Volume 1, Section 1 Snake Lake Reservoir Expansion Project
Project Description
Background and Introduction

Submitted to:

MPE
a division of Englobe
Lethbridge, Alberta

On behalf of:

Eastern Irrigation District
Brooks, Alberta

Submitted by:

AAR Environmental Services
Calgary, Alberta

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AARES Project #: 21-127

Executive Summary

The Eastern Irrigation District (EID) is applying for approval under the *Environmental Protection and Enhancement Act* (EPEA) (Government of Alberta [GOA], 2000a) to construct the proposed Snake Lake Reservoir (SLR) Expansion Project (the Project). This section introduces the existing SLR, the EID, and discusses its history, governance structure, and its water storage and conveyance system. The SLR is an off-stream reservoir owned and operated by the EID in southeast Alberta, south of the Trans-Canada Highway and Canadian Pacific Kansas City (CPKC) railway between the Town of Bassano and City of Brooks; it stores 19.25 million m^3 (15,600 acre-feet [ac-ft]) or at the full supply level (FSL) of 781.7 m above sea level (asl), with a wetted surface of 299 ha. It was constructed from 1995 to 1997 in a natural coulee with a downstream (east) and upstream (west) dam with natural slopes on the north and south sides. It is owned and operated by the EID, under an existing *Water Act* Licence (No. 00071066-00-00); the EID is regulated via Alberta's *Irrigation Districts Act*. In total, the EID is licenced to divert 938 million m^3/yr of water from the Bow River; there is ample of water available for additional offsite storage without requiring additional allocation.

The EID is proposing to expand the size and capacity of SLR to hold additional off-stream irrigation water to supply up to the entire 20,000 ha of irrigated land with enough water for an entire growing season. This would provide increased assurance that a secure source of water is present during a year-long drought. Development of the expansion will require new dam embankments between 1 m and 20 m high constructed on the north, east, and south sides of the proposed Project to hold water at the new FSL of 782.0 m asl; this will require construction of 8 km of earthen banks from an estimated 7,000,000 m^3 of material. The Project will include excavation of clay till within the Project footprint for embankment construction, while sand, gravel, and riprap will be shipped from sites south of the Project. Shipping and construction is expected to occur over three to five years. After that, the reservoir basins will be joined and the reservoir will be tested, commissioned and filled to begin operations. The expanded SLR will be a permanent feature. Total storage after expansion will be 87.4 million m^3 (70,900 ac-ft) covering 1,069 ha (excluding dams).

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Abbreviations

ac-ft	Acre-feet
asl	Above Sea Level
CPKC	Canadian Pacific Kansas City
CPR	Canadian Pacific Railway
DUC	Ducks Unlimited Canada
EIA	Environmental Impact Assessment
EID	Eastern Irrigation District
ESL	Eastern Section Lands
FSL	Full Supply Level
GOA	Government of Alberta
GOC	Government of Canada
SLR	Snake Lake Reservoir

1.1 PROJECT INTRODUCTION

The Snake Lake Reservoir (SLR) is an off-stream reservoir owned and operated by the Eastern Irrigation District (EID) in southeast Alberta, south of the Trans-Canada Highway and Canadian Pacific Kansas City (CPKC) railway between the Town of Bassano and City of Brooks; it is located within Townships 19 and 20, Ranges 16 and 17, west of the fourth meridian (see Attachment 1, Figure 1A-1). The reservoir stores 19.25 million m^3 (15,600 acre-feet [ac-ft]) at the full supply level (FSL) of 781.7 m above sea level (asl), with a wetted surface of 299 ha. It is contained by two earth-fill dams: one along the east end (East Dam) located in Section 31-19-16 W4M, and one along the west end (West Dam) located in Section 3-20-17 W4M. It was constructed from 1995 to 1997 in a natural coulee with a downstream (east) and upstream (west) dam with natural slopes on the north and south sides. It is owned and operated by the EID, under an existing *Water Act* Licence (No. 00071066-00-00); the EID is regulated via Alberta's *Irrigation Districts Act* (Government of Alberta [GOA], 2000b). In total, the EID is licenced to divert 938 million m^3/yr of water from the Bow River and uses an average (over 10 years) of 549 million m^3 per year, such that there is an average of 389 million m^3 of water available for additional offsite storage without requiring additional allocation.

