack of understanding agriculture that is seen outside of the industry. The opportunity is in consolidating data from multiple farms and communicating context with the data. This role of data management, consolidation and disclosure could be done by a larger, trusted organization in the industry. For example, the PSA is moving into this role for the potato supply chain.

Individual producers do not have a strong voice in the discussion of sustainability standards and reporting. Although individual producer operations in Canada are the foundation of the agriculture industry, and the requirements to report sustainability are compounded from multiple supply chains on a single farm, individual producers do not have the economic power to influence sustainability reporting overall. Crop sector groups, organizations representing producers, and individual producers themselves can potentially work together to overcome the reporting challenge. If the crop sector groups can come together to identify a single, all-encompassing reporting system for sustainability in agriculture across Canada, that can be presented as a marketing opportunity to the processor and retailer levels of the supply chain (domestic and international) and achieve a win-win for the producers and the industry.

Following the AWS Standard is an intensive process. The many criteria listed for each step of the AWS Standard, and the level of detailed documentation required through the process is time consuming and labour intensive. This is appropriate and necessary for a rigorous and reputable international standard. See Appendix C: Plain-language interpretation of the AWS Standard criteria for a farm for a list of the criteria in the AWS Standard. Focusing on the principles and intention of water stewardship, rather than meeting all the criteria, can still have value to an operation and the watershed in circumstances where the level of rigour and the certification will not be manageable or valuable to a specific operation.

10. Deliverable Documents

A number of deliverables were developed throughout the project. The following sections describe the documents and their purpose, and link to each deliverable document appended to this report.

10.1 Project Summaries

As part of completing the project, two one-page summaries were prepared. One was designed for an audience of producers, and the other was designed for an audience of Irrigation Districts. The summaries were intended to inform someone who was unaware of the project of the salient points of what was done, what was learned, and the results. Appendix A: Summary of project learnings for a producer perspective, is the summary prepared for someone coming from a producer's perspective, and Appendix B: Summary of project learnings for an irrigation district perspective, has the summary prepared for someone coming from the perspective of an Irrigation District.

10.2 Materials Developed to Support Producers

The objectives of the AWF project included to "develop an approach and framework for applying water stewardship planning across a full agri-food supply chain", and to "identify ways to support each level of the supply chain, particularly the producer level, to align with the currently evolving landscape of water-related metrics and reporting in the agriculture and agri-food supply chain."

Several documents were developed to support and enable water stewardship planning by interested producers. Two of these documents are tools aligned with the AWS Standard, which clarify AWS requirements within the context of agriculture in Alberta.

Facilitating Stakeholder Engagement: Practicing water stewardship requires understanding the watershed context in which the producer is operating, and connecting to the stakeholders of the operation to understand their water needs, concerns, and suggestions for water stewardship actions. Small-scale producers are often very experienced water managers; however, we learned they lack the time or resources to document the local watershed and do stakeholder engagement, which is key to water stewardship. There is an opportunity for a larger agricultural entity, such as an irrigation district or crop sector group, to coordinate stakeholder engagement and conversations about the watershed context.

The Facilitating Stakeholder Engagement document is designed to provide guidance to a larger agricultural entity in a localized area to support a group of producers with water stewardship and stakeholder engagement. This brief document defines stakeholders, and provides guidance around understanding the watershed, identifying stakeholders, engagement formats and objectives, event templates, documenting the engagement, and communication tools.

The deliverable document Facilitating Stakeholder Engagement is found in Appendix H: Water Stewardship Facilitation Guide.

Plain-language interpretation of the AWS Standard: The criteria specified in the AWS Standard are written using general language to be widely applicable, but this also makes the descriptions difficult for an implementer to understand for their operation. This deliverable document first lists each AWS criteria as stated in the standard, while also interpreting it in plain language that is for the perspective of a farm operation. Each criterion in the standard has one or more 'indicators' defined for it. In this deliverable the details of each indicator have been removed, leaving only the number for reference, and its plain-language interpretation. This tool is intended as guidance for a producer operation to pursue water stewardship in alignment with the AWS Standard.

The deliverable document AWS and EFP+ Crosswalk is found in Appendix C: Plain-language interpretation of the AWS Standard criteria for a farm.

Support for producers through exploring the EFP+: The project team also completed work to support

producers in Alberta through exploring the EFP+ as a potential single-reporting-system for sustainability related documentation of the farm operation. There are no formalized deliverable documents from this work, but the project team completed work to compare what components of water stewardship are already covered by the EFP+, and for the areas that are not covered, potential additions to the EFP+ were identified. These drafted documents have not been included in the appendix to this report.

Because most of the chapters to complete in the EFP+ are optional, and dependent on the type of farm, the comparison and evaluation of the EFP+ is only at a preliminary level.

10.3 Water Stewardship Plans

Comprehensive water stewardship plans were created for the St. Mary River Irrigation District (SMRID) West site and the Cavendish Farms Lethbridge Site. An example version of each of the two plans is a deliverable from this project. The example plans will help future water stewardship implementers complete the first two steps of water stewardship to the point of developing their own plan. These example plans compile and organize the information that was gathered and the work that was done through the project for water stewardship planning. Each plan is essentially four or more documents developed at different points through the project, all combined into one. The plan can be used by the implementer as an internal document for communicating results, and for keeping track of progress as an implementer works through the process of water stewardship. Additionally, the plan can be provided to an auditor if the implementer is seeking to be certified to the AWS Standard. These example versions outline how each section of the plan aligns with the AWS Standard criteria.

The plans capture information relevant to water stewardship about the implementer's operations, location, connections within the watershed, and water use. They describe the stakeholder engagement process that was conducted, the risks and opportunities assessment that was done, and the of both short-term and long-term water stewardship activities.

The deliverable document SMRID West Water Stewardship Plan is found in Appendix D: Example Plan - SMRID West Water Stewardship Plan.

The deliverable document Cavendish Farm Lethbridge Site Water Stewardship Plan is found in Appendix E: Example plan - Cavendish Farms Lethbridge Site Water Stewardship Plan.

10.4 Framework for the AWS Standard

The framework is a guidebook introducing the AWS Standard, the five steps for water stewardship, and the types of activities to complete within each step (based on the process shown in Figure 3). The framework is a tool specifically for Sustainability Officers, Board Members, Management Teams, or similar roles at an organization or company who are curious about water stewardship and the AWS Standard.

The AWS Standard follows five steps of Gather and Understand, Commit and Plan, Implement, Evaluate,

and Communicate and Disclose. For each step, the framework provides a high-level overview of what is involved to meet the AWS Standard requirements. The framework is an introduction only and it does not replace the detailed guidance documents published by the Alliance for Water Stewardship.

The framework includes a list of questions aligned with each step and criteria of the AWS Standard. Future implementers are invited to read through the "yes" or "no" questions, and wherever their answer is "yes" that indicates an aspect of water stewardship that their organization has already accomplished. Any "no" responses indicate where the organization has a gap in water stewardship. This list of questions will provide the potential implementer with a sense of what their organization would need to do to implement water stewardship and achieve AWS Standard certification.

10.5 Water stewardship one-page summary template

The project team identified a need for a summary that would capture the strategic focus of the water stewardship work for each implementer organization. A template was developed that can be completed by an organization starting on the process of water stewardship. The template deliverable document is in Appendix G: Water Stewardship One-Page Summary Template, and examples of completed summaries are found at the beginnings of the water stewardship plan documents in Appendix D: Example Plan - SMRID West Water Stewardship Plan and Appendix E: Example plan - Cavendish Farms Lethbridge Site Water Stewardship Plan. The one-page summary can be helpful for building understanding and getting agreement internally, and it can support succinct messaging to external parties. It can also keep the complex process of water stewardship planning oriented toward the same objectives over time.

The one-page summary is designed to highlight where water stewardship fits with the established corporate values and other stewardship related work of the implementer organization. It will also break out the objectives defined by the implementer into logical categories: watershed context and stakeholder engagement, impact mitigation within the operational boundary, impact mitigation beyond the operational boundary, and internal collaboration.

10.6 Template for Risks and Opportunities Identification and Assessment

Considerable time was spent during the AWF project on identifying risks and opportunities and then identifying what water stewardship actions would be appropriate and valuable responses to those risks and opportunities. All implementers pursuing water stewardship will need to follow a similar process; therefore, a high-level guidance document has been prepared with some template tables that may help a future implementer.

Appendix I: Risks and Opportunities Assessment Template identifies what was done in the AWF project and combines the process of identifying risks, an example risk ranking matrix that could be used, and a table for aligning opportunities and risks and identifying potential water stewardship actions.

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Appendix A: Summary of project learnings for a producer perspective

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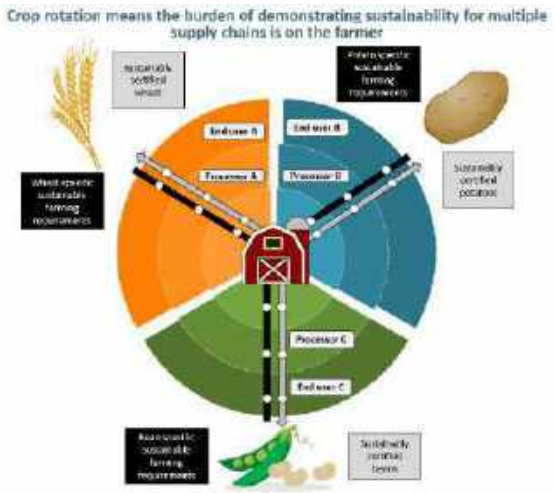
Sustainable Sourcing Pressures Converge on Producers

From March 2021 to March 2023, a pilot project centered around the Oldman River Watershed was conducted to explore water stewardship through the agri-foods supply chain in southern Alberta. Three levels of the potato supply chain were involved: St. Mary River Irrigation District (the water supplier), a potato producer operation near Taber, and Cavendish Farms Lethbridge site (the processor). Many diverse organizations with expertise in agriculture and water contributed to the project, which was coordinated by WaterSMART Solutions Ltd.

What we learned

- Commitment to stewardship: Producers are committed to the principles of stewardship.
- Lack of recognition for pre-existing sustainability work: Producers feel the effort and investment they have already made in sustainable practices are not being recognized, and there is no cost-recovery and compensation being offered.
- Documentation burden: A large volume of annual paperwork would be a barrier for producers to document water stewardship. Administrative burdens related to certification or sustainability reporting can affect business viability for producers.
- Sustainable sourcing documentation: Many different supply chains (retailers/key buyers) for agricultural products are starting to look for some form of measurable and verifiable way to demonstrate sustainable sourcing. In many cases, buyers have not yet defined sustainable sourcing for their business, or what they require to demonstrate it. The risk is there will be a lack of alignment around reporting requirements among buyers, which would complicate the reporting process for producers.
- Pressure on the producer: Crop rotation means producers have the burden of demonstrating sustainability for multiple supply chains.



Results

The Environmental Farm Plan (EFP) is a viable tool: In Alberta, the EFP is an online self-assessment tool that supports the understanding and management of environmental risks for the whole farm. The EFP is now benchmarked with an internationally recognized agriculture sustainability standard. Therefore, there is an option for the EFP to be a verifiable means of demonstrating farm sustainability to all buyers in an operation through a single documentation effort.

Opportunities for compensation: There is interest, and some established precedent, for cost-recovery/compensation going through the supply chain for verified sustainable practice. The EFP is shown to be able to support this.

Appendix B: Summary of project learnings for an irrigation district perspective

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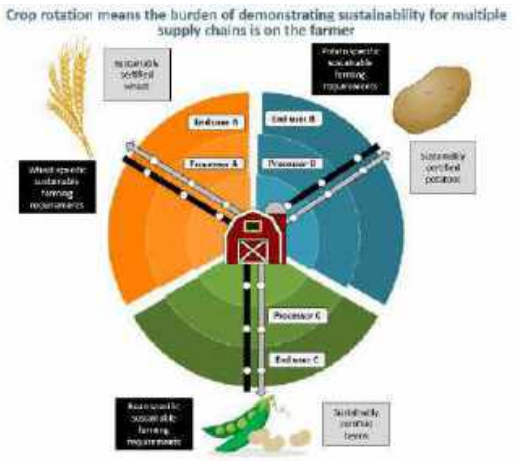
Documenting Irrigation District Water Stewardship

From March 2021 to March 2023, a pilot project centered around the Oldman River Watershed was conducted to explore water stewardship through the agri-foods supply chain in southern Alberta. Three levels of the potato supply chain were involved: St. Mary River Irrigation District (SMRID; the water supplier), a potato producer operation near Taber, and Cavendish Farms Lethbridge site (the processor). Many diverse organizations with expertise in agriculture and water contributed to the project, which was coordinated by WaterSMART Solutions Ltd.

What we learned

- The SMRID is a water steward: The project assessed the SMRID operations, management, and current initiatives against the criteria set by the Alliance for Water Stewardship Standard.
- Managing risks: Water stewardship planning and documentation can help one understand and manage the risks to one's operation, as well as benefit the watershed and other water users.
- Benefits of joint planning: There are more opportunities and benefits possible through joint implementation of water stewardship. Specific benefits include a strong understanding of each other's operations and perspectives, and easier and less time-consuming stakeholder engagement, when done jointly.
- Documenting sustainability: Water stewardship in the agri-food supply chain is closely linked with demonstrating overall sustainability. There is increasing scrutiny around responsible use of water resources from retailers, restaurants, consumers, and other parties outside the industry.



Results

Key document: The Water Stewardship Plan for the SMRID West, compiles all the relevant information of the SMRID and the local watershed, and supports ongoing work in planning and documenting further water stewardship actions. The Water Stewardship Plan includes the context of the local watershed, the potential risks and opportunities, and the list of water stewardship actions. A public version of the Water Stewardship Plan has been released as a guide for other irrigation districts.

Water stewardship is designed around the principle of continual improvement, and requires considering the area and the resources beyond the operation's fence line. Engaging with other water users in one's area is central to the planning process. Therefore, water stewardship supports ongoing relationships within the watershed and encourages finding solutions to localized challenges.

Appendix C: Plain-language interpretation of the AWS Standard criteria for a farm

Producer Plain-language guidance - Alliance for Water Stewardship Standard v. 2.0 and the Alberta Environmental Farm Plan				
AWS: The Alliance for Water Stewardship (AWS) is a global certification standard for water stewardship in industry, agriculture, commercial business and institutions. The AWS Standard involves a comprehensive water management framework				
AWF: Agriculture's Water Future (AWF)				
EFP: The Alberta Environmental Farm Plan (EFP)				
AWS Step	**AWS Criterion**	**AWS Indicator**	**AWS Indicator**	**Interpreted for an agriculture producer**
1				
	1.1			
	Gather information to define the site's physical scope for water stewardship purposes, including: its operational boundaries; the water sources from which the site draws; the locations to which the site returns its discharges; and the catchment(s) that the site affect(s) and upon which it is reliant.	1.1.1	1.1.1 - The physical scope of the site shall be mapped, considering the regulatory landscape and zone of stakeholder interests, including: • Site boundaries; • Water-related infrastructure, including piping network, owned or managed by the site or its parent organization; • Any water sources providing water to the site that are owned or managed by the site or its parent organization; • Water service provider (if applicable) and its ultimate water source; • Discharge points and waste water service provider (if applicable) and ultimate receiving water body or bodies; • Catchment(s) that the site affect(s) and is reliant upon for water.	Map the farmstead sites and the field groups - include all water-related physical attributes on the map (e.g. water bodies, dugouts, irrigation equipment, drainage ditches, culverts, berms, irrigation canals and pumps). Map the farm within the catchment from which it receives water and where drainage or runoff flows back to. Identify the source(s) of water to the farm.
	1.2			
	Understand relevant stakeholders, their water-related challenges, and the site's ability to influence beyond its boundaries.	1.2.1	1.2.1 - Stakeholders and their water-related challenges shall be identified. The process used for stakeholder identification shall be identified. This process shall: - Inclusively cover all relevant stakeholder groups including vulnerable, women, minority, and Indigenous people; - Consider the physical scope identified, including stakeholders, representative of the site's ultimate water source and ultimate receiving water body or bodies; - Provide evidence of stakeholder consultation on water-related interests and challenges; - Note that the ability and/or willingness of stakeholders to participate may vary across the relevant stakeholder groups; - Identify the degree of stakeholder engagement based on their level of interest and influence.	Make a list of which other producers and businesses in your immediate area that use the same water source(s). If water is provided by an irrigation district or management authority identify that organization as well. Make a list of communities that are upstream or downstream of the farm in the catchment identified in 1.1.1. Identify if there is an organization that does stewardship work for your local river or lake, and the source of water to the farm.
		1.2.2	1.2.2 - Current and potential degree of influence between site and stakeholder shall be identified, within the catchment and considering the site's ultimate water source and ultimate receiving water body for wastewater.	Review the list from 1.2.1 and clearly identify the organizations that you interact with mos for your farming operation.
	1.3			
	Gather water-related data for the site, including: water balance; water quality, Important Water-Related Areas, water governance, WASH; water-related costs, revenues, and shared value creation.	1.3.1	1.3.1 - Existing water-related incident response plans shall be identified.	Identify emergency response planning documents.
		1.3.2	1.3.2 - Site water balance, including inflows, losses, storage, and outflows shall be identified and mapped.	Identify on a map where the water used on your farm comes from and where wastewater and drainage water goes, the location of outflow/runoff/drainage points leaving the farm.
		1.3.3	1.3.3 - Site water balance, inflows, losses, storage, and outflows, including indication of annual variance in water usage rates, shall be quantified. Where there is a water-related challenge that would be a threat to good water balance for people or environment, an indication of annual high and low variances shall be quantified.	Calculate how much water is used by the farm in a year. Calculate roughly how much wastewater is produced and how it is treated (where it goes). Highlight which water use will change a lot from year to year and note why.

		1.3.4	1.3.4 - Water quality of the site's water source(s), provided waters, effluent and receiving water bodies shall be quantified. Where there is a water-related challenge that would be a threat to good water quality status for people or environment, an indication of annual, and where appropriate, seasonal, high and low variances shall be quantified.	Identify if the quality of water used on farm is good for it's purpose, and if there are any concerns about specific parameters. List any water quality tests that are done on the farm. Identify the quality of wastewater leaving the farm and/or runoff water.
		1.3.5	1.3.5 - Potential sources of pollution shall be identified and if applicable, mapped, including chemicals used or stored on site.	Identify, and if applicable, map the locations of potential risk of contamination and other water-related risks, including chemicals used or stored on site.
		1.3.6	1.3.6 - On-site Important Water-Related Areas shall be identified and mapped, including a description of their status including Indigenous cultural values.	Identify natural waterbodies (e.g. wetlands, creeks, rivers) on the map of the site (indicator 1.1.1) and note if they are used by other people or animals, or if they are of cultural significance.
		1.3.7	1.3.7 - Annual water-related costs, revenues, and a description or quantification of the social, cultural, environmental, or economic water-related value generated by the site shall be identified and used to inform the evaluation of the plan in 4.1.2.	Tally the estimated total annual water-related costs and revenues on your operation. If you have a wetland or environmental easement area on your property note the rough acreage.
		1.3.8	1.3.8 - Levels of access and adequacy of WASH at the site shall be identified.	Describe if drinking water and sanitation facilities are available on the farm for all family and employees, and note if they comply with Alberta provincial Operational Health & Safety regulations.
	1.4			
	Gather data on the site's indirect water use, including: its primary inputs; the water use embedded in the production of those primary inputs, the status of the waters at the origin of the inputs (where they can be identified); and water used in out-sourced water-related services.	1.4.1	1.4.1 - The embedded water use of primary inputs, including quantity, quality and level of water risk within the site's catchment, shall be identified.	List the primary inputs for the farm (e.g. fertilizer, diesel fuel, livestock feed) and if they are sourced from your local area, or far away. Also note if they require a lot of water for production.
		1.4.2	1.4.2 - The embedded water use of outsourced services shall be identified, and where those services originate within the site's catchment, quantified.	List the outsourced services for the farm and if they are sourced from your local area or far away. Note if those services require a lot of water.
Step 1 - Gather and Understand		1.4.3	1.4.3 - *Advanced Indicator* - The embedded water use of primary inputs in catchment(s) of origin shall be quantified.	*Advanced indicator*: Calculate how much water is used to produce all the primary inputs your farm relies on.
	1.5			
	Gather water-related data for the catchment, including: water governance, water balance, water quality, Important Water-Related Areas, infrastructure, and WASH.	1.5.1	1.5.1 - Water governance initiatives shall be identified, including catchment plan(s), water-related public policies, major publicly-led initiatives under way, and relevant goals to help inform site of possible opportunities for water stewardship collective action.	Identify any water management and planning documents in place for your local waterways. If possible, contact the local water stewardship organization and ask if they are doing any agriculture-related initiatives for improving water use or water quality.
		1.5.2	1.5.2 - Applicable water-related legal and regulatory requirements shall be identified, including legally-defined and/or stakeholder-verified customary water rights.	Know the local water-related legal and regulatory requirements relevant to your operation.
		1.5.3	1.5.3 - The catchment water-balance, and where applicable, scarcity, shall be quantified, including indication of annual, and where appropriate, seasonal, variance.	Contact the local water stewardship organization and ask about the status of the local waterway(s) in terms of available water, water scarcity, and healthy ecosystems.

		1.5.4	1.5.4 - Water quality, including physical, chemical, and biological status, of the catchment shall be identified, and where possible, quantified. Where there is a water-related challenge that would be a threat to good water quality status for people or environment, an indication of annual, and where appropriate, seasonal, high and low variances shall be identified.	Contact the local water stewardship organization and ask about the status of the local waterway(s) in terms of water quality.
		1.5.5	1.5.5 - Important Water-Related Areas shall be identified, and where appropriate, mapped, and their status assessed including any threats to people or the natural environment, using scientific information and through stakeholder engagement.	Understand if your local area has key wildlife areas centred around water, or reservoirs/lakes that are economically important. Understand if these waterbodies are considered healthy, declining, or unhealthy.
		1.5.6	1.5.6 - Existing and planned water-related infrastructure shall be identified, including condition and potential exposure to extreme events.	Understand what water infrastructure is upstream of the farm and what, if any, water infrastructure is used to convey water to the farm. Understand if any of these assets are nearing the end of their life-span or is at risk from extreme events.
		1.5.7	1.5.7 - The adequacy of available WASH services within the catchment shall be identified.	Note if any communities in your local area do not have access to drinking water or sanitation servicing, and if this is a challenge for the community.
		1.5.8	1.5.8 - *Advanced Indicator* - Efforts by the site to support and undertake catchment level water-related data collection shall be identified.	*Advanced indicator*: Note the type of support you provide to help collect data about local waterbodies.
		1.5.9	1.5.9 - *Advanced Indicator* - The adequacy of WASH provision within the catchments of origin of primary inputs shall be identified.	*Advanced indicator*: Note if the catchments where primary inputs come from have good drinking water and sanitation widely available.
	1.6			
	Understand current and future shared water challenges in the catchment, by linking the water challenges identified by stakeholders with the site's water challenges.	1.6.1	1.6.1 - Shared water challenges shall be identified and prioritized from the information gathered.	List the broad concerns and challenges related to water that water users in your area share.
		1.6.2	1.6.2 - Initiatives to address shared water challenges shall be identified.	Identify at least one action that can be done, on your operation or in the local area, that addresses or partly addresses each challenge listed in 1.6.1.
		1.6.3	1.6.3 - *Advanced Indicator* - Future water issues shall be identified, including anticipated impacts and trends	*Advanced indicator:* Circle the water challenges on the list from 1.6.1 that are expected to get worse in the future. Note the main impacts you expect from that happening.
		1.6.4	1.6.4 - *Advanced Indicator* - Potential water-related social impacts from the site shall be identified, resulting in a social impact assessment with a particular focus on water.	*Advanced indicator:* Describe the ways that water coming to your farm or wastewater or runoff water leaving your property can impact the neighbouring properties or the neighbouring communities. If there are notable positive impacts to the community (economic? recreational?) from water or irrigation on your property, describe those.
	1.7			
	Understand the site's water risks and opportunities: Assess and prioritize the water risks and opportunities affecting the site based upon the status of the site, existing risk management plans and/or the issues and future risk trends identified in 1.6.	1.7.1	1.7.1 - Water risks faced by the site shall be identified, and prioritized, including likelihood and severity of impact within a given timeframe, potential costs and business impact.	Evaluate the risks on your farm site, score and rank them. Determine your prioritization for risk management.
		1.7.2	1.7.2 - Water-related opportunities shall be identified, including how the site may participate, assessment and prioritization of potential savings, and business opportunities.	Identify the water-related opportunities for your operation. This may include where water efficiencies would result in cost saving or energy efficiency, changing practices could improve water quality and therefore long-term profits, or reducing impacts of flooding or drought, etc.
	1.8			
	Understand best practice towards achieving AWS outcomes: Determining sectoral best practices having a local/catchment, regional, or national relevance.	1.8.1	1.8.1 - Relevant catchment best practice for water governance shall be identified.	Understand the way decisions are made by the entity that manages the water source for your operation.
		1.8.2	1.8.2 - Relevant sector and/or catchment best practice for water balance (either through water efficiency or less total water use) shall be identified.	Identify the best practices for water efficiency for your type of farming operation (e.g. low pressure pivot irrigation, drip irrigation, automated livestock watering troughs) and for managing runoff to reduce the flood risk downstream.

		1.8.3	1.8.3 - Relevant sector and/or catchment best practice for water quality shall be identified, including rationale for data source.	Identify the best practices for your type of farming operation for maintaining good water quality (e.g. cover-cropping, no-till, buffer strips)
		1.8.4	1.8.4 - Relevant catchment best practice for site maintenance of Important Water-Related Areas shall be identified.	Identify the best practices for your type of farming operation for wetland health and maintenance.
		1.8.5	1.8.5 - Relevant sector and/or catchment best practice for site provision of equitable and adequate WASH services shall be identified.	Note the Operational Health and Safety guidelines related to drinking water and sanitation for farms.
2				
	2.1			
Step 2 - Commit and Plan	Commit to water stewardship by having the senior-most manager in charge of water at the site, or if necessary, a suitable individual within the organization head office, sign and publicly disclose a commitment to water stewardship, the implementation of the AWS Standard and achieving its five outcomes, and the allocation of required resources.	2.1.1	2.1.1 - A signed and publicly disclosed site statement OR organizational document shall be identified. The statement or document shall include the following commitments: - That the site will implement and disclose progress on water stewardship program(s) to achieve improvements in AWS water stewardship outcomes - That the site implementation will be aligned to and in support of existing catchment sustainability plans - That the site's stakeholders will be engaged in an open and transparent way - That the site will allocate resources to implement the Standard.	Write and sign a Statement of Commitment to stewarding water within your operation. The Statement should focus on minimizing the impact on water and how it will be done through specific actions, and that resources will be allocated to completing those actions.
		2.1.2	2.1.2 - *Advanced Indicator* - A statement that explicitly covers all requirements set out in Indicator 2.1.1 and is signed by the organization's senior-most executive or governance body and publicly disclosed shall be identified.	*Advanced Indicator*: the written statement from Indicator 2.1.1 is signed by the senior decision-maker for the operation and is publicly disclosed.
	2.2			
	Develop and document a process to achieve and maintain legal and regulatory compliance.	2.2.1 .	2.2.1 - The system to maintain compliance obligations for water and wastewater management shall be identified, including: - Identification of responsible persons/positions within facility organizational structure - Process for submissions to regulatory agencies.	Identify the documentation for regulatory compliance for water use and farm water management.
	2.3			
	Create a water stewardship strategy and plan including addressing risks (to and from the site), shared catchment water challenges, and opportunities.	2.3.1	2.3.1 - A water stewardship strategy shall be identified that defines the overarching mission, vision, and goals of the organization towards good water stewardship in line with this AWS Standard.	Draft a water stewardship strategy that defines the overarching mission, vision, and goals of the organization towards good water stewardship.
		2.3.2	2.3.2 - A water stewardship plan shall be identified, including for each target: - How it will be measured and monitored - Actions to achieve and maintain (or exceed) it - Planned timeframes to achieve it - Financial budgets allocated for actions - Positions of persons responsible for actions and achieving targets - Where available, note the link between each target and the achievement of best practice to help address shared water challenges and the AWS outcomes.	Create a plan with concrete actions to manage water-related risks and water challenges in the local area.
		2.3.3	2.3.3 - *Advanced Indicator* - The site's partnership/water stewardship activities with other sites within the same catchment (which may or may not be under the same organisational ownership) shall be identified and described.	*Advanced Indicator:* Describe what partnerships, water-sharing agreements, land-use agreements etc. you have with other operations or organizations. For example, a partnership with Ducks Unlimited.

