

## Review of the Implementation of the Approved Water Management Plan for the South Saskatchewan River Basin

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## SSRB WMP 10 Year Review

### Draft Outline v6

8 May 2017

#### Purpose

It has been 10 years since the approval of the South Saskatchewan River Basin Water Management Plan (WMP, Plan). As with all plans, it is prudent that its effectiveness be periodically reviewed. The purpose of this Review is to assess the implementation of the Plan in the Bow River Basin since its inception in 2006 using available data and information.

- Assess progress against WMP recommendations and intended outcomes based on best available data, including baseline comparison (prior to the implementation of the Plan).
- Identify information gaps and opportunities.
- Summarize what the Plan has accomplished since it was implemented in achieving its anticipated outcomes, and what further can be done.

This is not a required or approvals related review. This is a WPAC conducted review foreseen, in fact called for, in the original Plan. This is a transparent effort that is within the WPAC responsibilities intended to inform and improve water management in the basin.

The Review does not intend to recommend opening up the SSRB WMP nor the *Water Act* to revision. Rather, it intends to identify where further attention or effort is required to achieve the intended outcomes of the Plan, within the current regulatory framework.

The Review is closely linked with issues that have been identified as key priorities for Alberta:

- Climate change - The WMP provides the regulatory context within which water users and managers must balance supply and demand both now and for the future. Understanding how the regulatory context may evolve is vital for water planners, infrastructure operators, and water users. Water challenges will be compounded as climate change comes to ground in water. The basin's regulations, policy and infrastructure all define the extent to which the basin and its communities will be able to adapt to highly variable and shifting water supply.
- Economic growth - Water security is a necessity to municipalities, industry, agriculture, and tourism. The Plan and its associated regulations define how these drivers of Alberta's economy can access a reliable water supply. Having been in place for 10 years, it is prudent to review whether the regulations and market mechanisms have been effective in limiting the draw on the watershed while still enabling high value use of the basin's water resource.
- Land use planning – Water and land are inextricably linked. Alberta's Land-use Framework (LUF) guides its approach for managing the province's land and natural resources to achieve Alberta's long-term economic, environmental and social goals. The South Saskatchewan Regional Plan relies on the WMP to appropriately guide water quantity management. A thoughtful review of the Plan should inform land use planning in other basins by highlighting where the Plan has been effective and where it can be doing more.

## Process

Target launch: April 2017.

- One year to complete review and corresponding communication.
- Workshops with WPACs membership and/or committees akin to the Basin Advisory Councils that provided advice to GoA on the original development of the Plan. This would not be public consultation.
- A 10 year data set (where available) for the SSRB following implementation of the Plan, and in some cases, for 10 years prior to implementation as a baseline (data can be reused by WPACs).
- A summary assessment report to the WPAC membership (this will be a public document), including a water use summary report by sector.
- An advisory report from the SSRB WPACs to GoA for consideration.

## Communication

- The data and reports will be made publicly available, perhaps with a comment period for input beyond WPAC membership.
- The report will be made available province-wide through web-based communication platforms, e.g. WPAC websites, the Alberta WaterPortal.

## In Scope

### Recommendation 2.1 Establish a Limit on Water Allocations from the Bow, Oldman, South Saskatchewan River Sub-Basins

*“Alberta Environment no longer accept applications for new water allocations in the Bow, Oldman and South Saskatchewan River Sub-basins until the Minister of Environment specifies, through a Crown Reservation, how water not currently allocated is to be used.*

*Water be allocated from the Crown Reservation only for:.....”<sup>1</sup>*

Data required:

- Licence approvals since 2006 including number, volume, location, purpose, terms etc.
- Number of applications still “in the queue” and pending decision.
- Temporary Diversion Licenses (TDL) issued by sub basin including number, volume, location, purpose, terms etc.
- Groundwater licences that have been approved by sub basin including number, volume, location, purpose, terms etc.
- Amount of reserved water issued through Crown reservations issued for: WCOs, storage of peak flows, First Nations.
- WCO licenses issued by sub basin including number, volume, location, purpose, terms etc.

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<sup>1</sup> “Highlights: Approved Water Management Plan for the South Saskatchewan River Basin”, Alberta Environment, 2006

- Licence transfers that have been approved including number, volume, location, purpose, terms etc.
- Total water allocations by sub-basin year over year (prior and since 2006)
- Water withdrawals/use data collected through the AEP water reporting system and any other use water use data available from AEP, by sub-basin and by sector year over year from 1995-2015.)

Analysis & discussion:

- How has the trend in water allocation and/or use changed in the years before and since the implementation? I.e. has the limit stopped the increasing use of the river over what was already planned within existing licenses?
- Have there been any operational adaptations or options that may have had the unintended consequence of negating overall intended planned outcomes?
  - Change in TDL use?
  - Use of licence amendments and assignments? (including change of water rate, timing, purpose(e.g. irrigation to municipal)).
  - Has there been more of a draw on [unlicensed] groundwater?
- Is adaptation happening without transparent identified performance monitoring / assessment or partner (WPAC) consultation? This has implications for the “application public review process” where the public is not aware of adaptive changes that may influence the Director’s interpretation of the Plan.
- How many Crown licences have been issued and for what use?
- What information is missing (data gaps, legal mechanisms?)
- Who (AEP vs. AER) is making regulatory decisions on water allocations? Are both agencies using the same approval criteria?
- Have the Environmental Appeal Board decisions influenced any decisions made by AEP since the SSRB was enacted?

Recommendation 2.2 Future Water Allocation Limit in the Red Deer River Sub-Basin

*“When allocations in the Red Deer River Sub-basin reach 550,000 cubic decameters, a thorough review will be conducted to identify the maximum allocation limit.”<sup>2</sup>*

Data required: TBD

Analysis & discussion: TBD

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<sup>2</sup> “Highlights: Approved Water Management Plan for the South Saskatchewan River Basin”, Alberta Environment, 2006

Recommendation 2.3: Recommended Water Conservation Objectives (WCOs)

*“Alberta Environment establish Water Conservation Objectives (WCOs) for the Bow, Oldman, and South Saskatchewan River Sub-basins. Any licenses issued for applications received after May 1, 2005 be subject to the following water conservation objective:”<sup>3</sup>*

*“Alberta Environment establish Water Conservation Objectives (WCOs) for the Red Deer River Sub-basin. Any licenses issued for applications received after May 1, 2005 be subject to the following water conservation objective:”<sup>4</sup>*

Data required:

- List of where and when WCOs have been implemented throughout the SSRB including any details specific to each WCO: it’s priority, whether it is interim or long-term, specific purpose or concern it is addressing (to 2009).
- Indication of what performance monitoring is done towards determining WCO status (interim or long term).
- For each reach, the licences and corresponding volume that is and is not subject to the WCO.
- If available, the natural flow data set (either the formally released data or the data used by operations) to use as a baseline to estimate, how often and by what percentage WCOs have or have not been met since installation (to 2009).
- Information on what triggers the installation of a new WCO.
- Information confirming how WCOs would be applied to new storage.

Analysis & discussion:

- The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?
- In a heavily allocated closed basin, how often is a WCO relevant (because it is junior to most allocations)?
- Therefore, are they effective in restoring the aquatic environment?
- Is there a more effective alternative?
- How might WCOs need to be relaxed or revised to enable new storage to offer potential benefit to the basin?
- Are WCOs needed on more reaches, for example, some of the upper tributaries as mentioned in the SSRP?
- How much of a role does unused allocation within existing licences play in the river for healthy aquatic ecosystems?

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<sup>3</sup> “Highlights: Approved Water Management Plan for the South Saskatchewan River Basin”, Alberta Environment, 2006

<sup>4</sup> same

Recommendation 2.5: Establishment of an Interbasin Water Coordinating Committee

*“Form a committee to promote coordination of water management across the SSRB. The membership should include representation from the Watershed Planning and Advisory Councils....”<sup>5</sup>*

Data required:

- Confirmation of how often this committee meets.
- The committee’s Terms of Reference and Operating Plan.
- Any advice it has produced and shared with GoA, WPACs.

Analysis & discussion:

- Refresh the narrative on why the committee exists and whether it is effective.
- Does it have the right membership, mandate and accountability?
- Is it providing useful information to GoA? Could it be more useful to GoA?
- Is it representing the WPACs?

Recommendation 2.7: Use of Water Allocation Transfers, Water Conservation Holdbacks and Factors that Must be Considered When Making Decisions

*“The Director is authorized to consider applications for transfers of water allocations.*

*The Director is authorized to withhold up to 10% of the volume of water being transferred, if it is considered to be in the public interest to protect the aquatic environment or to implement a water conservation objective.*

*The Director consider the Matters and Factors provided in this plan in making decisions on applications for licenses, preliminary certificates, approvals, or transfers of an allocation of water.”<sup>6</sup>*

Data required:

- Repeated from Rec. 2.1: Licence amendments that have been approved including number, volume, location, purpose, terms etc. by AEP and AER.
- Repeated from Rec. 2.1: Licence transfers that have been approved including number, volume, location, purpose, terms etc. by AEP and AER.
- Holdback associated with each transfer and total holdback volume by sub basin. Any cases where the holdback has not been fully applied.
- An update/explanation from AEP of the scope of the water license transfer system and how it has have evolved over time (this should help refine the scope of this section’s data analysis & discussion).
- Information on any changes or additions made to the Matters & Factors tables pertaining to amendments and transfers.

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<sup>5</sup> same

<sup>6</sup> “Highlights: Approved Water Management Plan for the South Saskatchewan River Basin”, Alberta Environment, 2006

- As a comparison, what volume of water was requested in applications each year from ~1995-2005, by sub basin? What volume of water was requested in applications each year from ~2005-2015 in the Red Deer basin. These data points may be used in comparison with the transfer volumes applied for since the Plan was implemented.

Analysis & discussion:

- How many times has the Transfer system been used? How many times has it been abandoned? Expected vs actual uptake of mechanism? Have there been excessive barriers raised?
- How onerous is the Transfer system? Should it be simplified or is it appropriately rigorous?
- How long does a typical transfer take from application to approval?
- What form of public notice is provided for each application?
- Does AEP offer a public list of water allocation licenses and transfers?
- Is the application and approval process transparent and consistent?
- How often have transfers involved a change in purpose/timing/location? (including movement between tributaries and main stem, change from seasonal to year round use)
- Are the 10% holdbacks being used? Is it actually putting water back into the river? Is there an alternate mechanism to the holdback that would be more beneficial to developers and the aquatic ecosystem?
- There are water licence sharing assignments originally proposed as short term water shortage solutions between parties that do not go through approval process. Some of these are now becoming long term and should be looked at as permitted temporary transfer but this is not happening until someone complains. Allowing these long term assignments also raises some questions about the criteria for licences held in 'good standing'.
- Is the Matters and Factors table useful in guiding decision making. Should the Matters & Factors tables pertaining to amendments and transfers be revisited?
- What information is missing (data gaps, legal mechanisms?)
- Should all Transfers be managed in the same manner, or is there an opportunity to designate different types of transfers (as per the Water Allocation Transfer System Upgrade Project WATSUP 2009 Report)?
- Does there need to more clarity on the different between an Amendment and a Transfer?

Recommendation 2.8: Water Management Strategies

*“AENV and water users will pursue broad water management strategies to ensure water availability for economic development and the aquatic environment in the SSRB.*

*2.8.1 Water Demand and Consumption*

*2.8.2 Improved Dam Management to Protect the Aquatic Environment*

*2.8.3 Protection and Management of Riparian Vegetation*

*2.8.4 Flow Restoration in the Bow, Oldman and South Saskatchewan River Sub-basins*

*2.8.5 Water Quality*



### 2.8.6 Maintenance of the Red Deer River Sub-basins Aquatic Environment<sup>7</sup>

#### Data required:

- Is actual water use (not allocation) being tracked? (including: are water users providing water use reports? Is data provided and accessible real time?)

#### Analysis & discussion:

##### 2.8.1 Water Demand and Consumption

- Have modeling capabilities been upgraded?
- Have innovations and improvements in water licensing and legislation to better match allocations with needs been explored?
- Has the development of water markets and transfers been supported?
- Have improvements in water conservation methods been encouraged?

##### 2.8.2 Improved dam management to protect the aquatic environment

- Are post flood functional flows being released on GoA reservoirs?

##### 2.8.3 Protection and management of riparian vegetation

- The intent of the Aquatic and Riparian Condition Assessment for the main stem rivers of the SSRB (ARCA 2007) is to assist Alberta Environment and its partners in determining where to focus management efforts. To what extent has this been happening particularly from the perspective of effectively managing reach specific flow and water quality?
- Review how AEP has worked in partnership with the WPACs to prepare watershed management plans to encourage healthy riparian environments?

##### 2.8.4 Flow restoration on the Bow, Oldman and South Sask.

- Are licence holders taking voluntary flow restoration actions, particularly during critical periods?
- Are discussions with senior priority licence holders held?
- Has research been conducted to determine how flow restoration benefits the aquatic environment?
- Have operating licenses for government dams and WCO conditions been on diversion licenses been assessed?

##### 2.8.5 Water Quality

- Has water quality been studied in more detail throughout the SSRB to assess land use impacts and develop beneficial management practices to mitigate these impacts?

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<sup>7</sup> "Approved Water Management Plan for the South Saskatchewan River Basin (Alberta)", Alberta Environment, August 2006

### 2.8.6 Maintenance of the Red Deer River Sub-basins Aquatic Environment

- TBD

## Not In Scope

### Recommendation 2.6 Master Agreement on Apportionment (1969)

*“Alberta Environment continue to manage the SSRB as a whole, in order to meet the Master Agreement on Apportionment requirements.”<sup>8</sup>*

### Recommendation 2.9: Suggested changes to the Water Act

*“The following are possible amendments to the Water Act for which there is public support or which were suggested as a result of insights during work on this plan. Inclusion of these suggestions in this plan does not imply that the legislature will make any of these amendments.*

- *Allow private parties to hold licences for Water Conservation Objectives when obtained under the transfer provision of the Water Act.....*
- *Allow part of a licence to be cancelled.....*
- *Allow water that becomes unallocated in the future to become part of a Crown Reservation....”<sup>9</sup>*

## Roles & Resourcing

### AEP:

- Provides requested data and information.
- Participates on the Steering Committee.
- Participates in the work through the WPAC meetings, Steering Committee meetings and 1-2 additional working sessions to review data and findings.
- Formally receives the report from the WPACs.
- Provides guidance what other departments/agencies should be involved.
- Does not run the Review process.

### WPACs:

- Provide leadership to the work within their mandate and as per the Plan.
- Coordinate project funding.
- Conduct the Secretariat function for the Review, either through in-house staff or contractor.
- Host events or committees to garner membership input, with contract support as needed.
- Create a report of the Review for their membership either through in-house staff or contractor.
- Create and submit an advisory report to GoA either through in-house staff or contractor.

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<sup>8</sup> same

<sup>9</sup> “Approved Water Management Plan for the South Saskatchewan River Basin (Alberta)”, Alberta Environment, August 2006

**Contract support:**

Can be engaged as needed by the WPACs to provide specific resources and skill sets e.g. data analysis, meeting facilitation, report writing, steering committee support, project secretariat.

The Review would benefit from a Steering Committee that would include:

- Representation from AEP
- Representation from each participating WPAC (suggestion is the Ed plus 1-3 Board members)

**Preliminary Workplan**

Pre-Launch: Preparation <i>January - March</i>	WPACs and AEP confirm final scope and funding WPACs align/engage project resources WPACs and AEP form Steering Committee AEP compile requested data AEP and WPACs execute necessary data sharing agreements
Step 1: Preliminary data analysis <i>April - May</i>	AEP provides requested data WPACs access additional studies and reference material WPACs conduct preliminary data analysis WPACs compile initial findings for discussion
Step 2: Initial WPAC review <i>June - August</i>	Review preliminary data analysis with WPAC membership (via Quarterly Forum or Committee) WPACs complete data analysis and research WPACs compile draft findings for discussion
Step 3: Secondary WPAC review <i>September - October</i>	Review draft findings with AEP Review preliminary data analysis with WPAC membership (via Quarterly Forum or Committee)
Step 4: Completion of findings <i>November - January</i>	WPACs complete final analysis and research WPACs document findings in report to membership WPACs prepare advisory report to GoA AEP receives report from WPACs
Post Project: Further communication	WPACs, WPAC members, and AEP share findings and reports as they see fit

*Note: this timeline is contingent on the availability of data from AEP and their resource requirements to make the data available*

**Option: Pilot the Review in the Bow River Basin**

It is recognized that all parties involved in this potential Review (WPACs, AEP) have many priorities and limited resources. Given that, there could be an option to “pilot” the Review in the Bow River Basin with the BRBC. If the Pilot has good outcomes, it could then be rolled out to include all 4 WPACs and basins in the SSRB.

The Pilot could follow the same workplan and process as proposed in this document, however the Scope would be limited to the Plan Recommendations and data relevant to the Bow River Basin.

## Funding and Funding Options

A very preliminary estimate for the funding required for the Pilot in the Bow River Basin was set at \$75,000 - \$100,000. This would vary depending on data availability and complexity, the approach selected for engaging WPAC membership, and the extent of the secretariat role that would be required. This funding requirement would be significantly higher for a Review including all 4 WPACs and basins instead of 1.

In terms of accessing funding for this Review, three options have been identified so far:

1. WPACs submit request to GoA through their annual grant cycle
2. WPACs and AEP explore alternate mechanism to fund this Review.
3. Other potential funders will be identified and approached

## Frequently Asked Questions

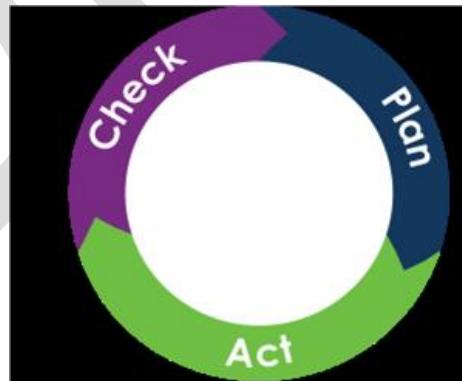
Note: All quotes, with page references, are from the Approved Water Management Plan for the South Saskatchewan River Basin (Alberta), Alberta Environment, August 2006.

### FAQ – Why is it important or necessary to review this Plan?

“The plan will provide guidance to decision makers and act as a foundation for future watershed management planning” (page v)

“This plan is the senior plan within the SSRB and all other water management plans in the SSRB must be consistent with it. However, it is recognized that improvements to this plan may be made as research results and other data become available. Section 12 of the *Water Act* describes the legal process for plan revisions.” (page 18)

This diagram is taken from the GOA’s Phosphorous Management Plan for the Bow River. The review is the “Check” phase, and the time is now.



### FAQ – Why should the BRBC be leading this review process?

“Watershed Planning and Advisory Councils (WPACs) are encouraged to consider the planning priorities in their watersheds and undertake future watershed management planning with this water management plan serving as a foundation.” (page 17)

“Future watershed planning will be led by the Watershed Planning and Advisory Councils. The Councils will work together to ensure their individual planning is aligned with the SSRB Plan. Together they will decide when sufficient new information has been obtained or situations have sufficiently changed to warrant review of any aspect of the SSRB plan.” (page 18)

FAQ – Does this review support recent modeling efforts, for example the Bow River Project?

Yes.

“Storage of peak flows to mitigate impacts on the aquatic environment and to support existing licences. (Alberta Environment will assist the Watershed Planning and Advisory Councils in evaluations of the potential for on-stream and off-stream storage.)” (page 6)

“It is also recommended that AENV hold discussions with Government and other dam owners to investigate opportunities to optimize operation of the facilities, to benefit water supply and the aquatic and riparian environment.” (page 16)

“Research be conducted to determine how flow restoration benefits the aquatic environment.” (page 16)

FAQ – What are the Important Considerations or “Givens” to keep in mind for a review?

1. “Given this understanding of the water supply, allocations and condition of the aquatic environment, it is recognized that the Bow, Oldman and South Saskatchewan River Sub-basins have reached their limit of allocations
2. “[The Plan] recognizes and accepts that limits for water allocations have been reached or exceeded in the Bow, Oldman, and South Saskatchewan River Sub-basins.” (page 5)
3. “As more water was allocated and as each allocation was more fully utilized, impacts on the aquatic environment became apparent.” (page 4)
4. “water should be respected now and into the future.” (page 1)
5. “Greater emphasis will also be placed on ensuring environmental considerations are taken into account.” (page 1)
6. “changes to the direction of water management in the SSRB must take place.” (page 4)

FAQ – Does the SSRB Plan give any direction on Triple Bottom Line (TBL) Considerations?

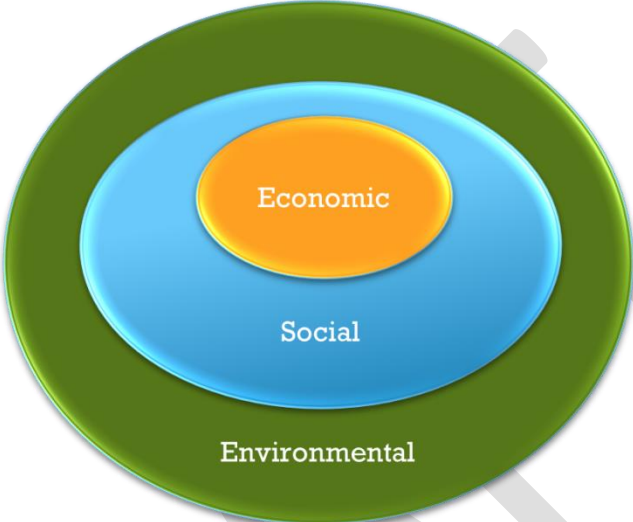
Yes.

