

BOW RIVER IRRIGATION DISTRICT - 2025 EXPANSION

REQUIRED INFORMATION – Section 4(1) Irrigation Plebiscite Regulation

- a) The volume of water allocated to the district under all of the district's existing water licences:

- 150,000 acre feet; 1908-10-27-02;
- 150,000 acre feet; 1913-03-25-01;
- 80,000 acre feet; 1953-06-25-01;
- 68 acre feet; 1975-11-10-005, 1977-08-25-002, 1978-09-19-001;
- 22 acre feet; 1983-05-31-014;
- 47 acre feet; 1978-06-07-020;
- 60 acre feet; 1985-03-21-008;
- 23 acre feet; 1990-10-23-009;
- 69,780 acre feet; 1992-02-05-10;
- 39,250 acre feet; 1992-02-05-011 (upon completion of the approved transfer of 750 acre feet to Cochrane).

The total existing licence allocation is 489,250 acre feet, upon completion of the approved transfer to Cochrane. Included within this total is 2,380 acre feet allocated to purposes other than irrigation and 1,780 acre feet which can be used for either irrigation or agricultural (stockwatering) purposes. To date, the district has entered into agreements which consume 2,365 acre feet of these allotments.

- b) The volume of water lost from canals and reservoirs:

Water related to the BRID licences is lost through seepage and evaporation from the district conveyance canal systems, and through evaporation from system reservoirs. Seepage and evaporation from canals have been significantly reduced over the last number of years through the rehabilitation of these works and the installation of pipelines and will continue to decrease as more canals are replaced with pipelines. It is estimated that on average 11,000 acre feet of water per operating season are lost from the conveyance system due to these consumptive loss processes.

The estimated average water loss through evaporation from the district's internal reservoirs is approximately 7,500 acre feet per year, for a total loss of 18,500 acre feet.

- c) the return flow volume:

Water related to the BRID diversion licences that is returned to the natural river systems averaged 42,900 acre feet per operating season the last three operating seasons (2022-2024) and includes natural runoff which enters our drains. The lowest total was 33,000 acre feet in 2023, when there was minimal runoff and a concerted effort to reduce spill due to dry conditions. Return flow has been decreasing as pipelines are added, and current pipeline projects will reduce return flow further. However, the expected future reductions are not included in the analysis described in this document. We anticipate that the Lateral B/K pipeline project, which should be completed in 2027, will reduce average return flow

by up to 11,000 acre feet and the proposed Deadhorse Coulee Reservoir could reduce return flow by up to 6,000 acre feet. Other pipelines planned in the near future will result in additional savings.

- d) the volume of water allocated under the district's water licences that is required for uses other than irrigation:
In 2011, the BRID was granted an amendment to its 70,000 acre foot licence (now 69,780 acre feet) which allows the BRID to divert up to 2,380 acre feet of that licence for purposes other than irrigation or domestic needs. The other uses the BRID is allowed to divert water to are industrial, agricultural (feedlots), municipal, commercial and habitat enhancement. In 2022, the BRID was granted an amendment to its 40,000 acre foot licence which allows up to 1,780 acre feet to be used for either irrigation or agricultural (stockwatering) purposes. To date, the district has entered into agreements that use 2,365 acre feet of these allotments.
- e) the remaining volume of water available for crop use:
The volume of water remaining for crop use is the total licenced volume less losses, return flows and other committed uses.

Total licenced volume	489,250 acre feet
Lost from canals and reservoirs	- 18,500 acre feet
Volume of return flow (3-year average)	- 42,900 acre feet
Water allocated exclusively to other uses	- <u>2,380 acre feet</u>
	425,470 acre feet

This remaining licenced volume would provide 17.3" of water per acre at the present expansion level of 295,000 acres and 16.0" at the proposed expansion level of 320,000 acres.

- f) the gross volume of water required per acre at the farm turnout for crops, including data on:
- i) the average net depth of water required per acre:
Over the last 10 irrigation seasons the average net depth delivered per irrigated acre was 11.2", with a high of 15.1" in 2017.
- ii) the percentage of each crop type (2023):
Forages: 15.8%
Cereals: 46.9%
Specialty: 31.7%
Oilseeds: 5.4%
Undesignated: 0.2%

2015 data was used for the modelling calculations, and would require similar water volumes:

Forages: 17.0%

Cereals: 40.0%

Specialty: 30.0%

Oilseeds: 13.0%

iii) the level of risk of a water shortage (deficit and frequency):

To assist with determining the level of risk of a water shortage for our last expansion Alberta Agriculture and Irrigation (AGI) and Alberta Environment and Protected Areas (AEPA) conducted a model analysis in 2018 examining 74 years of past weather and river flow records, and three possible expansion limits of 285,000, 310,000, and 335,000 acres. This analysis remains valid for the current proposed expansion, since the proposed new limit of 320,000 acres is within the modelled range.