		2.3.4	2.3.4 - *Advanced Indicator* - The site's partnership/water stewardship activities with other sites in another catchment(s) (either under same corporate structure or with another corporate site) shall be identified.	*Advanced Indicator*: Describe any partnerships or water stewardship activities you do with a landowner or organization that is in another water catchment.
		2.3.5	2.3.5 - *Advanced Indicator* - Stakeholder consensus shall be sought on the site's water stewardship plan. Consensus should be achieved on at least one target. A list of targets that have consensus and in which stakeholders are involved shall be identified.	*Advanced Indicator*: Confirm that the farm's neighbours and the other entities using the same water source think the actions identified in 2.3.2 are good ideas.
	2.4			
	Demonstrate the site's responsiveness and resilience to respond to water risks.	2.4.1	2.4.1 - A plan to mitigate or adapt to identified water risks developed in co-ordination with relevant public-sector and infrastructure agencies shall be identified.	Identify the actions in the Environmental Farm Plan that are related to emergency response processes related to water, if appropriate conduct a response drill.
		2.4.2	2.4.2 - *Advanced Indicator* - A plan to mitigate or adapt to water risks associated with climate change projections developed in co-ordination with relevant public-sector and infrastructure agencies shall be identified.	*Advanced Indicator:* Coordinate with relevant public-sector and infrastructure agencies to develop a plan for the farm to adapt to a water risk expected from climate change.
3				
	3.1			
	Implement plan to participate positively in catchment governance.	3.1.1	3.1.1 - Evidence that the site has supported good catchment governance shall be identified.	Support good water governance and water management in the local watershed, this could be through communication with the local water stewardship organizations or any entity that manages water locally.
		3.1.2	3.1.2 - Measures identified to respect the water rights of others including Indigenous peoples, that are not part of 3.2 shall be implemented.	Respect the rights of other water users, including Indigenous peoples.
		3.1.3	3.1.3 - *Advanced Indicator* - Evidence of improvements in water governance capacity from a site-selected baseline date shall be identified.	*Advanced Indicator*: Identify evidence of improvements in water governance ability on the farm.
		3.1.4	3.1.4 - *Advanced Indicator* - Evidence from a representative range of stakeholders showing consensus that the site is seen as positively contributing to the good water governance of the catchment shall be identified.	*Advanced Indicator*: Identify evidence that the farm's neighbours and other water users in the area see the farm as positively contributing to water governance.
	3.2			
	Implement system to comply with water-related legal and regulatory requirements and respect water rights.	3.2.1	3.2.1 - A process to verify full legal and regulatory compliance shall be implemented.	Implement changes (if necessary) and follow processes to be fully compliant with regulations for the farm.
		3.2.2	3.2.2 - Where water rights are part of legal and regulatory requirements, measures identified to respect the water rights of others including Indigenous peoples, shall be implemented.	Implement changes (if necessary) and follow process to be fully compliant with water licence(s).
	3.3			
	Implement plan to achieve site water balance targets.	3.3.1	3.3.1 - Status of progress towards meeting water balance targets set in the water stewardship plan shall be identified.	Identify water conservation actions for the short term, and (if possible) document the result.
		3.3.2	3.3.2 - Where water scarcity is a shared water challenge, annual targets to improve the site's water use efficiency, or if practical and applicable, reduce volumetric total use shall be implemented.	If water scarcity was identified as a risk, implement actions or changes on farm to improve drought resilience and/or water use efficiency.
		3.3.3	3.3.3 - Legally-binding documentation, if applicable, for the re-allocation of water to social, cultural or environmental needs shall be identified.	If any legal agreement (e.g. with Ducks Unlimited for a wetland, or conservation agreement or easements) protecting part of your farm, list documentation of it.
		3.3.4	3.3.4 - *Advanced Indicator* - The total volume of water voluntarily re-allocated (from site water savings) for social, cultural and environmental needs shall be quantified.	*Advanced Indicator:* If a volume of water is conserved or reallocated through any of the actions, estimate and note the volume of water.
	3.4			

Step 3 - Implement	Implement plan to achieve site water quality targets.	3.4.1	3.4.1 - Status of progress towards meeting water quality targets set in the water stewardship plan shall be identified.	Identify water quality improvement actions for the short term, and (if possible) document the result.
		3.4.2	3.4.2 - Where water quality is a shared water challenge, continual improvement to achieve best practice for the site's effluent shall be identified and where applicable, quantified.	If water quality was identified as a risk, implement actions or changes on farm to improve quality of nearby or receiving waterbodies.
	3.5			
	Implement plan to maintain or improve the site's and/or catchment's Important Water-Related Areas.	3.5.1	3.5.1 - Practices set in the water stewardship plan to maintain and/or enhance the site's Important Water-Related Areas shall be implemented.	If risks to wetland or other water-related areas on the farm were identified, implement actions to put in place the best management practices for your type of farming operation for wetland health and maintenance.
		3.5.2	3.5.2 - *Advanced Indicator* - Evidence of completed restoration of non-functioning or severely degraded Important Water-Related Areas including where appropriate cultural values from a site-selected baseline date shall be identified. Restored areas may be outside of the site, but within the catchment.	*Advanced Indicator:* If a wetland, creek, or water-related area was protected by an action, and environmental health improved, note the evidence of this.
		3.5.3	3.5.3 - *Advanced Indicator* - Evidence from a representative range of stakeholders showing consensus that the site is seen as positively contributing to the healthy status of Important Water-Related Areas in the catchment shall be identified.	*Advanced Indicator:* Identify evidence that the farm's neighbours and other water users in the area see the farm as doing positive work on wetlands or other water-related areas, on or off the farm property.
	3.6			
	Implement plan to provide access to safe drinking water, effective sanitation, and protective hygiene (WASH) for all workers at all premises under the site's control.	3.6.1	3.6.1 - Evidence of the site's provision of adequate access to safe drinking water, effective sanitation, and protective hygiene (WASH) for all workers onsite shall be identified and where applicable, quantified.	List the locations of drinking water, washrooms, and safety equipment available to all people working on the farm.
		3.6.2	3.6.2 - Evidence that the site is not impinging on the human right to safe water and sanitation of communities through their operations, and that traditional access rights for Indigenous and local communities are being respected, and that remedial actions are in place where this is not the case, and that these are effective.	Evidence that the site is not impinging on the human right to safe water and sanitation of communities through their operations, and that traditional access rights for Indigenous and local communities are being respected.
		3.6.3	3.6.3 - *Advanced Indicator* - A list of actions taken to support the provision to stakeholders in the catchment of access to safe drinking water, adequate sanitation and hygiene awareness shall be identified.	*Advanced Indicator:* List actions that were done in the catchment that improved people being able to access safe drinking water.
		3.6.4	3.6.4 - *Advanced Indicator* - In catchments where WASH has been identified as a shared water challenge, evidence of efforts taken with relevant public-sector agencies to share information and to advocate for change to address access to safe drinking water and sanitation shall be identified.	*Advanced Indicator:* If access to safe drinking water was identified as a challenge in the catchment, indicate evidence of effort taken to improve the situation.
	3.7			
	Implement plan to maintain or improve indirect water use within the catchment.	3.7.1	3.7.1 - Evidence that indirect water use targets set in the water stewardship plan, as applicable, have been met shall be quantified.	Quantify the evidence that indirect water use targets set in the water stewardship plan, as applicable..
		3.7.2	3.7.2 - Evidence of engagement with suppliers and service providers, as well as, when applicable, actions they have taken in the catchment as a result of the site's engagement related to indirect water use, shall be identified.	Quantify the evidence of engagement with suppliers and service providers, as well as, when applicable, actions they have taken in the catchment as a result of the site's engagement related to indirect water use.

		3.7.3	3.7.3 - *Advanced Indicator* - Actions taken to address water related risks and challenges related to indirect water use outside the catchment shall be documented and evaluated.	*Advanced Indicator:* Document actions taken to address water related risks and challenges for the areas where the main inputs to the farm come from. This links to 1.4.
	3.8			
	Implement plan to engage with and notify the owners of any shared water-related infrastructure of any concerns the site may have.	3.8.1	3.8.1 - Evidence of engagement, and the key messages relayed with confirmation of receipt, shall be identified.	Identify evidence of engagement, and the key messages relayed with confirmation of receipt.
	3.9			
	Implement actions to achieve best practice towards AWS outcomes: continually improve towards achieving sectoral best practice having a local/catchment, regional, or national relevance.	3.9.1	3.9.1 - Actions towards achieving best practice, related to water governance, as applicable, shall be implemented.	Implement water stewardship actions related to water supply and coordination between users.
		3.9.2	3.9.2 - Actions towards achieving best practice, related to targets in terms of water balance shall be implemented.	Implement water stewardship actions related to water efficiency on farm.
		3.9.3	3.9.3 - Actions towards achieving best practice, related to targets in terms of water quality shall be implemented.	Implement water stewardship actions related to water quality.
		3.9.4 -	3.9.4 - Actions towards achieving best practice, related to targets in terms of the site's maintenance of Important Water-Related Areas shall be implemented.	Implement water stewardship actions related to wetlands, creeks and rivers.
		3.9.5	3.9.5 - Actions towards achieving best practice related to targets in terms of WASH shall be implemented.	Implement water stewardship actions related to drinking water and sanitation for employees.
		3.9.6	3.9.6 - *Advanced Indicator* - Achievement of identified best practice related to targets in terms of good water governance shall be quantified.	*Advanced indicator:* Quantify achievement against targets for improving water governance.
		3.9.7	3.9.7 - *Advanced Indicator* - Achievement of identified best practice related to targets in terms of sustainable water balance shall be quantified.	*Advanced indicator:* Quantify achievement against targets for improving water efficiency.
		3.9.8	3.9.8 - *Advanced Indicator* - Achievement of identified best practices related to targets in terms of water quality shall be quantified.	*Advanced indicator:* Quantify achievement against targets for water quality improvement.
		3.9.9	3.9.9 - *Advanced Indicator* - Achievement of identified best practices related to targets in terms of the site's maintenance of Important Water-Related Areas have been implemented.	*Advanced indicator:* Quantify achievement against targets for maintaining or improving wetlands, creeks, or river health.
		3.9.10	3.9.10 - *Advanced Indicator* - Achievement of identified best practice related to targets in terms of WASH shall be quantified.	*Advanced indicator:* Quantify achievement against targets for people accessing good drinking water.
		3.9.11	3.9.11 - *Advanced Indicator* - A list of efforts to spread best practices shall be identified.	*Advanced indicator:* List the efforts to spread best management practices.
		3.9.12	3.9.12 - *Advanced Indicator* - A list of collective action efforts, including the organizations involved, positions of responsible persons of other entities involved, and a description of the role played by the site shall be identified.	*Advanced indicator:* Describe actions that were done in partnership with other groups and note who the main contact is.
		3.9.13	3.9.13 - *Advanced Indicator* - Evidence of the quantified improvement that has resulted from the collective action relative to a site-selected baseline date shall be identified and evidence from an appropriate range of stakeholders linked to the collective action (including both those implementing the action and those affected by the action) that the site is materially and positively contributing to the achievement of the collective action shall be identified.	*Advanced indicator:* Provide evidence of the improvements that resulted from actions identified in 3.9.12. Have perspectives provided by those affected positively by the action.
4				
	4.1			

Step 4 - Evaluate	Evaluate the site's performance in light of its actions and targets from its water stewardship plan and demonstrate its contribution to achieving water stewardship outcomes.	4.1.1	4.1.1 - Performance against targets in the site's water stewardship plan and the contribution to achieving water stewardship outcomes shall be evaluated.	A year or two later evaluate the success of the actions that were implemented.
		4.1.2	4.1.2 - Value creation resulting from the water stewardship plan shall be evaluated.	Summarize the value to the farm created from the water stewardship work.
		4.1.3	4.1.3 - The shared value benefits in the catchment shall be identified and where applicable, quantified.	Summarize the value to the watershed created from the water stewardship work.
		4.1.4	4.1.4 - *Advanced Indicator* - A governance or executive-level review, including discussion of shared water challenges, water risks, and opportunities, and any water-related cost savings or benefits realized, and any relevant incidents shall be identified.	Advanced indicator: Describe the overall improvement for water governance, shared water challenges, overall improvements and other relevant commentary of the water stewardship work.
	4.2			
	Evaluate the impacts of water-related emergency incidents (including extreme events), if any occurred, and determine the effectiveness of corrective and preventative measures.	4.2.1	4.2.1 - A written annual review and (where appropriate) root cause analysis of the year's emergency incident(s) shall be prepared and the site's response to the incident(s) shall be evaluated and proposed preventative and corrective actions and mitigations against future incidents shall be identified.	Evaluate the effectiveness of emergency response for any emergencies experienced on your farm.
	4.3			
	Evaluate stakeholders' consultation feedback regarding the site's water stewardship performance, including the effectiveness of the site's engagement process.	4.3.1	4.3.1 - Consultation efforts with stakeholders on the site's water stewardship performance shall be identified.	Get feedback from stakeholders regarding the water stewardship actions that were done and the overall effectiveness.
		4.3.2	4.3.2 - *Advanced Indicator* - The site's efforts to address shared water challenges shall be evaluated by stakeholders. This shall include stakeholder reviewing of the site's efforts across all five outcome areas, and their suggestions for continual improvement.	*Advanced indicator:* Get the farm's external and internal stakeholders to evaluate the success of the farm's efforts and their suggestions for continual improvement.
	4.4			
	Evaluate and update the site's water stewardship plan, incorporating the information obtained from the evaluation process in the context of continual improvement.	4.4.1	4.4.1 - The site's water stewardship plan shall be modified and adapted to incorporate any relevant information and lessons learned from the evaluations in this step and these changes shall be identified.	A year or two later review your EFP+ action plan and update and edit the actions that have not been done to ensure they align well with the effectiveness you have seen for completed actions on your farm.
5				
	5.1			
Step 5 - Communicate and Disclose	Disclose water-related internal governance of the site's management, including the positions of those accountable for legal compliance with water-related local laws and regulations.	5.1.1	5.1.1 - The site's water-related internal governance, including positions of those accountable for compliance with water-related laws and regulations shall be disclosed.	Disclose the legal compliance and the processes that ensure it.
	5.2			
	Communicate the water stewardship plan with relevant stakeholders.	5.2.1	5.2.1 - The water stewardship plan, including how the water stewardship plan contributes to AWS Standard outcomes, shall be communicated to relevant stakeholders.	Send the overall water stewardship action plan update to relevant stakeholders.
	5.3			
	Disclose annual site water stewardship summary, including the relevant information about the site's annual water stewardship performance and results against the site's targets.	5.3.1	5.3.1 - A summary of the site's water stewardship performance, including quantified performance against targets, shall be disclosed annually at a minimum.	Disclose a summary of water stewardship performance, including quantified performance against targets.
		5.3.2	5.3.2 - *Advanced Indicator* - The site's efforts to implement the AWS Standard shall be disclosed in the organization's annual report.	*Advanced indicator:* Release an annual report with a summary of the AWS Standard and the farm's work implementing it.
		5.3.3	5.3.3 - *Advanced Indicator* - Benefits to the site and stakeholders from implementation of the AWS Standard shall be quantified in the organization's annual report.	*Advanced indicator:* Include quantification of the benefits to the site and the stakeholders in the annual report.

	5.4			
	Disclose efforts to collectively address shared water challenges, including: associated efforts to address the challenges; engagement with stakeholders; and co-ordination with public-sector agencies.	5.4.1	5.4.1 - The site's shared water-related challenges and efforts made to address these challenges shall be disclosed.	The farm's water-related challenges and efforts made to address these challenges shall be disclosed.
		5.4.2	5.4.2 - Efforts made by the site to engage stakeholders and coordinate and support public-sector agencies shall be identified.	Disclose a summary of the stakeholder engagement and coordination for water stewardship actions.
	5.5			
	Communicate transparency in water-related compliance: make any site water-related compliance violations available upon request as well as any corrective actions the site has taken to prevent future occurrences.	5.5.1	5.5.1 - Any site water-related compliance violations and associated corrections shall be disclosed.	Disclose any site-related compliance violations and associated corrections.
		5.5.2	5.5.2 - Necessary corrective actions taken by the site to prevent future occurrences shall be disclosed if applicable.	Disclose actions by the site to prevent future violations or occurrences.
		5.5.3	5.5.3 - Any site water-related violation that may pose significant risk and threat to human or ecosystem health shall be immediately communicated to relevant public agencies and disclosed.	Any site water-related violation that may pose significant risk and threat to human or ecosystem health shall be immediately communicated to relevant public agencies and disclosed.

Appendix D: Example Plan - SMRID West Water Stewardship Plan

waterSMART
Water Management Solutions

Agriculture's Water Future

EXAMPLE

SMRID West Site Water Stewardship Plan

Submitted by:
WaterSMART Solutions Ltd.

Submitted to:
St. Mary River Irrigation District

Finalized on:
February 15, 2023

Contents

1. Document Purpose

The St. Mary River Irrigation District (SMRID) water stewardship plan combines the details of current operations, identifies connections to the local community and environment, lists the water related risks and opportunities, and lays out a plan for implementing water stewardship. It contains a section describing the SMRID West Site, how water is used in the operations, ongoing actions that align with water stewardship, and existing water management activities on site and water stewardship activities. The geographic area relevant to the site's operations and the current water stewardship activities are noted.

This water stewardship planning document is developed as part of the Agriculture's Water Future (AWF), Phase III project work, and it is intended to serve as an example for future water stewardship implementers in the agriculture and agri-food sector in Alberta.

This report is also intended to systematically identify the Alliance for Water Stewardship (AWS) Standard criteria that are met by the SMRID West Site. The criteria are highlighted in blue boxes throughout the document.

Appendix A provides the larger watershed context for the SMRID West Site, which includes details of the water availability and water quality in the Oldman River watershed, watershed stakeholders, the regulatory system and water management authorities.

2. Implementer overview

As per the Alberta Irrigation Districts Act, the St. Mary River Irrigation District (SMRID) is one of thirteen irrigation districts in Alberta tasked with conveying water to its members (Government of Alberta, 2021). Members of the SMRID are irrigators, municipalities, industries, or other water users within the boundaries of the district who pay for water delivery from the SMRID infrastructure. All Alberta irrigation districts must comply with water license agreements determined by the Water Act when diverting and utilizing water (Government of Alberta, 2021). All Alberta irrigation districts are governed by boards of elected members who are irrigators within the district (Government of Alberta, 2021).

The SMRID is the largest irrigation district in Alberta and Canada; it extends from the City of Lethbridge to the City of Medicine Hat in southern Alberta and includes member irrigators in Middle Coulee and Vertigris. Through its water licences, the SMRID is allowed to divert a total of 722,000 acre-feet annually, though in practice it typically diverts approximately 65% of this amount (St. Mary River Irrigation District, 2016), with diversions averaging at 64.2% for the 2018-2020 irrigation seasons (St. Mary River Irrigation District, 2020) (St. Mary River Irrigation District, 2019) (St. Mary River Irrigation District, 2018). Water in the SMRID system is diverted via Government of Alberta infrastructure at the St. Mary, Waterton, Jensen and Milk River Ridge reservoirs into the SMRID main canal, and is then further directed downstream through the SMRID infrastructure to users. Figure 1 displays the extent of the SMRID system with the

irrigated acres shown in green.

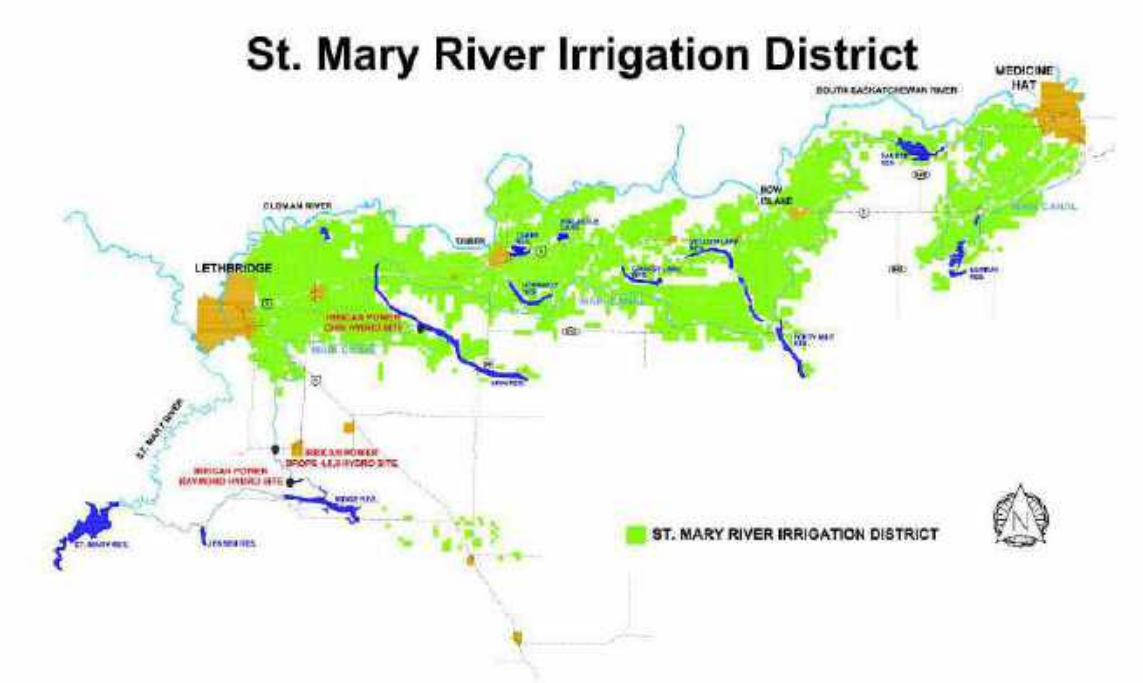


Figure 1. St. Mary River Irrigation District map.

The SMRID uses a variety of infrastructure to direct water for timely delivery to its users (see Section 6 for infrastructure details), as well as infrastructure for water storage and hydro-electric power generation. Water storage aids the SMRID in drought mitigation, which has positive economic implications for the region and its members. Reservoirs owned and operated by the SMRID are also used recreationally and serve as wildlife habitat. The SMRID, along with the Raymond Irrigation District, are members of the Irrigation Canal Power Cooperative Ltd. (IRRICAN Power), which utilizes water conveyance infrastructure to generate hydro-electric power. This power generated through IRRICAN Power is sold to generate funding for the irrigation districts (St. Mary River Irrigation District, 2016).

The SMRID has an organizational goal of improving the infrastructure, water management, and financial security of the district to fulfill their vision statement, which is to "support sustainable communities, environment and agriculture with water" (St. Mary River Irrigation District, 2016).

3. Water stewardship one-page summary

A one-page summary document was drafted in order to articulate the motivation and strategic direction for SMRID in its water stewardship activities. The one-page document was developed through putting the specific SMRID context into the pre-existing one-page summary template table, and then a process of reviewing and refining. The table format of the one-page makes it easy to understand and supports the overall water stewardship plan document, serving as a communication tool.

This one-page document specifies the alignment between water stewardship and the company values and communicates the high-level objectives under each of four specific areas of focus for water stewardship efforts. These areas of focus and high-level objectives include:

1. Watershed context and external engagement:
    - As SMRID operations depend on the water from the Oldman River Watershed, they must work closely with AEP, irrigators, and municipalities, and continue to engage stakeholders in water stewardship planning.
2. Impact mitigation (beyond the fence line)
    - Understand the impact of SMRID's operations.
3. Operational resilience (within the fence line):
    - Continually improve the efficiency and reliability of our infrastructure to provide water security for customers.
4. Internal collaboration (and continuity):
    - Engage all parts of our organization in water stewardship and risk management.

These objectives were used to help identify and align implementable actions to the overall water stewardship goal of SMRID. See section 13 Implementation Plan.

Table 1. Water stewardship one-page summary table.

Commitment statement: In alignment with our vision to support sustainable communities, environment and agriculture with water, the SMRID will implement water stewardship in the West section and improve water management and work with our stakeholders.				
Objective 'buckets'	**Watershed Context and External Engagement**	**Impact Mitigation (beyond the fenceline)**	**Operational Resilience (within the fenceline)**	**Internal Collaboration (and continuity)**
Objectives	The SMRID operation depends on the water from the Oldman River Watershed and the operations work closely with AEP, irrigators, and municipalities. Some water users rely on the SMRID, and others rely on the water that remains in the river. The SMRID will communicate with external organizations and the public in the water stewardship planning.	Understand the impacts of our operations.	Continually improve the efficiency and reliability of our infrastructure to provide water security for our customers	Engage all parts of our organization in water stewardship and risk management
Programs (sub-objectives)	Support sustainable communities by engaging agricultural communities and municipal stakeholder in water stewardship. Acknowledge the impact of the International Joint Commission with key water supply coming from the U.S. upstream, and mitigate risks. Work with other entities in the watershed to improve water security.	Understand impacts of reducing spill water returns to the Oldman River from infrastructure projects. Understand the water quality impacts of our operations.	Comply with regulatory requirements at all times and exceed them where it makes sense for the environment, our operations, and stakeholders.	Enable coordination across departments to maximize the opportunities of water stewardship actions and alignment with our core values and mandate.
Outcomes	The SMRID supports sustainable communities and agriculture within the Oldman River Watershed. The SMRID's water stewardship actions address future water reliability challenges.			

4. Existing standard compliance, memberships, and accreditations as relates to water stewardship

Partner group name	How the partner group promotes water stewardship efforts
Alberta Irrigation Districts Association (AIDA)	The AIDA is the representative body for all Alberta irrigation districts, promoting public education and research on irrigation in Alberta.
Alberta Conservation Association (ACA)	Involvement in ACA Connectivity Project and Ridge Reservoir Habitat Project to improve riparian management and biodiversity ecosystem services.
South East Alberta Watershed Alliance (SEAWA)	SEAWA promotes the Alberta Water for Life strategy to the public and water users in the South East Alberta watershed. An SMRID employee acts on the SEAWA board to promote information distribution about SMRID operations and initiatives.
Canadian Water Resources Association (CWRA)	An SMRID employee acts on the CWRA board.
Oldman Watershed Council	The SMRID is a member organization.
Canadian Dam Association	The SMRID is a member organization.

5. Site and Physical Scope

This section addresses AWS Criterion 1.1 "*Gather information to define the site's physical scope for water stewardship"*

Indicators for Criterion 1.1 include:
"1.1.1: The site's operational boundaries."
"1.1.2: The water sources from which the site draws."
"1.1.3: The locations to which the site returns its discharges."
"1.1.4: The catchments(s) that the site affects(s) and upon which it is reliant."

The Alliance for Water Stewardship (AWS) Standard (v. 2.0) requires that several pieces of information about the implementer's geographic location and water use be defined in order to evaluate the impact of an implementer in a watershed. The *site* and *physical scope* must be identified for each implementer. As

the AWF project is considering the water stewardship practices of several members of an agri-food supply chain, the site boundaries and physical scope of each implementer are taken into account when determining the *project geographic area* of the supply chain (see *Geographic context* subsection in Appendix A: Watershed Context).

5.1 Site

The *site*, as defined by AWS, can be seen below:

> **Site:** For the AWS Standard, the site is the physical area over which the implementing organization owns or manages land and carries out its principal activities. In most cases it is a contiguous area of land but may also include physically separated but nearby areas (especially if in the same catchment) (Alliance for Water Stewardship, 2019).

Due to the size as well as complexity of the operation and impact of the SMRID, the entirety of the SMRID could not be considered to be the *site*. For the AWF project, the western portion of the SMRID (as displayed in Figure 2) is considered the SMRID site.