The very first line of the Plan reads...” This plan reflects a balance between protecting the aquatic environment and water allocation of rivers in the South Saskatchewan River Basin (SSRB).”

“The intent of this plan is to accelerate the steps the citizens of the SSRB have already taken on the path towards a sustainable economy and environment.” (page 1) Note: recommend reverse order.

” In Alberta, our quality of life – and life itself – depends on having a safe and sustainable water supply for the environment, our communities, and our economic well-being.” (page 4)

**Guiding Principle for this Review**



DRAFT

Appendix B – Parking Lot

## Parking Lot

All sub-basins:

- Address questions of long-term funding and resourcing for watershed management (including planning, projects, modeling, monitoring).
- Integration of water quantity and quality modeling should be high priority.
- Groundwater and groundwater-surface water interactions data is needed for more effective water management (particularly given GOA aggregate mining policy is now allowing mining of alluvial aquifers)

### Bow BAC

- Recommendation 2.6 on the Master Agreement on Apportionment (1969) had been marked as out of scope, however the following observations were made:
  - The Plan states “The public should be provided with information on a regular basis as to the committee’s recommendations.” This is not being done.
  - The Plan states “AENV should submit an annual report to the public in its activities with respect to meeting apportionment.” This is being done.
- Characterization of impact on return flows due to water reuse and the associated water quality and aquatic health impact needs to happen (from The City of Calgary)
- One action item to be considered is a full legislative and policy review that would identify any barriers to setting and achieving goals to aquatic health and water conservation. Water Reuse is one element. Any legislative barriers that would end up being a dis-incentive for any proponent to be able to do work to help achieve their outcomes. (from City of Calgary)

### Red Deer BAC

- Special Areas Water Use. This is of concern for the health of the Red Deer Basin, especially in any future drought conditions.
- WCO’s with regard to a second dam
- Drought management action plan
- Based on forecasted water availability and anticipated growth within the Red Deer sub-basin, the Red Deer BAC would like to see the trigger for temporary closure to be amended to 500,000 dam<sup>3</sup>
- Gain a better understanding of the long-term water use impacts of fracking in the Red Deer River Basin.
- A more reliable system of water monitoring and management will be needed to ensure that their basin does not become overallocated
- Review the SSRB every 5 years to ensure targets are on track.
  - The Red Deer River BAC strongly recommends that a review of the SSRB plan be conducted every 5 years, rather than every 10 years. 10 years is simply too long, as much can change within this time frame and growth and development pressures may be greater than anticipated, while water supply remains variable. Reviewing the plan more frequently would allow the basin to get ahead of the curve with respect to water management issues and challenges, rather than always catching up after the critical juncture has been reached. Proactive review of the plan would also ensure more frequent assessment of the cumulative implications for healthy aquatic/riparian ecosystems, as well as the need to address the 550,000 dam<sup>3</sup> figure to ensure that the Red Deer River is able to meet projected demands



and allocations and anticipate possible implications to the basin in both the short and long term. (We would like to see all 4 BAC's in agreement on this).

#### South Saskatchewan BAC

- Drought storage that is longer than 1-2 years will likely become a more pressing issue in the coming years due to climate change. This issue will likely be exacerbated by physical limitations to surface storage, as well as uncertainty in the effectiveness of below-ground storage of surface water.

#### Oldman BAC

- Naturalized flow data not official, have “working data” but can't release it to us.
- More linkage is needed to water quality – something we need to work on in future.
- Still need to look at WATSUP report (a WATSUP summary presentation was emailed out and the link to the online report was made available).
- A case study analysis has been suggested by Shirley to understand the process of a water licence transfer, how matters and factors are considered in particular. Mike will find out more information for Brian, to see if this would be possible.
- Table needed to show what has been allocated since the plan was approved and what is still outstanding. This would show if there has been a limit on allocation or not. Allocation tables by year were added to the WaterSmart data package, outstanding allocations were not included.
- Some concerned that little water returns to the river, even though some conservation practices paid for with public resources. Debate about global food production, how healthy is the food produced, does it actually feed the hungry.
- What more incentives could we recommend for improving the health of the aquatic ecosystem?
- Question about where we want to go as a province – bigger debate than this project.
- Evaluate the efficacy of the current WCO for protecting aquatic environments.

Appendix C – 10-Year Review Data Analysis Package

# SSRB 10-year Review Data Analysis Package

April 2018

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## About this report

The purpose of this report is to provide BAC members with summary figures and tables about trends in water use, flows and other key metrics in the South Saskatchewan River Basin (SSRB). The tables and graphs presented are based on a series of questions posed by the BACs that were previously documented in a document entitled '*SSRB Water Management Plan 10 Year Review: Data summary and analysis plan*'. Each page of this report contains a separate graph or table, along with an explanation of the raw data sources used, the methods employed and other key points for interpretation. The analysis is broken-down into two key categories of information:

- (1) Trend and statistical analysis of water allocations; and
- (2) Analysis of observed versus naturalized flows.

Analysis was conducted for all four basins in the SSRB and is generally broken-down on the basis of the periods before and after the implementation of the SSRB Water Management Plan in 2007.

## Disclaimer

These analyses presented should be regarded as preliminary. This report is being provided for information purposes only and is not intended, nor should it be construed as providing legal advice or recommendations in any circumstances. The authors make no representation or warranty of any kind whatsoever with respect to the completeness or accuracy of the information contained in this report. While effort was made to assure the maximum accuracy possible, it is possible that some errors still remain. The authors are not liable of any use or speculative interpretation of the contents of this report. In no event shall the authors be liable for any damage whatsoever arising out the use of the information provided in this report. Readers are advised to obtain competent advice prior to relying on or using any information contained in the report with respect to its suitability for general or specific application/use.

## Contact

For more information, please contact Mike Murray from the Bow River Basin Council.

## A note about interpreting trend analysis

The trend test used in this study tests for a monotonic trend in data, which essentially means the trend is constantly increasing. In many cases, water allocation trends may appear to be increasing because of large jumps, and while this may be important from a water management perspective, such changes aren't considered monotonic. When looking at the trend, keep in mind that just because a result may not be "statistically significant", does not mean the visual changes are note negligible or unimportant. Best practice in interpreting trends suggests using a combination of statistical tests and visual interpretation<sup>1</sup>. Figure 1 shows how cumulative trends may appear increasing, however when only the net allocations on an annual basis are considered, there is a lack of a trend visible.

(a) Graph showing cumulative trends in water allocations by activity for groundwater in the Old Man River Basin

(b) Graph showing net trends in water allocations for 'Agriculture and irrigation' for groundwater in the Old Man River Basin

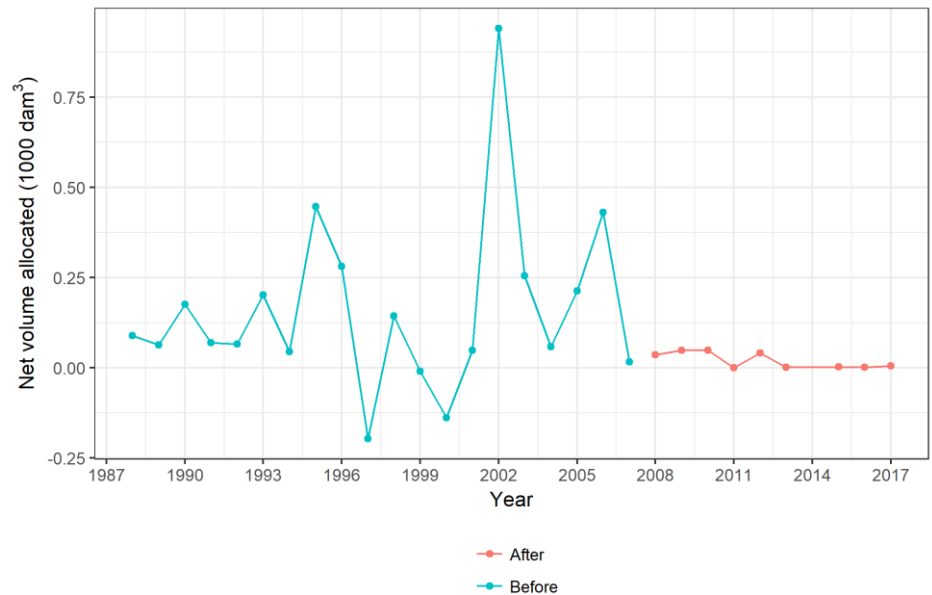
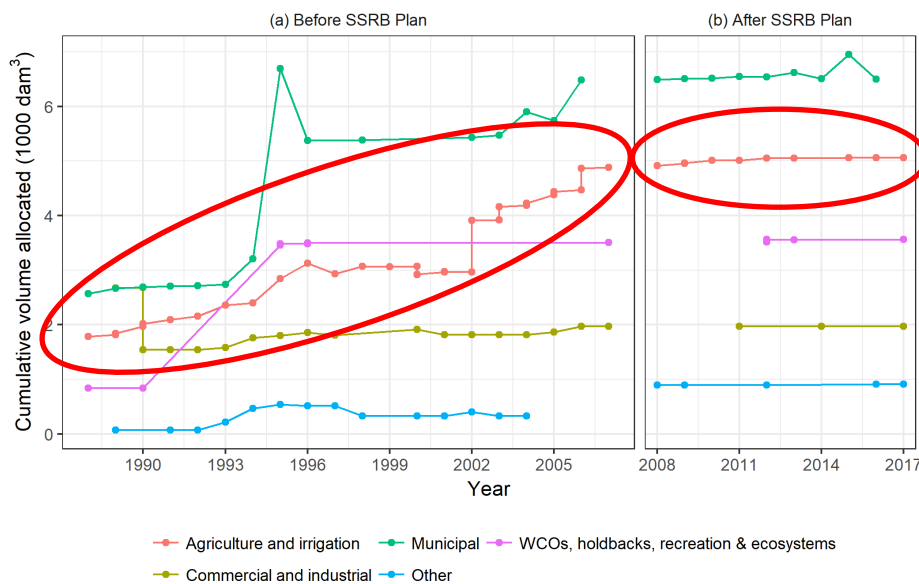


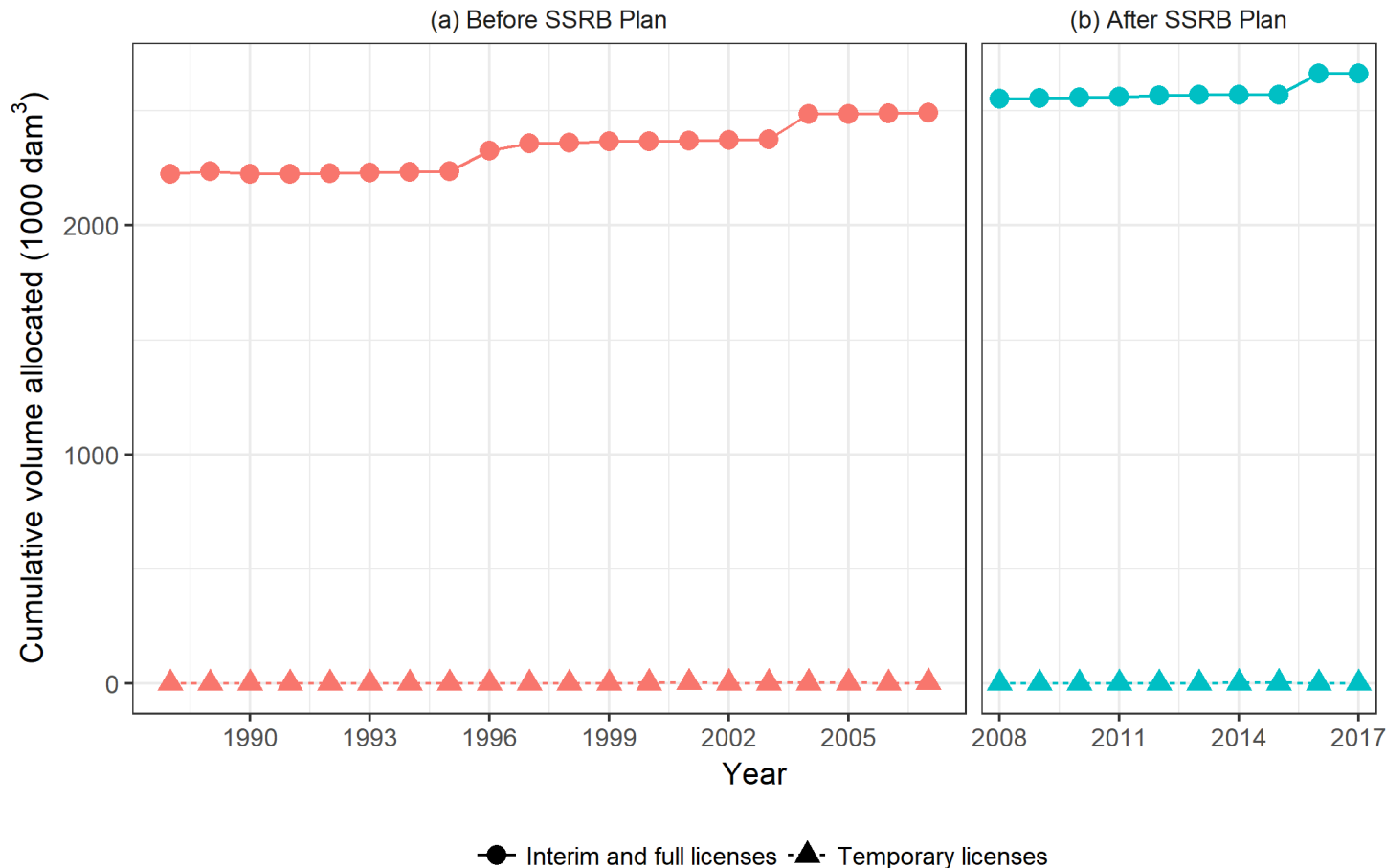
Figure 1: Comparison of (a) total cumulative water allocation with (b) net water allocation for what might appear to be an increasing trend in water allocations.

<sup>1</sup> Hipel, K. W., & McLeod, A. I. (1994). Time series modelling of water resources and environmental systems (Vol. 45). Elsevier.

**Recommendation 2.1: Establish a Limit on Water Allocations from the Bow, Oldman, South Saskatchewan River Sub-Basins**



Bow River Basin water allocations trends by type ('full' vs. 'temporary' allocations) – surface water



Why this graph?

This graph is intended to address the question of:

**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**

Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- Temporary license volumes are far lower than full licenses.
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- A key feature of the trends in water allocation are some “jumps” in allocated volumes in certain years (1996, 2004 and 2016)
- All trends in the total “new” volume each year are statistically significant, except “Temporary licenses” after the SSRB Plan implementation.
- The SSRB plan closed the basin to “new” applications, however at the time there were still pending applications that were allocated after closure.

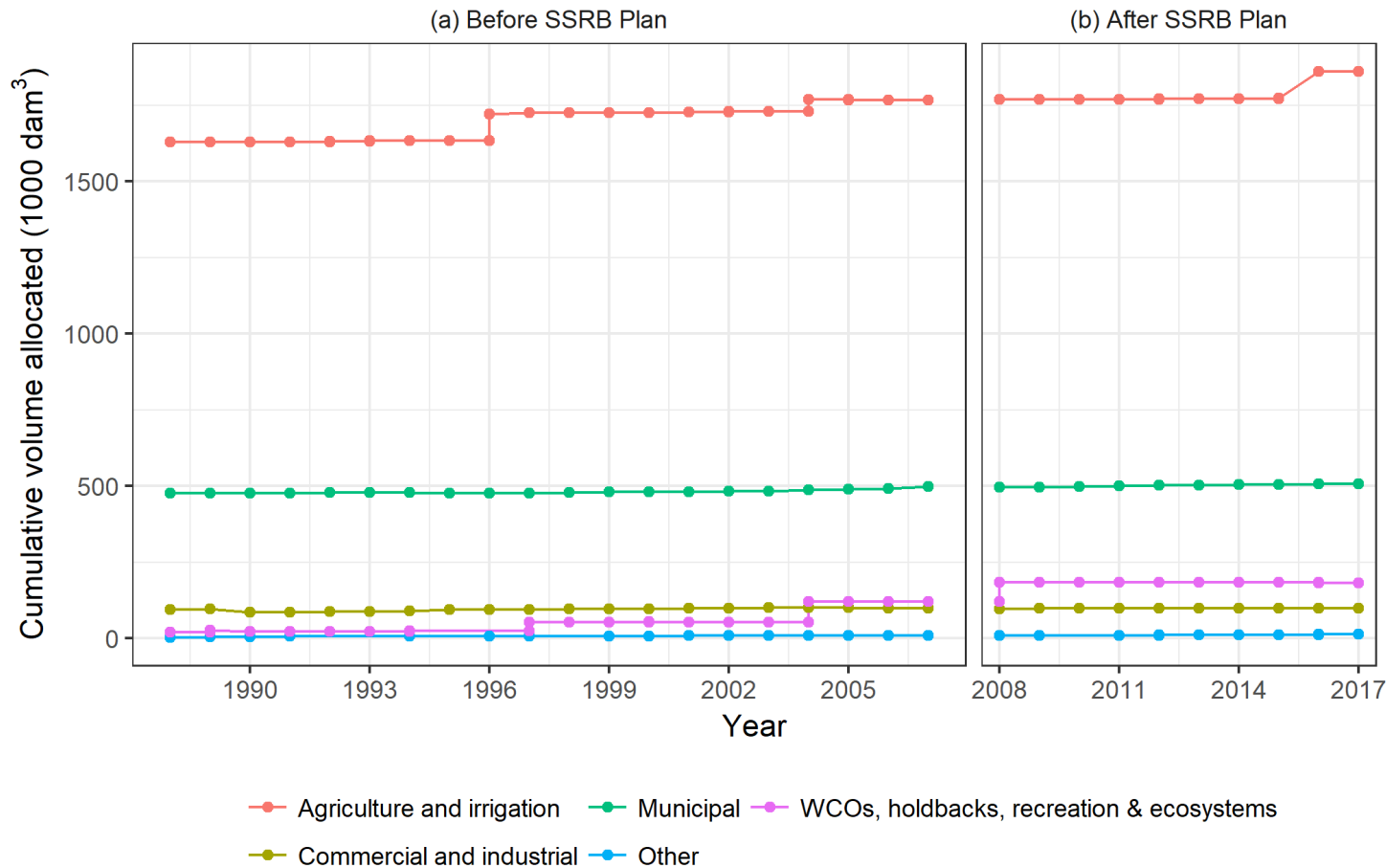
Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present.
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were classified as either “Interim and full” for long-standing licenses or “Temporary” for short-term diversions (see data processing model for details).
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Data table (Bow River Basin surface water allocations)

Year	Cumulative Volume Allocated (1000 dam <sup>3</sup> )		
	Interim and full licenses	Temporary licenses	Total
1988	2,226	0	2,226
1989	2,235	0	2,235
1990	2,224	0	2,224
1991	2,225	0	2,225
1992	2,229	0.01	2,229
1993	2,230	0.01	2,231
1994	2,233	0.01	2,233
1995	2,238	0.01	2,238
1996	2,325	0.01	2,325
1997	2,359	0.01	2,359
1998	2,361	0.01	2,361
1999	2,366	0.05	2,366
2000	2,367	1	2,368
2001	2,369	3	2,372
2002	2,372	1	2,373
2003	2,377	2	2,379
2004	2,488	1	2,489
2005	2,486	2	2,489
2006	2,489	0.4	2,489
2007	2,492	4	2,496
2008	2,554	1	2,555
2009	2,555	0.3	2,555
2010	2,559	0.08	2,559
2011	2,563	0.007	2,563
2012	2,567	0.05	2,567
2013	2,570	0.7	2,571
2014	2,571	2	2,573
2015	2,572	1	2,573
2016	2,664	0.2	2,664
2017	2,664	0.2	2,664

Bow River Basin water allocations trends by purpose of use – surface water



Why this graph?

This graph is intended to address the question of:  
**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**

Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- A key feature of the trends in water allocation are some “jumps” in allocated volumes in certain years:
  - Agricultural allocations in 1996, 2004 and 2016.
  - WCOs, etc. in 1997, 2004 and 2008.
- Despite the “jumps”, none of the individual trends in in new allocation volume by activity are statistically significant either before or after SSRB Plan implementation.