By maintaining a series of canals and reservoirs across the EID lands, which roughly correspond to the County of Newell, the EID provides benefits for agricultural producers who can grow higher value crops that support Alberta's growing economy (See Attachment 1, Figure 1A-2). There are also several additional benefits including provision of lands and reservoirs for recreational use and maintenance of waterfowl and other wildlife. The EID is involved in numerous regional programs to prevent the spread of invasive species and improve habitat for wildlife – including support for Ducks Unlimited Canada (DUC) waterbodies. The EID also supplies water for residential and industrial users throughout the County.

Water from Bassano Dam enters the Main Canal and flows east to the Little Dam Reservoir. There, the water divides into the North Branch and East Branch Canals. The East Branch Canal initially flows southeast, with water also branching into the Springhill Canal, sending water to the northeast. As the East Branch Canal continues southeast, it passes by SLR, and water is diverted into the west end of the reservoir via a gated inlet chute in combination with an online check structure. SLR water outflows through the East Dam Low Level Outlet into the Snake Lake Canal, which flows northward and back into the Spring Hill Canal. The reservoir helps support 50,000 acres (20,000 ha) of irrigated agriculture north and east of the reservoir. Because the SLR is located on the western side of the EID comparatively close to the water source from Bow River, it is at an ideal location to store off-stream water that can service a large area of the EID downstream.

The EID is applying for approval under the *Environmental Protection and Enhancement Act* (EPEA; Government of Alberta [GOA], 2000a) to expand the size and capacity of SLR to hold additional off-stream irrigation water. The goal is to store enough water to supply up to 20,000 ha of irrigated land with enough water for an entire growing season. This would provide increased assurance that a secure source of water is present during a year-long drought. The proposed Project would include reservoir expansion within Sections 29, 30, 31, and 32 of Township 19, Range 16, West of the Fourth Meridian. The land required for this Project is owned by the EID and is located directly east of the existing SLR. As the existing reservoir and East Branch Canal

occur on higher elevation lands on the west side of the proposed expansion, a new dam will not need to be constructed on the west side; however, embankments between 1 m and 20 m high will be needed on the north, east, and south sides of the proposed Project to hold water at the new FSL of 782.0 m asl; this will require construction of 8 km of earthen banks from an estimated 7,000,000 m^3 of material. The Project will include excavation of clay till for embankment construction within the footprint of the dam. Aggregate materials including sand and gravel for drainage chimneys and finger drains, and riprap for inside bank erosion protection, will be sourced and shipped from sites south of the Project. Shipping and construction is expected to occur over three to five years. After that, the reservoir basins will be joined and the reservoir will be tested, commissioned, and filled to begin operations. Once constructed, the new reservoir will include a new low-level outlet on the north end of the new embankments, connecting into the Snake Lake Canal. The extant SLR and expansion area will also be joined to form a connected reservoir basin. The expanded SLR will be a permanent feature and will not be decommissioned or reclaimed in the future; this is similar to other southern Alberta reservoirs, for example, the Bassano Dam reservoir has been in place since start of construction in 1910 and there are no plans to ever dismantle this structure. A Project schedule by phase is available in the Overview (Volume 1, Section 2.7).

Total storage in the expanded reservoir is estimated to be 85.3 million m^3 (69,200 ac-ft) with a new wetted area of 764 ha. Raising the dam to the new FSL of 782.0 m will store another 2.1 million m^3 (1,700 ac-ft); this raised water level will also add 6 ha to the extant reservoir. Thus, the total new storage will be 87.4 million m^3 (70,900 ac-ft), and the total reservoir will cover 1,069 ha (excluding dams). The reservoir would be able to supply 14.1 inches (35.8 cm) of water to each of the 20,000 irrigated ha, ensuring crop production in a drought, leaving enough water in the reservoir to protect the reservoir substrate and aquatic life.

All water will continue to be sourced from the Bow River at the Bassano Dam. The Bow River receives most of its water from annual snowpack melt in the Rocky Mountains and Foothills. In years with low snow accumulation there is reduced water directly available for irrigation. Off stream reservoirs allow the source of water to be shifted in time, filling the reservoir when water levels are high in early summer, thus reducing direct demand on the river in early spring and later summer.