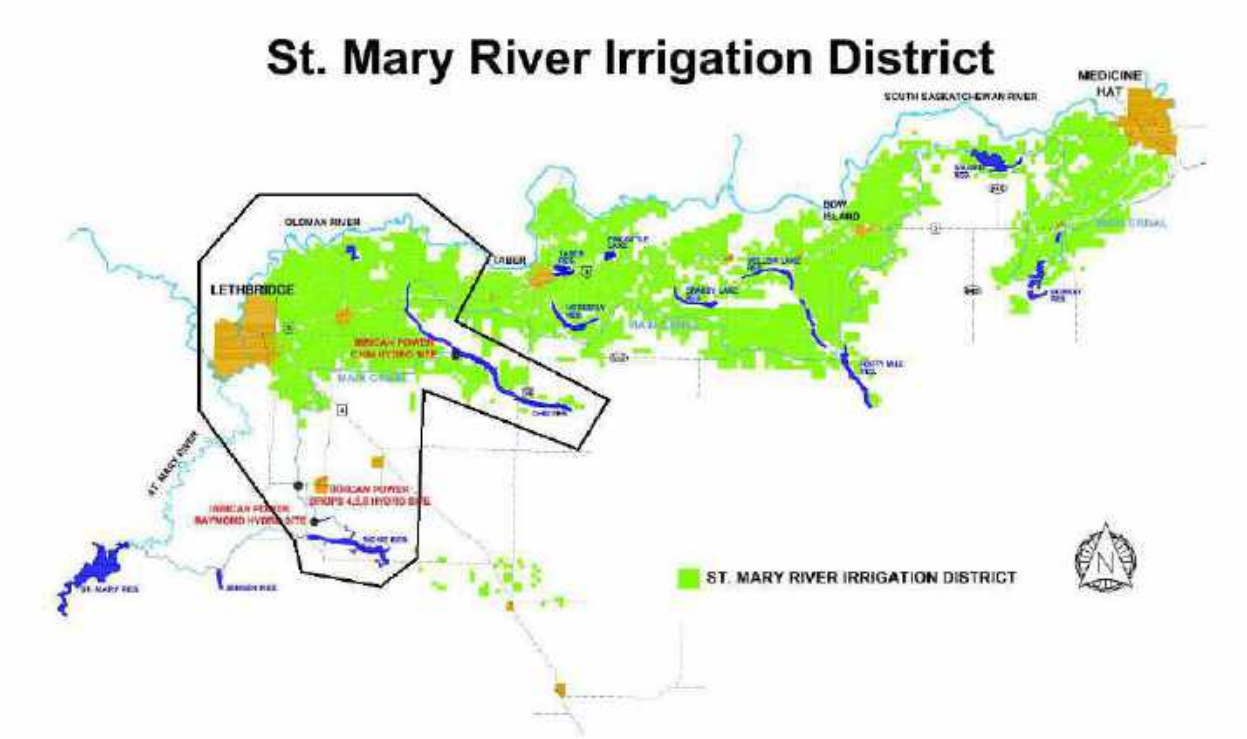


Figure 2. St. Mary River Irrigation District (SMRID) map. The western portion (i.e., the site considered for the AWF project) of the district is outlined in black.

The western portion of the SMRID was considered for the AWF project due to its location, as it is located entirely within the Oldman River subbasin, which is the same subbasin as the other AWF implementer

(see Figure 3 for the location of SMRID infrastructure within subbasin boundaries).

The SMRID receives its water from the Milk River Ridge Reservoir, through requests made to Alberta Environment and Parks (AEP). There is AEP diversion infrastructure located at the Milk River Ridge Reservoir to divert water into the SMRID main canal. The Main Canal infrastructure includes various types of diversion infrastructure, drop structures, canals, pipelines, and reservoirs. Discharge points (known as 'spill points') and drains are located throughout the SMRID system. Spill points are necessary release-points to a canal water delivery system. In the western portion of the SMRID, spill points drain to the Oldman River. Thus, the SMRID West Site, for the purposes of the AWF project, is defined as the SMRID infrastructure extending from Ridge Reservoir to the main canal prior to the Horsefly Reservoir. The "end point" of the SMRID West Site is the SMRID main canal between Chin Reservoir and Horsefly reservoir. All the rest of the SMRID infrastructure and users are considered downstream stakeholders for the activities conducted in the SMRID West Site.

5.2 Physical scope

The implementer's *physical scope*, as defined by AWS, can be seen below:

> **Physical scope:** The land area relevant to the site's water stewardship actions and engagement. It should incorporate the relevant catchment(s) but may extend to relevant political or administrative boundaries. It is typically centered on the site but may include separate areas if the origin of water supply is more distant (Alliance for Water Stewardship, 2019).

The SMRID is reliant on water from the St. Mary, Belly and Waterton rivers, which are tributaries to the Oldman River and some of the natural flow of all three Rivers are diverted to support the SMRID and other irrigation district water demands. All three rivers have at least a portion of their headwaters across the US boarder, in Montana. The quantity of naturally available water in the Oldman River watershed is highly dependant on the snow and rain in the Rocky Mountain headwaters of the watershed. The watershed has also historically experienced flooding and droughts. See, Appendix A: Watershed Context, sub-section: "Water Quantity Context of the Oldman River" for details on the available water. The St. Mary River water quality is influenced by the land uses within its boundaries, including municipal, agricultural, and industrial activities. Concentrations of phosphorous and nitrogen increase in the downstream reaches, however they are within provincial water quality guidelines. See Appendix A: Watershed Context, sub-section "Water Quality" for further information on the water quality in the St. Mary River.

Water from the St. Mary, Belly and Waterton rivers is diverted into the St. Mary and Waterton reservoirs by AEP. To acquire water for the irrigation district, water requests are made by the SMRID to AEP, and water is released from the St. Mary Reservoir into the Milk River Ridge Reservoir, which is then diverted into the SMRID main canal. Due to this reliance on AEP-controlled reservoirs as source water for the SMRID, the physical scope of the SMRID for the AWF project includes these upstream reservoirs, as well as the infrastructure and diversion points within the SMRID West Site (Figure 3).

The Oldman River Watershed can be subdivided into various hydrological unit code (HUC) scales. These subsections show which tributary systems join the mainstem of the river upstream of the implementer, and which are downstream. Below, in Figure 3, the physical scope for the SMRID West Site water stewardship activities is shaded in light blue, and the HUC 8 level watershed boundaries are shown in dark blue. Figure 3 shows that the SMRID West Site covers several HUC 8 watershed boundaries, indicating that there are a variety of stakeholders potentially influenced by SMRID actions, and who may potential influence the SMRID West Site source waters. These stakeholders must be considered when developing the water stewardship plan for the site (see Section 9).

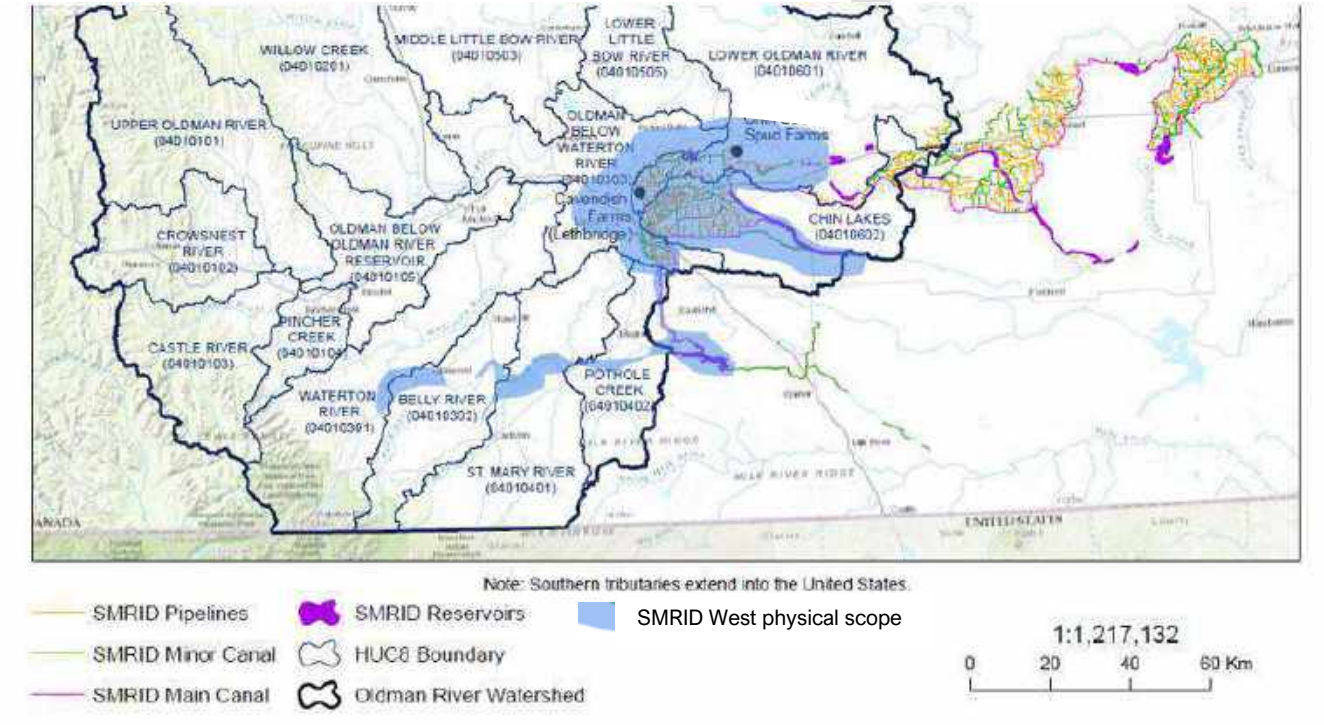


Figure 3. SMRID infrastructure and SMRID West Site boundaries considered in the AWF project. Blue shaded areas show the western SMRID physical scope, which includes upstream source water reservoirs. The boundaries of the Oldman River sub-basin are shown in black.

The physical scope for water stewardship activities of SMRID West Site has been determined through identifying the source of water, the area nearby that could be influenced by the activities of the site, and the places where water is returned to the natural system. The Oldman River receives the spill water from the SMRID West Site, and therefore the portion of the river extending downstream from Lethbridge to the Town of Taber is included in the physical scope. The physical scope extends downstream to ensure environmental areas, other water users and communities are taken into account in the water stewardship activities.

5.3 Project geographic area

The AWF project has one potato producer acting as a key advisor and two implementers, one of which is

the SMRID West Site, who are working in concert to implement water stewardship. For the purpose of the project, a geographic area that encompasses the physical scope for both implementers and the producer advisor, has been developed. Figure 4 shows the project geographic area, as well as the major waterways. See Appendix A: Watershed Context, sub-section "Geographic Context" for further description of the project geographic area.

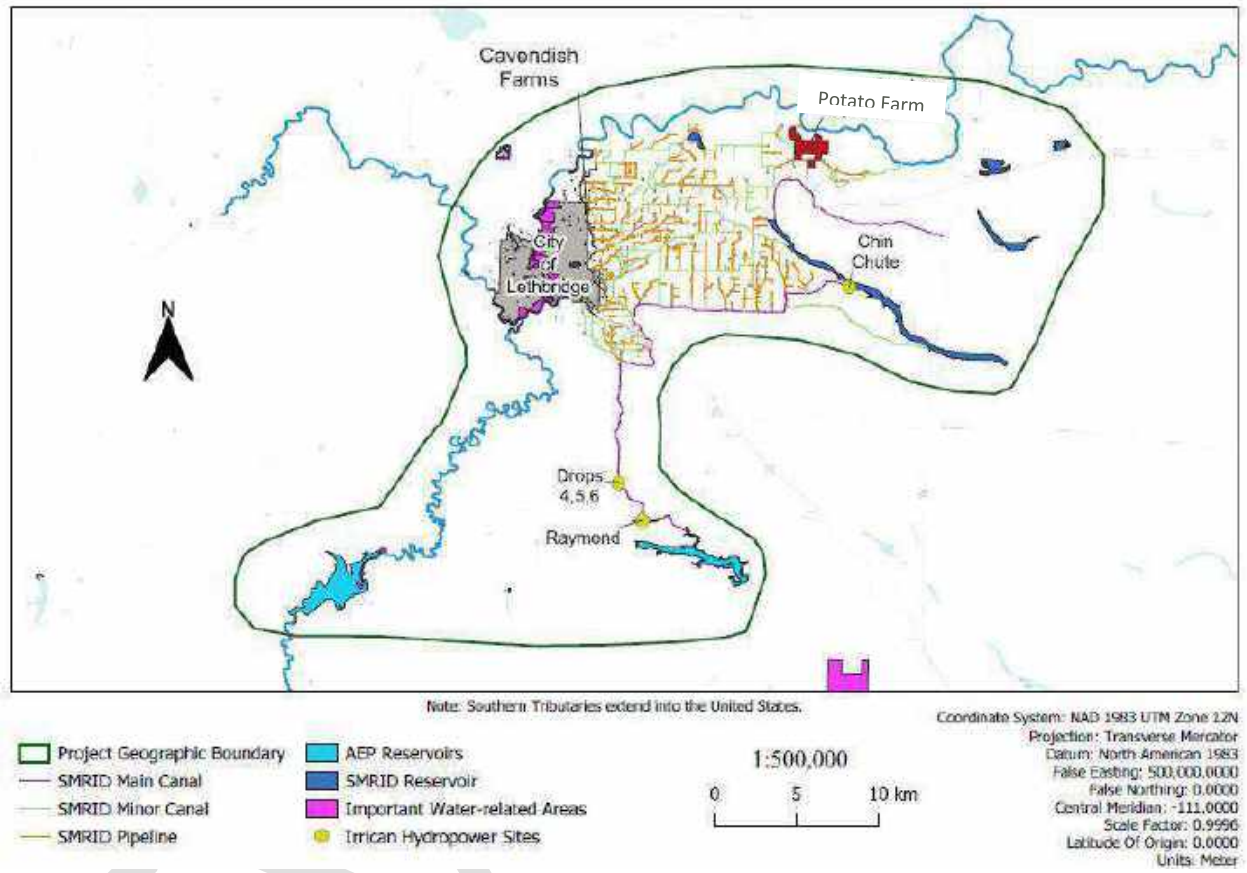


Figure 4. The project geographic area, which includes the physical scope for both AWF project implementers and the producer advisor.

6. Details of site water-related infrastructure

6.1 Water use on site

The SMRID West Site provides irrigation water to a variety of water users, including producers that irrigate over 60 different types of crops (St. Mary River Irrigation District, 2020), industrial facilities, and municipalities. Water is conveyed through a series of canals and pipelines to users and is stored in reservoirs to increase water security for users. Reservoirs within the SMRID West site include Cross Coulee, Raymond Reservoir, Chin Coulee Reservoir, Stafford Reservoir, and North East Reservoir. In addition to their primary purpose for irrigation water, these reservoirs provide recreation opportunities

for local populations, including boating and fishing, as well as wildlife habitat. Irrigation water is also used to support wetlands (Alberta Irrigation Districts Association, 2018).

6.2 Water-related infrastructure

A variety of infrastructure has been built to manage the water that the SMRID delivers to its customers. The main types of SMRID infrastructure are the main canal, canals, pipelines, drop structures, check structures, reservoirs, and dams. The main canal begins where the SMRID's requested water is diverted out of Ridge Reservoir by AEP. This canal is the main artery that carries water throughout the entire district, and has a matrix of canals and/or pipelines flowing out of it. Reservoirs, built off-stream, are built to store or control the SMRID's water supplies. SMRID reservoirs all utilize dams, which serve to direct water from the reservoir elsewhere, such as a stream or diversion canal (St. Mary River Irrigation District).

A series of additional structures aid the SMRID water coordinators and controllers in directing requested water to members. Drop structures (also known as chutes) aid in controlling water's velocity and energy through use of an elevation change to the flow of water. Spillways and check structures also aid in controlling water flow, the former through control of the release of flow from a dam, and the latter by blocking the canal. Screens, Gabion walls and settling ponds are all used to decrease or remove debris from water flowing through canals and pipelines; the size of debris removed depends on the structure used. Turnouts serve to divert water from SMRID infrastructure to a user; the flow of water from a pipeline to a turnout is controlled through use of valves, and gates are used to open and close turnouts. Finally, culverts are used to convey water across roads or other obstacles (St. Mary River Irrigation District).

Table 2: SMRID water-related conveyance infrastructure(Alberta Agriculture, Forestry and Rural Economic Development, 2022).

Conveyance Infrastructure	Length of the conveyance infrastructure (km)
Pipelines – Closed	1003.7
Pipelines – Open	25.9
Membrane-lined canals	64.1
Concrete-lined canals	42.0
Earth canals	457.0
Un-rehabilitated canals	229.2

7. Site water data

This section addresses AWS Criterion 1.3 "*Gather water-related data for the site, including: water balance; water quality, Important Water-Related Areas, water governance, WASH; water-related costs, revenues, and shared value creation.*"

Indicators for Criterion 1.3 considered in this section include:

"1.3.1: Existing water-related incident response plans shall be identified."

"1.3.2: Site water balance, including inflows, losses, storage, and outflows shall be identified and mapped."

"1.3.3: Site water balance, inflows, losses, storage, and outflows, including indication of annual variance in water usage rates, shall be quantified. Where there is a water-related challenge that would be a threat to good water balance for people or environment, an indication of annual high and low variances shall be quantified."

"1.3.4: Water quality of the site's water source(s), provided waters, effluent and receiving water bodies shall be quantified. Where there is a water-related challenge that would be a threat to good water quality status for people or environment, an indication of annual, and where appropriate, seasonal, high and low variances shall be quantified."

"1.3.5 - Potential sources of pollution shall be identified and if applicable, mapped, including chemicals used or stored on site."

"1.3.6 - On-site Important Water-Related Areas shall be identified and mapped, including a description of their status including Indigenous cultural values."

"1.3.7 - Annual water-related costs, revenues, and a description or quantification of the social, cultural, environmental, or economic water-related value generated by the site shall be identified and used to inform the evaluation of the plan in 4.1.2."

"1.3.8 - Levels of access and adequacy of WASH at the site shall be identified."

The SMRID has eight licenses to divert water from the St. Mary, Belly and Waterton rivers, as governed under the Water Act. The total allowable diversion by the SMRID from these three rivers is 880,000 acre-feet (approximately 1.085 million cubic decameters.

Figure 5, below, displays the sequence of reservoirs through the entire SMRID system, and includes total water diversion volumes and storage volume information within SMRID infrastructure at the beginning and end of the 2021 irrigation season.

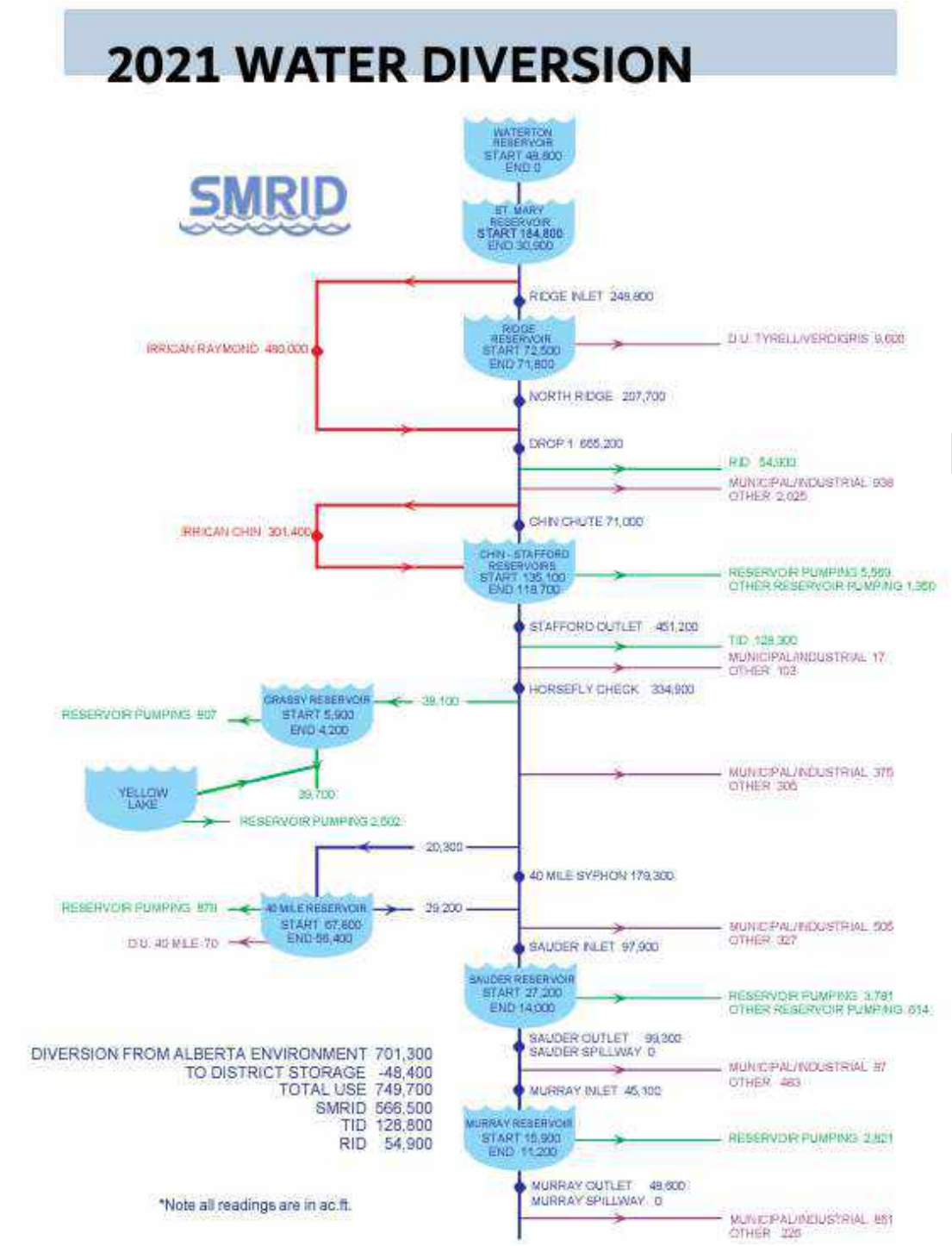


Figure 5. SMRID 2021 Water Diversion(St. Mary River Irrigation District, 2021).

Due to the reliance of irrigation districts such as the SMRID on water controlled by AEP headworks, close communication between the SMRID and AEP is necessary to run the irrigation system for the benefit of the water users and the environment. During the irrigation season, the SMRID and other irrigation

districts in the area meet weekly with AEP to discuss water demand and operations.

The SMRID West Site delivers water to its members as the primary activity of its business. This being the case, water is not only a key input to its business, it is also the central product and service of the SMRID. Therefore, water stewardship planning must be done with a different approach than a company where water is an input to their products.

The SMRID tracks water data through the irrigation infrastructure that they operate to a high granularity of detail. The SMRID uses an intricate system of built-in monitoring and data collection for water flow through all the SMRID operations. This includes water delivery data, reservoir levels, hydro-power generation, as well as water quality data.

7.1 Site Water Balance

The site water balance is intended to help verify that water volumes and flows on the site are reliably measured and accounted for. A simple equation of inflows, outflows and storage on site is used as the basis for the water balance. As the name implies, the equation must balance for the site water balance to be considered complete.

The site water balance equation is:

(Water outflow) = (Water inflow) + (change in storage volume)

The SMRID West Site is a complex system that is not closed to outside influences. Therefore, to create the site water balance, a number of assumptions and generalizations are included.

The inflows to the SMRID West site are from the Milk River Ridge reservoir, and from precipitation on the open canals and reservoirs, and the land that drains into the canals.

The outflows from the site are to a variety of users who pay for water delivery services from the SMRID, including agricultural, municipal and industrial users (Figure 6). Some water in the SMRID system is also lost to evaporation and seepage, and there is some water that flows out of the system at the spill points, however the SMRID tries to reduce and eliminate the loses from the system and deliver the water to their members.

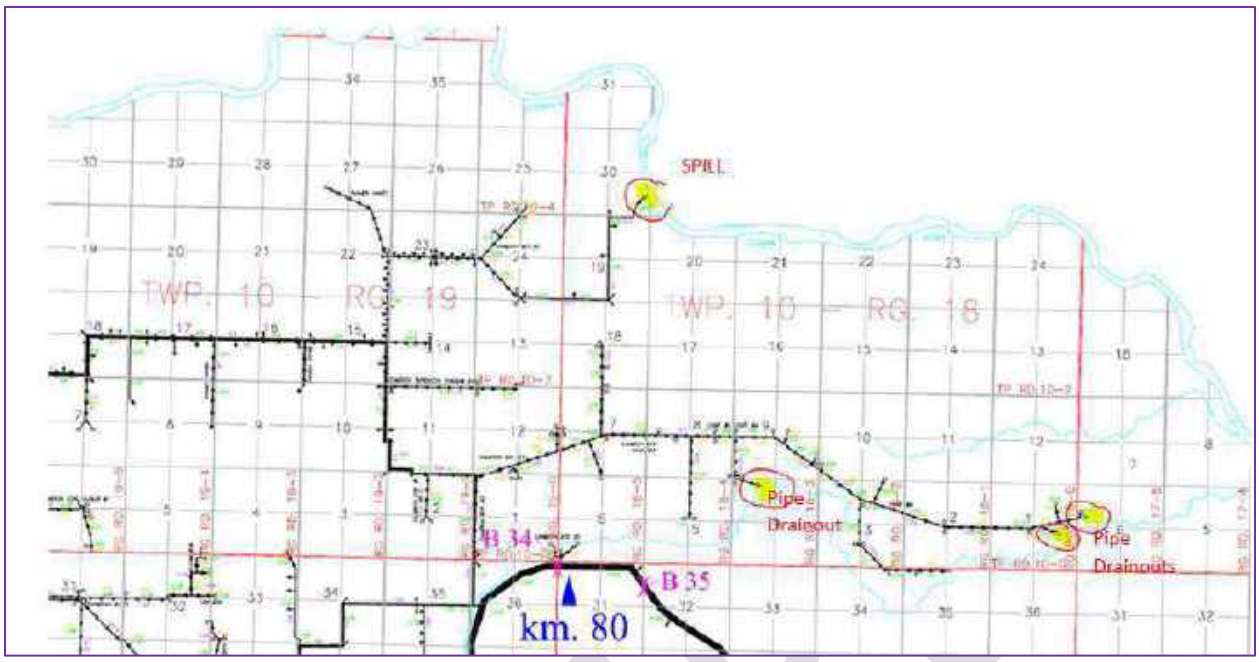


Figure 6: Map of the SMRID system

The inflow and outflow data available for the SMRID West Site are compiled in the table below. The data is compiled for the course of an irrigation season. The main water storage reservoir in the SMRID West Site is operated based on a rule curve that identifies an optimal water level at the beginning and end of the irrigation season, therefore the reservoir is considered a significant factor in the water balance equation.

Table 3 The water balance numbers for the year 2021.

Description	Gross water volume	Considerations or assumptions
Water coming into SMRID West from AEP-Ridge Reservoir	701,300 acre-ft	Total from Figure 5
Water leaving SMRID West to other areas of SMRID	334,900 acre-ft	Flow down the Main Canal at Horsefly check
Water gone to SMRID West members	150,948 acre-ft	Calculated through the water balance equation
Water gone to TID*, RID, industrial, municipal and other uses	199,052 acre-ft	Combining values from Figure 5 for D.U. RID, TID, industrial/municipal and 'other'
Change in storage at Chin Coulee reservoir from start to	-16,400 acre-ft	Difference of values in Figure 5

end of operating season

**Note: The water balance for 2021 is before the 2022 TID and SMRID amalgamation.*

The site water balance equation is:

$$\begin{pmatrix} Water\ outflow \\ to\ SMRID\ West \end{pmatrix} + \begin{pmatrix} Water\ outflow\ to \\ other\ areas\ of\ SMRID \end{pmatrix} = (Water\ inflow) + (Change\ in\ storage\ volume)$$

(150,948 acre-ft) + (533,952 acre-ft) = (701,300 acre-ft) + (-16,400 acre-ft)

7.2 Water Quality Data

Water quality is generally good in the SMRID West Site. Raw irrigation water in the SMRID system is not treated for human consumption and is primarily used for irrigating crops and landscapes. The Government of Alberta has published recommended water quality guidelines to ensure high quality water for crop irrigation and environmental health (Government of Alberta, 2018).