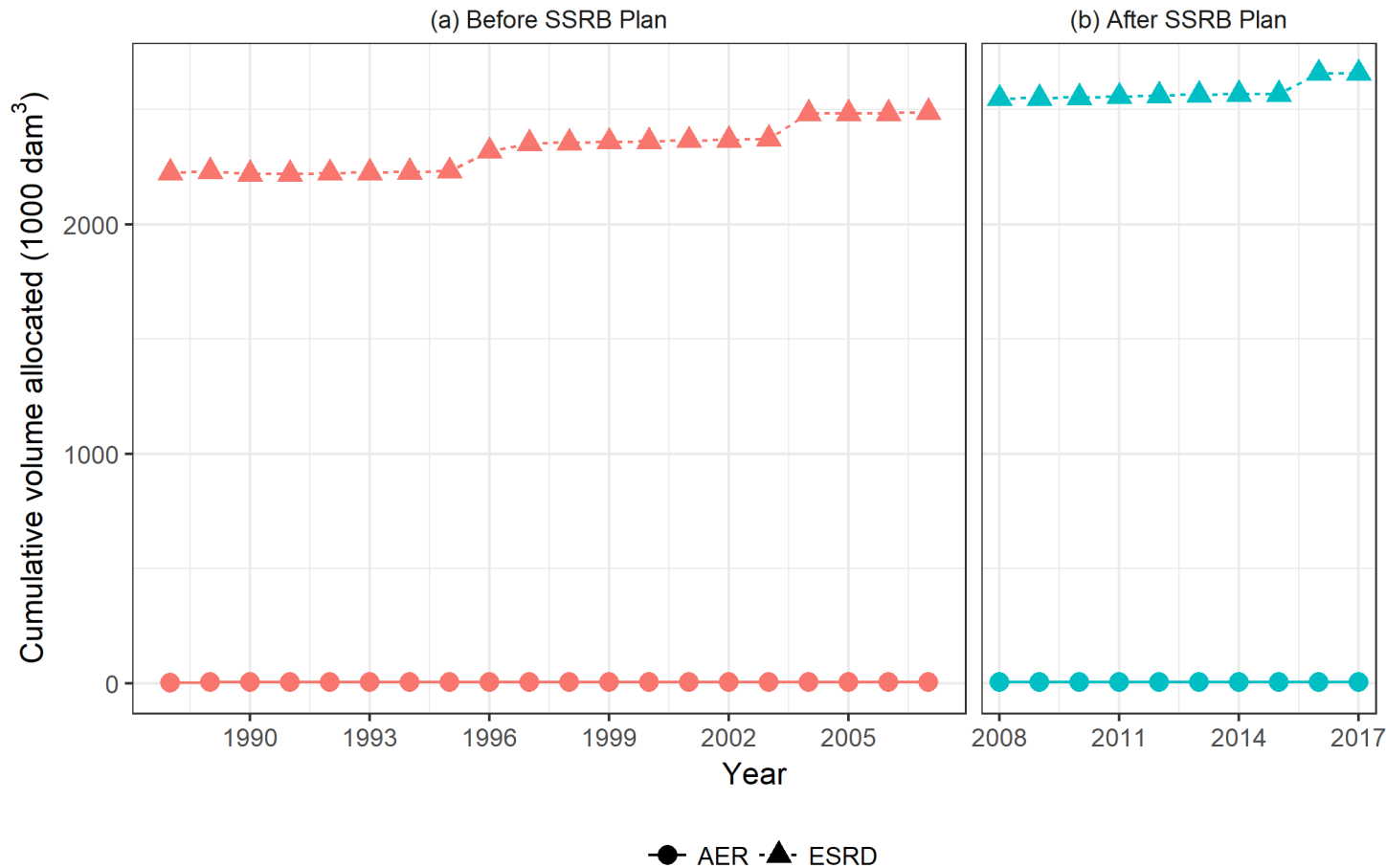
Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present (temporary and full).
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were all grouped together.
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Data table (Bow River Basin surface water allocations by activity)

Year	Cumulative Volume Allocated (1000 dam <sup>3</sup> )					Total
	Agriculture and irrigation	Commercial and industrial	Municipal	Other	WCOs, holdbacks, recreation & ecosystems	
1988	1,629	95	477	3	21	2,226
1989	1,629	96	478	5	28	2,235
1990	1,629	86	478	6	24	2,224
1991	1,630	87	478	7	24	2,225
1992	1,632	88	478	7	24	2,229
1993	1,632	89	479	7	24	2,231
1994	1,633	91	479	8	24	2,233
1995	1,633	96	477	8	24	2,238
1996	1,720	96	477	8	24	2,325
1997	1,725	95	477	8	53	2,359
1998	1,725	97	478	8	53	2,361
1999	1,725	98	481	8	53	2,366
2000	1,725	98	481	8	55	2,368
2001	1,728	98	482	10	54	2,372
2002	1,729	98	483	9	53	2,373
2003	1,730	102	484	9	53	2,379
2004	1,768	102	488	9	122	2,489
2005	1,767	102	490	9	120	2,489
2006	1,767	99	492	9	121	2,489
2007	1,767	100	498	9	122	2,496
2008	1,768	98	496	9	184	2,555
2009	1,768	98	496	9	184	2,555
2010	1,769	98	498	9	184	2,559
2011	1,769	98	502	10	184	2,563
2012	1,771	98	502	11	185	2,567
2013	1,771	99	504	12	185	2,571
2014	1,772	100	505	11	185	2,573
2015	1,772	100	505	12	185	2,573
2016	1,861	100	507	13	183	2,664
2017	1,861	100	507	13	183	2,664

Bow River Basin water allocations trends by approving agency – surface water



Why this graph?

This graph is intended to address the question of:

**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**

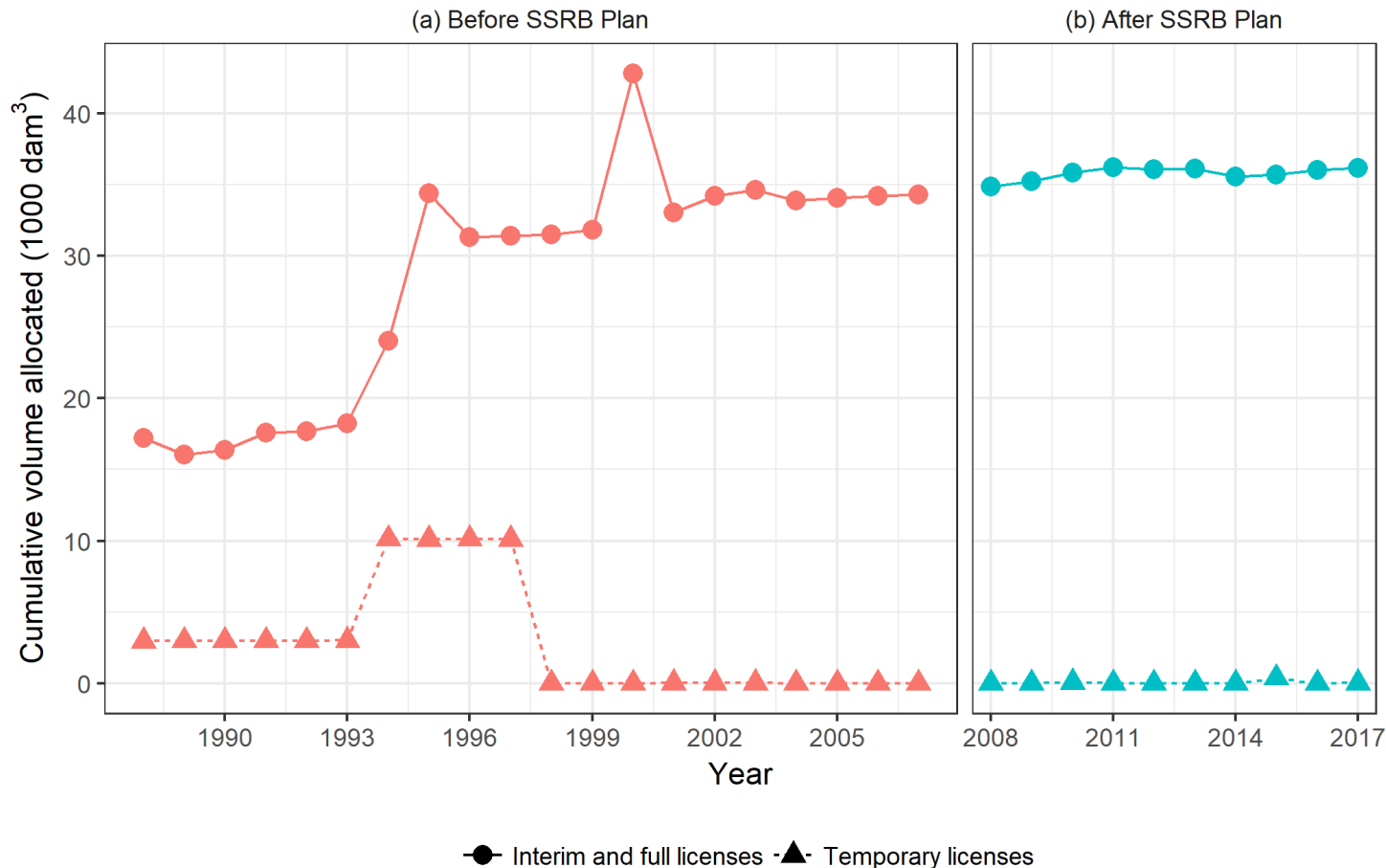
Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- The AER approvals are significantly lower than for AEP (ESRD).
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- A key feature of the trends in water allocation are some “jumps” in allocated volumes in 1996, 2004 and 2016.
- Despite the “jumps”, none of the individual trends in allocation by activity are statistically significant either before or after SSRB Plan implementation.

Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present (temporary and full).
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were all grouped together.
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Bow River Basin water allocations trends by type ('full' vs. 'temporary' allocations) – groundwater



Why this graph?

This graph is intended to address the question of:

**Assessment Question 1.1:** How has the trend in water allocation and/or use changed in the years before and since the implementation?

**Assessment Question 1.2:** Have there been any unintended consequence of negating overall intended planned outcomes?

Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- Temporary license volumes are lower than full ones, however this difference is lower than for surface water.
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- Jumps in 1995 and 2000 full allocations represent short term licenses.
- All trends in new volume each year are statistically significant and are increasing, except temporary one before the plan, which are decreased.
- A shift toward groundwater after closure may how users adapting to basin closure.

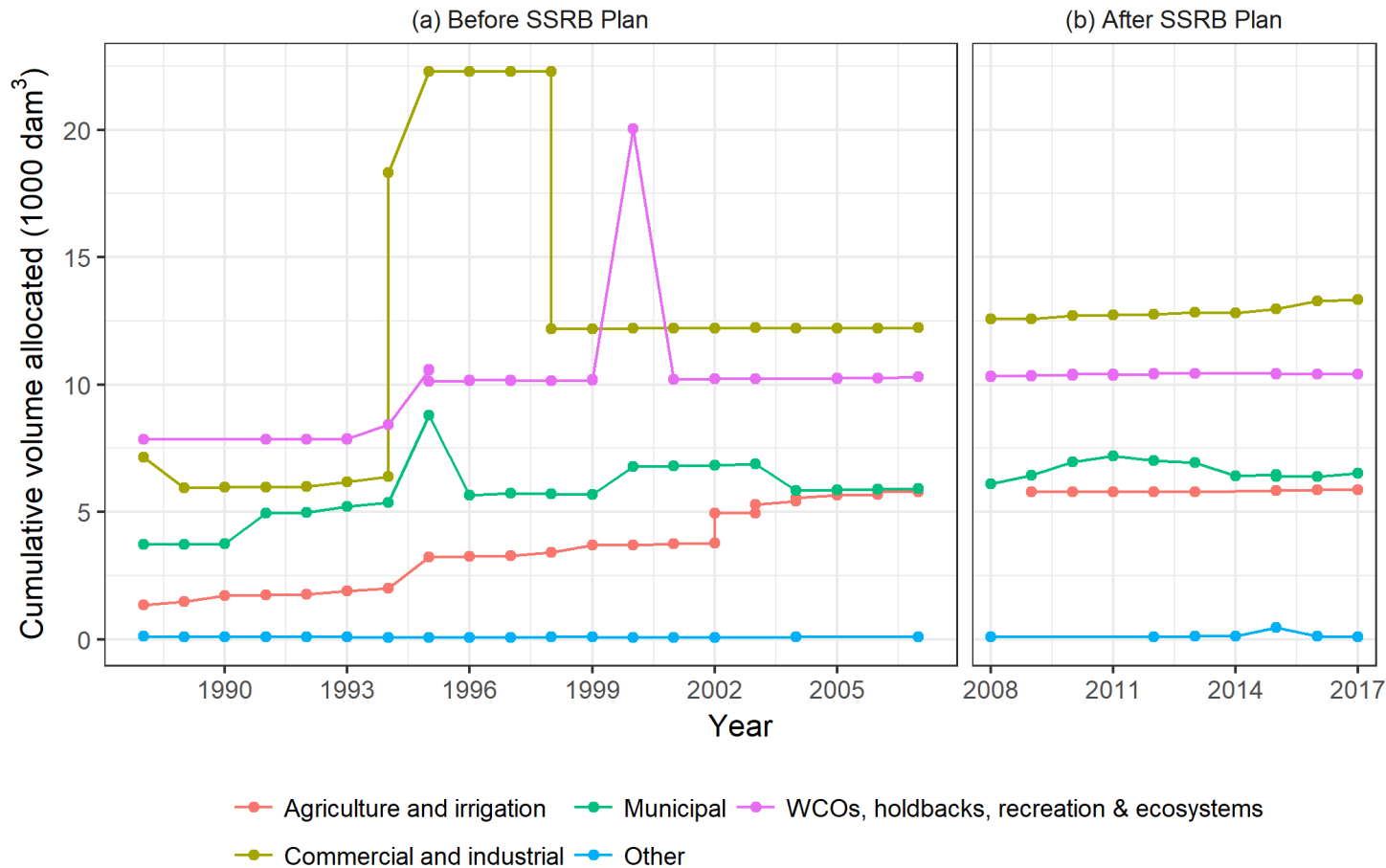
Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present.
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were classified as either “Interim and full” for long-standing licenses or “Temporary” for short-term diversions (see data processing model for details).
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Data table (Bow River Basin groundwater allocations)

Year	Cumulative Volume Allocated (1000 dam <sup>3</sup> )		
	Interim and full licenses	Temporary licenses	Total
1988	17	3	20
1989	16	3	19
1990	16	3	19
1991	18	3	21
1992	18	3	21
1993	18	3	21
1994	24	10	34
1995	34	10	44
1996	31	10	41
1997	31	10	42
1998	32	0	32
1999	32	0	32
2000	43	0	43
2001	33	0	33
2002	34	0	34
2003	35	0	35
2004	34	0	34
2005	34	0	34
2006	34	0	34
2007	34	0	34
2008	35	0	35
2009	35	0	35
2010	36	0.09	36
2011	36	0	36
2012	36	0	36
2013	36	0	36
2014	36	0	36
2015	36	0	36
2016	36	0	36
2017	36	0	36

Bow River Basin water allocations trends by purpose of use – groundwater



Why this graph?

This graph is intended to address the question of:  
**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**  
**Assessment Question 1.2: Have there been any unintended consequence of negating overall intended planned outcomes?**

Interpretation notes

- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- A key feature of the trends in water allocation is an increase in commercial and industrial allocations during the period of 1994-1998. This is due to a large increase in dewatering for allocations issued to aggregate companies in 1994.
- Despite the “jumps”, none of the individual trends in new allocation volume by activity are statistically significant.
- A shift toward groundwater after closure may how users adapting to basin closure.

Methods and data

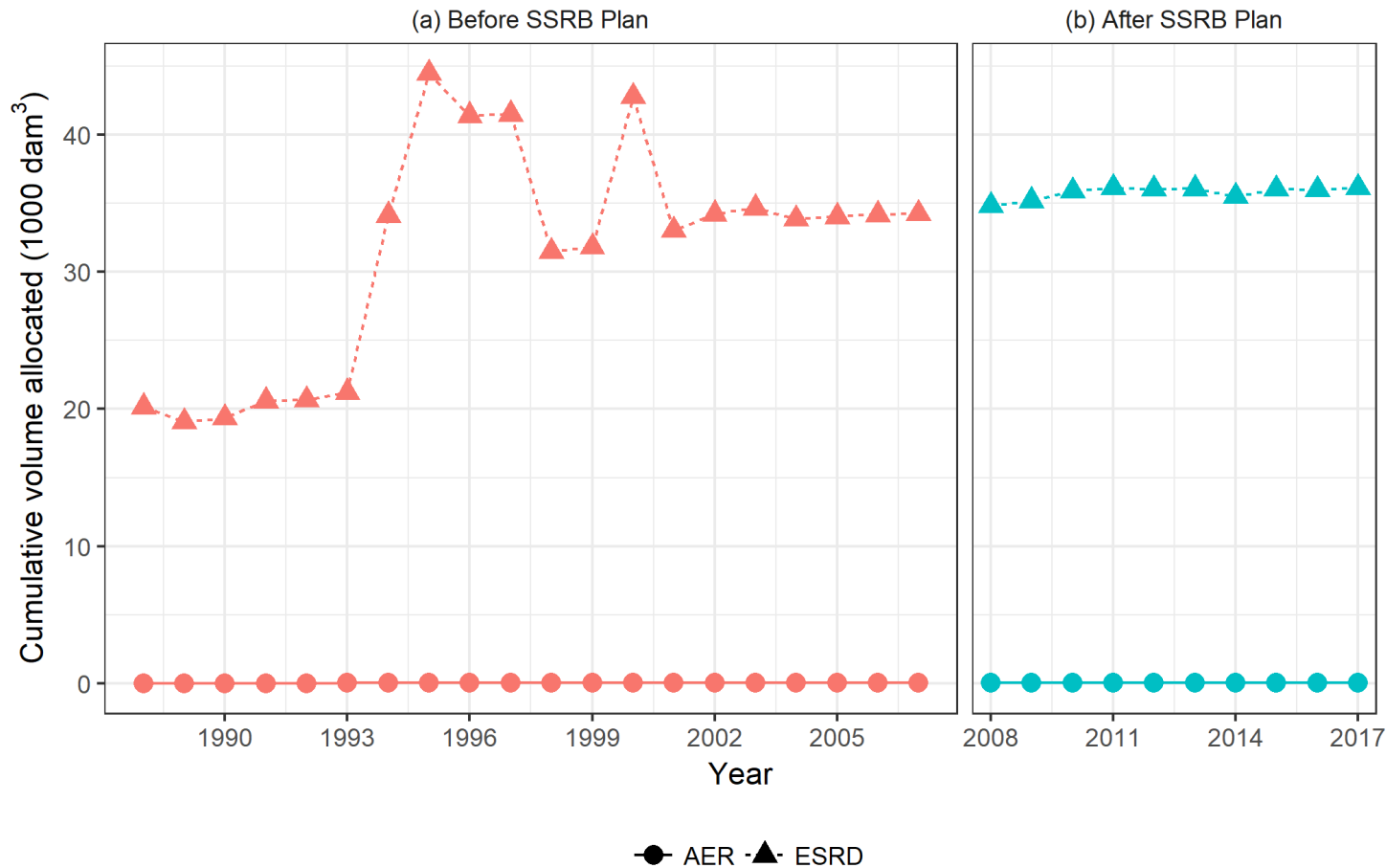
- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present (temporary and full).
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were all grouped together.
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.



Data table (Bow River Basin surface water allocations by activity)

Year	Cumulative Volume Allocated (1000 dam <sup>3</sup> )					Total
	Agriculture and irrigation	Commercial and industrial	Municipal	Other	WCOs, holdbacks, recreation & ecosystems	
1988	1	7	4	0	8	20
1989	1	6	4	0	8	19
1990	2	6	4	0	8	19
1991	2	6	5	0	8	21
1992	2	6	5	0	8	21
1993	2	6	5	0	8	21
1994	2	18	5	0	8	34
1995	3	22	9	0	10	44
1996	3	22	6	0	10	41
1997	3	22	6	0	10	42
1998	3	12	6	0	10	32
1999	4	12	6	0	10	32
2000	4	12	7	0	20	43
2001	4	12	7	0	10	33
2002	5	12	7	0	10	34
2003	5	12	7	0	10	35
2004	6	12	6	0	10	34
2005	6	12	6	0	10	34
2006	6	12	6	0	10	34
2007	6	12	6	0	10	34
2008	6	13	6	0	10	35
2009	6	13	6	0	10	35
2010	6	13	7	0	10	36
2011	6	13	7	0	10	36
2012	6	13	7	0	10	36
2013	6	13	7	0	10	36
2014	6	13	6	0	10	36
2015	6	13	6	0	10	36
2016	6	13	6	0	10	36
2017	6	13	7	0	10	36

Bow River Basin water allocations trends by approving agency – groundwater



Why this graph?

This graph is intended to address the question of:

**Assessment Question 1.1:** How has the trend in water allocation and/or use changed in the years before and since the implementation?

**Assessment Question 1.2:** Have there been any unintended consequence of negating overall intended planned outcomes?

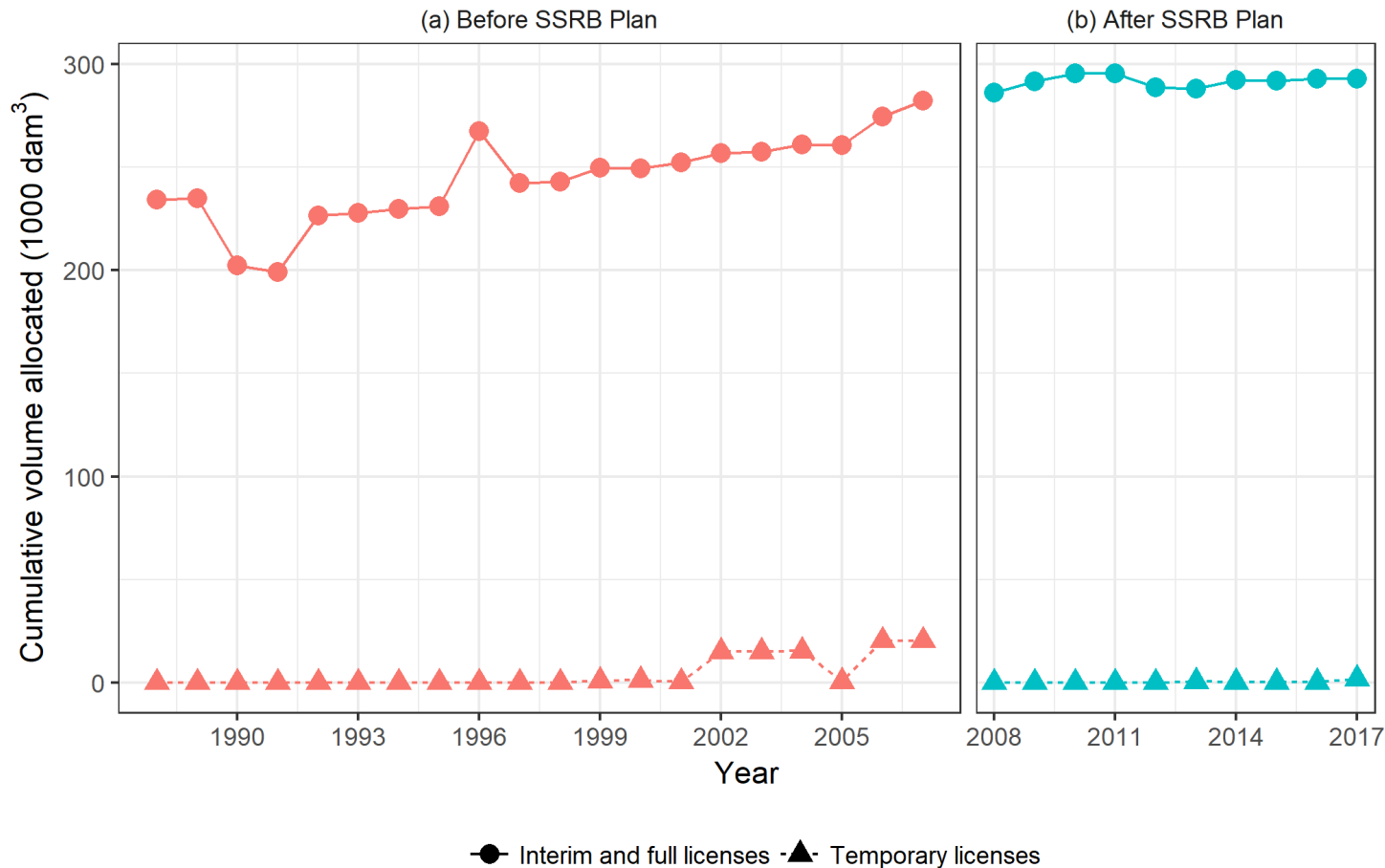
Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- The AER approvals are significantly lower than AEP's.
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- A key feature of the trends in water allocation are some "jumps" in allocated volumes in 1994 and 2000.
- Despite the "jumps", none of the individual trends in allocation by activity are statistically significant either before or after SSRB Plan implementation.
- A shift toward groundwater after closure may how users adapting to basin closure.

Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present (temporary and full).
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were all grouped together.
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Red Deer River Basin water allocations trends by type ('full' vs. 'temporary' allocations) – surface water



Why this graph?

This graph is intended to address the question of:

**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**

Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- Temporary license volumes are far lower than full licenses.
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- A key feature of the trends in water allocation are “jumps” downward in 1990 and increases in 1996 for full licenses.
- Between 2002-2004 and 2006-2007 there were jumps in temporary allocations.
- All trends in the total “new” volume each year are statistically significant, except “Temporary licenses” after the SSRB Plan implementation.

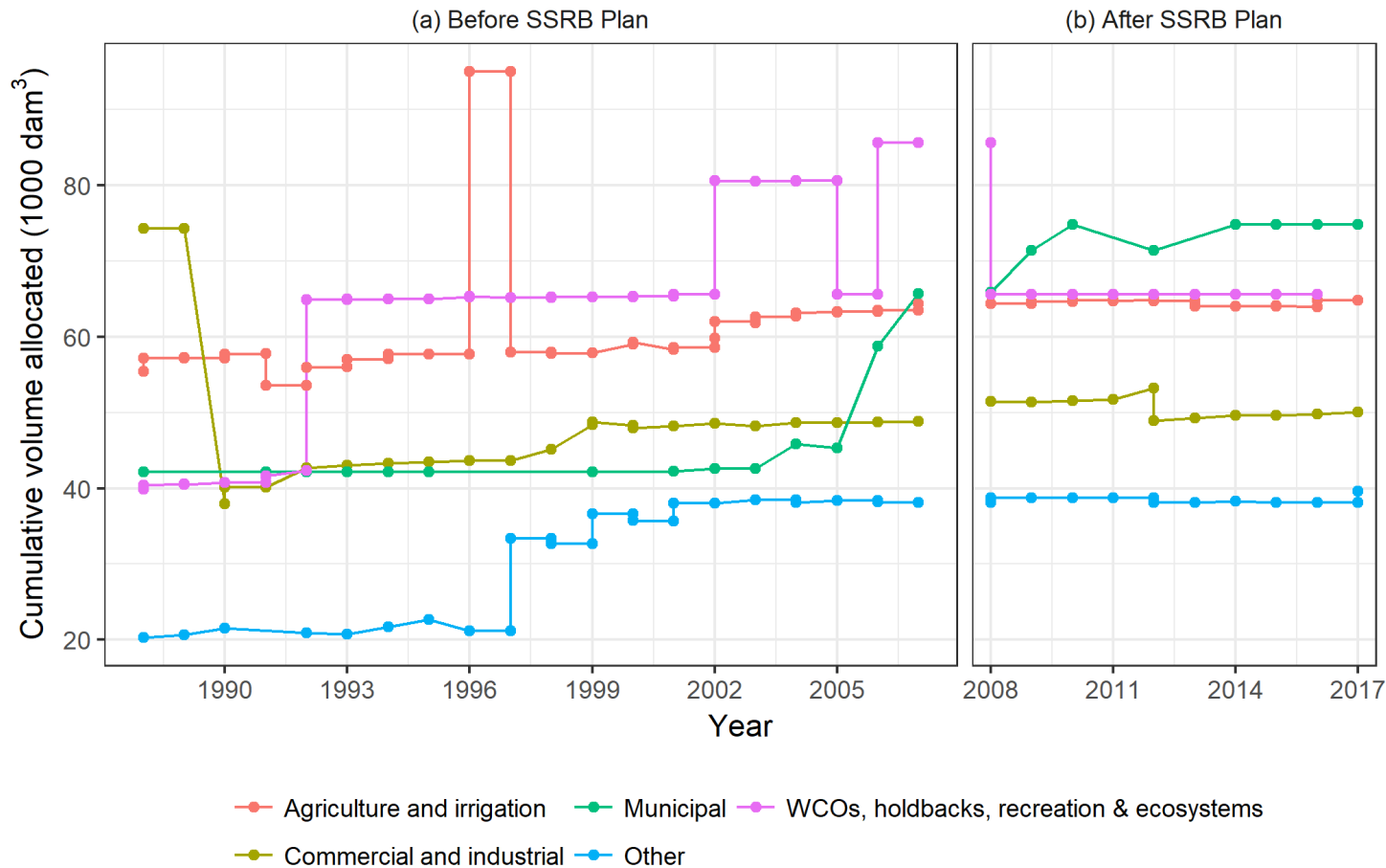
Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present.
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were classified as either “Interim and full” for long-standing licenses or “Temporary” for short-term diversions (see data processing model for details).
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Data table (Red Deer River Basin surface water allocations)

Year	Cumulative Volume Allocated (1000 dam <sup>3</sup> )		
	Interim and full licenses	Temporary licenses	Total
1988	234	0	234
1989	235	0	235
1990	202	0	202
1991	199	0	199
1992	227	0	227
1993	228	0	228
1994	230	0	230
1995	231	0	231
1996	267	0	267
1997	242	0.001	242
1998	243	0	243
1999	250	1	251
2000	249	1	251
2001	252	0.3	253
2002	257	15	272
2003	257	15	272
2004	261	15	276
2005	261	1	261
2006	274	20	295
2007	282	20	303
2008	286	0.03	286
2009	292	0.009	292
2010	295	0.13	295
2011	295	0.1	296
2012	289	0.1	289
2013	288	0.5	288
2014	292	0.3	292
2015	292	0.3	292
2016	293	0.2	293
2017	293	2	295

Red Deer River Basin water allocations trends by purpose of use – surface water



Why this graph?

This graph is intended to address the question of:  
**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**

Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- Despite the many “jumps”, none of the individual trends in in new allocation volume by activity are statistically significant either before or after SSRB Plan implementation.

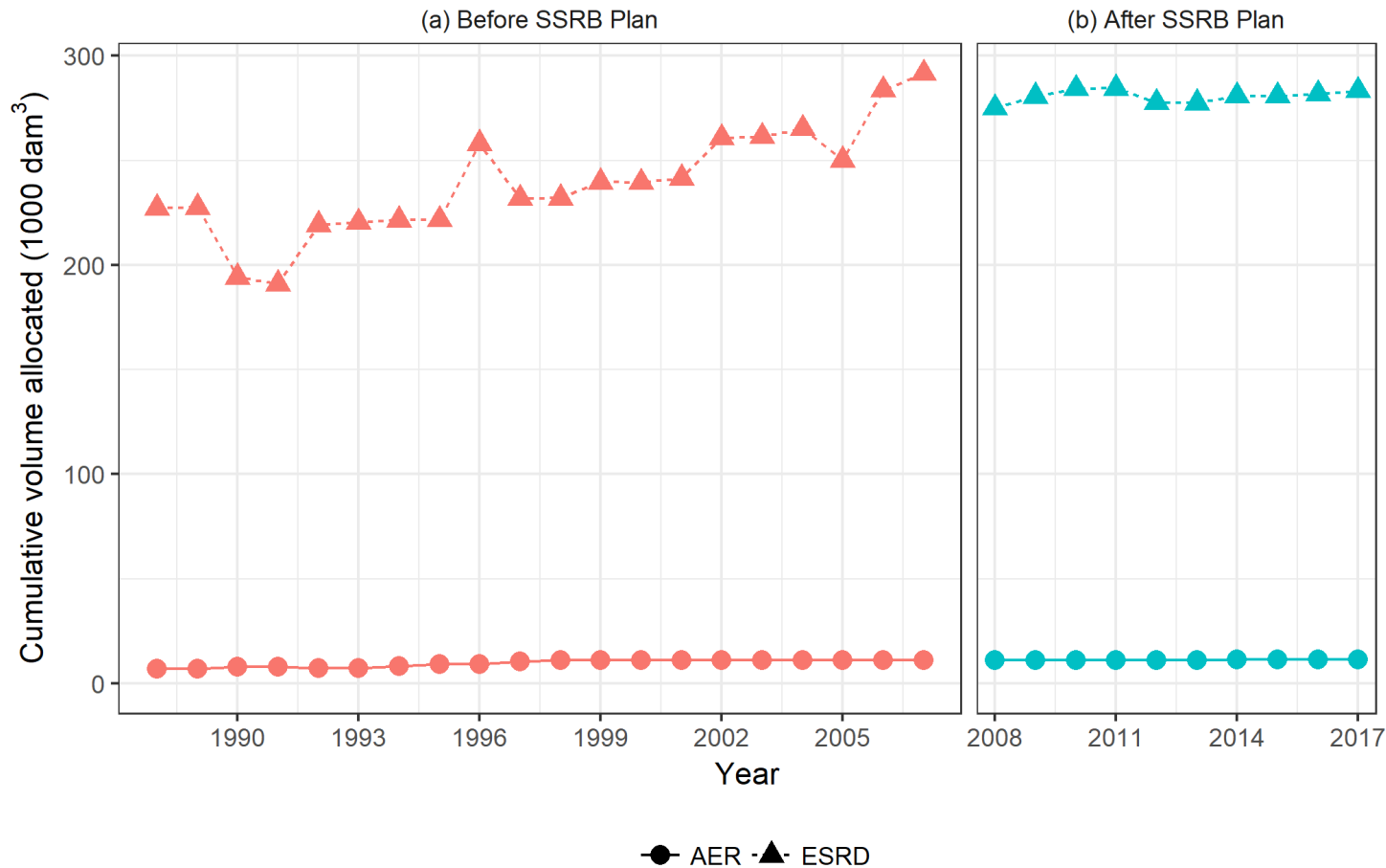
Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present (temporary and full).
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were all grouped together.
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Data table (Red Deer River Basin surface water allocations by activity)

Year	Cumulative Volume Allocated (1000 dam <sup>3</sup> )					Total
	Agriculture and irrigation	Commercial and industrial	Municipal	Other	WCOs, holdbacks, recreation & ecosystems	
1988	57	74	42	20	40	234
1989	57	74	42	21	40	235
1990	58	40	42	22	41	202
1991	54	40	42	22	42	199
1992	56	43	42	21	65	227
1993	57	43	42	21	65	228
1994	58	43	42	22	65	230
1995	58	43	42	23	65	231
1996	95	44	42	21	65	267
1997	58	44	42	33	65	242
1998	58	45	42	33	65	243
1999	58	49	42	37	65	251
2000	59	48	42	36	65	251
2001	59	48	42	38	66	253
2002	62	49	43	38	81	272
2003	63	48	43	38	81	272
2004	63	49	46	38	81	276
2005	63	49	45	38	66	261
2006	63	49	59	38	86	295
2007	64	49	66	38	86	303
2008	64	51	66	39	66	286
2009	65	51	71	39	66	292
2010	65	52	75	39	66	295
2011	65	52	75	39	66	296
2012	65	49	71	38	66	289
2013	64	49	71	38	66	288
2014	64	50	75	38	66	292
2015	64	50	75	38	66	292
2016	65	50	75	38	66	293
2017	65	50	75	40	66	295

Red Deer River Basin water allocations trends by approving agency – surface water



Why this graph?

This graph is intended to address the question of:  
**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**

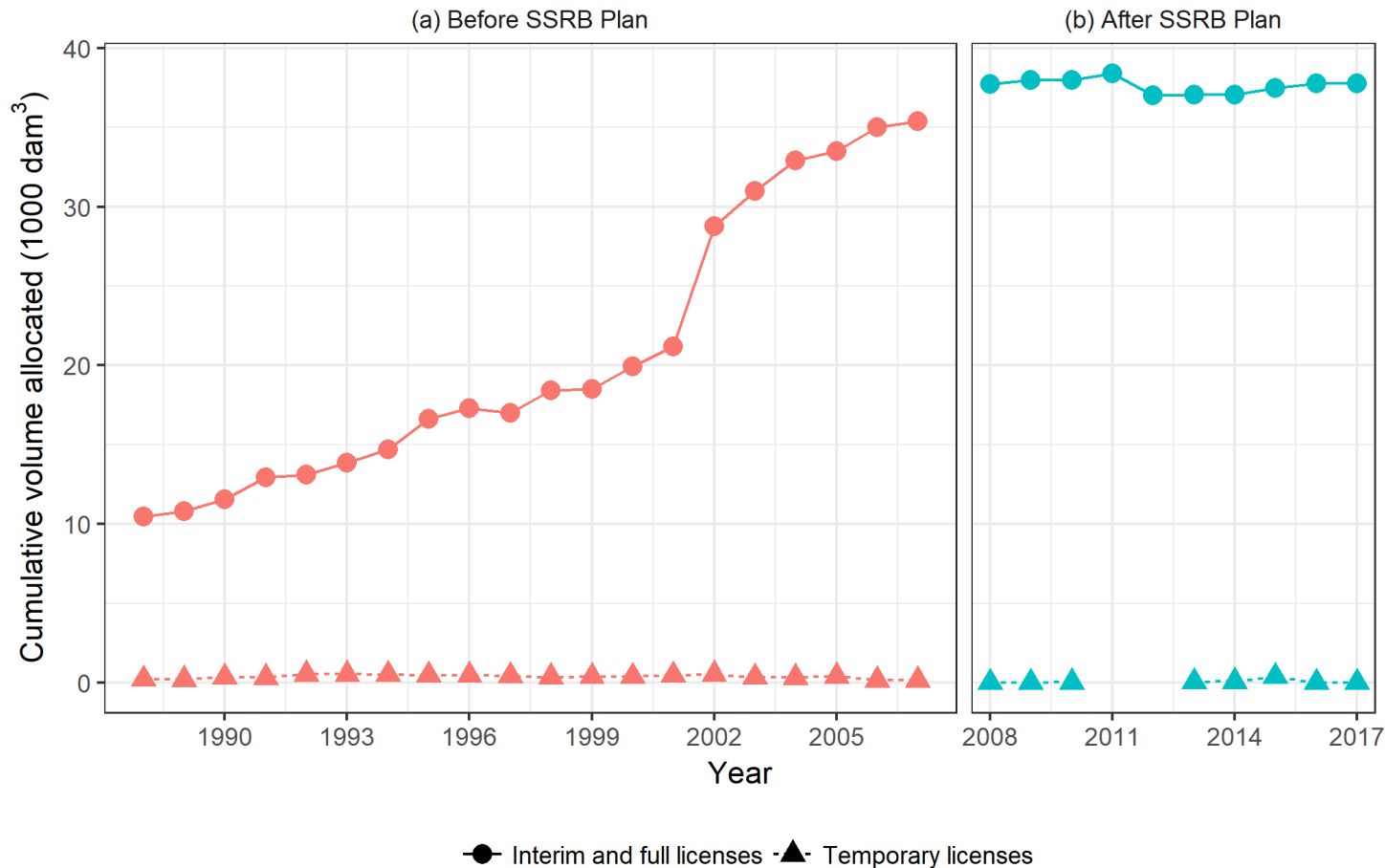
Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- The AER approvals are significantly lower than for AEP (ESRD).
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- A key feature of the trends in water allocation are decreases in 1990 and 2005, and increases in 1996 and 2007 for AEP (ESRD) approvals.
- Despite the “jumps”, none of the individual trends in allocation by activity are statistically significant either before or after SSRB Plan implementation.

Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present (temporary and full).
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were all grouped together.
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Red Deer River Basin water allocations trends by type ('full' vs. 'temporary' allocations) – groundwater



Why this graph?

This graph is intended to address the question of:

**Assessment Question 1.1:** How has the trend in water allocation and/or use changed in the years before and since the implementation?

**Assessment Question 1.2:** Have there been any unintended consequence of negating overall intended planned outcomes?

Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- Temporary license volumes are lower than full ones, however this difference is lower than for surface water.
- No temporary licenses were issued in 2011-2012.
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- Jumps in 1995 and 2000 full allocations represent short term licenses.
- The only statistically significant trend is an increase in full licenses before the SSRB Plan.
- A shift toward groundwater after closure may how users adapting to basin closure.

Methods and data

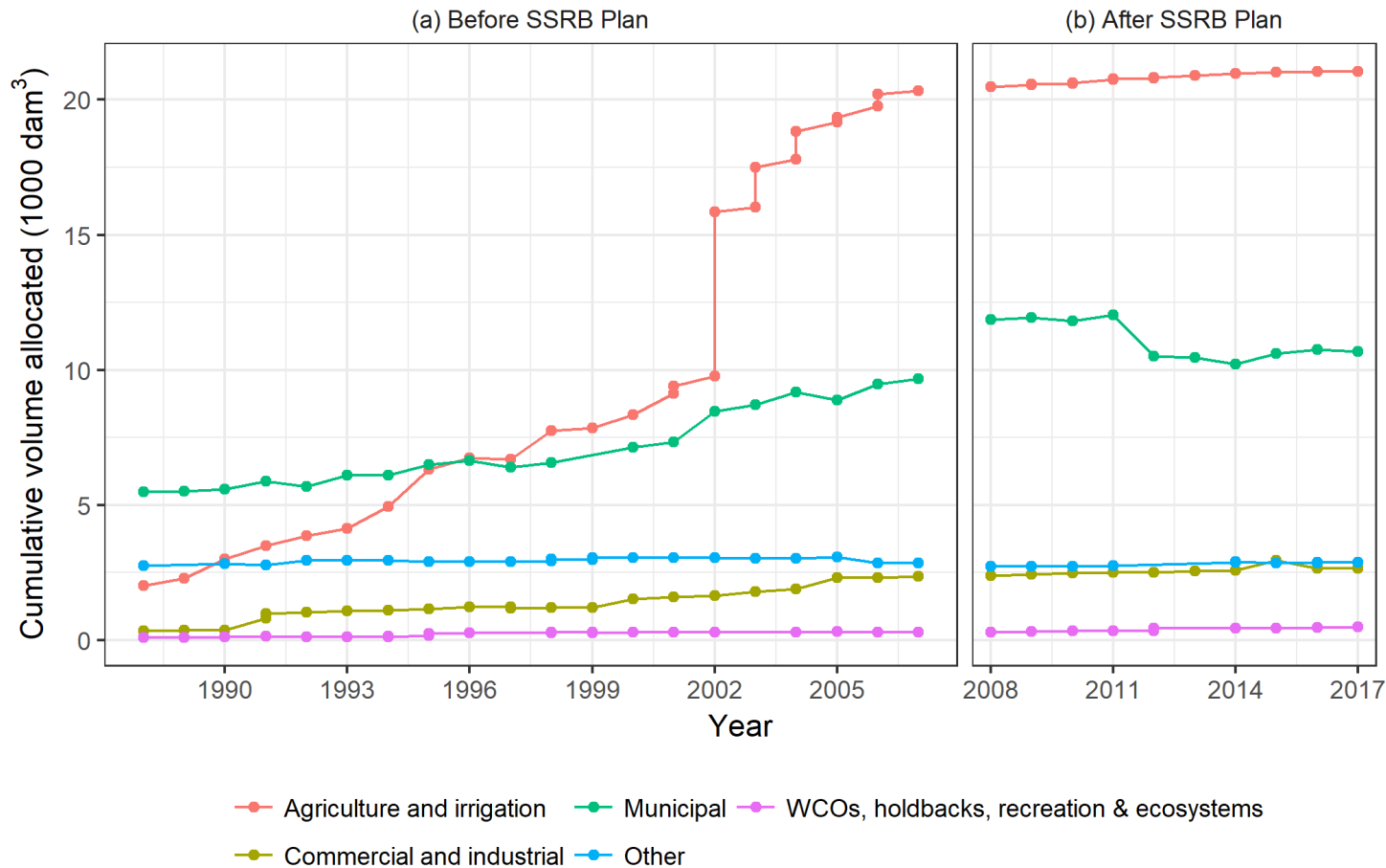
- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present.
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were classified as either “Interim and full” for long-standing licenses or “Temporary” for short-term diversions (see data processing model for details).
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.