Overall, this Environmental Impact Assessment (EIA) will demonstrate how the proposed Project will provide numerous benefits including agricultural security and socioeconomic effects, while mitigating negative effects on environmental or cultural resources, where possible. As outlined in the EIA, the EID has committed to programs to partially reclaim lost grassland areas on the reservoir embankments and will replace lost wetlands and some lost wildlife habitats, while increasing habitats for aquatic and semiaquatic species, including fish, waterfowl, and many other taxa. Recreation lands and activities such as fishing, boating, and wildlife viewing will also increase, as will access for the public and Indigenous Peoples who may want to use the reservoir area for cultural or traditional land uses.

1.2 HISTORY OF LAND USE IN THE EID

Located in southeastern Alberta, the EID (see Attachment 1, Figure 1A-2) is one of Canada's oldest and largest irrigation systems. It began in the early 20th century, when major efforts were made to develop agriculture on the arid Canadian Prairies (EID, 2015).

The EID occurs within the Palliser Triangle, an area of the western prairies characterized by low precipitation. The EID is bounded on the north by the Red Deer River and on the south and southwest by the Bow River. Its western boundary begins at Bassano and extends northeast to the Red Deer River. The eastern boundary is 12 miles (19 km) east of Tilley and extends north to the Red Deer River and south to Township 13, north of the Bow River (EID, 2015).

In 1903, the Canadian Pacific Railway (CPR; now the CPKC Railway) was granted a title from the Dominion of Canada for 3 million acres (1.2 million ha) of arable land between Medicine Hat and Calgary, as final payment for the construction of the national railroad. The area now known as the EID was part of this land grant and was designated by CPR as the Eastern Section Lands (ESL; (EID, 2015).

Although the amount of sunshine was deemed sufficient for crops, the CPR estimated that dryland agriculture in the ESL would be challenging due to insufficient rainfall. As a result, the CPR believed the value of land granted to them was lower than the amount calculated by the government. To increase the value and make these lands more attractive to settlers, CPR persuaded the government to develop an irrigation system (EID, 2015).

In 1910, CPR began construction of a diversion structure on the Bow River 6 km southeast of Bassano. They also began construction on 3,000 miles (5,000 km) of a conveyance system including earthen canals, wooden and concrete channels, and reservoirs to allow water to flow by gravity throughout much of the ESL (EID, 2015). The completion of the Bassano Dam, in 1914, regulated the flow of water into the canal system allowing irrigation of a third of ESL lands. Upstream of the Bassano Dam in the Bow River, a run-of-the-river reservoir was formed, meaning it filled water into the existing banks of the river rather than requiring construction of side dams to hold water. The water level upstream of the dam is currently raised by 11.1 m in winter and 14.5 m in summer and then diverted through headgates into the EID Main Canal (EID, n.d).

In the mid-1930s, landowners in the ESL were frustrated with the CPR's management of the irrigation system, due to unresolved water delivery issues and disputes over land classification. Additional issues included high irrigation costs and delays in resolving disputes. As dissatisfaction grew, landowners believed they could manage the system more efficiently, and in 1935 the ESL became the owners and operators of the irrigation system. Upon agreement between the two parties, the EID was officially created with the passing of the "*Act to incorporate the Eastern Irrigation District*" by the Province of Alberta on April 23, 1935 (EID, 2015).

In the following decades, the EID has continued to expand and improve water distribution networks and increase the irrigated land area. The district has played a crucial role in the region's agricultural development, particularly in the cultivation of cereals, vegetables, and livestock. Reliable access to water has enabled farmers to overcome some climatic challenges and maintain production, even during periods of drought.

After the 1950s, the EID undertook major improvements to modernize its irrigation network, initiating the replacement of canals with pipelines: reducing water losses from seepage and evaporation. These changes increased the system's efficiency and durability. As part of a 1970 provincial assistance program, the EID replaced or rehabilitated many of its main structures that were over 60 years old. Over $7 million was spent on this work to 1977. Following the 1973 Canada-Alberta agreement on the rehabilitation of irrigation facilities, the Prairie Farm Rehabilitation Administration replaced the Brooks aqueduct with a double-banked earthen canal, at a cost of nearly $8 million. In addition, the Bassano dam was repaired at a cost of $700,000 (GOC, n.d.).