The provincial irrigation water guideline for Total Dissolved Solids (TDS) recommends a maximum of 500-3500 mg/L. This recommended range is crop-specific; For example, strawberry irrigation recommends a maximum of 500 mg/L TDS (Government of Alberta, 2018). Salinity is often described by electrical conductivity and a Sodium Adsorption Ratio (SAR). SAR is a ratio of sodium to calcium and magnesium and has no units. A high SAR therefore indicates that the water has high amounts of sodium compared to calcium and magnesium, and may negatively impact crops and soils. Water quality guidelines for safe irrigation water recommend a SAR ≤ 5, and an electrical conductivity ≤ 1 dS/m (Government of Alberta, 2018).

To protect Alberta's surface water and environment, previous quality guidelines recommended a maximum of 0.05 mg/L of Phosphorus and 1.0 mg/L of Nitrogen; However, these values have been withdrawn as Alberta recognized that background nutrient concentrations vary throughout the province. Guidelines now indicate that Nitrogen and Phosphorus concentrations should be low enough to prevent negative changes to aquatic biodiversity and oxygen levels (Government of Alberta, 2018). Regarding Total Suspended Solids (TSS) in clear waters, guidelines recommend a maximum increase of 25 mg/L from background concentrations for the short term (i.e., 24 hours), and a maximum increase of 5 mg/L from background concentrations for the longer term (i.e., over 24 hours). Narrative guidelines for temperature indicate that changes in temperature should not modify thermal stratification or turnover (Government of Alberta, 2018).

Table 4 provides averages of various water quality measurements at SMRID West Site water quality monitoring stations. It is important to note that this table displays water quality averages over time (2006-2020) and geography (18 sample stations). This data therefore provides a general overview of

SMRID's water quality as part of their extensive water monitoring program.

As described in Table 4, SMRID's average water temperature is 18.34°C, with averages of each site ranging from 17.63-21.65°C. This would indicate that the temperature is stable, and does not modify stratification or turnover, as described by the Provincial guidelines. Average electrical conductivity at the SMRID sampling sites was found to be 0.24 dS/m with a SAR of 0.3. Both parameters are under the maximum recommendations as per the Provincial guidelines, which indicates that SMRID's irrigation water has low salinity and is ideal for crops. TSS was found to be an average of 11.51 mg/L in the SMRID canals, and therefore likely within range of the 5 mg/L change from background concentrations as described in the guidelines. SMRID water has an average of 141.30 mg/L of TDS, which is well below the maximum range of 500-3500 mg/L, indicating high quality water. SMRID sites had an average of 0.33 mg/L of Nitrogen and 0.03 mg/L of Phosphorus, and while guidelines are now narrative, these low concentrations are below the previous maximum recommended levels of 1 mg/L of Nitrogen and 0.05 mg/L of Phosphorus. Overall, this data indicates that SMRID's irrigation water is high quality.

Table 4: Average water quality values for various parameters at SMRID West Site water quality monitoring stations (Alberta Irrigation Districts Association, 2021).

SMRID West	Water Temperature (°C)	Electric conductivity (dS/m)	Sodium adsorption ratio (-)	Total Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	[X]
	18.34	0.24	0.30	11.51	141.30	0.33	0.03	[X]

7.3 Annual water-related costs, revenues and value generation

All of the operational and capital costs of the SMRID West site are water-related because the SMRID is a water delivery business. Similarly, the value generation from hydroelectric production, and from member fees paying for water encompass all the revenue for the SMRID. Therefore, this section will not be completed as it would not serve to identify possible water stewardship opportunities because the water-related costs and revenues are equivalent to the total business costs and revenues.

7.4 Potential sources of pollution to nearby and downstream waterways

There are minimal sources of pollution identified to nearby and downstream waterways within the SMRID West site facilities.

7.5 Water-related incident response plans

The site is required to identify any existing emergency response plans that is has that address water-related risks and events. This could also be a general site incident response plan that can be applied to water-related risks and emergencies.

The SMRID has numerous emergency response plans related to water, particularly dam and infrastructure safety.

7.6 Water, Sanitation and Hygiene (WASH)

The drinking water used by employees at the SMRID facilities is filtered and sanitized to meet the strict national government drinking water quality guidelines for human use. All employees have access to safe drinking water and safe and adequate toilets and washroom facilities.

8. Site water risks and opportunities

This section addresses AWS Criterion 1.7 "*Understand the site's water risks and opportunities: Assess and prioritize the water risks and opportunities affecting the site based upon the status of the site, existing risk management plans and/or the issues and future risk trends identified in 1.6.*"

Indicators for Criterion 1.7 considered in this section include*:*
"1.7.1: Water risks faced by the site shall be identified, and prioritized, including likelihood and severity of impact within a given timeframe, potential costs and business impact."
"1.7.2: "Water-related opportunities shall be identified, including how the site may participate, assessment and prioritization of potential savings, and business opportunities."

Understanding the water risks and opportunities for the site is essential to quantifying the value to be gained from water stewardship. By identifying the risks with enough detail to then determine how best to reduce or mitigate them, a site will be able to protect itself from unexpected costs and impacts through the water stewardship implementation work it undertakes.

There are four categories of risk for a site to consider.
Types of risk:

- Operational/physical (e.g., people, assets, infrastructure issues, by virtue of being located where the site is, drought/ flooding)
- Regulatory/legal (e.g., water allocation restrictions, discharge quality)
- Reputational (e.g., pressure from local watershed stakeholders, market share and brand protection)
- Financial (e.g., water costs, customer demands on crop water attributes)

WaterSMART Solutions made an initial educated attempt to categorize risks and opportunities for this AWF project by collaborating with the project team members from SMRID, Working Group members, and

engaged stakeholders in the brainstorming and risk identification process. Through a collaborative process, risks and opportunities were identified that seem relevant to SMRID, to the potato supply chain, and to the Oldman River watershed. Over a series of steps in the project process the risks were grouped, shortlisted, and evaluated.

A general risk matrix (Figure 6) was prepared by WaterSMART for the example exercise of evaluating risks based on the severity and likelihood. It includes these four categories and results in a risk ranking structure with four levels. The list of identified risks were ranked using this example risk matrix. This risk matrix and initial risk and opportunities ranking is an example tool by WaterSMART which SMRID can use moving forward if they so choose.

Later in this document is the Implementation Plan, which outlines ongoing, short-term, and long-term water stewardship actions for the SMRID. Each action corresponds with the relevant risks and opportunities below. This is to ensure that each action addresses risks and opportunities for the SMRID.

			Severity of risk			
			Low	Medium	High	Severe
			1	2	3	4
	Operational (people /assets)		minor	moderate	significant	critical failure
	Regulatory /legal		minor	moderate	significant	shut down
	Reputational (public concern)		a few people /minor concern	many people /moderate concern	many public and business influencing people	long term bad reputation
	Financial		<$50,000	>$50,000 to $500,000	>$500,000 to $1,000,000	>$1,000,000 (critical loss)
Likelihood of risk (frequency)	Remote	1				
	Occasional	2				
	Probably	3				
	Urgent/Freque	4				
			Level 1			
		Risk ranking	Level 2			
			Level 3			
			Level 4			

Figure 7 Example matrix for evaluating severity of risks to SMRID West site.

Table 5: Identifying and ranking risks to the SMRID

Ranking	Risk	Associated opportunity	Likelihood (1 to 4)	Severity (1 to 4)	Priority score
[#]	Water security • Drought and water demand • Worse in warm and dry years • Southern Alberta a semi-arid ecosystem – water availability already limited in this region • Fluctuation in precipitation at the headwaters of the St. Mary, Belly and Waterton rivers	Additional water storage for the SMRID West operation Alberta irrigation modernization, which is expected to result in significantly reduced volumes of water lost to seepage, evaporation and spilling.	**[value]**	**[value]**	**[level]**
[#]	Risks from invasive species • Costs to manage the invasive species • Invasive species (such as zebra mussels) can significantly reduce infrastructure longevity	Public education on the threat of invasive species to local water systems	**[value]**	**[value]**	**[level]**
[#]	Climate change • Changes in precipitation at the headwaters • Volatility – increased risk of both flood and drought • Shift in timing of precipitation, requiring different storage system management and possibly different infrastructure	Additional water storage enables the SMRID to better serve members needs and have more resilience in water shortage periods • Expansion of Chin reservoir is a project currently underway • Alberta irrigation modernization will rehabilitate canals and fit pipelines to modernize the SMRID system, which will increase the efficiency of SMRID water delivery	**[value]**	**[value]**	**[level]**

Ranking	Risk	Associated opportunity	Likelihood (1 to 4)	Severity (1 to 4)	Priority score
		(through decreases in evaporation and leakage)			
[#]	Decreased reputation and public license for the SMRID and irrigated agriculture • Public views may cause changes in provincial funding for Alberta irrigation districts and the SMRID • Perspective of disproportionate use of public funds (e.g., AIM program funded provincially) and federally financed • Perception of environmental considerations being taken as inefficient (reduction of in-river flow) • Negative publicity from some environmental NGOs	Improved reputation and public license for the SMRID and irrigated agriculture	**[value]**	**[value]**	**[level]**
[#]	Inability of the SMRID systems to handle a large influx of stormwater from a high flow event	An opportunity exists in having live data regarding stormwater volume to enable the SMRID to utilize stormwater in the system • The SMRID could aid in managing serious stormwater events, which could impact SMRID works or neighbours. • SMRID works on its own land to mitigate runoff	**[value]**	**2 [value]**	**[level]**

Ranking	Risk	Associated opportunity	Likelihood (1 to 4)	Severity (1 to 4)	Priority score
		• If stormwater water quality meets SMRID criteria, water could be pumped back into the SMRID system • Allows SMRID to play a role in flood management • Allows system to capture additional water *(note that this would need to fit within the regulatory system)*			
[#]	Risks from plant growth in-canal • SMRID water treatment in-canal (magnicide) to limit plant growth • Causes issues to irrigation equipment	Use of learnings from RDAR study on algae and aquatic weed control in-canal	**[value]**	**[value]**	**[level]**
[#]	Reliance on water from a transboundary source • The possibility of increased usage of water by the USA from the St. Mary River system (as per the IJC and Transboundary Water Agreements) poses a threat to the operations of the SMRID • The possibility of changes to the IJC (a current study is being undertaken to review the 1921 order) • Transboundary Water Agreements pose a threat to the operations of the SMRID	Involvement in International Joint Commission (IJC) discussions • Advocacy for southern Alberta agricultural sector through collaboration with provincial and federal negotiators • Current discussions planned	**[value]**	**[value]**	**[level]**

Ranking	Risk	Associated opportunity	Likelihood (1 to 4)	Severity (1 to 4)	Priority score
[#]	Increased severity of project funding approvals		**[value]**	**[value]**	**[level]**
[#]	Water loss from seepage, leakage and evaporation SMRID system • Monitoring data extensive in the SMRID system • Potential impacts to surrounding communities, farmland, or dwellings • Inability to deliver water	Canal rehabilitation and/or replacement with pipeline to limit evaporation and leakage losses SMRID Government of Alberta funded and Canada Infrastructure Bank financed projects currently underway for this work (see Alberta irrigation modernization projects)	**[value]**	**[value]**	**[level]**
[#]	Contamination of the water in the SMRID systems • Oil/gas pipeline break or hazardous material spill affecting SMRID water quality in canals or reservoirs • Contamination of SMRID water via stormwater runoff • Contamination of SMRID water via grazing around reservoirs	An opportunity for almost real-time water quality testing to enable SMRID users to return water to the SMRID system • SMRID works with water users to mitigate runoff • SMRID works on its own land to mitigate runoff • If user's water quality meets SMRID criteria, water could be pumped back into the SMRID system • Allows SMRID to play a role in flood management • Allows system to capture additional water	**[value]**	**[value]**	**[level]**

Ranking	Risk	Associated opportunity	Likelihood (1 to 4)	Severity (1 to 4)	Priority score
[#]	A risk is the complexity of managing water in a drought and that there isn't a prescribed regulatory process, the regulatory group could 'get it wrong' and result in limited water availability to the implementers • Provincial drought management is not prescriptive • Licence priority in a drought situation – can have supply chain impacts (e.g., if a processor is given priority over a grower)		**[value]**	**[value]**	**[level]**
[#]	The risk is that there is no return on investment for producers implementing water stewardship (the extreme case is the costs of implementation are so high that producers' operations are no longer viable) • Concern – water stewardship practices will be 'top-down' and the burden for implementation will fall on the growers without compensation • Sustainable sourcing demanded by the buyers/market • Must respond to third party organizations that monitor sustainable sourcing	The opportunity is in finding how to make implementation of water stewardship financially beneficial for producers • Should processors pay farmers for sustainable production? • Sustainable sourcing demanded by the buyers/market • Must respond to third party organizations that monitor sustainable sourcing • Provide incentives to the producer	**[value]**	**[value]**	**[level]**

Ranking	Risk	Associated opportunity	Likelihood (1 to 4)	Severity (1 to 4)	Priority score
	• Provide incentives to the producer				

Table 6: Identifying and ranking opportunities associated with the SMRID

Ranking	Opportunity
[#]	SMRID emergency response plan to hazardous materials contamination and/or oil/gas pipeline break • In the event of an emergency, necessary materials and infrastructure could be close at hand to preserve water quality and ensure water delivery is delayed for as little time as possible
[#]	Incentive for producers using SMRID water to not use all of their allocation • Producers using less of their allocation could mean more water in the SMRID system for distribution • In-canal flow may be more difficult to predict if water use by users is variable • Improve reputation of farming community as water efficient
[#]	Additional hydro-electric/renewable energy generation at SMRID West operation • Ideally, energy stored could be maximized to sell at optimal times (such as winter) • Additional revenue for SMRID operations
[#]	Financial incentives for water stewardship (via markets) • Marketing products adhering to water stewardship standards as premium, therefore selling at a higher price – assumes that increased revenue from sales are distributed throughout the supply chain

Ranking	Opportunity
[#]	Telling the southern Alberta agriculture story • Clean water • World-class infrastructure • Right conditions for potatoes • Communicating what is already being done is an opportunity (to facility staff, the public, regulators, etc.)
[#]	Promoting the ability of irrigation and agriculture to improve the provincial and national GDP • May aid in attracting more processing facilities to Canada, specifically the southern Alberta agricultural corridor

9. Stakeholder Engagement

9.1 Identifying Stakeholders

This section addresses AWS Criterion 1.2 "*Understand relevant stakeholders, their water-related challenges, and the site's ability to influence beyond its boundaries."*

Indicators for Criterion 1.2 considered in this section include*:*
"1.2.1: "Stakeholders and their water-related challenges shall be identified. The process used for stakeholder identification shall be identified."
"1.2.2: "Current and potential degree of influence between site and stakeholder shall be identified, within the catchment and considering the site's ultimate water source and ultimate receiving water body for wastewater."

Stakeholder engagement is an essential part of water stewardship because it involves reaching beyond the fence-line of the site and understanding the concerns, needs and interests of the stakeholders in the area. Stakeholders of the implementers site are groups or entities of people that can be affected by the implementer's activities.

Stakeholder: Any organization, group or individual that has some interest or 'stake' in the implementing organization's activities, and that can affect or be affected by them. The four main categories of stakeholder are: (1) Those who impact on the organization; (2) Those on whom the organization has (or is perceived to have) an impact; (3) Those who have a common interest; (4) Neutral - those with no specific link, but with whom it is relevant to inform. Of most relevance to water stewardship are stakeholders associated with water use and dependency, but engagement should not be limited to these. (Alliance for Water Stewardship, 2019).

The most relevant stakeholders for water stewardship activities are individuals, groups, and entities that share the same water sources. Many issues are interlinked, such as environmental health, community wellbeing, local economy, and the organization's reputation. This means that stakeholder will not be exclusively water users upstream or downstream from the implementer.

It is valuable to understand the water-related challenges from the stakeholders because it can inform the types of stewardship activities that will be beneficial to the catchment and the local communities. It can also help align the implementer with stakeholders to form partnerships for water stewardship work.

The stakeholders were identified in an iterative process of thinking through which organizations are connected to SMRID in terms of water-related activities, and then which individual for each organization could be contacted. The entity that supplies water, and the entity that processes wastewater for the site were added to the list, any major entity that shares the same source of water was considered in terms of

the potential impact from the site, and the organizations that are connected through management of water that is used by the site were considered. Then organizations were added to the list of stakeholders based on the fact that the overall watershed health and water supply were identified as shared water challenges, and also based on what potential water-related risks and impacts from the site were identified. There were also organizations added to the list of stakeholders simply based on their already being engaged as part of the project Working Group.

9.2 Stakeholder engagement tracking

As stakeholder engagement is essential for water stewardship and reaching across the fence-line, SMRID engaged in four different engagement formats with a variety of stakeholder groups. This included Working Group meetings, an in-person focus group, an online discussion via Microsoft Teams, and emailed questions. The objectives of each engagement were to provide understanding for stakeholders to be able to answer questions, understand their perspectives on water-related concerns, and hear suggestions for implementable water stewardship actions that could mitigate those concerns.

Working Group Meetings

Four Working Group meetings were held for the Agricultures Water Future project. The meetings included various discussions of the risks, opportunities, actions, and progress around the SMRID West site water stewardship planning. The Working Group meetings were held October 26th 2021, January 20th 2022, April 12th 2022, and October 19th, 2022.

The Working Group included representatives from the following organizations:

- Cavendish Farms
- Nutrien
- Alberta Irrigation Districts Association
- Potato Growers of Alberta
- Agriculture and Agri-Food Canada
- University of Lethbridge
- Lethbridge College
- City of Lethbridge
- Prairies Economic Development Canada
- Alberta Innovates
- Oldman Watershed Council
- Alberta Agriculture and Forestry
- Lethbridge Economic Development
- Ducks Unlimited
- SCS Global Services
- Canola Council of Canada
- Eastern Irrigation District
- Crop Sustainability Working Group

- Ag for Life
- ARECA

Focus Group

A focus group was held in Lethbridge on March 3, 2022, to bring together stakeholders of the SMRID. The stakeholders in this session included:

- Alberta Irrigation Districts Association
- Alberta Agriculture, Forestry and Rural Economic Development
- Alberta Conservation Association
- The Municipal District of Taber
- Potato Growers of Alberta
- City of Lethbridge
- Lethbridge County

This stakeholder group highlighted several key water-related concerns, the first being a reduction in government support and funding to support water quality and monitoring. Government responsibility in water quality monitoring has decreased over the last few years, as they used to take samples and provide administration and analysis. Much of this responsibility now lies within irrigation districts and AIDA, yet the agricultural sector feels that the government must be more involved to secure public confidence in the data. A second key concern is invasive species within upstream reservoirs, as stakeholders indicated that the boat cleaning and mussel program needs to evolve so there are other stakeholders that can be bonified inspectors. Further concerns include impacts of climate change on water availability and water quality impacts of upstream users (i.e., impacts of upstream coal mining).

This focus group then brainstormed and prioritized potential actions to address water stewardship and sustainability. The actions, prioritized from high to low, include:

1. Leveraging government support and funding for water quality and quantity monitoring.
2. Creating and formalizing opportunities for communication regarding water stewardship and water management in agriculture.
3. Communicating, and educating on farm level best management practices.
4. Working with end users to develop standards and to communicate the credibility of these standards publicly.
5. Companies to develop pages on their websites that specifically address sustainability and stewardship practices.
6. Collaboratively agree on one climate change projection model for planning purposes.
7. Buyers need to implement and support standard methods for purchase.
8. Implementing regional data collection to report on the big picture, of where and how water is used for irrigation throughout Southern Alberta. Increased data collection would aid in sustainability reporting for irrigation.

9. Improving inspection program for upstream reservoirs.

Online Meeting

An online meeting was held on March 31 via MS Teams for those who could not make it to the focus group, and it included [redacted] and the [redacted]. Stakeholders identified water related concerns to be enough water supply for all users, especially enough to support fish and other aquatic species in the river. Actions identified to address these concerns included ensuring river instream flow objectives, wetland restoration and conservation, improving water use efficiency, defining sustainability, and encouraging more collaborative discussions regarding the balance of agriculture and environmental protection. A key action to addressing instream needs is improving water use efficiency, which includes irrigation moving towards high- and low-pressure pivots, producers diversifying their crops, and instrumentation that allows producers to understand exactly when to irrigate.

Email Correspondence

Several stakeholder groups were invited over email to provide their perspectives to the same questions of water related concerns and potential mitigation actions. On March 28, 2022, the following groups were contacted:

- Raymond Irrigation District
- Lethbridge North Irrigation District
- Trout Unlimited
- Pulse Growers of Alberta
- Alberta Wheat Commission
- Alberta Sugar Beet Growers
- Government of Alberta (a Fisheries Biologist)
- Town of Taber

The [redacted] responded to the outreach email on April 8, 2022, and highlighted their concern for water quality. As [redacted] receives water from Chin Reservoir and the TID main canal, they are concerned with the amount of organics in canal water. To mitigate this water quality issue, [redacted] feels that they would receive higher water quality if they received water from Chin Reservoir all-year round. With higher quality water they would require less chemicals to treat algal blooms. [redacted] suggested that to support water stewardship in the Oldman River watershed, all municipalities, counties, and Municipal Districts must be involved to ensure the watershed's health and allocate funds to maintain that health.

The [redacted] responded on April 5, 2022 and highlighted their concerns for sufficient water supply to provide adequate irrigation for crops, along with their ability to capture and store water. To mitigate these water supply concerns, [redacted] suggests increasing the number and expansion of reservoirs, increase funding for AEP to expand snowpack monitoring, and being vigilant in defending the IJC water agreement as it stands. Other water related concerns include maintaining high quality water in

Alberta and restricting aquatic invasive species that may impact recreation, irrigation, and potable water transportation. To mitigate water quality concerns, [redacted] suggests careful review of future industrial expansions, and increase government funding for AEP water quality monitoring in Alberta's rivers, lakes, reservoirs, and canals. To mitigate invasive species, it is necessary to have a strict monitoring program and more boat checks with cleaning stations. [redacted] believes that improvement of water stewardship includes participating in water quality monitoring programs, undertaking water conservation projects, and increasing efficiency of diverted water use.

The [redacted] responded on April 12, 2022 to highlight their water related concerns of efficient water use, water supply for irrigation, the amount of flood irrigation that is still being used, leaking ditches creating alkaline soils, and potato plant wastewater management. To mitigate these concerns, the [redacted] suggests that the government allow more water for irrigation from upstream reservoirs, increase oversight of irrigation boards to ensure water is being used efficiently and strategically, invest in more low-pressure pivots, and invest in irrigation pipelines instead of open ditches. The [redacted] highlighted a number of actions for water stewardship, including bringing back government assistant programs to offer rebates on upgrading irrigation equipment, decreasing irrigation during rain events, decreasing irrigation canal leakage, replacing ditches with pipelines, and educating producers on water efficiency techniques.

[redacted] responded on April 14, 2022 with a detailed email of concerns and suggested concrete actions. They identified a concern for the amount of fish losses from getting into irrigation canals and dying at the end of the irrigation season. Dams and weirs fragmenting fish habitat is noted as a concern. A significant concern is invasive species and the impacts to the aquatic ecosystems. Climate change was also noted as a concern, particularly in combination with water demands where the concern is climate change may create additional challenges for meeting instream flows and water quality needs for ecosystems. Stream and riparian habitat degradation in the headwaters was noted as a concern, particularly for native trout species. [redacted] stated that generally they support the following approaches to mitigate the water-related challenges; on-the-ground restoration work, education and awareness initiatives to draw attention to issues, science-based decision making, and regulatory tools to conserve and protect water resources. They also support increasing water efficiency in irrigation, as well as development of crops that are less water intensive. The suggested direct water stewardship actions for this project are to partner with [redacted] in habitat rehabilitation projects, partner with local academic institutions on related research projects, and explore solutions to fish entrainment in irrigation canals.

10. Shared water challenges

This section addresses AWS Criterion 1.6 "*Understand current and future shared water challenges in the catchment, by linking the water challenges identified by stakeholders with the site's water challenges.*"

Indicators for Criterion 1.6 considered in this section include*:*
"1.6.1 - Shared water challenges shall be identified and prioritized from the information gathered," and "1.6.2 - Initiatives to address shared water challenges shall be identified."

As is identified in Appendix A: Watershed Context, the Oldman River Watershed experiences high water demands relative to the annual volume of water naturally available. For years when there is less precipitation than usual and lower natural water supply, there may not be sufficient water for all water users to withdraw their full amount. Water use is managed by the provincial government through a water licencing system that uses priority numbers, the more senior licences have prior right to withdraw their water allocation when there is water scarcity. The relative demand in the Oldman River Watershed is high and the government no longer accepts applications for new surface water licences. The most commonly discussed shared water challenge is water scarcity or drought.

Much of the geographic region of the Oldman River Watershed is arid and experiences hot, dry summers (see Appendix A: Watershed Context). Most of the agricultural water users in the region are experienced in managing limited water availability and changing their operations in drier years, however economic impact is still felt and there is still significant concern about extreme events and multi-year droughts as these have very significant negative impacts.

The stakeholder engagement process identified a variety of shared water challenges. The following are the primary shared water challenges:

Impact of climate change on water availability. Changing timing and volume of water available due to changes in natural precipitation (snow and rain).

Impact of climate change and the high water demands compounding stress on the ecosystems. There are concerns that climate change may create additional challenges for meeting instream flow and water quality needs for southern Alberta rivers, and therefore the health of river ecosystems (and connected ecosystems) will be negatively impacted.

Reduced government support for water quality monitoring. Lack of government support for streamflow monitoring stations and water quality monitoring programs results in very limited data for all forms of planning and water management.

Oldman watershed closed to new licences. The fact that the basin is fully allocated (Alberta

Environment, 2006)and there are no more surface water licences being issued is a shared water challenge.

Threat of invasive species. Invasive species can cause significant damage to ecosystems, native species populations, irrigation infrastructure, water treatment infrastructure, recreation, etc.

Water quality impacts of upstream users. Increasing sedimentation, contaminants, or factors that increase water temperature upstream negatively impact downstream uses.

Wetland restoration and conservation. Wetlands are considered valuable natural areas providing many services and loss of these areas is an ongoing challenge in the watershed.

Meeting instream objectives in the river and ensuring water in the river for ecosystem needs. There are minimum flow objectives for the Oldman River and its tributaries that are not always met, which is a challenge for aquatic and riparian ecosystems and species.

Increase of organics in water, and algae blooms. Increasing nutrients and organics in the water bodies leads to water quality problems, including algae blooms, which are difficult to manage.

10.1 Opportunities and actions

The stakeholder engagement focus group (March 3rd) discussed shared water challenges, then they identified the opportunities and actions to respond to those challenges, and then voted on the ideas list to prioritize them. The focus group brainstormed and prioritized actions to address water stewardship and sustainability. Table 7 below captures the results of that exercise.

Table 7. Stakeholder focus group prioritized actions to address water stewardship and sustainability.

Priority items	Government and Municipal	Industry Associations	Conservation Groups	Implementers
Leveraging government support and funding for water quality and quantity monitoring	**2 votes**	**2 votes**	**1 vote**	**1 vote**
Creating and formalizing opportunities for communication regarding water stewardship and water management in agriculture	**3 votes**		**1 vote**	**1 vote**
Communicating, and educating on, farm level best management practices		**2 votes**		**2 votes**
Working with end users to develop standards and to communicate the credibility of these standards publicly	**2 votes**	**1 vote**		
Companies to develop pages on their websites that specifically address sustainability and stewardship practices (e.g., "Sustainability FAQ")	**1 vote**		**1 vote**	
Collaboratively agree on one climate change projection model for planning purposes	**1 vote**			**1 vote**
Buyers need to implement and support standards methods for purchase		**1 vote**		**1 vote**
Implementing regional data collection to report on water use		**2 votes**		
Improving inspection program for upstream reservoirs (i.e., modernise inspection program)		**1 vote**		

11. Important Water-Related Areas

This section addresses AWS Criterion 1.3 "*Gather water-related data for the site, including: water balance; water quality, Important Water-Related Areas, water governance, WASH; water-related costs, revenues, and shared value creation.*"

Indicators for Criterion 1.3 considered in this section include:
"1.3.6: On-site Important Water-Related Areas shall be identified and mapped, including a description of their status including Indigenous cultural values."

Please see Appendix A: Watershed Context (page 15) for an introduction to Important Water-Related Areas, and the definition according to AWS.