Data table (Red Deer River Basin groundwater allocations)

Year	Cumulative Volume Allocated (1000 dam <sup>3</sup> )		
	Interim and full licenses	Temporary licenses	Total
1988	10	0.2	11
1989	11	0.2	11
1990	12	0.3	12
1991	13	0.3	13
1992	13	0.5	14
1993	14	0.5	14
1994	15	0.5	15
1995	17	0.5	17
1996	17	0.5	18
1997	17	0.4	17
1998	18	0.4	19
1999	19	0.4	19
2000	20	0.4	20
2001	21	0.5	22
2002	29	0.5	29
2003	31	0.3	31
2004	33	0.3	33
2005	34	0.4	34
2006	35	0.2	35
2007	35	0.2	36
2008	38	0.01	38
2009	38	0.005	38
2010	38	0.02	38
2011	38	0	38
2012	37	0	37
2013	37	0.05	37
2014	37	0.06	37
2015	37	0.4	38
2016	38	0.01	38
2017	38	0.004	38

Red Deer River Basin water allocations trends by purpose of use – groundwater



Why this graph?

This graph is intended to address the question of:  
**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**  
**Assessment Question 1.2: Have there been any unintended consequence of negating overall intended planned outcomes?**

Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- Despite some of the “jumps”, particularly in the municipal allocations, the only statistically significant trend is for agricultural and irrigation use before and after the Plan.
- A shift toward groundwater after closure may how users adapting to basin closure.

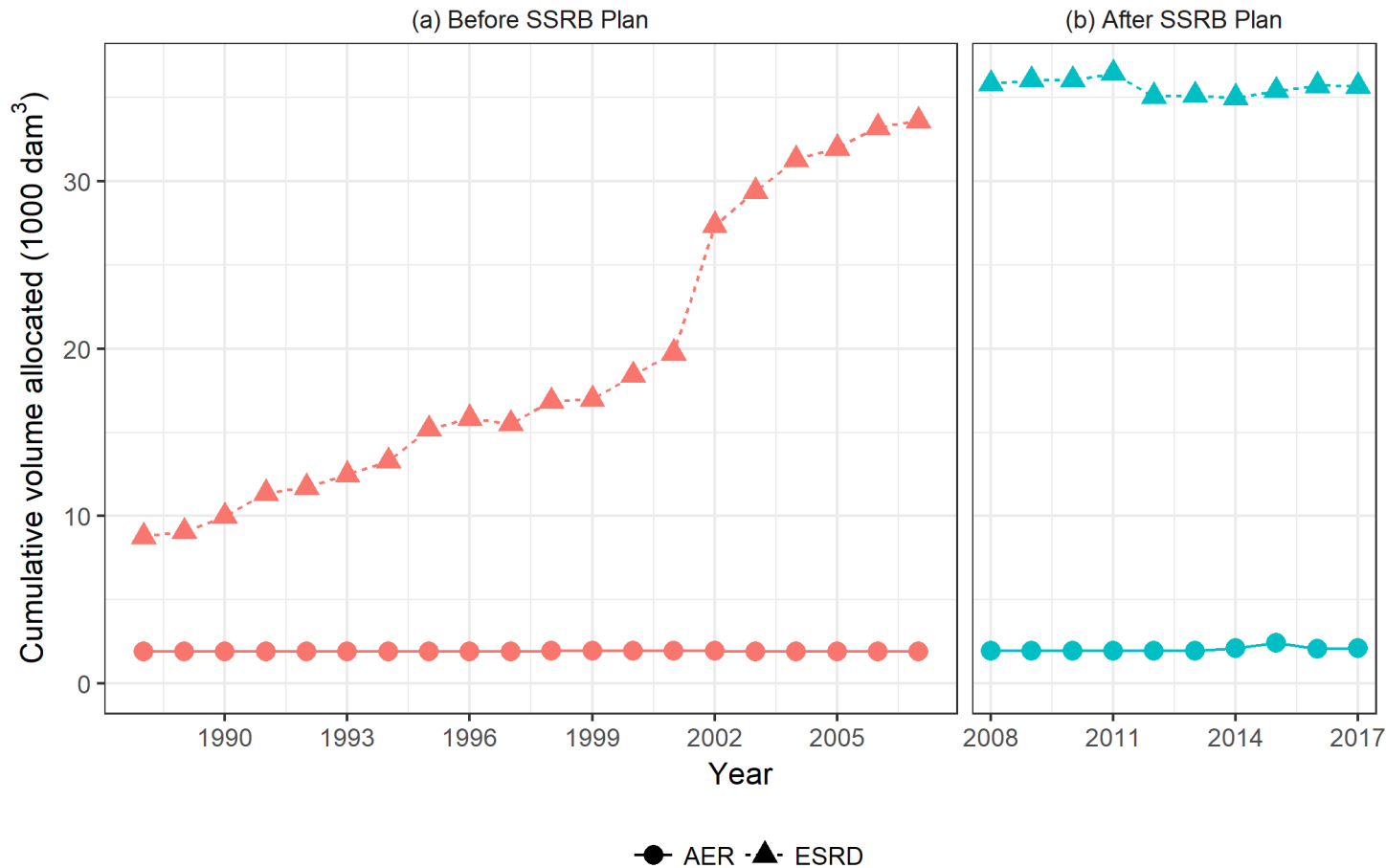
Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present (temporary and full).
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were all grouped together.
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Data table (Red Deer River Basin groundwater allocations by activity)

Year	Cumulative Volume Allocated (1000 dam <sup>3</sup> )					Total
	Agriculture and irrigation	Commercial and industrial	Municipal	Other	WCOs, holdbacks, recreation & ecosystems	
1988	2	0.3	5	3	0.1	11
1989	2	0.4	5	3	0.1	11
1990	3	0.4	6	3	0.1	12
1991	3	1	6	3	0.1	13
1992	4	1	6	3	0.1	14
1993	4	1	6	3	0.1	14
1994	5	1	6	3	0.1	15
1995	6	1	6	3	0.2	17
1996	7	1	7	3	0.3	18
1997	7	1	6	3	0.3	17
1998	8	1	7	3	0.3	19
1999	8	1	7	3	0.3	19
2000	8	2	7	3	0.3	20
2001	9	2	7	3	0.3	22
2002	16	2	8	3	0.3	29
2003	18	2	9	3	0.3	31
2004	19	2	9	3	0.3	33
2005	19	2	9	3	0.3	34
2006	20	2	9	3	0.3	35
2007	20	2	10	3	0.3	36
2008	20	2	12	3	0.3	38
2009	21	2	12	3	0.3	38
2010	21	2	12	3	0.3	38
2011	21	3	12	3	0.3	38
2012	21	3	11	3	0.4	37
2013	21	3	10	3	0.4	37
2014	21	3	10	3	0.4	37
2015	21	3	11	3	0.4	38
2016	21	3	11	3	0.5	38
2017	21	3	11	3	0.5	38

Red Deer River Basin water allocations trends by approving agency – groundwater



Why this graph?

This graph is intended to address the question of:

**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**

**Assessment Question 1.2: Have there been any unintended consequence of negating overall intended planned outcomes?**

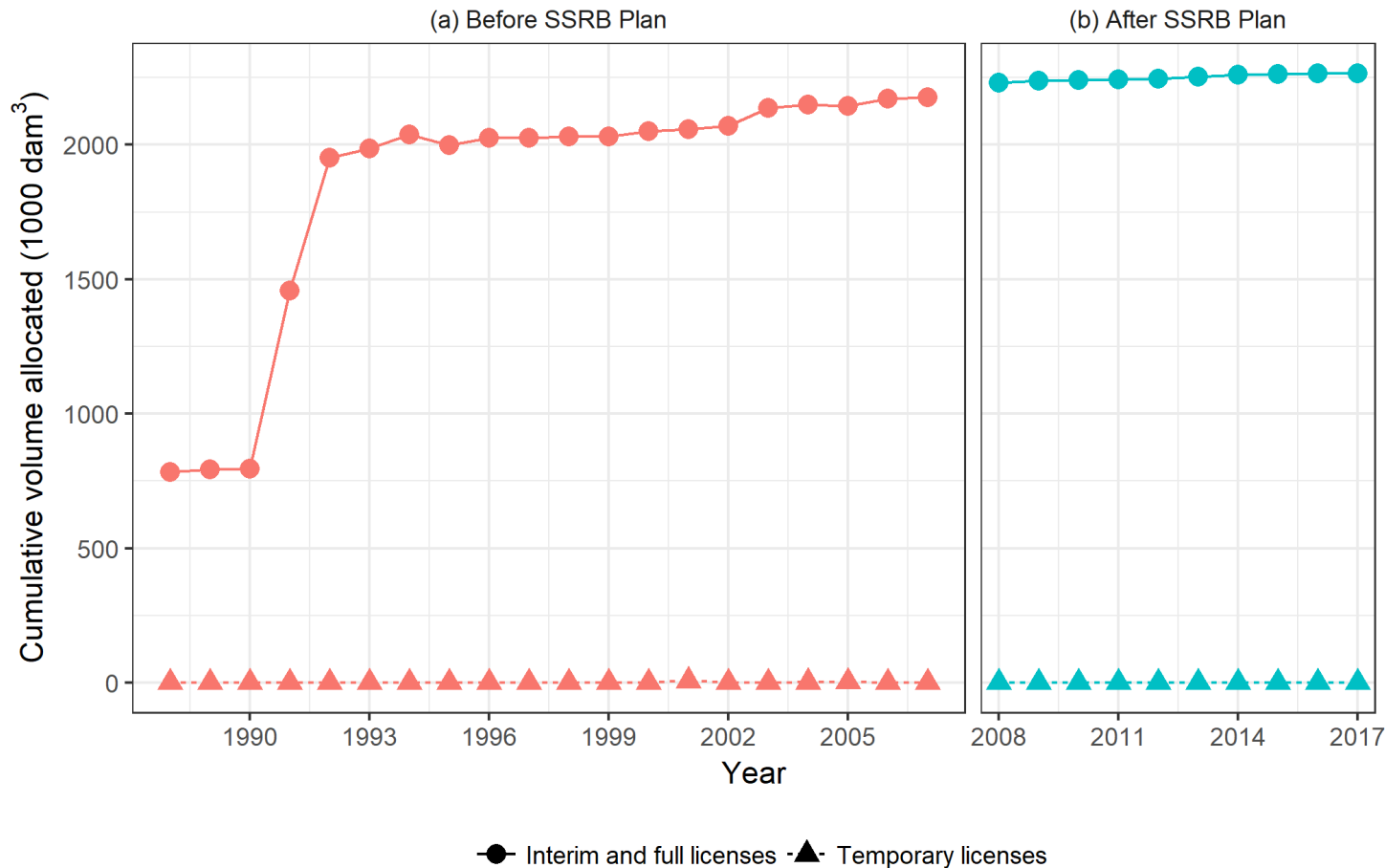
Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- The AER approvals are significantly lower than for AEP (ESRD).
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- A key feature of the trends is a major increase between approximately 1999 and 2007 in AEP (ESRD) approvals. This is the only statistically significant trend.
- A shift toward groundwater after closure may how users adapting to basin closure.

Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present (temporary and full).
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were all grouped together.
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Old Man River Basin water allocations trends by type ('full' vs. 'temporary' allocations) – surface water



Why this graph?

This graph is intended to address the question of:

**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**

Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- Temporary license volumes are far lower than full licenses.
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- A key feature of the trends in water allocation are “jumps” from 1990 to 1992 in full allocations.
- All trends in the total “new” volume each year are statistically significant, except “Temporary licenses” after the SSRB Plan implementation.
- The SSRB plan closed the basin to “new” applications, however at the time there were still pending applications that were allocated after closure.

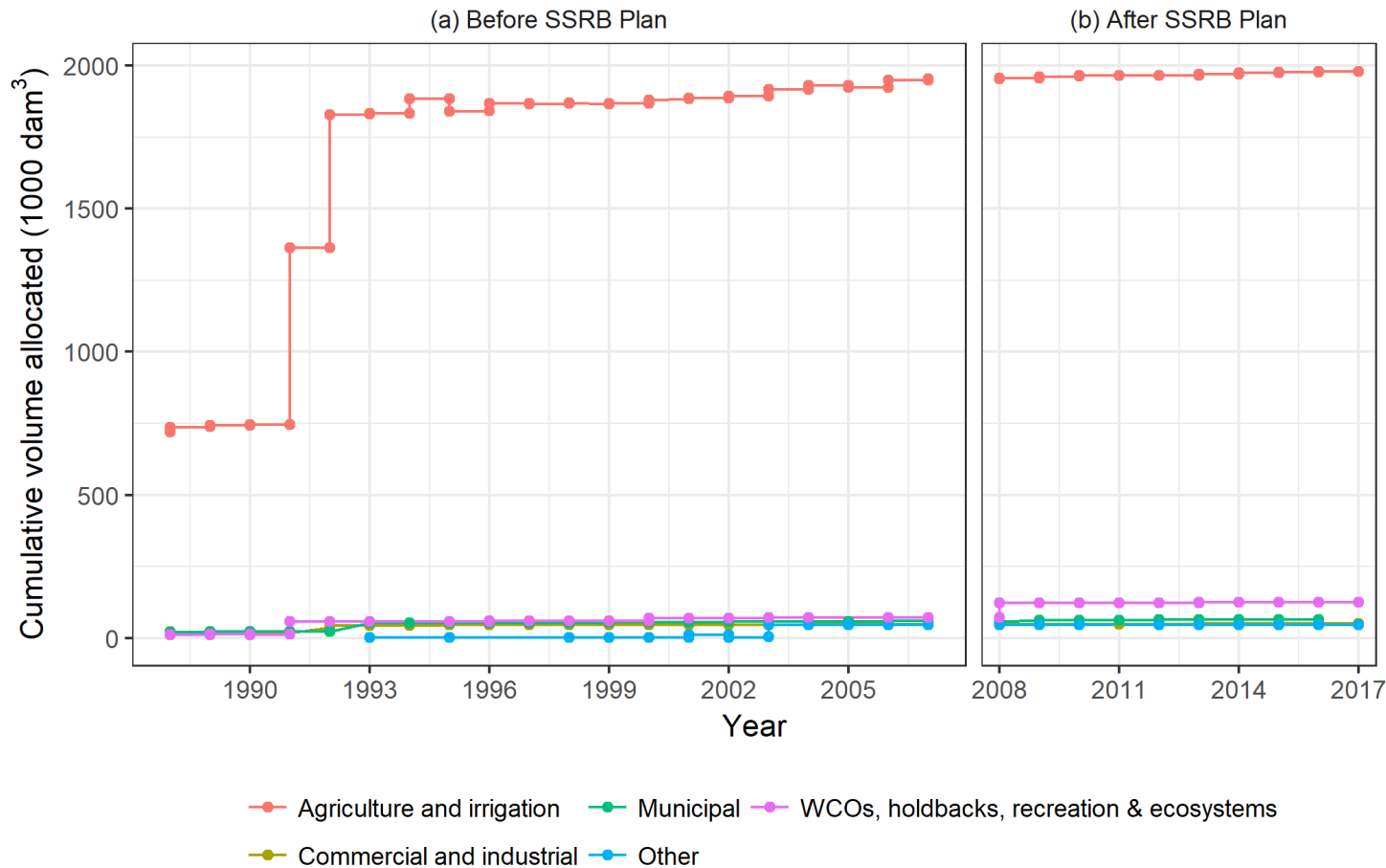
Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present.
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were classified as either “Interim and full” for long-standing licenses or “Temporary” for short-term diversions (see data processing model for details).
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Data table (Old Man River surface water allocations)

Year	Cumulative Volume Allocated (1000 dam <sup>3</sup> )		
	Interim and full licenses	Temporary licenses	Total
1988	783	0	783
1989	792	0	792
1990	795	0	795
1991	1,459	0	1,459
1992	1,952	0	1,952
1993	1,986	0	1,986
1994	2,038	0	2,038
1995	1,997	0	1,997
1996	2,026	0	2,026
1997	2,026	0	2,026
1998	2,030	0	2,030
1999	2,030	0.2	2,030
2000	2,051	0.04	2,051
2001	2,059	7	2,066
2002	2,070	0.09	2,070
2003	2,138	0.2	2,138
2004	2,149	1	2,151
2005	2,145	3	2,147
2006	2,171	0.06	2,171
2007	2,177	0.06	2,177
2008	2,231	0.05	2,231
2009	2,238	0	2,238
2010	2,241	0.1	2,242
2011	2,243	0.2	2,243
2012	2,246	0	2,246
2013	2,253	0.07	2,254
2014	2,260	0.4	2,260
2015	2,262	0.05	2,262
2016	2,265	0.06	2,265
2017	2,266	0.37	2,266

Old Man River Basin water allocations trends by purpose of use – surface water



Why this graph?

This graph is intended to address the question of:  
**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**

Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- Agricultural and irrigation allocations dominate the Old Man River and increased substantially in 1991 and 1992.
- Despite the many “jumps”, none of the individual trends in in new allocation volume by activity, the only statistically significant one is for “other” water use after the plan.
- The SSRB plan closed the basin to “new” applications, however at the time there were still pending applications that were allocated after closure.

Methods and data

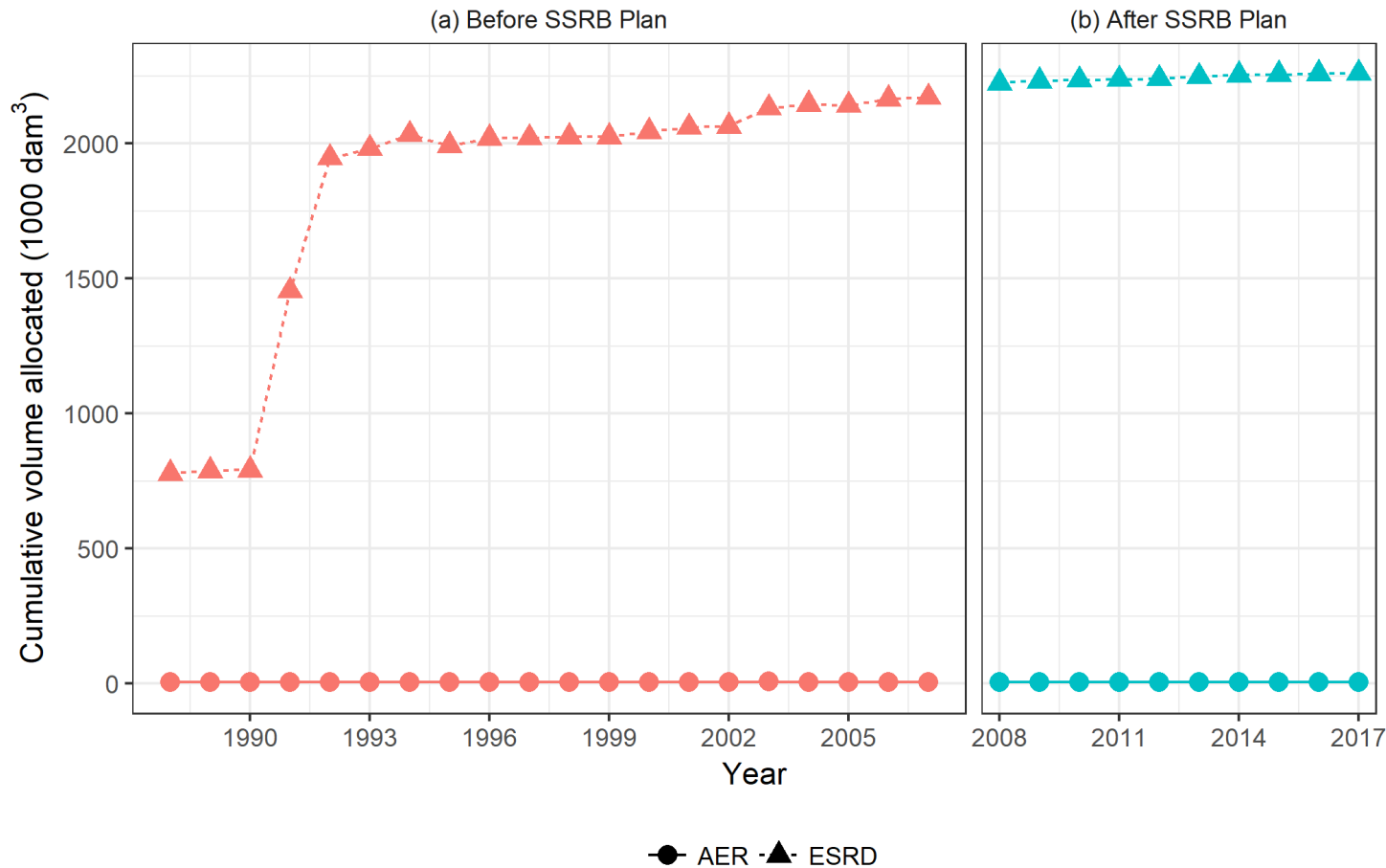
- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present (temporary and full).
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were all grouped together.
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Data table (Old Man River Basin surface water allocations by activity)

Year	Cumulative Volume Allocated (1000 dam <sup>3</sup> )					Total
	Agriculture and irrigation	Commercial and industrial	Municipal	Other	WCOs, holdbacks, recreation & ecosystems	
1988	737	13	21	1	11	783
1989	742	15	21	1	13	792
1990	745	16	22	1	12	795
1991	1,363	16	22	1	56	1,459
1992	1,830	43	22	1	56	1,952
1993	1,833	43	53	1	56	1,986
1994	1,885	43	53	1	56	2,038
1995	1,842	44	53	2	56	1,997
1996	1,867	45	53	2	59	2,026
1997	1,867	45	53	2	58	2,026
1998	1,871	45	53	2	59	2,030
1999	1,870	45	54	2	59	2,030
2000	1,880	45	54	2	70	2,051
2001	1,887	45	55	9	70	2,066
2002	1,895	45	58	2	70	2,070
2003	1,918	45	59	46	70	2,138
2004	1,930	47	57	45	70	2,151
2005	1,924	50	57	45	70	2,147
2006	1,950	47	58	45	70	2,171
2007	1,956	47	58	45	70	2,177
2008	1,957	47	58	45	122	2,231
2009	1,962	47	61	45	123	2,238
2010	1,965	47	61	45	123	2,242
2011	1,966	47	62	45	123	2,243
2012	1,967	47	63	45	123	2,246
2013	1,970	50	64	45	123	2,254
2014	1,976	51	64	45	124	2,260
2015	1,978	50	64	45	124	2,262
2016	1,981	51	64	46	124	2,265
2017	1,981	51	64	46	124	2,266



Old Man River Basin water allocations trends by approving agency – surface water



Why this graph?