At present, the EID continues to complete extensive rehabilitation work including replacing canals with pipelines, lining canals, adding automation and control systems, and working with County of Newell and DUC on numerous water projects. Typically, $20 to $25 million are spent annually. At the same time, farmers have made a significant shift from flood irrigation to wheel line systems and now to low pressure drop tube pivots to improve efficiency of water use. More information on these improvements are discussed in Volume 1, Section 2.

1.3 EID OVERVIEW

Today, the EID is one of eleven irrigation districts in southern Alberta, operating under the Alberta *Irrigation Districts Act* [RSA 2000 c. I-11] and which collectively irrigates over 600,000 ha of land (1.5 million ac; (EID, 2015). The EID is currently authorized under the *Irrigation Districts Act*, via the Expansion Limit, to irrigate up to 345,000 acres (139,616 ha). Its mandate is to construct, operate, and maintain irrigation works to deliver water as per licenses granted under the Alberta *Water Act*. The EID operates an extensive water supply, storage, and drainage network to deliver water to each parcel of irrigated agricultural land. It provides water for privately owned farmland and supplies water for municipal, industrial, wildlife (e.g., DUC), and recreational purposes.

The *Irrigation Districts Act* provides for the formation, governance, and operation of the EID. The EID is governed by a Board of Directors elected by its irrigators. The EID board is structured like a corporation, with rules governing membership, vacancies, and elections. The *Act* also prescribes the Expansion Limit. Currently, about 315,000 acres (127,000 ha) are under irrigation. Thus, 30,000 acres (13,000 ha) of additional irrigated lands are already approved by the province (and can be accommodated under its existing water licence).

In addition to the water management functions of the District, the EID owns and is responsible for the operation and management of large tracts of native and improved pasture lands. These lands are primarily used in support of the beef cattle industry. The EID also runs various commercial ventures (e.g., EIDNet, an internet service), supports recreation (e.g., fishing and water sports) at its reservoirs, supports wildlife habitat (e.g., wetland restoration), and supports the energy industry through land access agreements.

The EID has taken an integrated resource management approach to guide activities on its lands for multiple uses. For example, in partnership with DUC, the EID supplies water to create and/or enhance of waterfowl habitat. Public access to reservoirs is also provided. The management of water and land is guided by the *Eastern Irrigation District Integrated Resource Management Strategy* (EID, 1995).

1.4 REFERENCES

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GOC. (n.d.). *Alberta: History of Irrigation Districts Eastern Irrigation District (E.I.D)*. (L. a. Canada, Producer) Retrieved September 2024, from https://epe.lac-bac.gc.ca/100/205/301/ic/cdc/soilandwater/aleid.htm

Attachment 1

Attachments

Figures

SCALE: 1:80,000

650 0 650 1,300 m

Drafted:	MM	Date: Feb 21, 2025	
Approved:	WB	Revision:	0
Route Source:		Date: Oct. 20, 2024	
CAD Survey		Revision:	0

Data Sources:
Imagery Reference: ESRI 2021/07/10
ATS Grid: AltaLIS 2007

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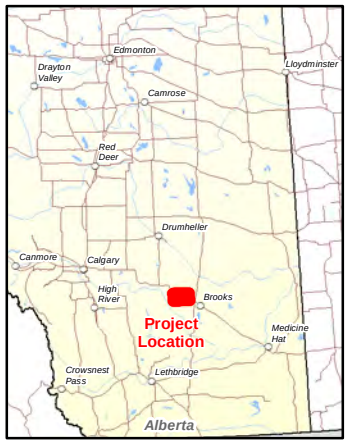
Please contact AARES for all other sources.

Please note that the imagery is from 2021 and although we have no reason to doubt the accuracy and completeness of it, users should be aware of that discrepancies may be present.