11.1 Site

Name of IWRA and description	Location	Value or factors of importance	Status	Any water-related risks
Cross Coulee Reservoir	Beginning of SMRID system	Economic value	Good working condition	Invasive species, riparian damage and sedimentation
Raymond Reservoir	Beginning of SMRID system	Economic value	Good working condition	Invasive species, riparian damage and sedimentation
North-East Reservoir	Central to SMRID West distribution	Economic value	Good working condition	Invasive species, riparian damage and sedimentation
Chin Reservoir	Key storage for central and east SMRID	Economic and community value	Good working condition	Invasive species, riparian damage and sedimentation
Stafford Reservoir	Storage for central and east SMRID	Economic value	Good working condition	Invasive species, riparian damage and sedimentation

11.2 Project Geographic Area

Name of IWRA and description	Location	Value or factors of importance	Status	Any water-related risks
Oldman River		Community, economic, environmental	Fair[1]	
St. Mary River		Community, economic, environmental	Fair[1]	
St. Mary Reservoir	Upstream water source for SMRID	Community, economic, environmental	Good	
City of Lethbridge water treatment and wastewater treatment facilities	Lethbridge	Community, economic, environmental	Good working order	
Lethbridge Coulee	Lethbridge	Community, economic, environmental	Fair	
Hellen Schuler Nature Reserve	Lethbridge	Community, economic, environmental	Good	
Henderson Lake	Lethbridge	Community, economic	Good	
Park Lake	North-west of Lethbridge	Community, economic, environmental	Good	

[1] From the Oldman River State of the Watershed Report (Oldman Watershed Council, 2010)

12. Indirect Water Use by site

This section addresses AWS Criterion 1.4 "*Gather data on the site's indirect water use, including: its primary inputs; the water use embedded in the production of those primary inputs the status of the waters at the origin of the inputs (where they can be identified); and water used in out-sourced water-related services.*"

Indicators for Criterion 1.4 considered in this section include:
"1.4.1 - The embedded water use of primary inputs, including quantity, quality and level of water risk within the site's catchment, shall be identified."
"1.4.2 - The embedded water use of outsourced services shall be identified, and where those services originate within the site's catchment, quantified."

The AWS Standard directs water stewards to think through and begin to understand the reliance on water quality and quantity that arises in their suppliers and key input products. The indirect water use is referring to water used in the creation, processing and transportation of goods and services supplied to the site. It is increasingly recognized as good practice for an operation to understand their indirect water use to some extent, and the importance of water through the agriculture supply chain is a central principal for the AWF project overall. Involving multiple, connected supply chain members as implementers in water stewardship within the project inherently incorporates indirect water use.

Indirect Water Use: Water used in a site's supply chain representing that used in the manufacturing and provision of all products and services, excluding water used on site. In effect, it is the sum of 'embedded water' of all products and services (Alliance for Water Stewardship, 2020).

Primary Input: The materially important products or services that a site consumes to generate the products or services it provides as its primary function (Alliance for Water Stewardship, 2019). A larger component of materials, ingredients or services used at the site to produce its principal outputs (products or services). It does not include supplies for 'one-off' constructions or services such as for infrastructure or buildings (Alliance for Water Stewardship, 2020).

AWS guidance suggests that primary inputs should include any externally procured goods or services that account for over 5 per cent of the total weight of the goods generated, or 5 per cent of the costs of a site (Alliance for Water Stewardship, 2020).

The list of primary inputs to the SMRID West site is below:

- **[list of primary inputs and relevant details]**

13. Implementation Plan

Water stewardship is aligned with the vision of the St. Mary River Irrigation District (SMRID), which is "supporting sustainable communities, environment and agriculture with water." Water is central to everything the SMRID does, and the quality and reliability of the water supply is a key commitment to its members. As such, the SMRID recognizes that they have a role as water stewards and management of the water in their system impacts many other water users in the watershed.

13.1Throughout this section the water stewardship actions are categorized in alignment with the four water stewardship objectives in Table 1. Water stewardship one-page summary table. As well, each action has one or more potential metrics identified. These metrics have been developed from an initial brainstorming process only. If the SMRID chooses to conduct monitoring and reporting on their water stewardship actions, internally or externally, they will likely determine the exact metrics to be used through an internal, strategy-based decision-making process.

The last column in each of Table 8, Table 9, and Table 10 links to Section 8: Site water risks and opportunities of this document. The process of identifying and ranking the water-related risks and opportunities for SMRID enables the implementation actions to be chosen based on their ability to mitigate risks or leverage opportunities. The 'Risks and Opportunities' column in the tables supports that consideration.

Water stewardship activities are part of the SMRID operations in a variety of ways, many are described in Table 8.

Table 8. Water stewardship to date and ongoing activities.

Identifier	Action	Status	Water Stewardship Objectives	Potential Metrics and Target	Costs	Benefits	Risks and Opportunities
Current Action 1	Close coordination with the provincial government entities responsible for estimating the water available each year, and the operator responsible for water management infrastructure in the Oldman River Watershed.	Ongoing	Watershed context and external engagement Internal collaboration	Metrics: - Key individual contact number and email identified. - Average number of times per week during the irrigation season communication (email or phone) between parties is conducted. **[insert target here]**	Minimal costs.	Aids in planning for water use in the year ahead and encourages strong relationships.	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**

Identifier	Action	Status	Water Stewardship Objectives	Potential Metrics and Target	Costs	Benefits	Risks and Opportunities
Current Action 2	Supporting increasing efficiency of water use in SMRID infrastructure and among the membership.	Ongoing	Operational resilience	Metrics: - Averaged water withdrawals per acre irrigated decreases over time, **[insert target here].** - Ratio of pipelines relative to canals increases, **[insert target here].**	Costs are in updating infrastructure and supporting water efficiency research.	Less water is lost to spill, seepage and evaporation. This increases water available for irrigators and creates a positive public perception.	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**
Current Action 3	Coordination and collaboration with AEP, landowners, local municipalities, municipal districts, and watershed councils regarding stormwater management, flooding, and water stewardship.	Ongoing	Watershed context and external engagement Operational resilience Internal collaboration	Metrics: - Number of watershed meetings attended each year, **[insert target here].**	Minimal costs.	Increased ability to plan for storm events. Commitment to the watershed and relationships. Allows SMRID to understand what is happening around the watershed and how they may be affected.	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**
Current Action 4	Working with recreational groups regarding use of the reservoirs, including designing and running an educational campaign for the risks from invasive species to the watershed and how to limit their spread**.**	Ongoing	Watershed context and external engagement	Metrics: - Number of recreational users aware of water protection efforts, **[insert target here].** - Number of public individuals directly engaged, **[insert target here].**	Costs associated with creating an educational campaign.	Working with the public creates a positive perception and helps decrease the spread of invasive species.	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**
Current Action 5	Participating in the design and implementation of information campaigns to increase the understanding of irrigation and	Ongoing	Watershed context and external engagement	Metrics: - Number of viewers of online information, **[insert target**	Costs from time required to design and implement a	Create a positive public perception.	**[link to identified ranked risk or opportunity in**

Identifier	Action	Status	Water Stewardship Objectives	Potential Metrics and Target	Costs	Benefits	Risks and Opportunities
	irrigation water use.			**here].**	program.		**Table 5 and Table 6]**
Current Action 6	Monitor various water quality parameters, compilation of the data and reporting the results, ensuring water quality risks are being watched on a regular basis.	Ongoing	Impact mitigation	Metrics: - Number of water quality samples taken per year - Unit chemical/ L water (e.g., micrograms of nitrogen per litre of water) - Change in water quality parameter of interest over time due to change in practice	Minimal cost.	Support public understanding of water quality in the watershed as reports are public.	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**
Current Action 7	Support research into water quality monitoring, including piloting new technologies for real-time water quality testing for SMRID system, neighbours, and water users (e.g., working with Roshan Water Solutions testing their system of water quality monitoring devices appropriate for real-time water quality testing for SMRID system, neighbours, and water users.	Ongoing	Impact mitigation Operational resilience	Metrics: - Number of new technology units tested in the SMRID system, **[insert target here].**	The costs on investing in R&D for water quality monitoring.	Enable landowners to pump water into the SMRID canal system if it meets quality standards, thereby SMRID provides a service and water is managed better in the whole system. Be able to better understand the water quality in the system.	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**

13.1 Process of identifying implementation actions

SMRID identified water-related risks to their operation through a brainstorming process with the support of stakeholders and other experts through a Working Group session. This process took into consideration the watershed context and potential direct and indirect impacts to the SMRID, and the impacts the SMRID West site could have on other users. With this same group of people, the SMRID brainstormed opportunities for improvements and partnerships related to water. The identified risks and opportunities were combined into a list, because in many instances an identified risk had a corresponding opportunity already

articulated. The list of risks and opportunities was reviewed, refined and streamlined to ensure that the way each was articulated was clear and relevant to the SMRID operations.

The list of risk and opportunities was used to identify actions, which would be the basis for this implementation plan. One, or a series of, action(s) was identified for each risk and opportunity, which formed a large list of potential actions that address water stewardship and sustainability. For each potential water stewardship action, a high-level assessment of costs and benefit was completed. The cost and benefits were added to the list of actions, to enable some comparison between the actions. The actions list was sorted by the timeline of feasible implementation. The immediate and short-term actions are listed in Table 9 below, and long-term actions are in Table 10.

13.2 Implementation actions

The list of actions in Table 9 will be implemented by SMRID as part of this water stewardship initiative.

The potential metrics and targets in the fifth column of Table 9 are included as examples for SMRID, they were developed through a preliminary brainstorming process.

Table 9. Short term implementation actions

Identifier	Action	Status	Water Stewardship Objectives	Potential Metrics and Targets	Costs	Benefits	Start and End Date	Risks and Opportunities
Short Term 1	Participate in a collaborative drought simulation exercise with other water users.	This year – A drought simulation exercise to be held on June 10 with AIDA and other IDs and MDs.	Watershed context and external engagement Operational resilience	Metrics: - Participate in a drought simulation exercise, **[insert target here].**	The time associated with engaging in water management discussions. The financial cost will depend on what form of engagement is determined to be valuable.	Demonstration of commitment to the community. Improve water security.	Start: May 15th 2022 End: June 15th 2022	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**
Short Term 2	Have a conversation related to water quality parameters that are already monitored. Discuss if there are parameters to watch regarding potential threats to people or the environment. Understand from the government what direction the water quality monitoring	This year – need to connect with Janelle Villeneuve and Alberta Agriculture to get a better understanding of the data and where this is going.	Impact mitigation	Metrics: - Organize and complete one or more conversations with key individual(s) at government departments, **[insert target here].**	Minimal cost.	Gain more value and wider benefit from water quality data that is already being collected.	Start: July 2022 End: January 2023	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**

Identifier	Action	Status	Water Stewardship Objectives	Potential Metrics and Targets	Costs	Benefits	Start and End Date	Risks and Opportunities
	program is heading in.							
Short Term 3	Implement riparian care and invest in control structures for stability and planting (e.g., in partnership with ACA?).	Part-Complete – SMRID has committed funding, allowing ACA to apply for additional funding related to riparian care and control structures. This will include wetlands, fencing, and other initiatives (check with Paul who is leading this project)	Operational resilience	Metrics: - Number of discrete wetland and riparian areas that are improved, **[insert target here].** - Amount of acres of area of riparian zone improved or protected, **[insert target here].**	The costs associated with investing in riparian care and control structures	Demonstration of a commitment to the local aquatic environment. Reduced water quality issues in SMRID-managed water and downstream	Building on previous work on a site by site basis	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**
Short Term 4	Invest to replace SMRID canals with pipelines to reduce water evaporation and seepage losses.	Part -Complete – Several specific canals have been converted to pipelines in the West portion of SMRID between 2020 and the end of 2022 (for the timing of this AWF project review)	Operational resilience	Metrics: - Dollars spent on shared infrastructure repairs (e.g., dams, pipelines, canals) - Kilometers of canal converted to pipeline, **[insert target here].**	The costs associated with transitioning from canal to pipeline and ongoing maintenance costs.	Reduction in water losses from seepage and evaporation following the transition to pipeline. Reduction of the risk of hazardous materials spilling into the open canal and causing water quality concerns. Water savings and	Start: 2020 End: unknown	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**

Identifier	Action	Status	Water Stewardship Objectives	Potential Metrics and Targets	Costs	Benefits	Start and End Date	Risks and Opportunities
						efficiency could lead to irrigation expansion and an increase of irrigable land.		
Short Term 5	Support initiatives with partner entities to plan and invest in stormwater management infrastructure to mitigate the impacts from major stormwater events.	Part-Complete – SMRID is participating in the Horsefly Regional Emergency Spillway Project through buying land and purchasing right-of-way for the project.	Watershed context and external engagement Operational resilience	Metrics: - Progress from design and contracting toward construction of the Horsefly Regional Emergency Spillway.	The costs associated with buying land and right-of-way.	Investing in stormwater management infrastructure projects will protect SMRID's infrastructure and water.	Start: 2020 Construction commencing 2022 End: Unknown	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**
Short Term 6	Support research and conversations with irrigation equipment and technology manufacturers (e.g. pivot companies) to potentially improve water use efficiency.	Part-complete –	Operational resilience	Metrics: - Organize and complete one or more conversations with key individuals, **[insert target here].**	Cost of investing in equipment.	Potential benefits include less water demand, less spill water, and overall less water needing to go through the SMRID system. Ability to have more detailed information about the water in the system. Ability to cut down of 'water poaching'. Ability to demonstrate to the	Start: End:	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**

Identifier	Action	Status	Water Stewardship Objectives	Potential Metrics and Targets	Costs	Benefits	Start and End Date	Risks and Opportunities
						public the collective commitment of irrigators to use water responsibly.		
Short Term 7	Provide guidance and support specific irrigation representative to the International Joint Commission watershed-level discussions regarding transboundary water management.	This year– support participants of stakeholder meetings with IJC task force.	Watershed context and external engagement	Metrics: - Number of conversations with Richard Philips to support him, **[insert target here].**	The time required to engage is discussions.	Strengthen international relationships. Have an opportunity to be aware of and possibly provide input in decisions about upstream water supply management. Mitigate water supply risk.	Start: July 2022 End: Unknown	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**
Short Term 8	Develop and roll-out an online system (like an app) for SMRID members to order water.	This year	Operational Resilience	Metrics: - Completion of the new online system. - Number of water users successfully on the system.	Cost of developing the online system	Improve the service to members of SMRID.	Start: 2021 End: 2022	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**

13.3 Roadmap for potential future water stewardship actions

The list of actions in Table 10 are the water stewardship actions that will not be completed within the short-term, but are being considered in multi-year planning and budgeting process.

Table 10: Long-term implementation actions

Identifier	Action	Status	Water Stewardship Objectives	Potential Metrics and Targets	Costs	Benefits	Risks and Opportunities
Long Term 1	Collaborate with other water users to optimise drought management operations and drought mitigation approaches. Engaging with the SSROM model project. As new data and modeling are available, SMRID will suggest changes to their drought management plans.	Long term	Watershed context and external engagement	Metrics: - Participation in collaborative planning sessions, **[insert target here].** - Number of other water users that the SMRID collaborates with, **[insert target here].** - Availability of water supply deficit forecast, **[insert target here].**	The time associated with engaging in water management discussions. The financial cost will depend on what form of engagement is determined to be valuable.	Demonstration of commitment to the community. Improve water security.	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**
Long Term 2	Encourage and support producers in development of water stewardship planning. Membership with SMRID and AIDA allows for increased water stewardship as they aid in public communications and stakeholder engagement on behalf of producers.	Long term	Watershed context and external engagement	Metrics: - Number of SMRID members demonstrating water stewardship, **[insert target here].** - Percent increase in average per-acre water use efficiency over time **[insert target here].** - Number of stakeholders engaged.	Minimal costs.	Demonstration of commitment to water stewardship.	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**

Identifier	Action	Status	Water Stewardship Objectives	Potential Metrics and Targets	Costs	Benefits	Risks and Opportunities
Long Term 3	Design and take part in a public education campaign telling the Southern Alberta agriculture story, partner with other organizations to extend the reach of the campaign. Specifically communicating what is already being done, responsible water use and water stewardship throughout the supply chain, and collaborative planning for water scarcity.	Long term	Watershed context and external engagement	Metrics: - Number of public individuals reached, **[insert target here].** - Number of public individuals directly engaged **[insert target here].**- Number of partner organizations.	Cost and time associated with planning and running a public education campaign	Improving public trust in agriculture. Improving relationships with other organizations. More public recognition of SMRID as a responsible and good corporate citizen.	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**
Long Term 4	Design and take part in a campaign targeting various levels of governments (local, domestic and foreign…) promoting the ability of irrigation and agriculture to improve the provincial and national GDP of Canada. Partner with other organizations to do this.	Long term	Watershed context and external engagement	Metrics: - Number of meetings attended, **[insert target here].** - Change in government or other funding over time for sustainable agriculture projects (e.g., for irrigation infrastructure improvements)	Cost and time associated with planning and running a promotional campaign.	Improving economic opportunities for ag and agri-food sector in Alberta.	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**
Long Term 5	For overall basin water security, invest or support initiatives preserving and developing headwaters/upstream natural infrastructure like wetlands, support protecting and restoring upstream ecosystem	Long Term	Operational resilience	Metrics: - $ spent on shared natural infrastructure - Acres of restored wetlands (area and total number) - Improved Riparian Health Assessment Score	The costs will depend on what type of upstream natural infrastructure is chosen. This may take the form of funding NGOs that	Demonstrate a commitment to the aquatic ecosystem and water stewardship overall. Improve water security.	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**

Identifier	Action	Status	Water Stewardship Objectives	Potential Metrics and Targets	Costs	Benefits	Risks and Opportunities
	services.				already do this work.		
Long Term 6	Investigate the potential for solar panels covering open canals to reduce evaporation and weed growth. If investigation indicates benefits of solar panels/solar infrastructure, then implement the solar/installation	Possible long-term on smaller laterals that are not converting to pipeline	Operational resilience	Metrics: - Change/ improvement in weed growth and water quality parameters over time. - Financial benefit (in offset cost or in direct revenue) from electricity generation.	$ for conducting a study. Costs of solar infrastructure (frames, panels, electricity lines and systems).	Benefits are knowing the extent of cost and benefits. The actual implementation would have benefits including reduction in water loss through evaporation (water efficiency and being water conscious), and increasing profits from energy production ($ for SMRID), and less cost of magnicide and less impact on water quality from using magnicide to control weed growth.	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**
Long Term 7	Evaluate stormwater impacts to SMRID canals in high flow events (source, quality, quantity, ownership) and understand how the SMRID can help manage high flow-events for the benefit of the watershed overall (beyond the Horsefly Regional Emergency Spillway. This would likely be other project recommended by the SA Regional Drainage	Long-term	Operational resilience	Metrics: - Amount of stormwater runoff (volume). - Number of water quality samples taken during storm events. - Comparative analysis of flood areas across SMRID geography and identified cause.	The staff time required to assess stormwater impacts, or $ for a study to be done.	Better understanding of impacts from stormwater.	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**

Identifier	Action	Status	Water Stewardship Objectives	Potential Metrics and Targets	Costs	Benefits	Risks and Opportunities
	Committee.						
Long Term 8	Develop and test water-related emergency response plan(s) based on risks identified in risk assessment and emergency response plans needed.	Long Term	Operational resilience	Metrics: - Number of emergency response plans. - Number of emergency drills/tests done each year.	The staff time required.	Have a proactive response plan prepared in the event of an emergency to quickly mitigate the impact.	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**
Long Term 9	Invest in a new storage reservoir, or expansion of existing storage, to support mitigation of the impacts of droughts and enable flood event mitigation	Planning and design stage underway for Chin reservoir expansion.	Operational resilience	Metrics: - Regulatory approvals. - Progress toward construction of the Chin reservoir expansion.	Costs of investing in a storage reservoir.	Invest in a new storage, or expansion of existing storage, to support mitigation of the impacts of droughts and flooding.	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**
Long Term 10	Identify locations along the SMRID West canals where hydro power production is an opportunity to generate renewable energy and an additional income source Complete cost-benefit assessment of installing hydro-power production infrastructure. Invest in additional hydropower generation	Long term	Operational resilience	Metrics: - Financial benefit (in offset cost or in direct revenue) from electricity generation) - Amount of new hydropower generating capacity (kWh).	The time required to identify locations. Cost of constructing new infrastructure and managing and maintaining it. Potential risk of negative view of	Increased power production is an opportunity for additional revenue.	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**

Identifier	Action	Status	Water Stewardship Objectives	Potential Metrics and Targets	Costs	Benefits	Risks and Opportunities
	stations.				hydropower.		
Long Term 11	Partner with RDAR to research new systems for managing aquatic weed growth. Potentially implement new system for managing aquatic weed growth based on findings from RDAR study. SMRID has initiated a partnership for algae and aquatic weed growth monitoring study with U of A.	Initiated – completion likely long term.	Watershed context and external engagement	Metrics: - Change/ improvement in weed growth and water quality parameters over time. - Financial benefit (in reduced cost for herbicide treatment relative to capital cost for new system)	Minimal cost.	Magnicide H is an expensive herbicide the SMRID uses to treat algae. This research would help look for alternative options for algae treatment, or identifying the most efficient way to use Magnicide H. This would reduce SMRID's costs related to this herbicide.	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**
Long Term 12	Complete preliminary risk assessment to quantify risks of potential emergencies (e.g. pipeline break, or hazardous material spills). Evaluate what water-related incident response plans do not already exist or which need to be updated. The SMRID has Engineering and Technical Services team members dedicated to dam safety. They identify risks, potential emergencies, and evaluate water-related incident response plans.	Initiated – completion likely long term.	Operational resilience	Metrics: - Number of emergency response plans updated or newly drafted. - Number of emergency events per year. - $ spent on emergency preparedness, e.g., shared infrastructure repairs.	Time associated with completing risk assessment.	Meet the AWS criteria, and know which incident response plans are not on hand.	**[link to identified ranked risk or opportunity in Table 5 and Table 6]**

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15. Appendix A: Watershed Context

waterSMART
Water Management Solutions

Agriculture's Water Future

Appendix A: Watershed Context
Appendix to the Water Stewardship Plan

Submitted by:
WaterSMART Solutions Ltd.

Appended on:
February 15 2023

Contents

Document purpose

This document supports a pilot study of implementing water stewardship across an agri-food supply chain. It is the third phase of work for the Agriculture's Water Future project, which is referred to as the AWF project throughout this document.

Setting the watershed context is the beginning of the Agriculture's Water Future (AWF) process. This step involves developing and documenting the characteristics of the watershed where the implementer operates, including water availability, water quality, water source reliability, local stakeholders, current water management, stewardship and governance. This requires research and compiling data and information about the area where the implementer's site is located. The watershed context fits closely with the information gathered about the implementer's site and operations. Together this information is the basis for planning and implementing water stewardship. Further details on the background of the Agriculture's Water Future project can be found in the AWF Phase II report: *A business case blueprint and framework for providing value to the agri-food supply chain through water stewardship* (WaterSMART Solutions Ltd. 2019).

The watershed context is intended to be a tool for creating the water stewardship plans. It provides the information necessary to understand the current state of the watershed (e.g., hydrological, social and economic aspects related to water and the sector of interest), and how a site (e.g., farm, processing facility) interacts with the watershed.

Understanding and documenting the watershed context aligns with the first steps for the with Alliance for Water Stewardship (AWS) Standard (Alliance for Water Stewardship 2019). The information that meets specific criteria for the AWS standard are identified through this document in the blue pop-out boxes.

Geographic context

This section addresses **a portion of** AWS Criterion 1.1 "*Gather information to define the site's physical scope for water stewardship".*

Indicators for Criterion 1.1 include:
"1.1.4: The catchment(s) that the site affect(s) and upon which it is reliant."

A key component to the AWS Standard is defining the physical scope of the site where water stewardship is being implemented. The AWS Standard is a site-based certification system, and the 'site' is defined as the physical area that is owned or directly managed by the implementing organization, and where they carry out their principal activities (Alliance for Water Stewardship 2019). The 'site' can be considered the area within the fence line. Water stewardship requires understanding impacts and planning stewardship actions that extend beyond the fence line. Implementers identify the physical scope for their water stewardship as the site itself and the land and water areas around the site that are impacted by, or have

an impact on, the site. The physical scope is defined by each entity implementing the AWS Standard and is dependent on many factors including the local geography, the size of the site, the wastewater produced on the site, and the source of water used by the site.

The AWF project involves two implementers: the St. Mary River Irrigation District (SMRID) and Cavendish Farms (Lethbridge Site) and one producer advisor. Each implementer has their site and defined physical scope. See Figure 2 for a map of the sites and Figure 3 for a map of the physical scope for the implementers. The implementers are part of the same agri-food supply chain and are located in the same watershed, reliant on essentially the same source water. Therefore, the geography of focus for the AWF project is the area that captures all three implementers. This will be referred to as the project geographic area. Figure 4 shows the defined project geographic area. The definition of project geographic area has been adapted from the definition of *Physical Scope* from the Alliance for Water Stewardship Standard version 2.0, as seen below:

> **Project geographic area**: The land area relevant to the supply chain's water stewardship actions and engagement. It should incorporate all or part of the relevant catchment(s) but may extend to relevant political or administrative boundaries. It is typically centered on the supply chain, but may include separate areas where the origin of water supply is more distant. (Alliance for Water Stewardship 2019)

The project geographic area that is the focus for the AWF project is located within the Oldman River watershed (also referenced as the catchment or the basin). This section of the report will introduce the larger scale context, and then go into detail on the project geographic area.

The Oldman River is a sub-basin of the South Saskatchewan River Basin (SSRB), which eventually flows into Hudson Bay. The implementers participating in the AWF project all source their water from the Oldman River watershed. The Oldman River watershed is predominantly in Alberta, but a small portion originates in Northern Montana, flowing north into Alberta. The area of the watershed within Alberta is approximately 23,000 km^2 (Oldman Watershed Council 2010). Figure 1 (below) is a map of the Oldman River watershed, detailing the major sub-basins of the Oldman watershed.

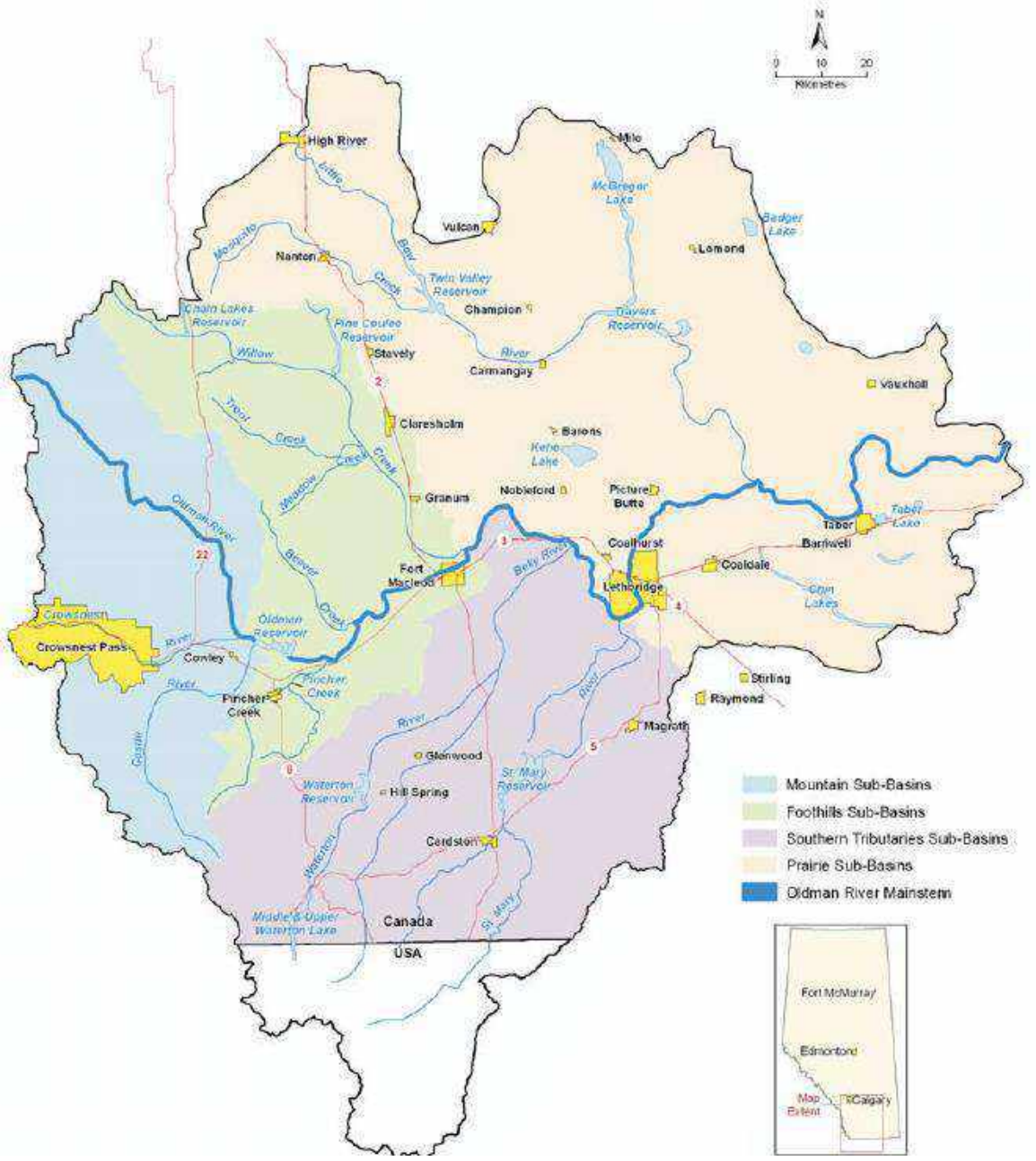

Figure 1: Map of the Oldman River watershed (Oldman Watershed Council 2010)

About 90% of the streamflow in the South Saskatchewan River Basin (SSRB), including the Oldman River watershed, is generated from snow and glacier melt in the Rocky Mountains (WaterSMART Solutions Ltd. 2019).The majority of the Oldman River watershed receives little precipitation throughout the year, and therefore downstream portions of the basin are heavily reliant on precipitation and snowmelt from the Rocky Mountain headwaters for streamflow. A system of major reservoirs and diversions regulates river flows and diverts water to areas of high demand.