This graph is intended to address the question of:

**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**

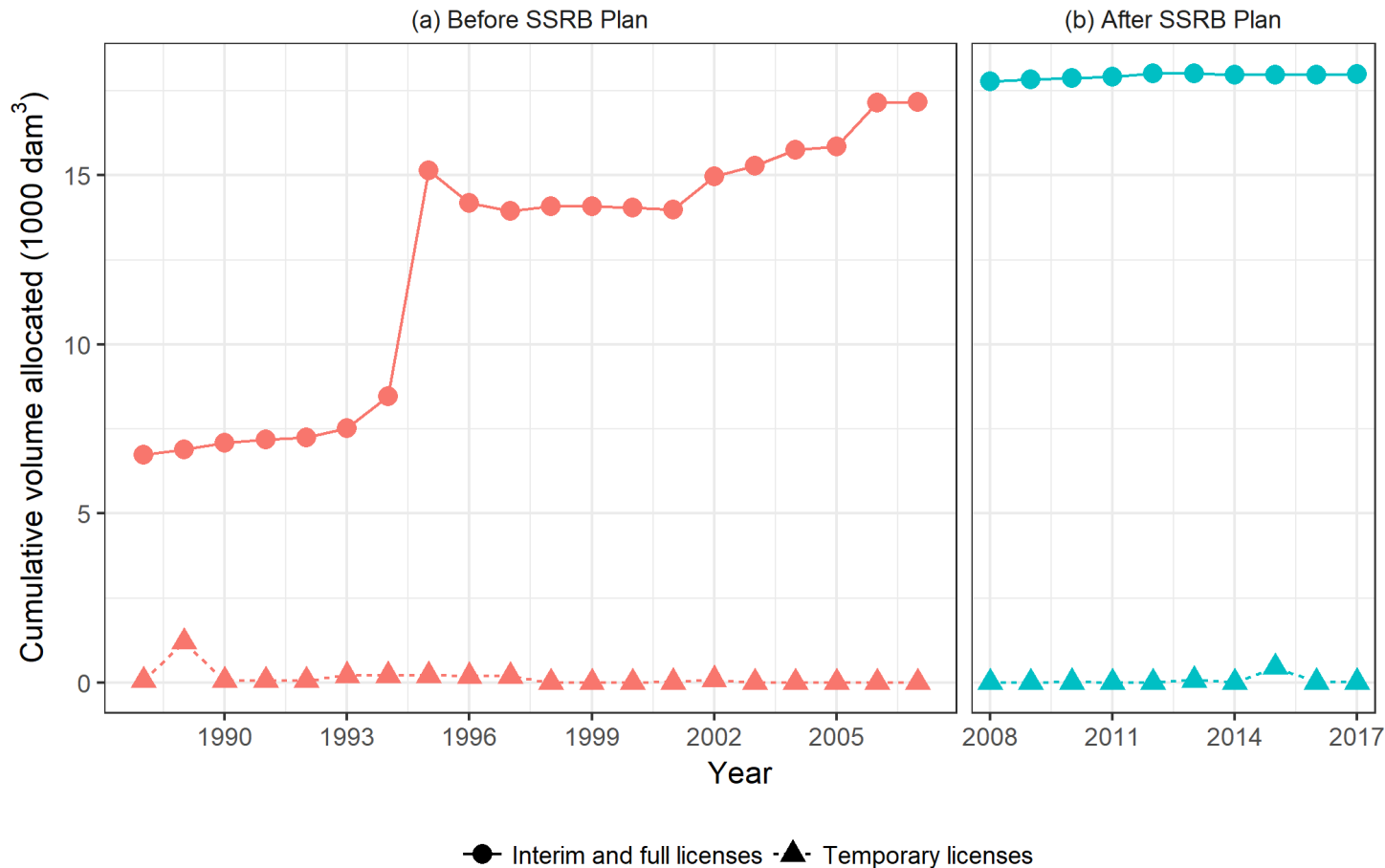
Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- The AER approvals are significantly lower than for AEP (ESRD).
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- A key feature is the 1991-1992 increase in AEP (ESRD) approvals.
- Despite the “jumps” evident in the dataset, the only statistically significant trend is for AEP (ESRD) approvals after the SSRB plan.

Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present (temporary and full).
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were all grouped together.
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Old Man River Basin water allocations trends by type ('full' vs. 'temporary' allocations) – groundwater



Why this graph?

This graph is intended to address the question of:

**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**

**Assessment Question 1.2: Have there been any unintended consequence of negating overall intended planned outcomes?**

Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- Jumps in 1989 and 2015 in temporary allocations and in 1995 for full allocations are key features of this dataset.
- All trends are statistically significant increases, with the exception of temporary approvals before the SSRB plan, which show a decrease.
- A shift toward groundwater after closure may show users adapting to basin closure.

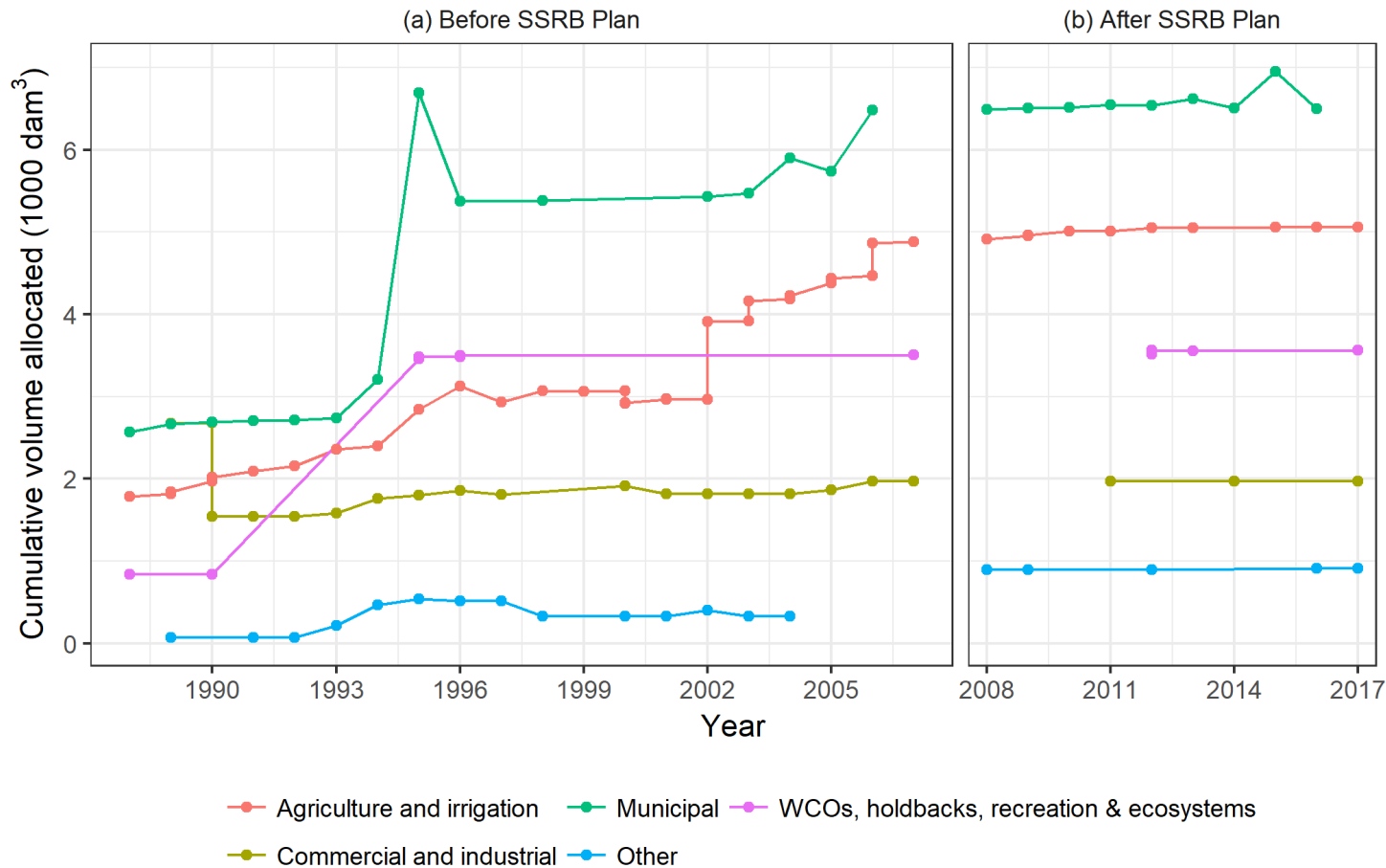
Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present.
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were classified as either “Interim and full” for long-standing licenses or “Temporary” for short-term diversions (see data processing model for details).
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Data table (Old Man River Basin groundwater allocations)

Year	Cumulative Volume Allocated (1000 dam <sup>3</sup> )		
	Interim and full licenses	Temporary licenses	Total
1988	7	0.07	7
1989	7	1	8
1990	7	0.07	7
1991	7	0.07	7
1992	7	0.07	7
1993	8	0.2	8
1994	8	0.2	9
1995	15	0.2	15
1996	14	0.2	14
1997	14	0.2	14
1998	14	0	14
1999	14	0.0001	14
2000	14	0	14
2001	14	0.02	14
2002	15	0.09	15
2003	15	0.003	15
2004	16	0.006	16
2005	16	0	16
2006	17	0	17
2007	17	0	17
2008	18	0	18
2009	18	0.007	18
2010	18	0.01	18
2011	18	0.007	18
2012	18	0.007	18
2013	18	0.08	18
2014	18	0.007	18
2015	18	0.5	18
2016	18	0.02	18
2017	18	0.02	18

Old Man River Basin water allocations trends by purpose of use – groundwater



Why this graph?

This graph is intended to address the question of:  
**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**  
**Assessment Question 1.2: Have there been any unintended consequence of negating overall intended planned outcomes?**

Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- Missing points mean no allocations were provided in that year.
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- Despite some of the “jumps”, particularly in the municipal allocations, no of the trends are statistically significant.
- A shift toward groundwater after closure may how users adapting to basin closure.

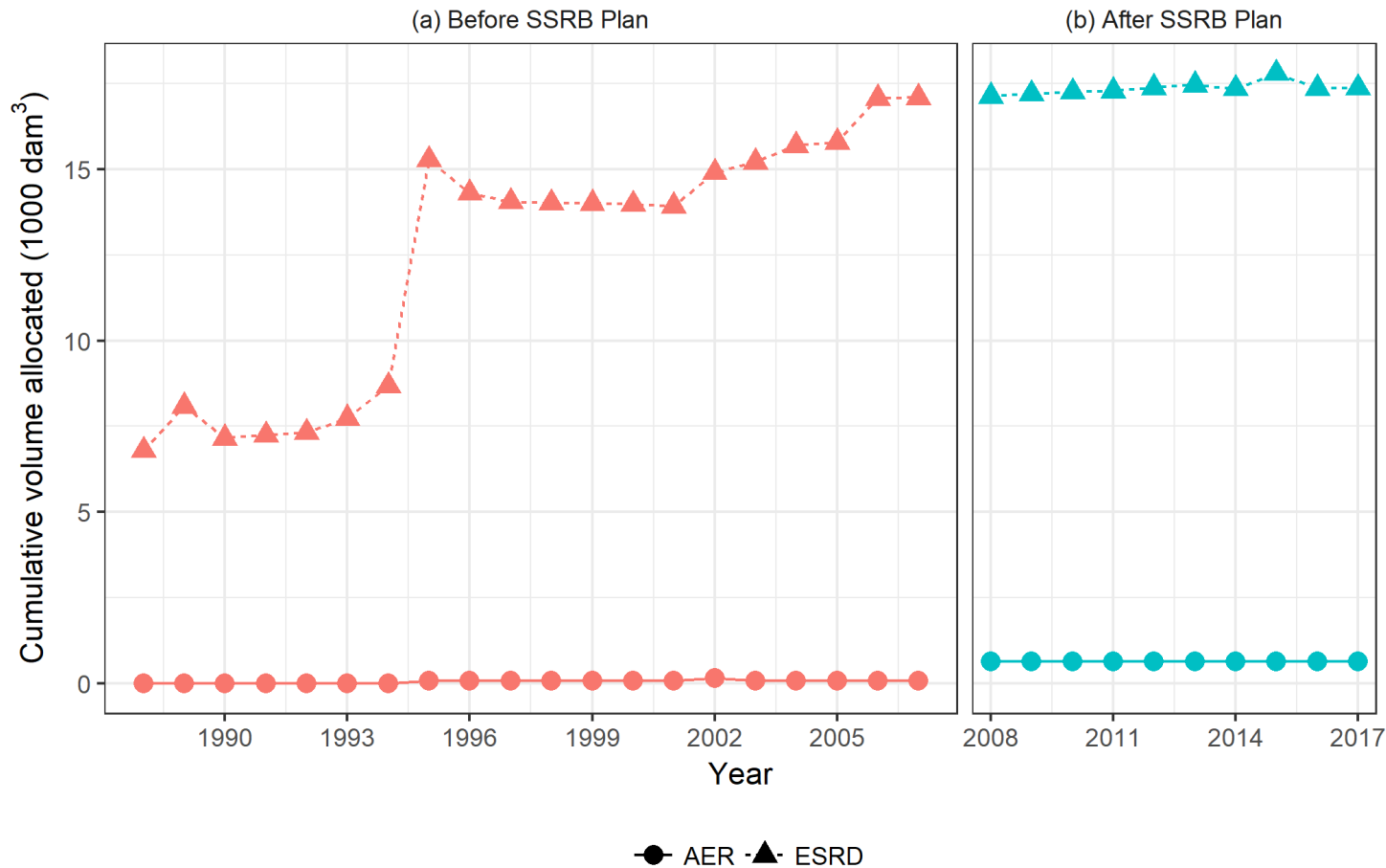
Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present (temporary and full).
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were all grouped together.
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Data table (Old Man River Basin groundwater allocations by activity)

Year	Cumulative Volume Allocated (1000 dam <sup>3</sup> )					Total
	Agriculture and irrigation	Commercial and industrial	Municipal	Other	WCOs, holdbacks, recreation & ecosystems	
1988	2	2	3	0.1	1	7
1989	2	3	3	0.1	1	8
1990	2	2	3	0.1	1	7
1991	2	2	3	0.1	1	7
1992	2	2	3	0.1	1	7
1993	2	2	3	0.2	1	8
1994	2	2	3	0.5	1	9
1995	3	2	7	1	3	15
1996	3	2	5	1	3	14
1997	3	2	5	1	3	14
1998	3	2	5	0.3	3	14
1999	3	2	5	0.3	3	14
2000	3	2	5	0.3	3	14
2001	3	2	5	0.3	3	14
2002	4	2	5	0.4	3	15
2003	4	2	5	0.3	3	15
2004	4	2	6	0.3	3	16
2005	4	2	6	0.3	3	16
2006	5	2	6	0.3	3	17
2007	5	2	6	0.3	4	17
2008	5	2	6	1	4	18
2009	5	2	7	1	4	18
2010	5	2	7	1	4	18
2011	5	2	7	1	4	18
2012	5	2	7	1	4	18
2013	5	2	7	1	4	18
2014	5	2	7	1	4	18
2015	5	2	7	1	4	18
2016	5	2	6	1	4	18
2017	5	2	6	1	4	18

Old Man River Basin water allocations trends by approving agency – groundwater



Why this graph?

This graph is intended to address the question of:  
**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**  
**Assessment Question 1.2: Have there been any unintended consequence of negating overall intended planned outcomes?**

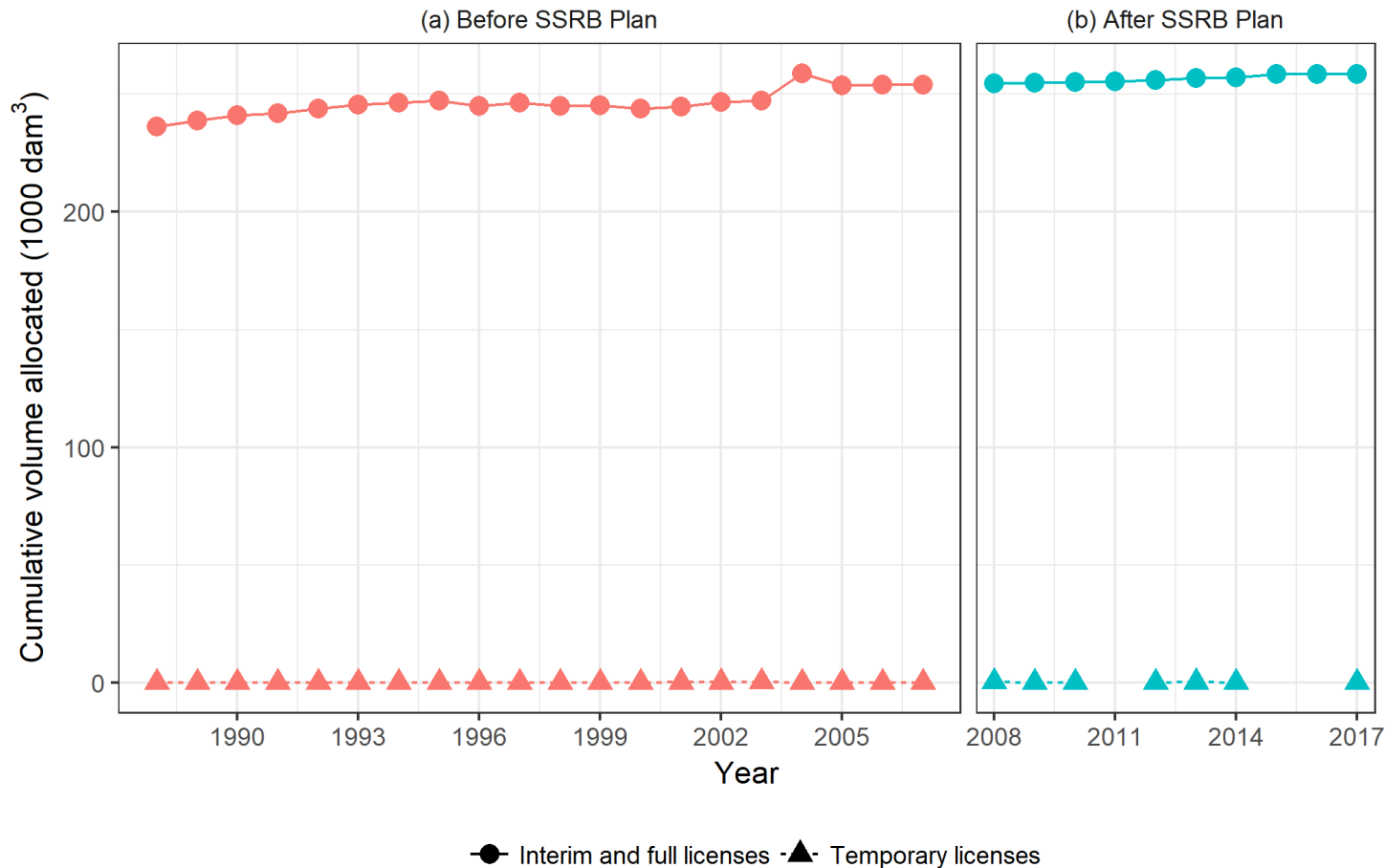
Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- The AER approvals are significantly lower than for AEP (ESRD).
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- A key feature of the trends is a major increase in AEP (ESRD) approvals.
- The only statistically significant trend is an increase in AEP (ESRD) allocations after the Plan.
- A shift toward groundwater after closure may how users adapting to basin closure.

Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present (temporary and full).
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were all grouped together.
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

South Saskatchewan River Sub-Basin water allocations trends by type ('full' vs. 'temporary' allocations) – surface water



Why this graph?

This graph is intended to address the question of:

**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**

Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- Temporary license volumes are far lower than full licenses.
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- A key feature of the trends in water allocation is a jump in 2004.
- No temporary allocations were issued in 2001 and 2015-2016.
- All trends in the total “new” volume each year are statistically significant, except temporary licenses after the SSRB plan.