Data on the canal infrastructure, on-farm irrigation systems and crop mix in 2015 were entered into the model to predict in which of those 74 years the BRID would have been deficient in supplying the crop demand. The model then ran nine scenarios at three levels of expansion (25,000, 50,000 and 75,000 acres added to the previous 260,000 acre limit) for the same set of years to determine when deficiencies would have occurred at those expansion levels. Three scenarios include the Western Irrigation District and Eastern Irrigation District expansions of 10% and one scenario includes a 20% expansion of the WID and EID.

In AGI's work on deficits and financial risks to irrigators, AGI determined that, as a guide, a significant risk would be a diversion deficit greater than 100 millimeters per year. An unacceptable risk was defined as a diversion deficit greater than 100 mm occurring more than 1 in 10 years. A deficit under 25 millimeters is of no concern and a deficit between 25 and 100 millimeters is a minor concern.

The baseline scenario (previous expansion limit of 260,000 acres) had no irrigation demand deficits over the 74 year range of the modelling.

None of the modelled scenarios had significant deficits greater than 100 millimeters. At the 50,000 acre expansion (310,000 acres), there were three years in 74 with a deficit between 25 and 100 millimeters and 9 years with a deficit under 25 millimeters. At the 75,000 acre expansion (335,000 acres), five years in 74 showed deficits between 25 and 100 millimeters and 24 years showed a deficit under 25 millimeters. One year showed a 98 millimeter deficit.

Small deficits under 25 mm were often attributed to the modelled demand exceeding the capacity of the outlet of Little Bow Reservoir, which is 3,100 cubic

feet per second (cfs). This is far higher than our actual record high diversion at Little Bow Reservoir of 2,500 cfs set in July of 2021. This demonstrates the conservative nature of the model, since it calculates required flows much greater than we use. The total irrigated area in 2021 was 273,000 acres, so an expansion to 320,000 acres would increase the area by 17.2% relative to 2021. A corresponding 17.2% increase in the peak outflow from Little Bow Reservoir would result in a flow of 2930 cfs, which is still well below the design capacity.

Deficits of 25 to 100 millimeters were attributed to either a shortage of water supply (reservoir and river) or the design capacity limitation between the headworks reservoirs and the Little Bow Reservoir outlet. The capacity of the Lake McGregor Reservoir to Travers/Little Bow Reservoir is 2,800 cubic feet per second. The model assumes that no water is withdrawn from Lake McGregor Reservoir below an elevation of 871.74 meters, which is less than 2.4 metres below the full operating level. However, there is 180,000 acre feet of useable storage remaining at that level, which is 2/3 of the total storage, so except for irrigators pumping directly from McGregor, the results are conservative.

The district's assessment of the modelling results and comparison of the 2015 model inputs to current data identified two significant efficiency gains since the modelling was completed which make the results conservative:

1. Return flow was modelled at 60,750 acre feet in the 310,000 acres scenarios, whereas 42,900 acre feet is reasonable for current conditions, an improvement of 17,850 acre feet.
2. The on-farm system mix was modelled as 81% low pressure pivot, 9% high pressure pivot, 4% wheel moves, and 6% flood. The 2024 on-farm system mix is 89.2% low pressure pivot, 6.5% high pressure pivot, 1.7% wheel moves, and 2.6% flood. Using the current system mix in the model for a net application of 10" for actual plant water use would reduce water requirements by approximately 3,500 acre feet for the 310,000 acre scenarios.

Combining the water savings for the current return flow and on-farm systems, there would be 21,350 acre feet more water available than modelled, which would be enough for over 10,000 acres of irrigation. Therefore, the modelled results for 310,000 acres are conservative for the proposed 320,000 acre expansion, even without considering the storage in McGregor which the model does not use. Reductions of return flow expected in the near future and additional storage in the proposed Deadhorse Coulee Reservoir will further reduce the risk of water shortages.

- g) the total acres that could be irrigated based on the calculations made under clause (f): Based on the 2015 modelled irrigation demand, the district's current water allocation of 489,250 acre feet is sufficient to irrigate at least **335,000** acres. The current proposal is to expand by **25,000** acres to **320,000** acres.

- h) the present expansion limit:
Bylaw 2018-04 set the present expansion limit at **295,000** acres.
- i) the number of acres on the current assessment roll:
As of December 4, 2024 the BRID assessment roll held **293,153.1** acres.
- j) the proposed expansion limit:
The BRID Board of Directors is proposing to increase the expansion limit to **320,000** acres.
- k) a description of the areas in the district where additional irrigation will be allowed if the district will not allow additional irrigation in all areas of the district:
All areas of the district will be eligible for expansion with the only restriction being parcels potentially served from a conveyance system on which there are existing capacity restrictions.