The project geographic area of three AWF project implementers is located in the downstream portion of the Oldman River watershed. Figure 2 below shows the locations of the implementers' sites (SMRID and

Cavendish Farms Lethbridge Site), as well as the producer advisor's operation. All are within the Oldman River watershed, which is outlined in black. The SMRID is spread over a large geographic area, and extends beyond the Oldman River watershed into additional areas of the greater SSRB. The original source point of water for all areas of the SMRID is the same upstream reservoir within the Oldman River Watershed.

The map in Figure 2Figure 1 also divides the Oldman River watershed into level 8 scale basins, as defined by the Hydrological Unit Code (HUC). The HUC 8 watershed boundaries are in dark blue.

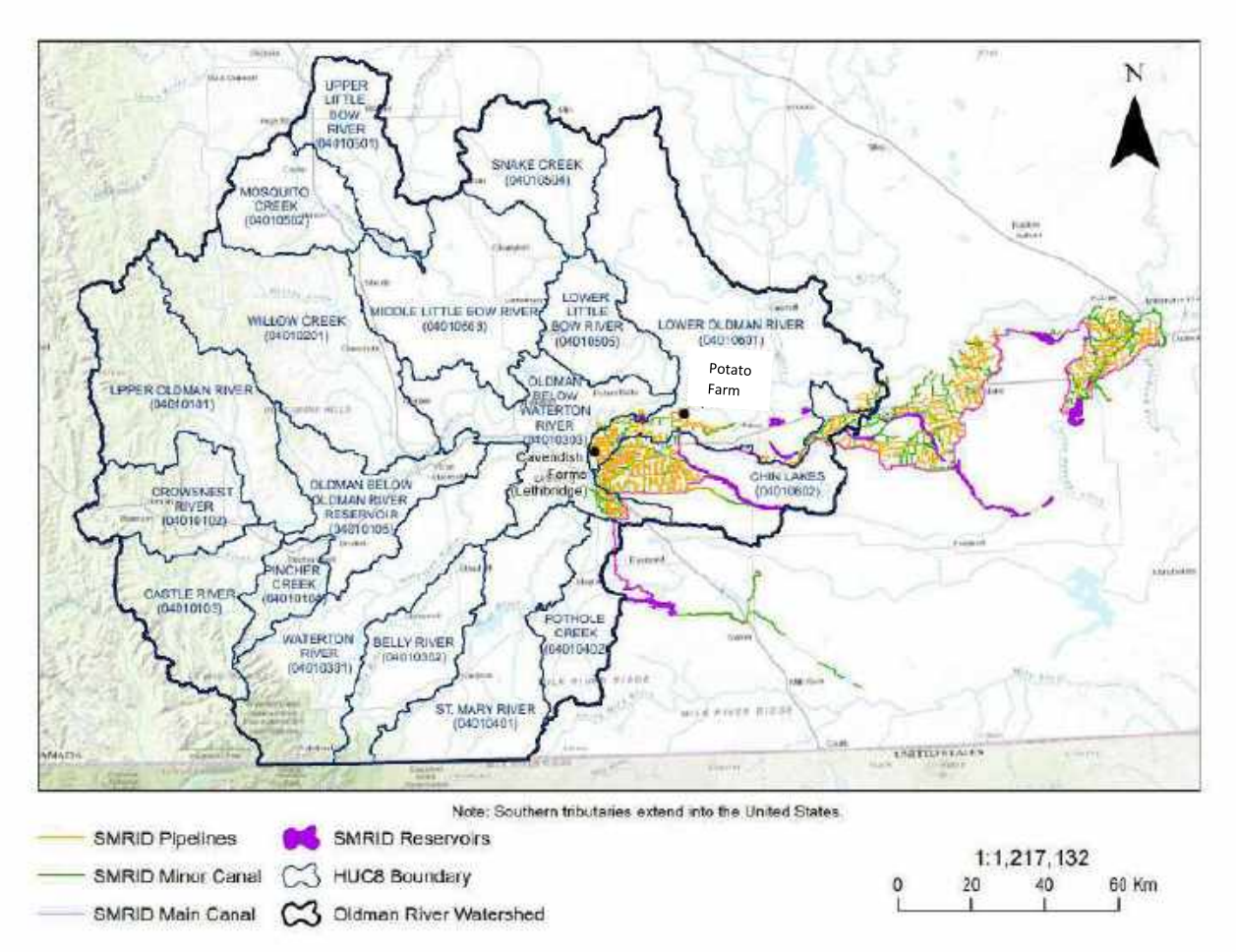

Figure 2: Map showing the locations of the implementers: the SMRID and Cavendish Farms, and the producer advisor's operation.

The physical scope (area beyond the fence line) of each of the AWF project Implementers and producer advisor are shown in Figure 3. The physical scope of each is shaded in a different colour; the SMRID in blue, Cavendish Farms Lethbridge Site in purple, and the potato farm in green. The physical scope of each extends over multiple HUC 8 scale watersheds.

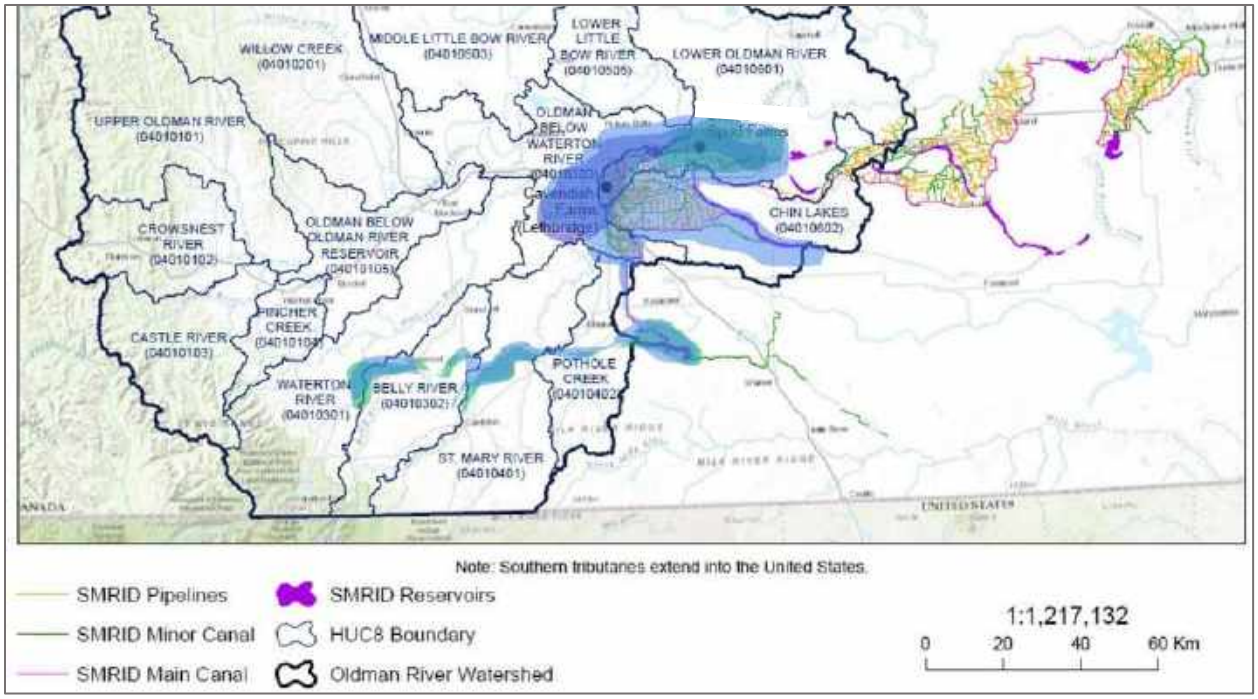

Figure 3: The physical scopes of the two Implementers and the producer advisor are overlaid to show the areas of overlap.

The project geographic area is the focus for watershed stewardship by all three AWF project implementers. The project geographic area is shown in Figure 4.

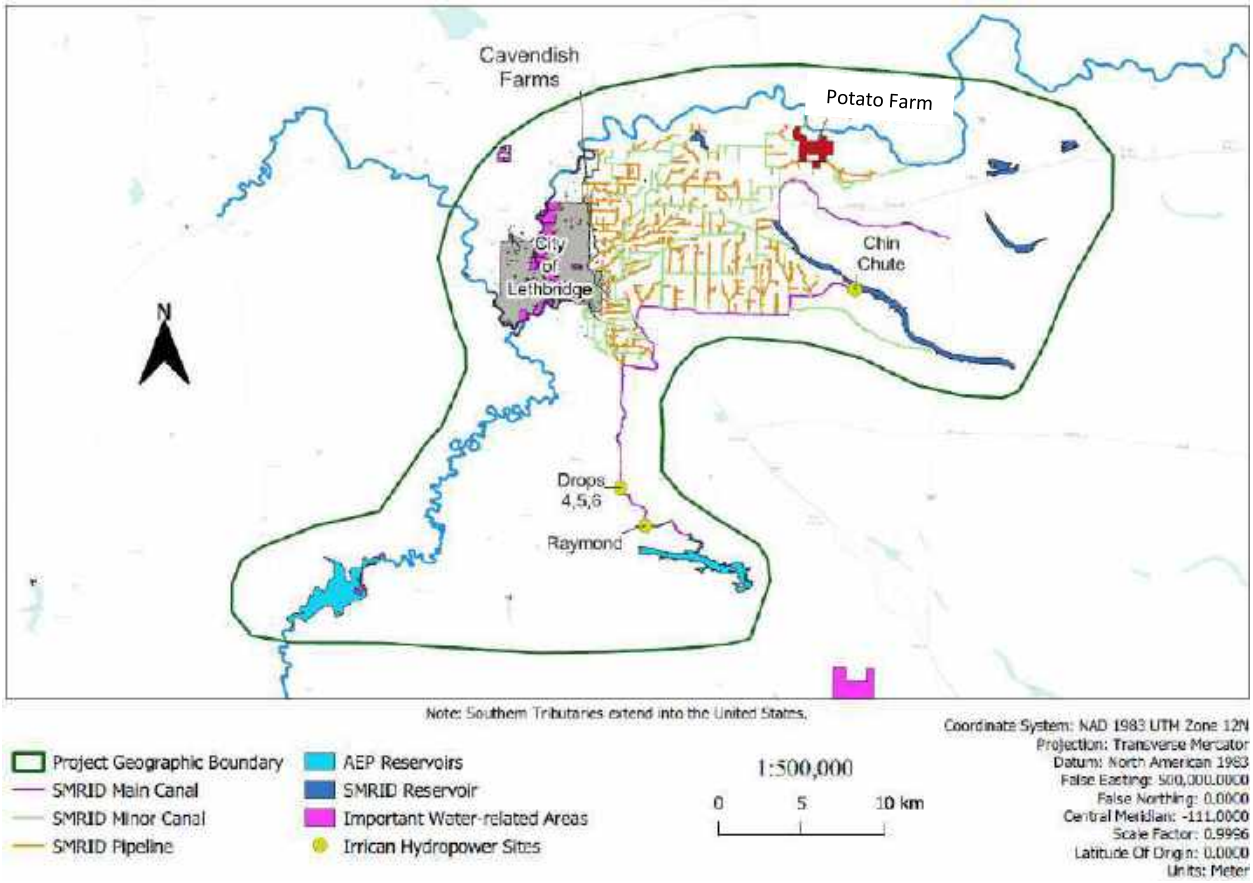

Figure 4: Map displaying the defined project geographic area for the AWF project.

Water quantity

This section addresses **a portion of** AWS Criterion 1.5 "*Gather water-related data for the watershed.*"

Indicator for Criterion 1.5 **that is addressed** is:
"*1.5.3 - The catchment water-balance, and where applicable, scarcity, shall be quantified, including indication of annual, and where appropriate, seasonal, variance.*"

Water Quantity Context of the Oldman River

Both surface water and groundwater can be evaluated for water quantity and availability. In the Oldman River watershed, surface water is the predominant water source for human uses, with less than 1% of the total water license allocations in the basin issued for groundwater (Government of Alberta 2021). For the AWF project, groundwater is not considered because the AWF implementers rely on surface water.

As noted above, the naturally available water in the Oldman River is mainly determined by the amount of snowmelt and precipitation in the headwaters, which is the area of the watershed with the greatest amount of precipitation (Oldman Watershed Council 2010). Therefore, flow in the Oldman River is naturally highest in the spring, due to snowmelt runoff, and lowest in the late summer.

The St. Mary, Waterton, and Belly rivers are three of the main tributaries to the Oldman River. The headwaters of these three rivers are located in Glacier National Park, Montana (Oldman Watershed Council 2010).

The water quantity in the Oldman River watershed is highly managed, with several major reservoirs capturing snowmelt and releasing it through the year based on the needs of downstream water users. The Oldman River basin has a variety of human water users, including irrigation, industry and municipal use. The differences in allocation for each water use can be seen in Figure 5.

The reservoirs are managed so that water is available for users through the naturally low flow times of the year. If precipitation and snow melt are minimal over multiple years, the reservoirs may not have enough water to meet all water user's demands resulting in challenging drought conditions. The Oldman River watershed has experienced severe drought and flooding events in the past, and the reservoirs play a key role in mitigating both (Oldman Watershed Council 2010).

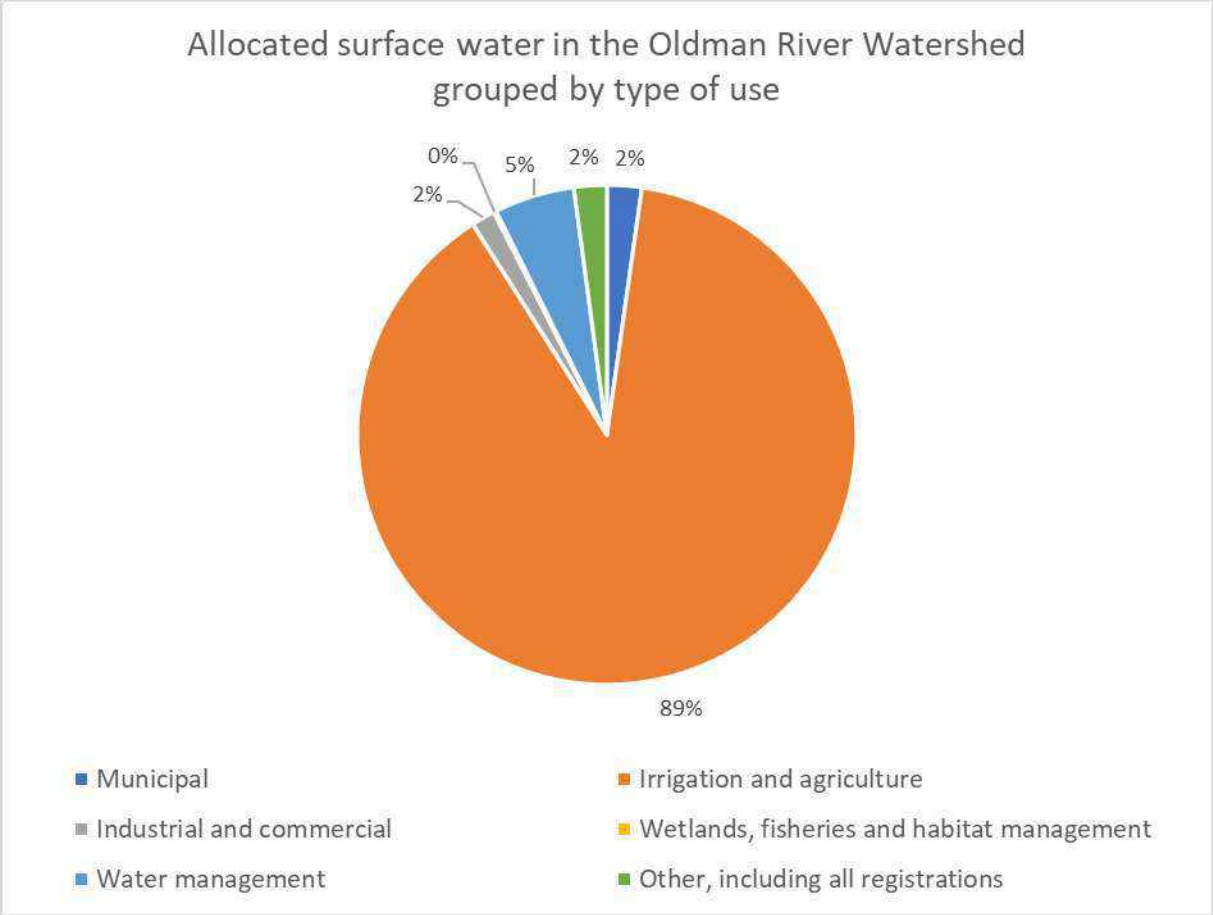

Figure 5. Allocated surface water in the Oldman River watershed grouped by type of use (data source (Government of Alberta 2021)

The total licensed volume in surface water licenses for the Oldman River watershed is 2.25 billion m^3/year (Government of Alberta 2021), which means that approximately 66% of the naturally available water is allocated for users in the watershed.

Because the project geographic area is in the downstream portion of the watershed, water available for human use and instream flows for the environment is largely dependent on how water is managed upstream on the Oldman River mainstem and its major tributaries. This section focusses on key upstream factors at a high-level, as well as the project geographic area specifically.

Project Geographic Area context

Water availability in the AWF project geographic area (Figure 4) is ultimately determined by the snowmelt at the headwaters of the Oldman River. Specifically, water quantity in the AWF project geographic area is determined by the water held in and released from the reservoirs upstream. Reservoirs upstream of the project geographic area of note include the St. Mary Reservoir, the Waterton Reservoir, and Ridge Reservoir. The St. Mary Reservoir and Waterton Reservoir are operated by the Government of Alberta, while the diversion gates from the Ridge Reservoir are operated by the SMRID.

The climate in this region is significantly drier than the upstream areas of the watershed, with between 300mm and 450mm of precipitation per year in different parts of the region (Oldman Watershed Council 2010). The temperatures vary significantly through the year, and frequently windy conditions can also contribute to loss of moisture. Summers are sunny, hot, and dry, with three to four months of growing season. Rich soils make for good agricultural growing conditions, with water as a limiting resource (Oldman Watershed Council 2010). The mean annual natural discharge of the Oldman River measured near Lethbridge from 1912-2001 is 3.4 billion m^3 (Oldman Watershed Council 2010).

Though the Oldman River mainstem at Lethbridge has no significant trends in changes to natural flow (Oldman Watershed Council 2010), simulated climate and streamflow models for the Oldman River indicate lower annual flows and a greater probability of extreme low flows in the future. Projections for the period of 2025-2054 found that there is a 60% chance that daily stream flow will not exceed 104.4 m^3/s. This projected flow is significantly lower than the historical period of 1912-2009, where there was a 60% chance that daily stream flow did not exceed 116.4 m^3/s (WaterSMART Solutions Ltd. 2014).

Climate change projections anticipate that precipitation events in the Basin are likely to become more variable and unpredictable in the future, leading to events such as floods, droughts, and wildfires (Durack, Wijffels and Matear 2012). A striking example is the catastrophic flood events of June 2013, which cost an estimated $6 billion, and in economic terms was considered the worst natural disaster in Alberta's history (McClure 2015). Additionally, projections indicate that summer flows are expected to decrease due to an increase in winter snowmelt (Western Economic Diversification Canada 2020). These changes within the basin will have implications for reservoir and irrigation management (Stewart, Cayan and Dettinger 2005). The Oldman River Basin therefore needs to be resilient and adaptable in responding to a wide range of future climate and stream flow variability.

Within the project geographic area, the Oldman River has a Water Conservation Objective (WCO) in place. The WCO is a regulatory tool that ensures a minimum amount of water in the river for environmental needs, and it requires water to be released from upstream reservoirs to support this minimum flow. See the section in this report titled *Regulatory system and water management authorities* for more information about the WCO for the Oldman River mainstem.

Multi-year droughts have had significant impacts on the region in the past, which have resulted in the implementation of water sharing agreements. For example, a large number of water users committed to sharing the available water during a multi-year drought in 2000-2001. Additionally, irrigation water users

in the area have an established system of sharing water through the irrigation districts who supply available water to their members.

Catchment Water Balance

The AWS Standard requires understanding the catchment water balance as a way to help identify increasing water scarcity. The water balance is an assessment of inflows and outflows, as well as storage in the system over a period of time (Alliance for Water Stewardship 2020). The equation defined by the AWS Standard is simplified, especially for the system of an entire catchment. Additional factors such as evaporative losses and consumptive water use can be included. As the name suggests, the equation should balance at least approximately. The catchment water balance is defined by the equation:

(Water outflow) = (Water inflow) + (Change in storage volume)

The estimated naturalized annual flow in the Oldman River is 3.5 billion m^3/year (Government of Alberta 2004). This is a long-term average calculated based on the data recorded since 1914 and adjusted to account for the effects of licensed diversions and reservoirs. The reservoirs in the Oldman River watershed (including the St. Mary, Waterton, and Oldman reservoirs) provide control over the river flow and mitigate drought and flooding. The reservoirs also increase the surface area of water and therefore increase evaporative losses, reducing the total volume of water available over the year. The recorded data shows a decrease in the annual flow volume over time compared to the naturalized series. This can be attributed to the increased consumption and water infrastructure operations upstream of Lethbridge (Government of Alberta 2004).

The authority governing water balance by managing the infrastructure is Alberta Environment and Parks (AEP). Snow and streamflow monitoring is done by AEP using monitoring stations placed on the major rivers and their tributaries. Current water availability data is provided by AEP to its licensed users, as well as predictions of availability for the coming season. These data can also be accessed publicly from Alberta Rivers (Alberta Environment and Parks), which are updated on a monthly basis. See the *Regulatory system and water management authorities* section for further explanation of AEP and regulatory mechanisms for water management in Alberta.

Water source reliability

Water is provided for the Oldman River at the headwaters in the Rocky Mountains, while the headwaters of the Waterton, Belly and St. Mary rivers are in Montana (Oldman Watershed Council 2010). Water availability in Alberta is determined through monitoring by the Government of Alberta.

Water availability of sources originating in the USA, such as the Belly, Waterton and St. Mary rivers, is governed by international agreements between the USA and Canada. These agreements are the Boundary Waters Treaty of 1909 and the International Joint Commission (IJC) Order of 1921, which apportion water from transboundary water bodies between the two nations (Government of Alberta 2020). The IJC is an international organization with representation from the United States and Canada that works to “provide direction on measurement and apportionment” for transboundary waters between the two countries (International Joint Commission 2020). As mandated by the IJC Order of 1921, the Water Survey of Canada and the United States Geological Survey monitor flow volume every 15 days (Government of Alberta 2020). Typically, more water is received in Canada than is strictly required based on the agreements for these transboundary waterways.

Water quality

This section addresses **a portion of** AWS Criterion 1.5 "*Gather water-related data for the watershed.*"

Indicator for Criterion 1.5 **that is addressed** is:
"*1.5.4 - Water quality, including physical, chemical, and biological status, of the catchment shall be identified, and where possible, quantified. Where there is a water-related challenge that would be a threat to good water quality status for people or environment, an indication of annual, and where appropriate, seasonal, high and low variances shall be identified.*"

Water quality at the headwaters

Water quality in the headwaters of the Oldman River is generally high, with the majority of headwater stream flow sourced from snow or glacier melt. The headwaters region in the Oldman River has limited impacts from urban and industrial activities, due to low levels of development in those areas. Additionally, several areas of the headwaters are protected from many activities and forms of future development by national or provincial park designations.

General water quality in the region

Though the water is of high quality at the headwaters of the Oldman River, water quality tends to degrade in the lower reaches of the river due to the impacts of municipal, agricultural and industrial land use. Phosphorus and nitrogen concentrations have been shown to increase in the main stem of the Oldman as the river passes through agricultural regions (Howery 2010). While these major indicators continue to be monitored, monitoring has shown that nitrogen and phosphorous concentrations in the Oldman River mainstem are within provincial water quality guidelines (Oldman Watershed Council 2010). Fecal coliforms and E. Coli were also shown to increase near grazed lands, and more significantly when water samples were taken immediately after larger rainfall events (Hyland, et al. 2003). While there have been fecal coliform guidelines exceedances in the Oldman River mainstem, these events are uncommon (Oldman Watershed Council 2010).

Watershed stakeholders

This section addresses AWS Criterion 1.2 *"Identify stakeholders and their water-related challenges".*

Indicators for Criterion 1.2 include:
"1.2.1: Stakeholders and their water-related challenges shall be identified. The process used for stakeholder identification shall be identified.
1.2.2: Current and potential degree of influence between site and stakeholder shall be identified, within the catchment and considering the site's ultimate water source and ultimate receiving water body for wastewater."

Relevant stakeholders for water stewardship are determined by the implementer, their location, and their impacts. For this watershed context, the initial screening level list of stakeholders captures those who are potentially relevant for the three AWF project implementers. This list of stakeholders is based on the

physical location of the project geographic area, and the water users sharing the same source of water as the implementers.

Stakeholders and water related challenges

In any agri-food supply chain, there are a number of individuals and/or organizations that are relevant stakeholders to the water stewardship of the supply chain. However, stakeholders have different levels of interest and influence, depending on their involvement in the supply chain and their power within society. Table 1 (below) is a starting point list of stakeholders that are relevant in the Oldman River Watershed and water stewardship practices. This list is refined further for each implementer specific to their operation, location, and the potato supply chain, which is the focus of the AWF project. The list in Table 1 is not exhaustive but provides the reader with an understanding of the number of potential players that should be engaged when considering water stewardship for an agri-food supply chain.

Stakeholders were suggested using the matrix shown in Figure 6 (below), which considers stakeholder influence, interest and engagement in the given region.

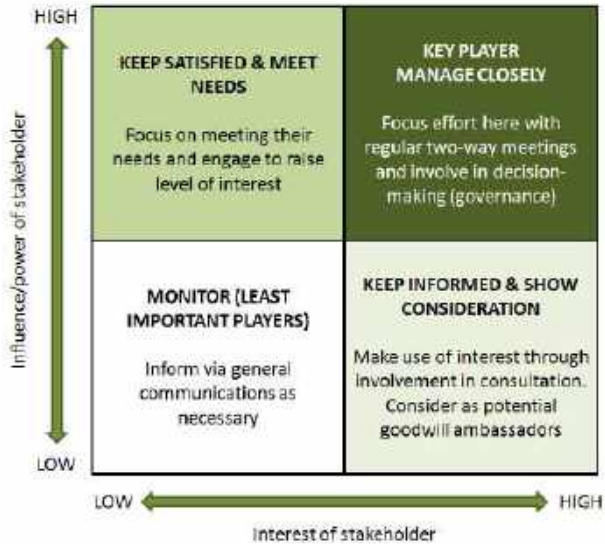

Figure 6: Stakeholder power, interest and engagement matrix (Alliance for Water Stewardship 2020).