Methods and data

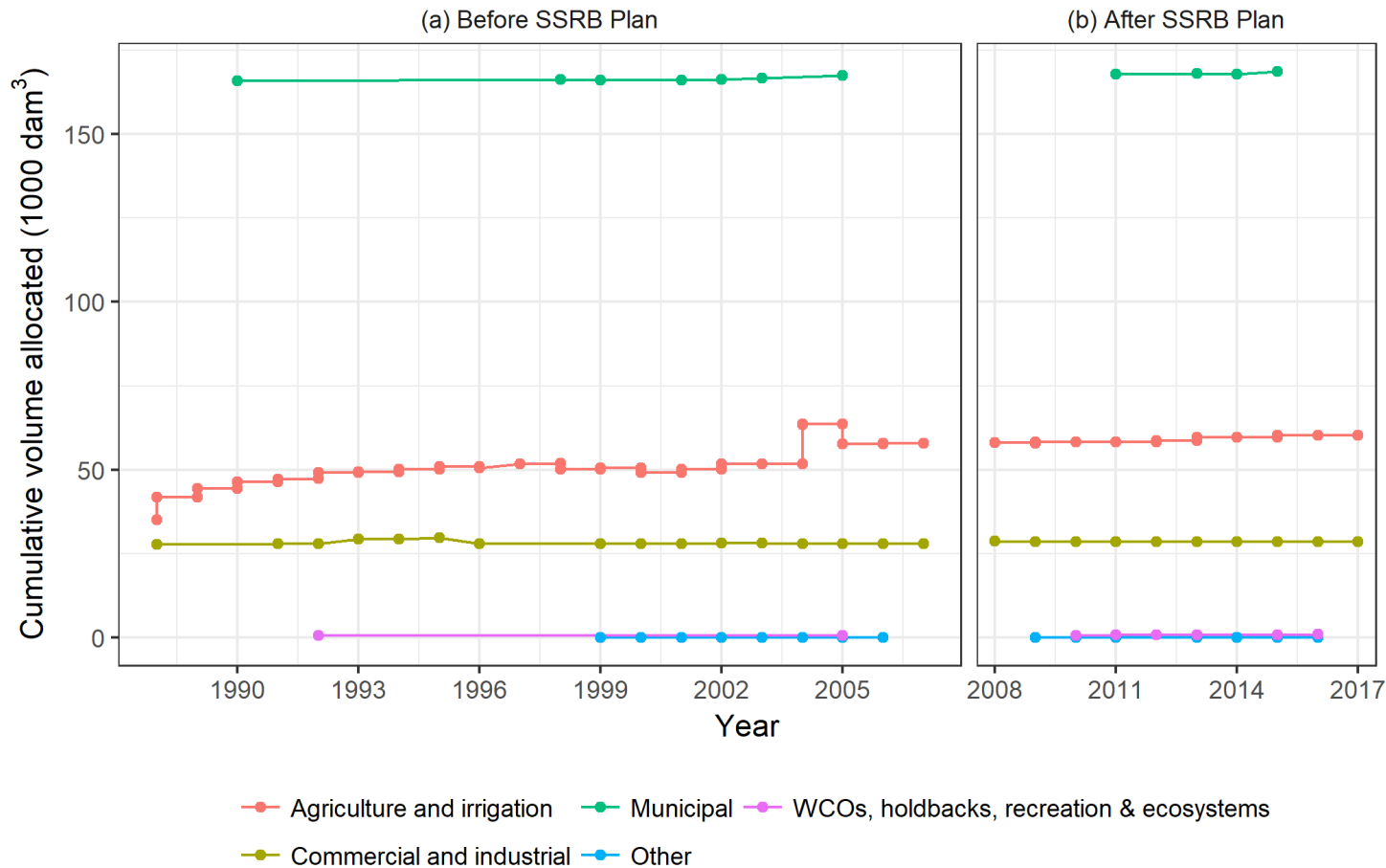
- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present.
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were classified as either “Interim and full” for long-standing licenses or “Temporary” for short-term diversions (see data processing model for details).
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Data table (South Saskatchewan River Sub-Basin surface water allocations)

Year	Cumulative Volume Allocated (1000 dam <sup>3</sup> )		
	Interim and full licenses	Temporary licenses	Total
1988	236	0	236
1989	239	0	239
1990	241	0	241
1991	242	0	242
1992	244	0	244
1993	245	0	245
1994	246	0	246
1995	247	0	247
1996	245	0	245
1997	246	0	246
1998	245	0	245
1999	245	0	245
2000	244	0.04	244
2001	245	0.2	245
2002	247	0.26	247
2003	247	0.4	247
2004	259	0.07	259
2005	254	0.01	254
2006	254	0.02	254
2007	254	0.05	254
2008	255	0.30	255
2009	255	0.008	255
2010	255	0.01	255
2011	256	0	256
2012	256	0	256
2013	257	0.2	257
2014	257	0.02	257
2015	258	0	258
2016	258	0	258
2017	259	0.0001	259



South Saskatchewan River Sub-Basin water allocations trends by purpose of use – surface water



Why this graph?

This graph is intended to address the question of:  
**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**

Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- Agricultural and irrigation allocations before the SSRB plan are the only significant trend.
- Municipal allocations are by far the largest.

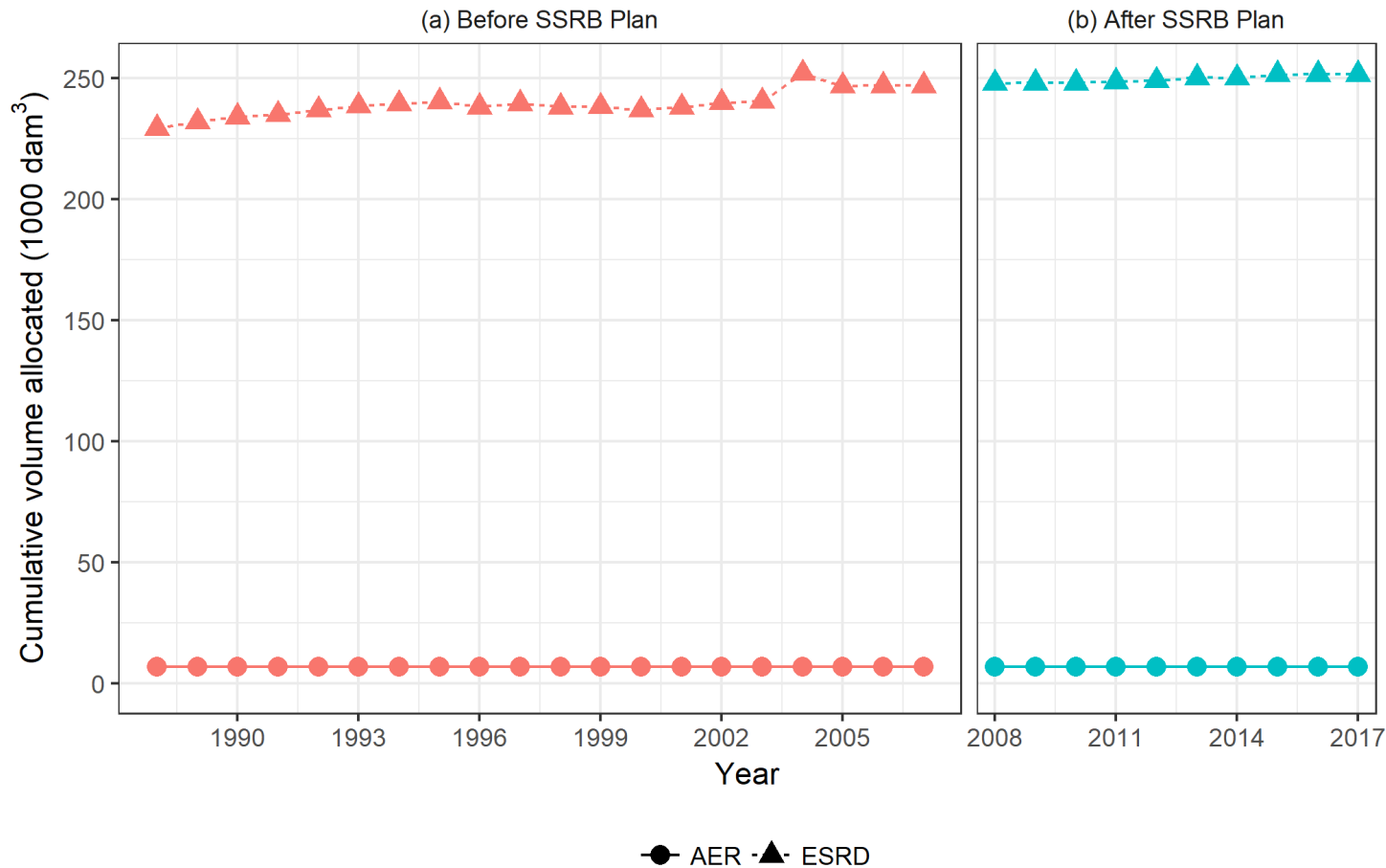
Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present (temporary and full).
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were all grouped together.
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Data table (South Saskatchewan River Sub-Basin surface water allocations by activity)

Year	Cumulative Volume Allocated (1000 dam <sup>3</sup> )					Total
	Agriculture and irrigation	Commercial and industrial	Municipal	Other	WCOs, holdbacks, recreation & ecosystems	
1988	42	28	166	0.02	1	236
1989	44	28	166	0.02	1	239
1990	46	28	166	0.02	1	241
1991	47	28	166	0.02	1	242
1992	49	28	166	0.02	1	244
1993	49	29	166	0.02	1	245
1994	50	29	166	0.02	1	246
1995	51	30	166	0.02	1	247
1996	50	28	166	0.02	1	245
1997	52	28	166	0.02	1	246
1998	50	28	166	0.02	1	245
1999	51	28	166	0.02	1	245
2000	49	28	166	0.03	1	244
2001	50	28	166	0.06	1	245
2002	52	28	166	0.08	1	247
2003	52	28	167	0.06	1	247
2004	64	28	167	0.02	1	259
2005	58	28	167	0.02	1	254
2006	58	28	167	0.02	1	254
2007	58	28	167	0.02	1	254
2008	58	29	167	0.02	1	255
2009	58	29	167	0.02	1	255
2010	58	29	167	0.02	1	255
2011	58	29	168	0.02	1	256
2012	59	29	168	0.02	1	256
2013	60	29	168	0.02	1	257
2014	60	29	168	0.02	1	257
2015	60	29	169	0.02	1	258
2016	60	29	169	0.02	1	258
2017	60	29	169	0.02	1	259

South Saskatchewan River Sub-Basin water allocations trends by approving agency – surface water



Why this graph?

This graph is intended to address the question of:  
**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**

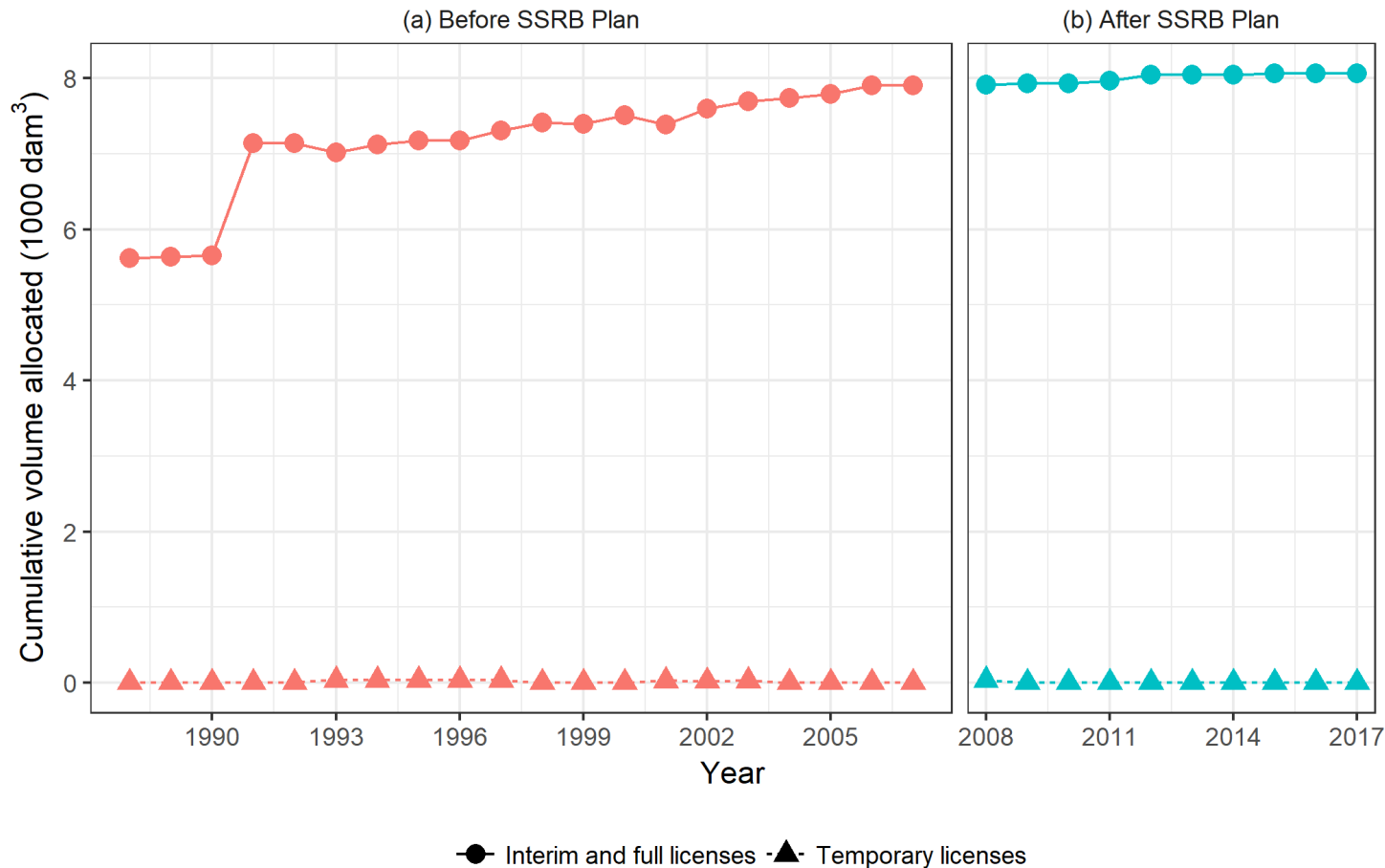
Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- The AER approvals are significantly lower than for AEP (ESRD).
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- A key feature is the 2004 increase in AEP (ESRD) approvals.
- Only AEP (ESRD) approvals are statistically significant.

Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present (temporary and full).
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were all grouped together.
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

South Saskatchewan River Sub-Basin water allocations trends by type ('full' vs. 'temporary' allocations) – groundwater



Why this graph?

This graph is intended to address the question of:

**Assessment Question 1.1:** How has the trend in water allocation and/or use changed in the years before and since the implementation?

**Assessment Question 1.2:** Have there been any unintended consequence of negating overall intended planned outcomes?

Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- Jump in 1991 for full allocations is a key feature of this dataset.
- All trends are statistically significant increases, with the exception of temporary approvals before the SSRB plan, which show a decrease.
- A shift toward groundwater after closure may how users adapting to basin closure.

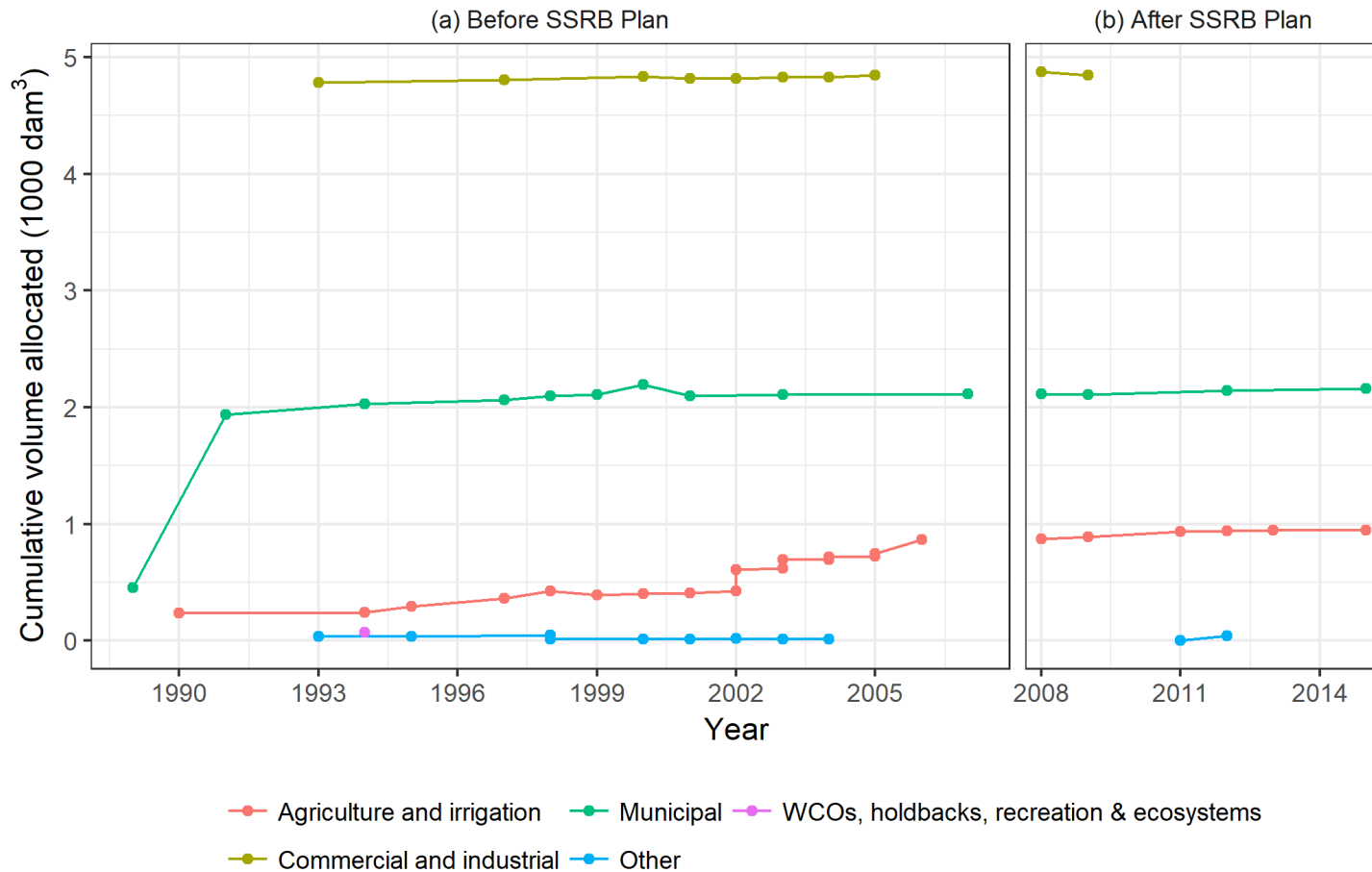
Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present.
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were classified as either “Interim and full” for long-standing licenses or “Temporary” for short-term diversions (see data processing model for details).
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Data table (South Saskatchewan River Sub-Basin groundwater allocations)

Year	Cumulative Volume Allocated (1000 dam <sup>3</sup> )		
	Interim and full licenses	Temporary licenses	Total
1988	6	0	6
1989	6	0	6
1990	6	0	6
1991	7	0	7
1992	7	0	7
1993	7	0.03	7
1994	7	0.03	7
1995	7	0.03	7
1996	7	0.03	7
1997	7	0.03	7
1998	7	0	7
1999	7	0	7
2000	8	0	8
2001	7	0.03	7
2002	8	0.02	8
2003	8	0.0	8
2004	8	0	8
2005	8	0	8
2006	8	0	8
2007	8	0.001	8
2008	8	0.03	8
2009	8	0	8
2010	8	0	8
2011	8	0	8
2012	8	0	8
2013	8	0	8
2014	8	0	8
2015	8	0	8
2016	8	0	8
2017	8	0	8

South Saskatchewan River Sub-Basin water allocations trends by purpose of use – groundwater



Why this graph?

This graph is intended to address the question of:  
**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**  
**Assessment Question 1.2: Have there been any unintended consequence of negating overall intended planned outcomes?**

Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- Missing points mean no allocations were provided in that year.
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- Despite some of the “jumps”, particularly in the municipal allocations, no of the trends are statistically significant.
- A shift toward groundwater after closure may how users adapting to basin closure.

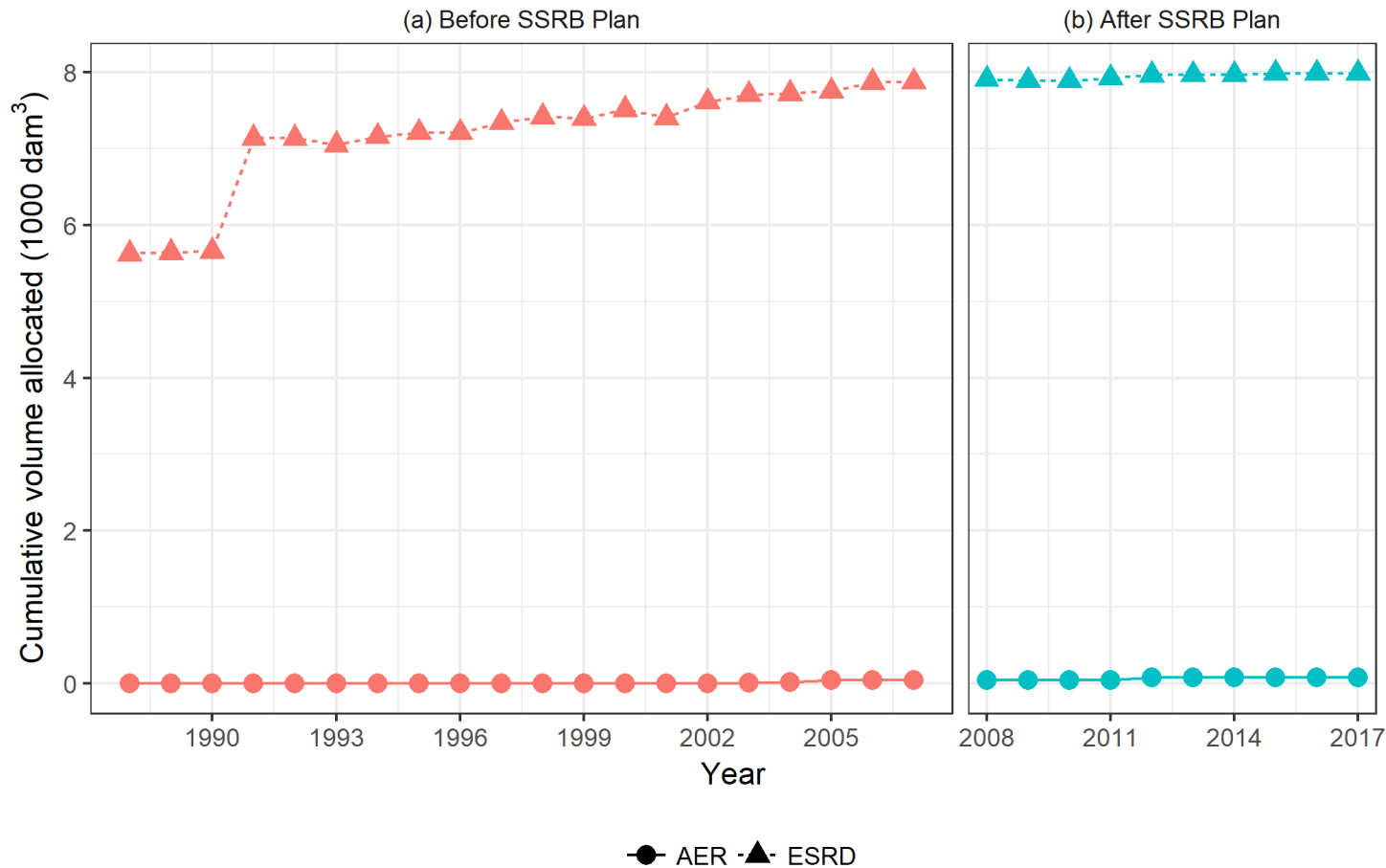
Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present (temporary and full).
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were all grouped together.
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.