Legend

- Original Snake Lake Boundary
- Canal



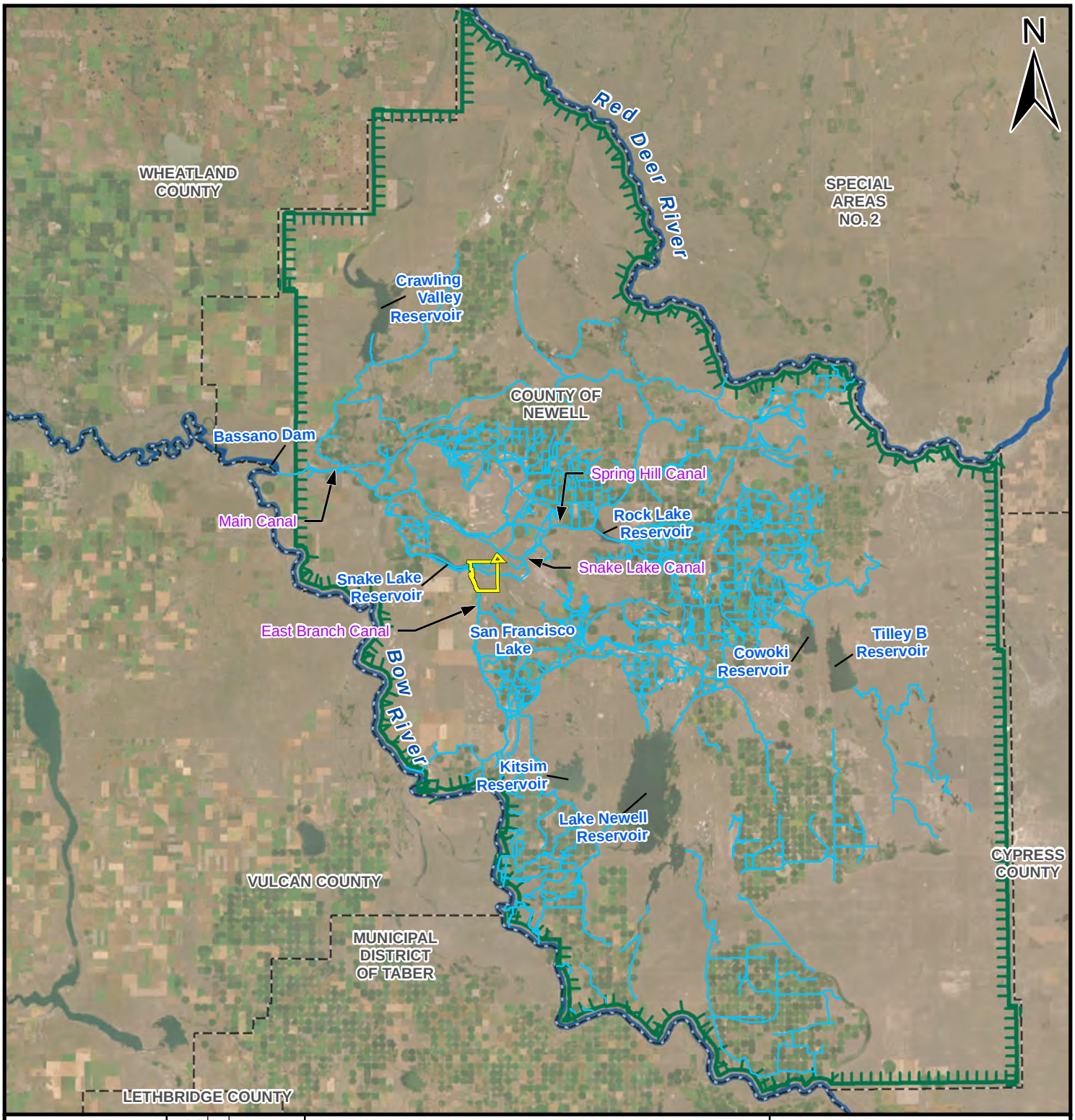
EID

Extant Snake Lake Reservoir and Connected Irrigation Canals

February 2025

REF.: AARES 21-127
(ProjectDescription)

Figure 1A-1



SCALE: 1:600,000

4 0 4 8 Km

Drafted:	MM	Date:	Mar 14, 2025
Approved:	WB	Revision:	0
Route Source:		Date:	Feb 18, 2022
CAD Survey		Revision:	0

Data Sources:
Imagery Reference: ESRI 2021/07/10
ATS Grid: AltaLIS 2007

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Please contact AARES for all other sources.

Please note that the imagery is from 2021 and although we have no reason to doubt the accuracy and completeness of it, users should be aware that discrepancies may be present

Legend

- Snake Lake Reservoir Expansion Project Area
- River
- EID Canal system
- Eastern Irrigation District No. 13
- Rural Boundary

EID

Eastern Irrigation District

March 2025

REF.: AARES21-127 (ProjectDescription)

Figure 1A-2