Table 1: Starting point list of relevant stakeholders in the Oldman River Watershed for the AWF project

Potential Stakeholder
Alberta Agriculture and Forestry - Provincial Government Department
Alberta Environment and Parks - Provincial Government Department
Alberta Tourism and Rec - Provincial Government Department
Alberta Irrigation District Association
Alberta Conservation Association
Alberta Wheat Commission
BASF (Canola)
Blood Tribe no. 148
Canadian Food Inspection Agency
Cardston County

Cavendish Farms
City of Lethbridge
Ducks Unlimited
Lethbridge County
Lethbridge Fish and Game
Lethbridge North Irrigation District
Magrath Irrigation District
Municipal District of Taber
Newell County
Oldman River Chapter of Trout Unlimited
Oldman Watershed Council
Potato Growers of Alberta
Pulse Growers of Alberta
Raymond Irrigation District
Restaurant buyers
Retail buyers
SMRID
SMRID (western portion) members/rate payers
SMRID central and east members/rate payers
Taber Irrigation District
Town of Taber
Vulcan County
Warner County

Shared water challenges

This section addresses AWS Criterion 1.6 *"Understand current and future shared water challenges in the watershed"*

Indicators for Criterion 1.6 include:
"1.6.1: Shared water challenges shall be identified and prioritized from the information gathered.
1.6.2: Initiatives to address shared water challenges shall be identified."

There are several water-related challenges that are common among water users in the Oldman River basin. The previous sections that discuss the basin's geographic context, regional water quality and water quantity provide background and research on the shared water challenges that will be discussed in this section. Shared water challenges are defined by AWS as challenges that are "shared by the site and one or more relevant stakeholders" (Alliance for Water Stewardship 2020). There may be additional challenges identified through the stakeholder engagement process.

As the Oldman River basin is in an arid region, water must be carefully managed to ensure there is enough for people, for the environment and for a successful economy. Due to the amount of water already allocated for use in the region, the Oldman River and its tributaries are closed to new surface water licence applications. Best water management practices are key to the success of the region.

Table 2 below is a draft list of water challenges shared by multiple users in the Oldman River watershed. This table will be updated and refined to reflect the challenges and concerns that are identified through the stakeholder engagement process of the AWF project. These shared challenges will inform the water stewardship implementation actions of the AWF project implementers.

Table 2: Shared water challenges in the Oldman Basin identified in the initial research of the AWF project

Priority	Challenge	Catchment-level management
	Water security	- Drought response approach in the South Saskatchewan River Basin Water Management Plan - Water sharing agreements during times of drought (Water Act, section 33)
	Water quality	- Stream flow monitoring, the Water Conservation Objective and Instream Flow Needs - Oldman River Basin Water Quality Initiative
	Declining ecological health	- Instream flow needs (IFN) - Whirling disease and invasive species - Monitoring westslope cutthroat trout population in upper reach of Oldman River - Operations of the Oldman River Dam (ORD)
	Adapting to Hotter and Drier Future	- Simulation modelling
	Contaminants	- Emerging Contaminants of Concern

Important water-related areas

This section addresses **a portion of** AWS Criterion 1.5 "*Gather water-related data for the watershed.*"

Indicator for Criterion 1.5 **that is addressed**:
"1.5.5: Important Water-Related Areas shall be identified, and where appropriate, mapped, and their status assessed including any threats to people or the natural environment, using scientific information and through stakeholder engagement."

This section identifies the Important Water-Related Areas (IWRAs) that fall within the project geographic area. The site-specific IWRAs, if applicable, are dealt with in the Watershed Stewardship Plan document for each implementer.

The area must link to water in some way to be considered an IWRA. An IWRA is defined as an area or feature that, if impaired or lost, would adversely impact the environmental, social, cultural or economic benefits derived from the catchment in a significant or disproportionate manner. Although the term 'important' is subjective, the IWRAs are identified through research and engagement with local stakeholders. The term 'water-related' is intentional and it refers not only to areas that contain a natural

waterbody, but also areas that rely on water for their condition and protection, but which may be dry for much of the year.

The most obvious IWRAs for this project are the original water diversion points for the water sources of the implementers. Those diversion points are the Ridge Reservoir and the intake for the City of Lethbridge municipal water treatment plant. These two locations provide water to numerous other water users in addition to the implementers.

The Oldman River Valley from Lethbridge to the confluence with the Little Bow River is deeply cut below the Prairie plain and has deep coulees running down to the river. That area falls within the project geographic area and is recognized as an environmentally significant area. The coulee ecosystems and riparian areas are key nesting places for birds, including prairie falcons, golden eagles and ferruginous hawks (Oldman Watershed Council 2010).

There are multiple areas within the City of Lethbridge that have been identified as culturally significant by the Blackfoot Confederacy. The Indian Battle Park, Bull Trail Park, Popson Park, Pavan Park, the Turtle Effigy located on the West Lethbridge Prairie upland, and many other sites within the City of Lethbridge are identified in the 2017 report “Traditional Knowledge and Use Assessment, City of Lethbridge” by the Blackfoot Confederacy Nations of Alberta in association with Arrow Archeology Ltd. (The Blackfoot Confederacy of Alberta in association with Arrow Archaeology Ltd. 2017).

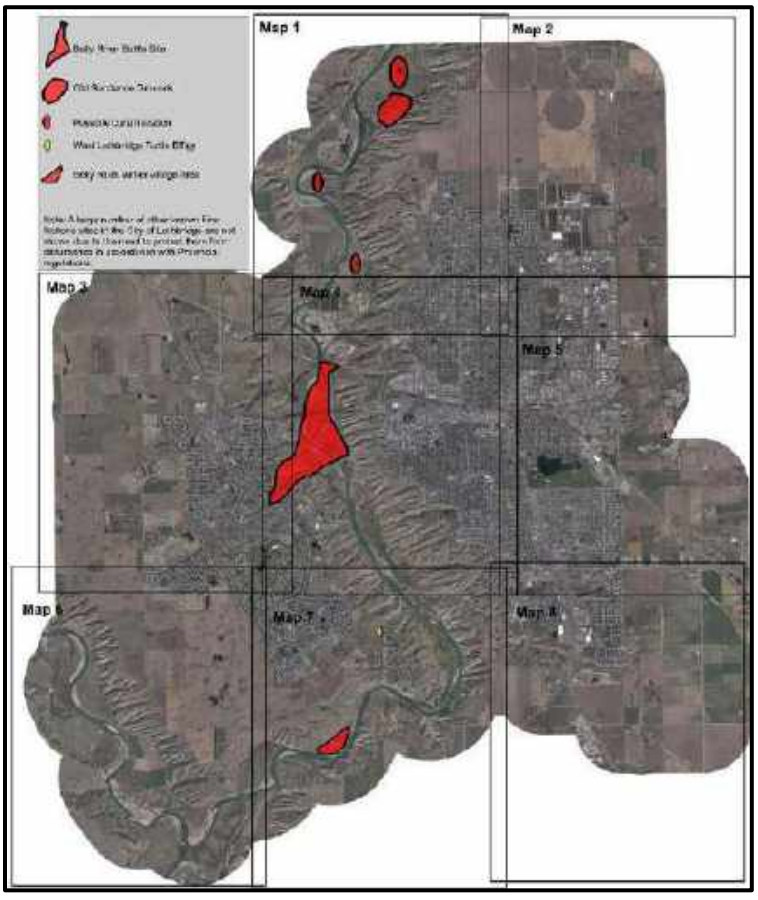

Figure 7. Historical site locations from the Traditional Knowledge and Use Assessment, City of Lethbridge (The Blackfoot Confederacy of Alberta in association with Arrow Archaeology Ltd. 2017).

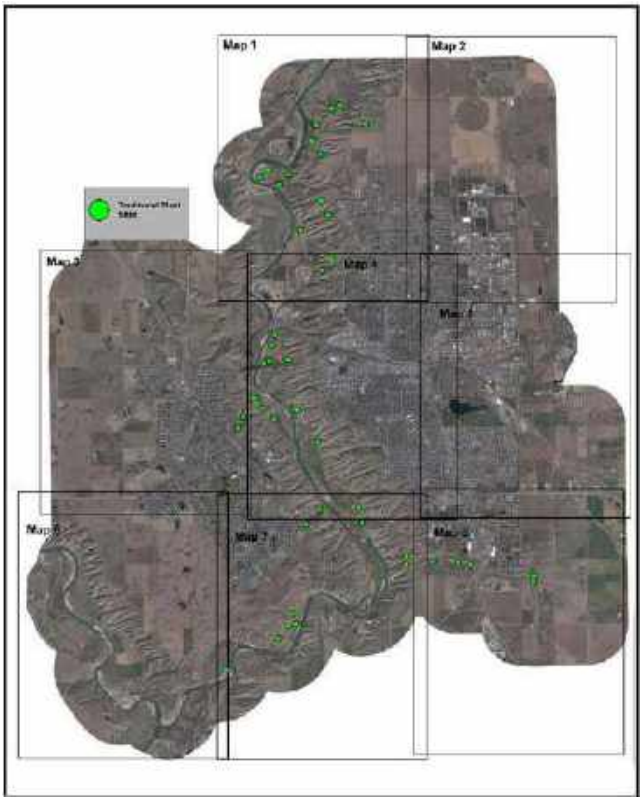

Figure 8. Select plant locations from the Traditional Knowledge and Use Assessment, City of Lethbridge (The Blackfoot Confederacy of Alberta in association with Arrow Archaeology Ltd. 2017)

Within the City of Lethbridge there is a network of connecting city parks that protect much of the river valley and riparian areas through the city limits. Several of these are designated as protected parks because of their ecosystem services. The Elizabeth Hall Wetlands and the Hellen Schuler Nature Reserve are two examples. See Figure 4 earlier in this report for an indication of where these parks are located, in the map legend the parks are referred to as Important Water-Related Areas, identified in pink.

Regulatory system and water management authorities

This section addresses **a portion of** AWS Criterion 1.5 "*Gather water-related data for the watershed.*"

Indicators for Criterion 1.5 **that are addressed** include:
"1.5.1: Water governance initiatives shall be identified, including catchment plan(s), water-related public policies, major publicly-led initiatives under way, and relevant goals to help inform site of possible opportunities for water stewardship collective action.
1.5.2: Applicable water-related legal and regulatory requirements shall be identified, including legally-defined and/or stakeholder-verified customary water rights."

The *Water Act* is the central piece of legislation governing water in the province of Alberta. The *Water Act* provides tools, orders and authority for management of water resources. It supports and promotes water

conservation and management of water through the use and allocation of water. Alberta Environment and Parks (AEP) delivers the *Water Act* mandate, manages reservoir ownership and operations, and regulates impacts to water quality under the *Environmental Protection and Enhancement Act* (EPEA), for all water matters not associated with oil, gas, coal and pipelines.

In addition to the *Water Act*, numerous policies and other pieces of legislation provide direction and limit activities related to water. Below are descriptions of several of them. The *Approved Water Management Plan for the South Saskatchewan River Basin* (2006) made various recommendations including to close the Bow, Oldman and South Saskatchewan River sub-basins to new applications and to designate WCOs on the mainstem rivers and their tributaries. The *Bow, Oldman, and South Saskatchewan River Basin Allocation Order* was issued in 2007 as a regulation under the Water Act that implemented the recommendations of the *Approved Water Management Plan*.

Water Conservation Objectives (WCOs) are established under the *Water Act* as a regulatory tool for balancing human and environmental needs for water flows. Water allocation licenses can include conditions that determine minimum flows that must be present before water can be diverted in order to protect the aquatic ecosystem. WCOs affect flows by governing the amount of water that must be released from a dam, when a license holder can divert water, and by guiding government officials on decisions about when water can be allocated, and the amount of water needed for flow restoration.

WCOs do not guarantee the designated WCO volume of water remains in the water course, as some licensees are not subject to a WCO condition and may withdraw water when a WCO threshold is surpassed. There are WCOs for the SSRB, recommended as part of the *Approved Water Management Plan for the South Saskatchewan River Basin*. For the Oldman River mainstem below the Oldman River Dam to the confluence with the Bow River, the WCO is either 45% of the natural flow or the existing instream objective increased by 10%, whichever is greater at any point in time. For the headwater reaches of the Oldman River, the existing instream objective is the WCO (Alberta Environment and Parks, 2019).

Another key legislative piece is the Master Agreement on Apportionment (1969), which outlines how the governments of Alberta, Saskatchewan, Manitoba and Canada share the waters of eastward flowing interprovincial streams. The agreement requires that at minimum 50% of the annual flow by volume of the headwaters of the eastward-flowing provincial watercourses must be passed from Alberta to Saskatchewan.

Water for Life strategy and action plan (2003) affirmed Alberta's commitment to the wise management of the province's water resources for the benefit of all Albertans.

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Appendix E: Example plan - Cavendish Farms Lethbridge Site Water Stewardship Plan

waterSMART
Water Management Solutions

Agriculture's Water Future Project

A Recommended Template for Water Stewardship at Cavendish Farms (Lethbridge Site)

Submitted by:
WaterSMART Solutions Ltd.

Submitted to:
Cavendish Farms Ltd.

Submitted on:
February 15, 2023

WaterSMART Solutions Ltd. (WaterSMART) is pleased to deliver this recommended template of a water stewardship plan for the Cavendish Farms Lethbridge site. This document has been prepared through a collaborative working group process, as part of the Agriculture's Water Future project, which Cavendish Farms is supporting through funding and in-kind contributions of personnel time.

Corporate Commitment Statement

[A statement of commitment to water stewardship should be drafted and signed by Cavendish Farms as part of the water stewardship plan. The statement can include identifying the alignment with the broader corporate values, commitment to the principles of water stewardship, and other relevant specific statements about water resource quantity, quality, and the health of the local watershed and communities. The commitment can speak to the systems that will be used internally to continue to evaluate and improve responsible water use, operations and connections to the local community.

An example of a way to summarize the water stewardship strategy and commitment on one page is shown below in Table 1. This could be used to illustrate and easily communicate the principles in the corporate commitment statement.

The commitment statement would be signed by corporate leadership.]

The summary table below (Table 1) captures the commitment, objectives, and intended outcomes for water stewardship.

Table 1 Water stewardship summary of commitment statement, objectives and outcomes.

Commitment statement: Cavendish Farms Lethbridge Site manages water quantity and quality carefully both on-site and through engagement with stakeholders as a key input to our business and to minimize impacts to the environment.				
Objective 'buckets'	**Watershed Context and External Engagement**	**Impact Mitigation (beyond the fenceline)**	**Operational Resilience (within the fenceline)**	**Internal Collaboration (and continuity)**
Objectives	Operate our facility while recognizing the unique environmental and stakeholder context, challenges, and opportunities of the Oldman River Watershed.	Understand and mitigate the impacts of our operations on the local watershed.	Continually apply water stewardship actions to reduce operational risks and improve resilience.	Coordinate water stewardship across all internal departments to promote meaningful and long-lasting benefits.
Programs (sub-objectives)	Acknowledge the watershed's capacity to meet our operational needs. Actively participate in the local community to inform stakeholders about water management successes and challenges and solicit their input.	Understand and mitigate the impacts from operations on the Oldman River. Support activities to improve water quality throughout the watershed.	Optimize water conservation in operations. Optimize the reuse of water in operations	Regularly review water performance and internal communication. Continue to strengthen corporate and site water accountability.
Outcomes	Cavendish Farms Lethbridge Site's water stewardship actions support the local community, the local aquatic environment, and the resilience of our operations.			

Contents

1. Document Purpose

The Cavendish Farms water stewardship planning document is a report specific to the Lethbridge site of Cavendish Farms. It combines the details of current operations, identifies connections to the local community and environment, lists the water related risks and opportunities, and lays out the plan for implementing water stewardship. It contains a section describing Cavendish Farms Lethbridge Site, how water is used in the operations, and existing water management actions on site and water stewardship activities. The geographic area relevant to the site's operations and the current water stewardship activities are noted.

This water stewardship planning document is developed as part of the Agriculture's Water Future (AWF), Phase III, project work, and it is intended to serve as an example for water stewardship work on other Cavendish Farms locations, and for other operation in the agriculture and agri-food sector in Alberta.

This report is also intended to systematically identify the Alliance for Water Stewardship (AWS) Standard criteria that are met by the Cavendish Farms Lethbridge Site. The AWS Standard is an internationally recognized and verifiable framework for water stewardship that drives, recognizes, and rewards good water stewards. The criteria are highlighted in blue boxes throughout the document.

Appendix A provides the larger watershed context for the Cavendish Farms Lethbridge Site, which includes details of the water availability and water quality in the watershed, watershed stakeholders, the regulatory system and water management authorities.

2. Implementer overview

Cavendish Farms Lethbridge Site is a potato processing facility where water is primarily used for washing potatoes and to move potatoes through the automated processing line. More moderate amounts of water are used for other parts of the process, such as blanching potato product, removing potato slivers, moving potato peelings, producing steam, and cleaning the conveyor belts and the facility in general. Further details of the process are discussed in Section 5, below. The facility is provided treated municipal water from the City of Lethbridge, and the wastewater leaving the site is sent to the City of Lethbridge wastewater treatment plant.

Water reuse and water efficiency was a key consideration in the design of the Lethbridge facility. The site uses water management systems, including for efficient water reuse, which are at the forefront of the potato processing industry. Additionally, the operations management personnel have particular awareness of, and focus on, improvement in water use efficiency and have taken steps to conserve water in the processing line.

3. Existing standard compliance, memberships, and accreditations as relates to water stewardship

Standard/Group/Accreditation	How the membership promotes water stewardship
Member of the Potato Sustainability Alliance	Alliance members are committed to advancing a common vision of potato sustainability and delivering economic, environmental and social outcomes at scale.
Safe Quality Foods (SQF) accredited	Facilities with SQF accreditation adhere to global food safety and quality standards.

4. Site and Physical Scope

This section addresses AWS Criterion 1.1 "*Gather information to define the site's physical scope for water stewardship"*

Indicators for Criterion 1.1 include:
"1.1.1: The site's operational boundaries."
"1.1.2: The water sources from which the site draws."
"1.1.3: The locations to which the site returns its discharges."
"1.1.4: The catchments(s) that the site affects(s) and upon which it is reliant."

The Alliance for Water Stewardship (AWS) Standard (v. 2.0) requires that several pieces of information about the implementer's geographic location and water use be defined in order to evaluate the impact of an implementer in a watershed. The *site* and *physical scope* must be identified for each implementer. As the AWF project is considering the water stewardship practices of several members of an agri-food supply chain, the site boundaries and physical scope of each implementer are taken into account when determining the *project geographic area* of the supply chain (as seen in Appendix A: Watershed Context).

4.1 Site

The *site*, as defined by AWS, can be seen below:

> **Site:** For the AWS Standard, the site is the physical area over which the implementing organization owns or manages land and carries out its principal activities. In most cases it is a contiguous area of land but may also include physically separated but nearby areas (especially if in the same catchment). (Alliance for Water Stewardship, 2019)

The boundaries of the area managed by Cavendish Farms Lethbridge site are shown in Figure 1. The site geography is flat land, bordered by city roads on three sides, beyond the roads is private agricultural land, and the BASF Canada Inc. to the north. The total site area is approximately **[X]** acres, with the majority of that space being leased out to a local producer, and approximately **[X]** acres being used by the Cavendish Farms facility.

A stormwater pond located in the north-east corner of the site delineated in Figure 2 captures the stormwater from the facility and the parking lot.

Figure 1. Site boundaries of Cavendish Farms Lethbridge Site.

4.2 The physical scope

The site's *physical scope*, as defined by AWS, can be seen below:

> **Physical scope:** The land area relevant to the site's water stewardship actions and engagement. It should incorporate the relevant catchment(s) but may extend to relevant political or administrative boundaries. It is typically centered on the site but may include separate areas if the origin of water supply is more distant. (Alliance for Water Stewardship, 2019)

The Cavendish Farms Lethbridge Site is situated on the north-east side of the City of Lethbridge, see Figure 2 for the relative location of the site. The City of Lethbridge is in the Oldman River Watershed and sources its municipal water from the Oldman River. The City also returns its treated wastewater to the Oldman

River, and stormwater generally flows into the Oldman River. For further information about the Oldman River Watershed and Cavendish's location within it, please see Appendix A, sub-section "Geographic Context".

The quantity of naturally available water in the Oldman River watershed is highly dependant on the snow and rain in the Rocky Mountain headwaters of the watershed. The watershed has also historically experienced flooding and droughts. Please see Appendix A, sub-section: "Water Quantity Context of the Oldman River" for details on the available water.

The Oldman River water quality is influenced by the land uses within its boundaries, including municipal, agricultural and industrial activities. Concentrations of phosphorous and nitrogen increase in the downstream reaches, however they are within provincial water quality guidelines. Please see Appendix A, sub-section "Water Quality" for further information on the water quality in the Oldman River.

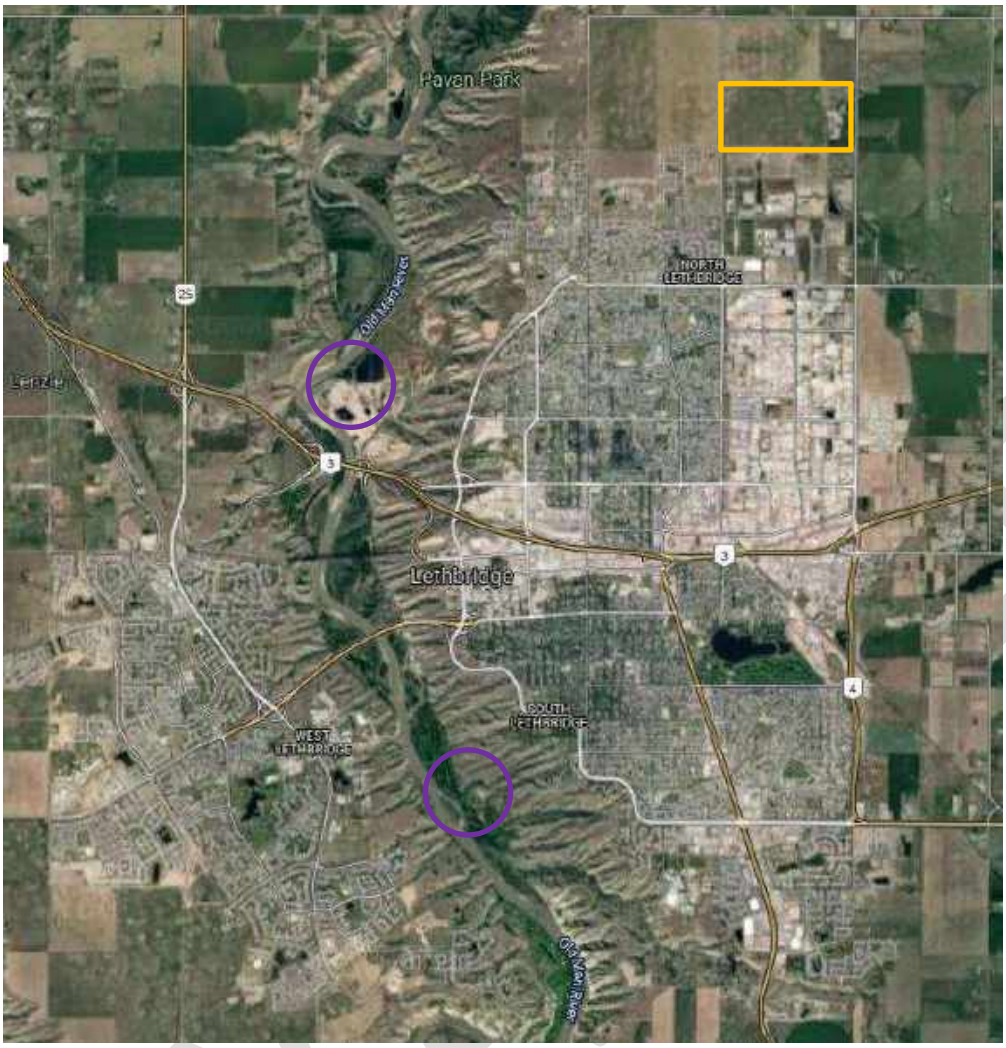

Figure 2. Location of Cavendish Farms Lethbridge site (yellow rectangle) in relation to the City of Lethbridge and the Oldman River. The city water and wastewater treatment plants are circled in purple.

The physical scope for water stewardship activities of the Cavendish Farms Lethbridge Site has been determined through identifying the source of water, the area nearby that could be influenced by the activities of the site, and the places where wastewater is returned to the natural system. Because the facility sources its water from the municipal system, and returns wastewater through the municipal wastewater treatment plant, the City of Lethbridge is included in the physical scope. The area around the site is included for more than a kilometer on all sides, and some of the St. Mary River Irrigation District (SMRID) irrigation infrastructure is found directly bordering and passing underneath the site. The mainstem of the Oldman River and riparian areas downstream to the Town of Taber are included to account for the impact of the City's wastewater treatment plant discharge. The physical scope extends downstream to ensure environmental areas and other water users and communities are taken into account in the water stewardship activities.

The Oldman River Watershed can be subdivided into various hydrological unit code (HUC) scales. These subsections show which tributary systems join the mainstem of the river upstream of the implementer, and which are downstream. Below, in Figure 3, the physical scope for the Cavendish Farms Lethbridge Site water stewardship activities is shaded in transparent blue, and the HUC 8 level watershed boundaries are shown in dark blue.

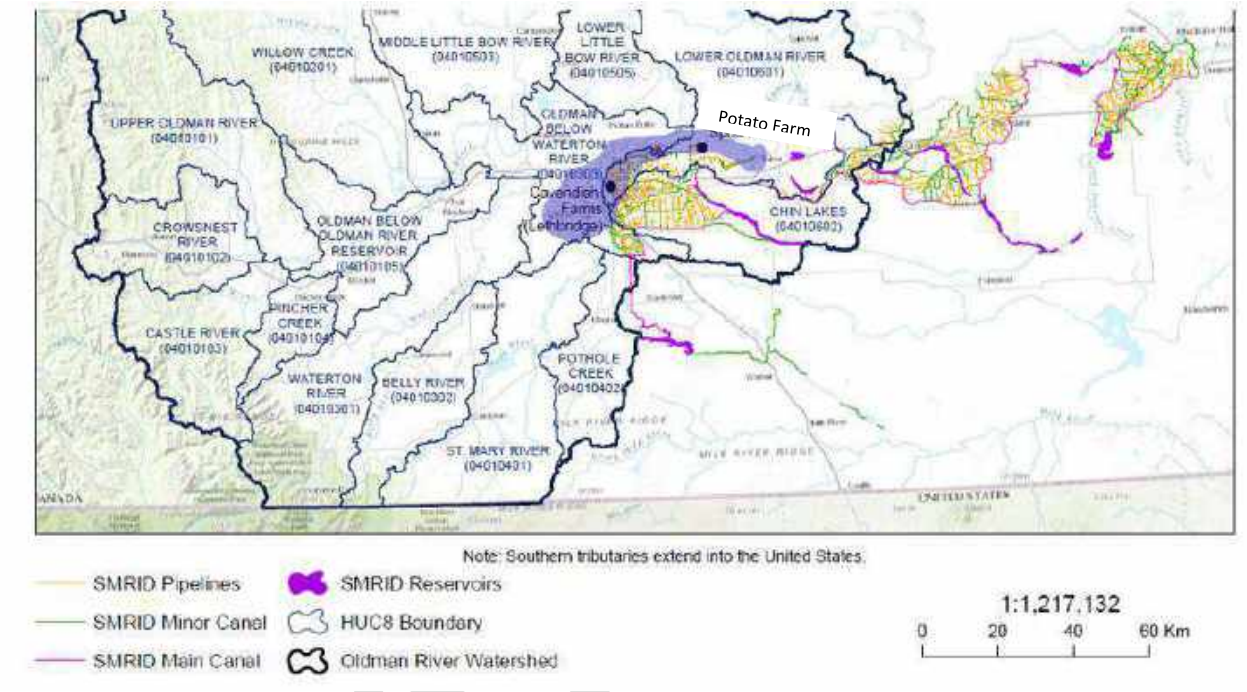

Figure 3. The physical scope for Cavendish Farms Lethbridge site water stewardship activities, shown along with the HUC 8 watershed boundaries.

4.3 Project geographic area

The AWF project has one potato producer as a key advisor and two Implementers, one of which is the Cavendish Farms Lethbridge Site, who are working in concert to implement water stewardship. A geographic area that encompasses the physical scope for both Implementers and the producer advisor has been developed for the purpose of the project. Figure **4** shows the project geographic area, as well as the major waterways. Please see Appendix A: Watershed Context, sub-section "Geographic Context" for further description of the project geographic area.

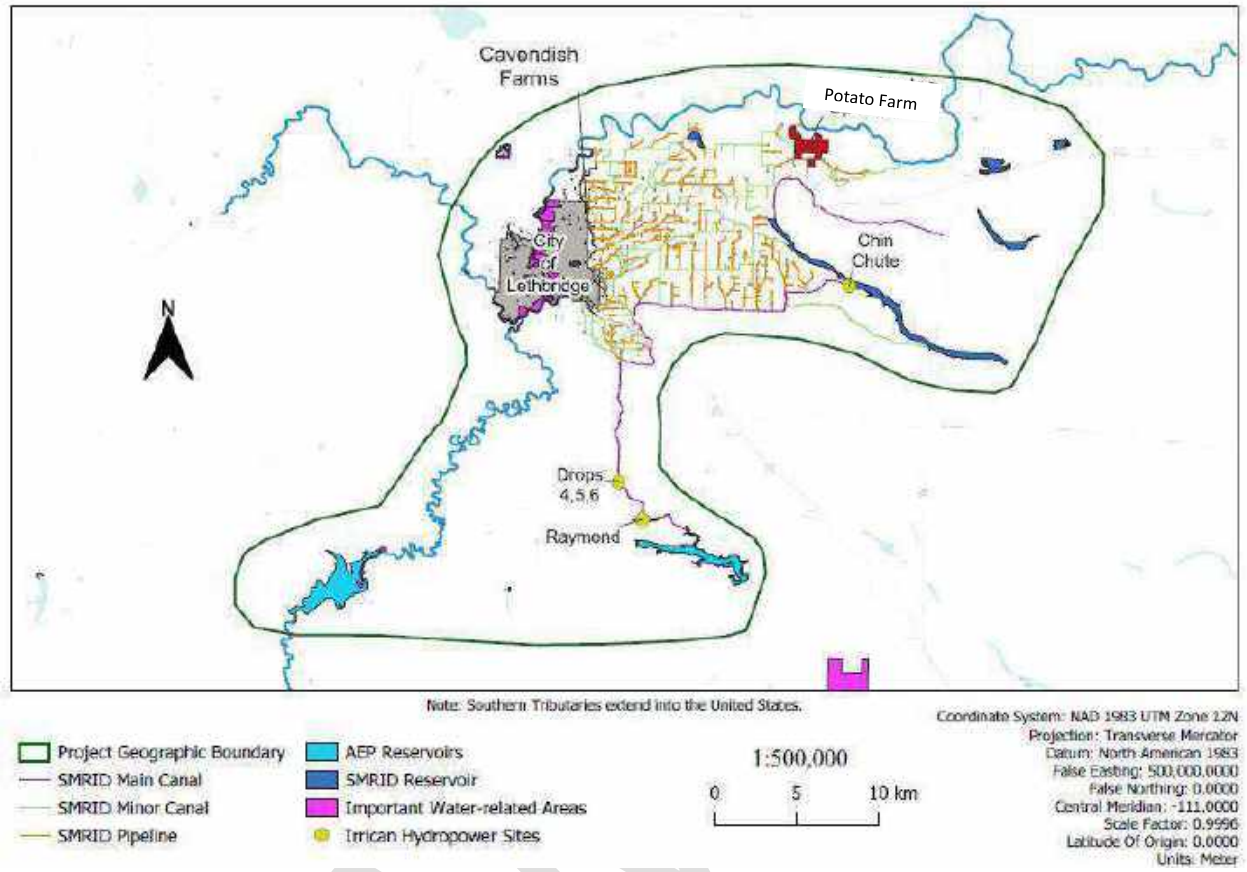

Figure 4. The project geographic area, which includes the physical scope for both AWF project implementers and the producer advisor.

5. Details of site water-related infrastructure

The site water-related infrastructure is most easily described through the separate processes where water is used in the facility. The subsequent sections describe the water use processes and water management on site.

5.1 Water use processes

5.1.1 Processes used to move potatoes with water

Potatoes are delivered to the Cavendish facility and stored temporarily in a series of large, indoor bunkers. When the potatoes are needed, water is sprayed in at the corners of the bunker to carry the potatoes out the drain at the bottom and onto the series of belts that elevate and direct them into the start of the processing line. The water used to move potatoes out of the bunkers collects a large amount of dirt and silt because the potatoes are generally delivered unwashed. This water is captured in the silt pit (see below for details), and then reused for moving potatoes out of the bunkers.

Throughout the processing line, potato products are moved around with the help of water, augers, pumps and conveyer belts in various combinations. The water for moving the potatoes is all treated municipal water after the point where the potatoes are peeled.

5.1.2 Details of washing process

The raw potatoes are cleaned in an auger system using water and friction. The water used for this process is a combination of reused water from the silt pit and treated municipal water. The organic matter is removed using screens, and the wastewater from the washing process goes to the silt pit.

5.1.3 Details of other steps in the potato processing that use water (peeling, boilers, etc.)

The peeling system uses steam to remove the potato skins, therefore a small volume of water is needed for the steam. The dry peel separator removes final debris and skin from potatoes using brushes.

A large metal tank of mild saline water with a pulsed electric field (PEF) sends a current through the water to soften the potatoes in preparation for cutting. This is much more efficient than hot water systems because the PEF does the work, and the water does not need to be heated. Water is reused in this step, thus saving both water and electricity compared to the same processes being done using previous technology.

The potatoes are pumped at high speeds through the cutters using water, which is captured in a tank and reused in this step.

The section of the process that removes the potato fragments and slivers also uses **[X m^3]** of municipal water. Manually shutting off valves for some of the water sprayers has resulted in **[X m^3]** of water conservation in this section without changing the processing speed or results.

The blanching section uses municipal water for the boilers. Blanching is a process that removes sugars from the potatoes, and therefore the amount of blanching required is a function of potato quality and end use. A number of factors influence sugar content in potatoes and when managed, reduce the requirement for blanching. This section uses a large amount of water, and the wastewater goes to the municipal water treatment plant. The quality of water throughout the steps after the potatoes are peeled is very important for the quality of the end product.

Water is used for cleaning the floors of the whole facility, and for cleaning the machinery in the processing line.

5.1.4 Details of water reuse systems

Raw receiving area, silt pit and silt removal

The silt system is specifically designed for this facility to reuse as much water as possible in the areas of the processing line that do not require high quality water, in particular, the raw receiving area. The silt pit holds the water that has been used to flush the potatoes out of the bunkers and move them to the

processing line. The dirty water is sent to the silt removal system in the process water room. The silt removal system uses chemical and mechanical systems to remove dirt, which is captured and shipped back to producer's fields. The water is then sent back to the silt pit.

The silt pit reuse has measurable water efficiency and cost saving benefits. When the silt capturing system is not working, the facility uses **[X m^3]** of additional water per day. In addition, the wastewater that is sent to the City of Lethbridge has a high solid content and therefore Cavendish is charged more by the City for treatment services.

Water reuse

There are multiple areas within the processing line where water is reused directly in the same processes until it has accumulated starch or pieces of potato and gets sent to one of the areas of the process water room for treatment.

Starch recovery system

Starch is captured from the water from some areas of the processing line. Removing the starch reduces the load on the eventual water treatment. Although the recovered starch has value on its own, the starch recovery system is used specifically to support the wastewater treatment process. After the starch has been removed, the water is sent back to the cutter area of the processing line.

5.1.5 Details of wastewater treatment

All the water from the processing floor eventually is sent to the onsite wastewater treatment system in the process water room, where it is treated for solids. The system strains out the bits of potato and organic matter, as well as using polymers and flocculants for removing suspended materials. After this wastewater treatment process, the water is sent to the City of Lethbridge wastewater treatment plant. There is no opportunity for water reuse within the facility from the final wastewater treatment step.

5.1.6 Details of outdoor irrigation

The lawn around the facility is currently irrigated with municipal water and is approximately **[X]** acres in size. There are opportunities related to this noted later in this report.

5.1.7 Stormwater management

The building facility, combined with the parking lot, creates a large area of impervious surface. Stormwater management infrastructure on the site includes; **[list of infrastructure]**. The stormwater management system is built to the standard **[identify the standard to which infrastructure is built]**. Development of the Cavendish facility required infrastructure for catch basins, surface run-off, storm ponds, and associated storm connections and facilities. This may have included required easements, a service agreement, and/or an overland flow agreement.

5.2 Additional relevant operations considerations

Natural gas is the main energy input, and therefore a key input to the Cavendish Farms Lethbridge Site overall. The natural gas is conveyed via pipeline to the facility.

The raw and cooked potato waste, including what is strained out of the wastewater, is sold as cattle feed for **[X dollars per tonne]**. Because of this, the chemicals that are used in the wastewater treatment system must meet specific regulatory standards for livestock feed.

The starch that is captured in the starch recovery area is packaged and sold for **[X dollars per tonne]**.

6. Site water data

This section addresses AWS Criterion 1.3 "*Gather water-related data for the site, including: water balance; water quality, Important Water-Related Areas, water governance, WASH; water-related costs, revenues, and shared value creation.*"

Indicators for Criterion 1.3 considered in this section include:

"1.3.1: Existing water-related incident response plans shall be identified."

"1.3.2: Site water balance, including inflows, losses, storage, and outflows shall be identified and mapped."

"1.3.3: Site water balance, inflows, losses, storage, and outflows, including indication of annual variance in water usage rates, shall be quantified. Where there is a water-related challenge that would be a threat to good water balance for people or environment, an indication of annual high and low variances shall be quantified."

"1.3.4: Water quality of the site's water source(s), provided waters, effluent and receiving water bodies shall be quantified. Where there is a water-related challenge that would be a threat to good water quality status for people or environment, an indication of annual, and where appropriate, seasonal, high and low variances shall be quantified."

"1.3.5 - Potential sources of pollution shall be identified and if applicable, mapped, including chemicals used or stored on site."

"1.3.6 - On-site Important Water-Related Areas shall be identified and mapped, including a description of their status including Indigenous cultural values."

"1.3.7 - Annual water-related costs, revenues, and a description or quantification of the social, cultural, environmental, or economic water-related value generated by the site shall be identified and used to inform the evaluation of the plan in 4.1.2."

"1.3.8 - Levels of access and adequacy of WASH at the site shall be identified."

Cavendish Farms Lethbridge Site does not have any water licences. The water it uses comes from the City of Lethbridge and is sourced from the Oldman River under a municipal water licence.

There is an intricate system of built-in monitoring and data collection systems for all aspects of the Cavendish Farms Lethbridge Site facility. The site uses **[X m^3]** of water per day with a breakdown of use for the different processes as follows **[water use volume data].** The site reuses **[X m^3]** of water per day in the following specific areas of the facility **[water reuse volume data]**.

In a standard 24 hour period, when the Cavendish Farms Lethbridge Site is running at current typical capacity, the site pipes in **[X]** m^3 of water from the City of Lethbridge, and sends **[X]** m^3 of wastewater back to the city for treatment. In addition to the water received and discharged, the facility reuses **[X]** m^3 of water each day in the raw receiving and washing area. There is also **[X]** m^3 of water that is reused in the cutting section after starch removal each day.

During the summer growing season, the lawn outside the facility is watered by sprinklers each night. The amount of water used for outdoor irrigation is an average of **[X]** m^3 per day, and **[X]** m^3 per year.

6.1 Site Water Balance

The site water balance is intended to help verify that water volumes and flows on the site are reliably measured and accounted for. A simple equation of inflows, outflows and storage on site is used as the basis for the water balance. As the name implies, the equation must balance for the site water balance to be considered complete.

The site water balance equation is:

(Water outflow) = (Water inflow) + (change in storage volume)

In addition to the inflow, outflow and storage information described below, evaporation losses and rainwater runoff are factored into the water balance equation.

The outflows at the Cavendish Farms Lethbridge Site are the volume returned to the City of Lethbridge for wastewater treatment, and the evaporative loses from heat and open water in the processing line, and from evaporation and transpiration from the parking lot and the lawn outside.

The water inflows at the site are treated water provided from the City of Lethbridge water treatment plant, and precipitation on the building and grounds outdoors.

There is water storage indoors at the site in multiple points in the processing line, but they are used as part of the water reuse systems and the volumes do not change substantially from day to day, and they will not alter the water balance. The storage volumes will still be accounted for in the water balance equation.

The table below captures the averaged inflow and outflow data for the period of one day.

Description (inflow/outflow)	Gross water volume	Considerations or assumptions
[X X X]	**[X m^3]**	
[X X X]	**[X m^3]**	
[X X X]	**[X m^3]**	
[X X X]	**[X m^3]**	

Site water balance equation:

(**[X m^3 evaporated water]**) + (**[X m^3 wastewater]**) = (**[X m^3 water inflow]**) + (**[X m3 rain water]**)

Figure 5 below shows a map of the site with rough indications of the water coming on site and the water leaving the site. These pathways make-up the water balance for the site.

Figure 5. Map of the rough water balance for the site.

6.2 Site water quality data

All of the water used inside the facility is sourced from the municipal water treatment plant and meets the municipal use standard for water quality. Water used in the raw receiving area and initial portion of the processing line is reused many times and collects water quality contaminants as a function of moving

and washing raw potatoes.

The City of Lethbridge has certain water quality requirements for the wastewater they receive from the facility. If the wastewater quality does not meet these requirements the City charges an additional **[$XX.XX]** per cubic meter of wastewater for treatment.

Table 2. Wastewater quality compliance requirements from the City of Lethbridge.

Standard parameter	Accepted level	Description
Biological Oxygen Demand	**[X]**	
Suspended Solids	**[X]**	
Organic Matter	**[X]**	

The City of Lethbridge charges Cavendish for the treated municipal water they use, and for the wastewater that is sent for processing. It is estimated that 5% of the municipal water piped in is lost (evaporation etc.) during processing, and therefore the City charges Cavendish for wastewater treatment of 95% of the volume of municipal water they draw.

Outdoors, the **[list of products]** products are used to maintain the lawn and landscaping. The outdoor maintenance equipment such as lawn-mower and snow removal machine **are [identify fuel or power source]** powered. **[X number]** of stormwater quality samples have been analysed. The results show **[X indicate if any water quality results]** from products used outdoors on the site parking lot and lawn.

6.3 Annual water-related costs, revenues and value generation

The costs of water for operating the Cavendish Farms Lethbridge Site for a day is between **[$X]** and **[$X]**. This is for the treated municipal water supplied by the City, and for wastewater treatment services. The cost for input water alone is an average of **[$X]** per month, or **[$X]** per day.

The total volume of water used for irrigating the lawn varies from **[X m^3]** to **[X m^3]** each growing season, depending on the amount of natural precipitation received. When the treated water from the City of Lethbridge is used, this costs $ **[volume multiplied by $ per cubic meter]** each year.

The costs for water treatment products such as polymers, flocculants, filter inserts, etc., is approximately **[$ X]** each year.

The cost for maintenance of the water reuse, starch removal, and wastewater treatment systems is approximately **[$ X]** each year.

The calculated annual value to Cavendish Farms from having a water treatment system is estimated to

be: $**[((cost of maintaining water treatment system)+(cost for water treatment products)+(cost for shipping solid waste removed from water away))*365)/((cost per cubic meter city water)*1000)*365)]**

No water-related value generated by the site has been identified in terms of social, cultural, environmental or economic services or value.

6.4 Potential sources of pollution

There are minimal sources of pollution on site, the following Table 3 lists the substance, volume and storage facility for each of the potential sources.

Table 3 Potential sources of pollution from the site.

Substance	Volume (lt)	Storage
[specify potential pollutant, e.g. lawn fertilizer or pesticide(s)]	**[X]**	**[Storage room compliant with hazardous substance storage]**
[specify potential pollutant, e.g. machinery cleaning agent]	**[X]**	**[Storage room compliant with hazardous substance storage]**
[specify potential pollutant, e.g. lawn mower fuel, vehicle fuel]	**[X]**	**[Storage room compliant with hazardous substance storage]**

6.5 Water-related incident response plans and plant upsets

The site is required to identify any existing emergency response plans that is has that address water-related risks and emergency events. This could also be a general site incident response plan that can be applied to water-related risks and emergencies.

The operation of the Cavendish Farms Lethbridge site is reliant on adequate quantity and quality of water to operate. If an emergency situation closes the City of Lethbridge water treatment plant or delivery of water from the treatment plant to Cavendish Farms facility is prevented, the operations would cease operations while the situation was being dealt with.

The Cavendish Farms Lethbridge Site has **[list of response plans]** emergency response plan(s). The following provides a breakdown of the different water-related incidents for which there is a response procedure.

Table 4 Water-related incident response procedures for Cavendish Farms Lethbridge site.

Water-related incident	Relevant response plan/	Response action

	procedure	
[XXX]	**[XXX]**	
[XXX]	**[XXX]**	
[XXX]	**[XXX]**	
[XXX]	**[XXX]**	
[XXX]	**[XXX]**	

6.6 Water, Sanitation and Hygiene (WASH)

The City of Lethbridge delivers water treated to the standard for human consumption, therefore the drinking water used by employees at the Cavendish Farms Lethbridge facility meets the strict national government drinking water quality guidelines. All employees have access to safe drinking water, safe and adequate toilets and washroom facilities. As a processor of food, Cavendish Farms follows strict protocols to ensure the health and safety of all employees and products. These protocols are audited on a regular basis.

7. Site water risks and opportunities

This section addresses AWS Criterion 1.7 "*Understand the site's water risks and opportunities: Assess and prioritize the water risks and opportunities affecting the site based upon the status of the site, existing risk management plans and/or the issues and future risk trends identified in 1.6.*"

Indicators for Criterion 1.7 considered in this section include:
"1.7.1: Water risks faced by the site shall be identified, and prioritized, including likelihood and severity of impact within a given timeframe, potential costs and business impact."
"1.7.2: "Water-related opportunities shall be identified, including how the site may participate, assessment and prioritization of potential savings, and business opportunities."

Understanding the water risks and opportunities for the site is essential to quantifying the value to be gained from water stewardship. By identifying the risks with enough detail to then determine how best to reduce or mitigate them, a site will be able to protect itself from unexpected costs and impacts through the water stewardship implementation work it undertakes.

There are four categories of risk for a site to consider.
Types of risk:

- Operational/physical (e.g. people, assets, infrastructure issues, by virtue of being located where the site is, drought/ flooding)
- Regulatory/legal (e.g. water allocation restrictions, discharge quality)
- Reputational (e.g. pressure from local watershed stakeholders, market share and brand protection)
- Financial (e.g. water costs, customer demands on crop water attributes)

The project team members from Cavendish, Working Group members, and engaged stakeholders all contributed to the risk identification process and brainstorming work in the AWF project. Risks and opportunities were identified that are relevant to Cavendish Farms Lethbridge, to the potato supply chain, and to the Oldman River watershed. Over a series of steps in the project process the risks were grouped, shortlisted, and evaluated.

A general risk matrix (Figure 6) was prepared for evaluating risks based on the severity and likelihood. It includes these four categories and results in a risk ranking structure with four levels. The list of identified risks were ranked using this risk matrix.

			Severity of risk			
			Low	Medium	High	Severe
			1	2	3	4
	Operational (people /assets)		minor	moderate	significant	critical failure
	Regulatory /legal		minor	moderate	significant	shut down
	Reputational (public concern)		a few people /minor concern	many people /moderate concern	many public and business influencing people	long term bad reputation
	Financial		<$50,000	>$50,000 to $500,000	>$500,000 to $1,000,000	>$1,000,000 (critical loss)
Likelihood of risk (frequency)	Remote	1				
	Occasional	2				
	Probably	3				
	Urgent/Freque	4				
			Level 1			
		Risk ranking	Level 2			
			Level 3			
			Level 4			

Figure 6 Matrix for evaluating severity of risks.

Table 5 Risks identified for Cavendish, with priority score and ranking.

Ranking	Risk	Associated opportunity	Likelihood (1 to 4)	Consequence (1 to 4)	Priority Score
Risk 1 (FF)	Water security • Drought and water availability • Worse in warm and dry years • Southern Alberta a semi-arid ecosystem – water availability already limited in this region	• The opportunity is in communicating with City of Lethbridge and with producers about the potential for drought and planning around what extreme drought would mean for Cavendish operations	3	3	Level 3
Risk 2 (A)	A risk lies in Cavendish not having answers to questions/sustainability requirements from their buyers and losing business as a result • Different buyers may require different metrics/reporting standards, it could be costly and burdensome for Cavendish to meet the many different requirements • Difficult to address and manage across a geographically diverse corporation • The company is increasingly urged towards corporate responsible water use and ESG reporting	There is an opportunity to pre-empt customers requiring unique reporting on sustainable agriculture • Industry demonstrating it is taking initiative and addressing public concerns may get ahead of government imposing regulatory requirements, may even be an opportunity to inform regulations in the future • Sustainable sourcing expectations are already being seen, can be involved helping to define what that should look like for the potato industry • Adaptation of the sector to future sustainable farming practices • Promoting and encouraging regenerative production practices by their potato suppliers • The potential to maintain supplier partnership with big buyers by adhering to sustainability practices	4	2	Level 2

Ranking	Risk	Associated opportunity	Likelihood (1 to 4)	Consequence (1 to 4)	Priority Score
		• Aid in developing sustainability metrics for the sector, likely through involvement with the PSA			
Risk 3 (E)	Negative public perception of corporate responsibility due to the extent of irrigated lawn at the Cavendish facility	Alternative management of the Cavendish facility lawn presents multiple opportunities. Reducing costs, improving public image, alternative sources of water and conserving water (the lawn currently is watered with municipal potable water) are among the opportunities • Lawn is particularly visible to the public, it is an opportunity to present Cavendish initiatives in sustainability and water stewardship to the public	4	2	Level 2
Risk 4 (AA)	Climate change • Changes in precipitation at the headwaters • Volatility – increased risk of both flood and drought • Shift in timing of precipitation, requiring different storage system management and possibly different infrastructure	There are opportunities in communicating Cavendish's corporate strategy and initiatives regarding climate change and volatility of water availability.	3	2	Level 2
Risk 5 (F)	Perceived or real risk to nearby water quality via runoff from the Cavendish facility	The opportunity for demonstrating responsible water management from the facility grounds by having stormwater	1	1	Level 1

Ranking	Risk	Associated opportunity	Likelihood (1 to 4)	Consequence (1 to 4)	Priority Score
	• Cavendish lawn and parking lot • Where is drainage managed? • SMRID lateral canal runs through the Cavendish property	management in place • Use the lawn area to create natural nutrient/wastewater treatment (e.g., wetlands) • Align nutrient control on Cavendish Farms facility grounds with applicable BMPs implemented on-farm			
Risk 6 (G)	A risk lies in negative perception from other water users or the public due to high water use at the Cavendish facility in a water-scarce region • Water scarcity is a concern in southern Alberta • Due to the City of Lethbridge's water license priority, the Cavendish facility will likely not experience a water shortage • Facility expansion at the Lethbridge location will need to have water efficiency as a key focus to appeal to stakeholders	An opportunity to expand the relationship between Cavendish Farms and the City of Lethbridge to build on multiple potential opportunities • The balancing of the facility's water reuse and water demand process can be fine-tuned for improved water efficiency • Future discussion regarding facility expansion should factor in public perception of water scarcity issues in the area	2	2	Level 1
Risk 7 (H)	High cost incurred if organic matter unable to be removed from facility wastewater • If wastewater treatment in the facility is not operational, can	Further wastewater treatment at Cavendish Farm's facility • Utilize SMRID infrastructure for appropriate wastewater return (must	3	1	Level 1

Ranking	Risk	Associated opportunity	Likelihood (1 to 4)	Consequence (1 to 4)	Priority Score
	have a high cost incurred to the plant for additional municipal treatment.	adhere to SMRID return water guidelines) • Increased wastewater treatment on-site to decrease costs of returning wastewater to the City of Lethbridge and to increase water reuse • Use of Cavendish wastewater for irrigation of local greenspaces? • Use of process wastewater for crop irrigation (this is done in Manitoba). Water storage and transportation would need to be determined.			
Risk 8 (C)	Sustainability data collection programs from multiple buyers may be intensive and highly demanding for producers, causing producers to exit the market and reducing Cavendish's supplies Producers may have difficulties complying due to the resources necessary for data collection	An opportunity lies in better using existing sustainability documentation from producers' operations • Ensures that producers can comply with future regulations and buyer demands • May allow producers and Cavendish to engage in long-term contracts with suppliers and buyers • Current data gathered could be used to develop sustainability metrics for the sector • Alignment of sustainability documentation gathered throughout the sector could create on-farm and processing efficiencies	1	1	Level 1

Ranking	Risk	Associated opportunity	Likelihood (1 to 4)	Consequence (1 to 4)	Priority Score
Risk 9 (D)	A risk of water lost through leakage in the Cavendish system • This risk can take the form of not addressing water efficiency concerns from external parties There is a risk of paying unnecessary extra cost for water	There is an opportunity to increase water efficiency at the Cavendish Farms Lethbridge facility • The Lethbridge site facility has extensive water measurement in place throughout the processing line, there are currently further opportunities to incentivise increasing efficiency • There is an opportunity to have one or more positions that 'care' about efficiency and established KPIs related to water efficiency specifically • Draw on knowledge of water treatment reuse from PEI facilities • Reduction of water use would also result in a reduction in costs	2	1	Level 1
Risk 10 (I)	Risk to processing line operations and end-product quality if municipal water not of adequate quality • May cause delays in processing or additional costs if water quality provided to Cavendish facility degrades	•	1	4	Level 1
Risk 11 (BB)	A risk is the complexity of managing water in a drought and that there isn't a prescribed regulatory process, the regulatory group could	•	1	3	Level 1

Ranking	Risk	Associated opportunity	Likelihood (1 to 4)	Consequence (1 to 4)	Priority Score
	'get it wrong' and result in limited water availability to the implementers • Provincial drought management is not prescriptive Licence priority in a drought situation – can have supply chain impacts (e.g., if a processor is given priority over a grower)				
Risk 12 (DD)	The risk is that there is minimal return on investment for producers implementing water stewardship, the extreme case is the costs of implementation are so high that producers operations are no longer viable) • Concern – water stewardship practices will be 'top-down' and the burden for implementation will fall on the growers without compensation • Sustainable sourcing demanded by the buyers/market • Must respond to third party organizations that monitor sustainable sourcing	The opportunity is in finding how to make implementation of water stewardship financially beneficial for producers • Should processors pay farmers for sustainable production? • Sustainable sourcing demanded by the buyers/market • Must respond to third party organizations that monitor sustainable sourcing • Provide incentives to the producer, potentially in partnership with another entity	1	4	Level 1

Ranking	Risk	Associated opportunity	Likelihood (1 to 4)	Consequence (1 to 4)	Priority Score
	Provide incentives to the producer				

Table 6 Identified opportunities for Cavendish, not associated with a risk.

Ranking	Opportunity
Opp 13 (B)	Supporting all of Cavendish Farms' suppliers to implement on-farm nutrient control, thus allowing Cavendish to claim water stewardship across their suppliers and processing • Identify farm-level BMPs as they pertain to water stewardship • Streamlined BMP implementation and documentation for grower's convenience in reporting • Certain controls, if documented correctly, could align with carbon credit programs
Opp 14 (CC)	Financial incentives for water stewardship (via markets) • Marketing products adhering to water stewardship standards as premium, therefore selling at a higher price – assumes that increased revenue from sales are distributed throughout the supply chain
Opp 15 (EE)	Telling the southern Alberta agriculture story • Clean water • World-class infrastructure • Right conditions for potatoes • Communicating what is already being done is an opportunity (to facility staff, the public, regulators, etc.)

Ranking	Opportunity
Opp 16 (GG)	Promoting the ability of irrigation and agriculture to improve the provincial and national GDP • May aid in attracting more processing facilities to Canada, specifically the southern Alberta agricultural corridor