Data table (South Saskatchewan River Sub-Basin groundwater allocations by activity)

Year	Cumulative Volume Allocated (1000 dam <sup>3</sup> )					Total
	Agriculture and irrigation	Commercial and industrial	Municipal	Other	WCOs, holdbacks, recreation & ecosystems	
1988	0.2	5	0	0.001	0.1	6
1989	0.2	5	0	0.001	0.1	6
1990	0.2	5	0	0.001	0.1	6
1991	0.2	5	2	0.001	0.1	7
1992	0.2	5	2	0.001	0.1	7
1993	0.2	5	2	0.03	0.1	7
1994	0.2	5	2	0.03	0.1	7
1995	0.3	5	2	0.03	0.1	7
1996	0.3	5	2	0.03	0.1	7
1997	0.4	5	2	0.03	0.1	7
1998	0.4	5	2	0.01	0.1	7
1999	0.4	5	2	0.01	0.1	7
2000	0.4	5	2	0.01	0.1	8
2001	0.4	5	2	0.01	0.1	7
2002	1	5	2	0.02	0.1	8
2003	1	5	2	0.01	0.1	8
2004	1	5	2	0.01	0.1	8
2005	1	5	2	0.01	0.1	8
2006	1	5	2	0.01	0.1	8
2007	1	5	2	0.01	0.1	8
2008	1	5	2	0.01	0.1	8
2009	1	5	2	0.01	0.1	8
2010	1	5	2	0.01	0.1	8
2011	1	5	2	0.001	0.1	8
2012	1	5	2	0.04	0.1	8
2013	1	5	2	0.04	0.1	8
2014	1	5	2	0.04	0.1	8
2015	1	5	2	0.04	0.1	8
2016	1	5	2	0.04	0.1	8
2017	1	5	2	0.04	0.1	8

South Saskatchewan River Sub-Basin water allocations trends by approving agency – groundwater



Why this graph?

This graph is intended to address the question of:

**Assessment Question 1.1: How has the trend in water allocation and/or use changed in the years before and since the implementation?**

**Assessment Question 1.2: Have there been any unintended consequence of negating overall intended planned outcomes?**

Interpretation notes

- The y-axis represents cumulative volume allocated over time.
- The AER approvals are significantly lower than for AEP (ESRD).
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.
- A key feature of the trends is a major increase in AEP (ESRD) approvals.
- The only statistically significant trend is an increase in AEP (ESRD) allocations before the Plan.
- A shift toward groundwater after closure may how users adapting to basin closure.

Methods and data

- Cumulative volumes are based on all water allocation records provided by AEP from the late 1800s to present (temporary and full).
- Analysis starts in 1988 – 20 years before the SSRB plan was introduced.
- AEP has many types of licenses. For this analysis, they were all grouped together.
- The Mann-Kendall trend test was run on the time series of new allocations only (not cumulative) for both periods in question. The test was run at a significance level of 0.9.



List of all active Government of Alberta licenses in the SSRB – surface water

Why this table?

This table is intended to address the question how many licenses are held by the Crown and for what purposes.

Interpretation notes

- This table does not include crown licenses created from 10% holdbacks on transfers

PRIORITY	APPLICANT	PURPOSE	SPECIFIC	WATER_BODY	QUANTITY	CONSUM.	LOSSES	RETURN	BASIN
19731109001	ALBERTA ENVIRONMENT AND PARKS	WDIRR	CROP	Bow River	246,696,000	246,696,000	-	-	BOW
19970902003	ALBERTA INFRASTRUCTURE	WDWMNGT	STBLZTN	Highwood River	68,600,000	68,600,000	-	-	BOW
19790726001	WATER OPERATIONS BRANCH, LETHBRIDGE	WDWMNGT	STBLZTN	Highwood River	22,212,000	22,212,000	-	-	BOW
19331005001	WATER OPERATIONS BRANCH, LETHBRIDGE	WDAGR	STCKWT	Highwood River	4,933,930	4,933,930	-	-	BOW
19331005001	WATER OPERATIONS BRANCH, LETHBRIDGE	WDWMNGT	STBLZTN	Highwood River	4,933,930	4,933,930	-	-	BOW
20100525001	ENVIRONMENT AND PARKS - WMO	WDOTHER	SOTHER	Bow River	2,250,000	-	2,250,000	-	BOW
19870922001	AEP   ALBERTA TOURISM, PARKS AND RECREATION	WDFISH	FISHERY	Ribbon Creek	370,046	-	3,700	366,346	BOW
19710709013	ALBERTA ENVIRONMENT AND PARKS	WDFISH	FISHERY	Bow River	357,710	-	-	357,710	BOW
19971204003	ALBERTA TOURISM, PARKS AND RECREATION	WDCOM	GLFCRS	Kananaskis River	259,031	250,397	8,634	-	BOW
19860416002	AEP   ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Spray River	111,010	111,010	-	-	BOW
19641230001	ALBERTA ENVIRONMENT AND PARKS	WDREC	RCRTN	Nose Creek	104,850	104,850	-	-	BOW
19830520002	AEP   ALBERTA TOURISM, PARKS AND RECREATION	WDFISH	FISHERY	Rawson Lake	71,540	-	71,540	-	BOW
19821026002	AEP   ALBERTA TOURISM, PARKS AND RECREATION	WDCOM	PRK	Bow River	48,110	48,110	-	-	BOW
19860826006	AEP   ALBERTA TOURISM, PARKS AND RECREATION	WDMUN	CONDOD	Kananaskis River	34,530	34,530	-	-	BOW
19700731037	ALBERTA ENVIRONMENT AND PARKS	WDCOM	PRK	Bow River	29,200	29,200	-	-	BOW
20050517002	ALBERTA TOURISM, PARKS AND RECREATION	WDMUN	SCHOOLS	Kananaskis River	27,545	27,545	-	-	BOW
19921021001	AEP   ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Kananaskis River	22,200	22,200	-	-	BOW
20040513004	ALBERTA ENVIRONMENT AND PARKS	WDCOM	PRK	Bow River	20,800	20,800	-	-	BOW
19851210002	FISHERIES MANAGEMENT DIVISION	WDFISH	FISHERY	Bow River	19,740	-	19,740	-	BOW
19210514001	ALBERTA ENVIRONMENT AND PARKS	WDIRR	CROP	Highwood River	18,500	18,500	-	-	BOW

19770111001	AEP   ALBERTA TOURISM, PARKS AND RECREATION	WDWMNGT	STBLZTN	Moose Lake	17,270	-	17,270	-	BOW
19811021001	AEP   ALBERTA TOURISM, PARKS AND RECREATION	WDFISH	FISHERY	Elbow River	13,570	-	13,570	-	BOW
19791213001	AEP   ALBERTA TOURISM, PARKS AND RECREATION	WDFISH	FISHERY	Evan-Thomas Creek	13,570	-	13,570	-	BOW
19970714001	AEP   ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Elbow River	12,335	-	12,335	-	BOW
19810917001	AEP   ALBERTA TOURISM, PARKS AND RECREATION	WDFISH	FISHERY	Sibbald Creek	11,100	-	11,100	-	BOW
19870528001	AEP   ALBERTA TOURISM, PARKS AND RECREATION	WDFISH	FISHERY	Spray Lake	7,401	-	7,401	-	BOW
19810521001	AEP   ALBERTA TOURISM, PARKS AND RECREATION	WDFISH	FISHERY	Bow River	6,170	-	6,170	-	BOW
20040513005	ALBERTA ENVIRONMENT AND PARKS	WDREC	RCRTN	Bow River	5,000	5,000	-	-	BOW
19800905001	AEP   ALBERTA TOURISM, PARKS AND RECREATION	WDFISH	FISHERY	Kananaskis River	4,930	-	4,930	-	BOW
19830902002	AEP   ALBERTA TOURISM, PARKS AND RECREATION	WDFISH	FISHERY	McLean Creek	3,700	-	3,700	-	BOW
19951123002	AEP   ALBERTA TOURISM, PARKS AND RECREATION	WDCOM	PRK	Pocaterra Creek	2,467	2,467	-	-	BOW
19951123001	AEP   ALBERTA TOURISM, PARKS AND RECREATION	WDMUN	COOPD	Stony Creek	1,230	1,230	-	-	BOW
19820107002	ALBERTA MUNICIPAL AFFAIRS	WDMUN	MOTHER	Heart Creek	1,230	1,230	-	-	BOW
19820107001	ALBERTA MUNICIPAL AFFAIRS	WDCOM	OTHR	Pigeon Creek	1,230	1,230	-	-	BOW
19820107001	ALBERTA MUNICIPAL AFFAIRS	WDMUN	MOTHER	Pigeon Creek	1,230	1,230	-	-	BOW
19930831001	ALBERTA ENVIRONMENT AND PARKS	WDCOM	OTHR	Bow River	340	340	-	-	BOW
19700225001	ALBERTA MUNICIPAL AFFAIRS	WDDEWAT	FLOODCNT	Ghost River	10	10	-	-	BOW
19530625003	ALBERTA ENVIRONMENT AND PARKS	WDOTHER	SOTHER	Bow River	-	-	-	-	BOW
19081027004	ALBERTA ENVIRONMENT AND PARKS	WDOTHER	SOTHER	Bow River	-	-	-	-	BOW
19940510002	ALBERTA ENVIRONMENT AND PARKS	WDWMNGT	STBLZTN	Willow Creek (009-25-W4 to 014-02-W5)	52,466,140	123,340	-	52,342,800	OLD
20021206002	ALBERTA ENVIRONMENT AND PARKS	WDOTHER	SOTHER	Oldman River	43,200,000	43,200,000	-	-	OLD
19500531006	ENVIRONMENT AND PARKS - WMO	WDCOM	OTHR	St. Mary River	43,171,870	-	43,171,870	-	OLD
19500531006	ENVIRONMENT AND PARKS - WMO	WDWMNGT	STBLZTN	Belly River	14,390,623	-	14,390,623	-	OLD
19500531006	ENVIRONMENT AND PARKS - WMO	WDWMNGT	STBLZTN	St. Mary River	14,390,623	-	14,390,623	-	OLD
19500531006	ENVIRONMENT AND PARKS - WMO	WDWMNGT	STBLZTN	Waterton River	14,390,623	-	14,390,623	-	OLD
19171116002	ALBERTA ENVIRONMENT AND PARKS	WDCOM	OTHR	Oldman River	12,342,590	-	12,342,590	-	OLD
19970902005	ALBERTA ENVIRONMENT AND PARKS	WDWMNGT	STBLZTN	Mosquito Creek	11,160,000	9,275,942	1,884,058	-	OLD

19880203001	WATER OPERATIONS BRANCH, LETHBRIDGE	WDDEWAT	FLOODCNT	Oldman River	7,820,280	-	7,820,280	-	OLD
19741104002	ALBERTA ENVIRONMENT AND PARKS	WDCOM	OTHR	Oldman River	6,167,410	-	6,167,410	-	OLD
19440207001	ALBERTA ENVIRONMENT AND PARKS	WDWMNGT	STBLZTN	Willow Creek (009-25-W4 to 014-02-W5)	6,142,730	-	43,170	6,099,560	OLD
19781222003	ALBERTA ENVIRONMENT AND PARKS	WDCOM	OTHR	Allison Creek	5,083,170	1,230	18,500	5,063,440	OLD
19800207001	ALBERTA ENVIRONMENT AND PARKS	WDDEWAT	FLOODCNT	St. Mary River	2,466,960	-	2,466,960	-	OLD
19940510003	ALBERTA ENVIRONMENT AND PARKS	WDWMNGT	STBLZTN	Pine Creek	1,850,240	1,825,550	-	24,690	OLD
19651018001	WATER, SOUTHERN REGION - LETHBRIDGE	WDREC	RCRTN	Beaver Lake	1,726,870	-	1,726,870	-	OLD
19720503001	FISHERIES MANAGEMENT DIVISION	WDHBTENH	WTLNDS	St. Mary River	1,006,520	1,006,520	-	-	OLD
19500607001	WATER, SOUTHERN REGION - LETHBRIDGE	WDCOM	PRK	Beauvais Lake	451,450	-	451,450	-	OLD
19881208004	FISHERIES MANAGEMENT DIVISION	WDHBTENH	WTLNDS	St. Mary River	226,960	226,960	-	-	OLD
19881209008	LETHBRIDGE AREA OFFICE	WDWILD	SRWILD	Oldman River	209,693	209,693	-	-	OLD
19881209009	LETHBRIDGE AREA OFFICE	WDWILD	SRWILD	Oldman River	129,516	129,516	-	-	OLD
19881025005	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDCOM	OTHR	Oldman River	77,710	59,210	18,500	-	OLD
19900130001	ALBERTA TOURISM, PARKS AND RECREATION	WDCOM	PRK	Oldman River	44,960	44,960	-	-	OLD
19890223019	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Oldman River	25,900	18,500	7,400	-	OLD
19870306001	AEP   ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Johnson Creek	24,670	-	24,670	-	OLD
19890714012	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Oldman River	22,200	8,630	13,570	-	OLD
19870605002	LETHBRIDGE AREA OFFICE	WDFISH	FISHERY	Oldman River	20,970	-	20,970	-	OLD
19870717003	LETHBRIDGE AREA OFFICE	WDFISH	FISHERY	Drywood Creek	16,040	-	16,040	-	OLD
19890223017	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Oldman River	9,860	3,700	6,160	-	OLD
19730601002	ALBERTA ENVIRONMENT AND PARKS	WDREC	RCRTN	Belly River	7,400	-	7,400	-	OLD
19490330002	ALBERTA INFRASTRUCTURE, CALGARY	WDAGR	STCKWT	Willow Creek (009-25-W4 to 014-02-W5)	7,400	1,230	6,170	-	OLD
19890223015	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Crowsnest River	6,170	2,470	3,700	-	OLD
19750430001	ALBERTA ENVIRONMENT AND PARKS	WDAGR	STCKWT	Castle River	6,160	1,230	4,930	-	OLD
19871215003	ALBERTA ENVIRONMENT AND PARKS	WDAGR	STCKWT	Castle River	4,930	1,230	3,700	-	OLD
19810520001	ALBERTA ENVIRONMENT AND PARKS	WDFISH	FISHERY	Drywood Creek	4,930	-	4,930	-	OLD
19490330004	ALBERTA INFRASTRUCTURE, CALGARY	WDAGR	STCKWT	Willow Creek (009-25-W4 to 014-02-W5)	4,930	1,230	3,700	-	OLD

19890714010	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Oldman River	4,920	2,460	2,460	-	OLD
20030527004	ALBERTA CULTURE AND TOURISM	WDREC	RCRTN	Beauvais Lake	4,500	4,500	-	-	OLD
19490330001	ALBERTA INFRASTRUCTURE, CALGARY	WDAGR	STCKWT	Willow Creek (009-25-W4 to 014-02-W5)	3,700	1,230	2,470	-	OLD
19861103001	LETHBRIDGE AREA OFFICE	WDREC	RCRTN	Crowsnest River	3,700	-	3,700	-	OLD
19890714013	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Castle River	3,700	1,230	2,470	-	OLD
19890223010	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Castle River	3,700	1,230	2,470	-	OLD
19890223009	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Castle River	3,700	2,470	1,230	-	OLD
19890223013	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Crowsnest River	3,700	2,470	1,230	-	OLD
19890223020	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Oldman River	3,700	1,230	2,470	-	OLD
19890223018	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Oldman River	3,700	1,230	2,470	-	OLD
19890714009	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Oldman River	3,700	2,470	1,230	-	OLD
19890714008	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Oldman River	3,700	2,470	1,230	-	OLD
19890714005	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Oldman River	3,690	1,230	2,460	-	OLD
19890223016	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Oldman River	3,690	1,230	2,460	-	OLD
19381123001	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDAGR	STCKWT	Castle River	2,460	1,230	1,230	-	OLD
19890223008	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Castle River	2,460	1,230	1,230	-	OLD
19890714004	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Crowsnest River	2,460	1,230	1,230	-	OLD
19890223014	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Crowsnest River	2,460	1,230	1,230	-	OLD
19890714007	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Oldman River	2,460	1,230	1,230	-	OLD
19890714006	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Oldman River	2,460	1,230	1,230	-	OLD
19900130001	ALBERTA ENVIRONMENT AND PARKS	WDREC	RCRTN	Oldman River	2,000	2,000	-	-	OLD
19890223011	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Castle River	1,240	620	620	-	OLD
19890223012	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Crowsnest River	1,240	620	620	-	OLD
19831021007	ALBERTA INFRASTRUCTURE, CALGARY	WDCOM	OTHR	Crowsnest River	1,230	1,230	-	-	OLD

19890714011	WATER MANAGEMENT, NORTHERN EAST SLOPES REGION	WDHBTENH	WTLNDS	Oldman River	1,220	610	610	-	OLD
19490330003	ALBERTA INFRASTRUCTURE, CALGARY	WDAGR	STCKWT	Willow Creek (009-25-W4 to 014-02-W5)	990	620	370	-	OLD
19450630010	ALBERTA ENVIRONMENT AND PARKS	WDIRR	CROP	Belly River	-	-	-	-	OLD
19230710004	ALBERTA ENVIRONMENT AND PARKS	WDIRR	CROP	Belly River	-	-	-	-	OLD
19390617006	ALBERTA ENVIRONMENT AND PARKS	WDIRR	CROP	Belly River	-	-	-	-	OLD
19911219005	ENVIRONMENT AND PARKS - WATER OPERATIONS (DICKSON DAM)	WDWMNGT	STBLZTN	Red Deer River	22,572,720	-	22,572,720	-	RED
19831124003	ALBERTA ENVIRONMENT AND PARKS	WDIRR	CROP	Red Deer River	22,202,680	22,202,680	-	-	RED
19740107002	ENVIRONMENT AND PARKS - WATER OPERATIONS (DICKSON DAM)	WDWMNGT	STBLZTN	Blindman River	5,185,200	-	5,185,200	-	RED
19641217001	ALBERTA ENVIRONMENT AND PARKS	WDDEWAT	FLOODCNT	Blood Indian Creek	3,083,710	3,083,710	-	-	RED
19770802005	ENVIRONMENT AND PARKS - WATER OPERATIONS (DICKSON DAM)	WDDEWAT	FLOODCNT	Gleniffer Lake	3,034,360	-	3,034,360	-	RED
19770315002	FISHERIES MANAGEMENT DIVISION	WDFISH	FISHERY	Raven River	2,393,830	-	-	2,393,830	RED
19860411004	ENVIRONMENT AND PARKS - WATER OPERATIONS (DICKSON DAM)	WDCOM	OTHR	Parlby Creek	2,196,830	2,196,830	-	-	RED
19900913003	ENVIRONMENT AND PARKS - WATER OPERATIONS (DICKSON DAM)	WDCOM	OTHR	Parlby Creek	2,145,020	1,460,440	684,580	-	RED
19710323001	ALBERTA ENVIRONMENT AND PARKS	WDWMNGT	STBLZTN	Threehills Creek	641,410	-	641,410	-	RED
19480805001	ENVIRONMENT AND PARKS - WATER OPERATIONS (DICKSON DAM)	WDREC	RCRTN	Parlby Creek	253,090	-	253,090	-	RED
19701023003	ALBERTA ENVIRONMENT AND PARKS	WDDEWAT	FLOODCNT	Severn Creek	197,350	86,340	111,010	-	RED
19770422002	ALBERTA ENVIRONMENT AND PARKS	WDWMNGT	STBLZTN	West Stony Creek	177,620	-	177,620	-	RED
19821122002	ALBERTA ENVIRONMENT AND PARKS	WDFISH	FISHERY	Red Deer River	123,350	-	123,350	-	RED
19161130001	ALBERTA ENVIRONMENT & PARKS - WMO	WDHBTENH	WTLNDS	Berry Creek	123,348	-	123,348	-	RED
19821122001	ALBERTA ENVIRONMENT AND PARKS	WDHBTENH	WTLNDS	Red Deer River	51,810	-	51,810	-	RED
19860218006	FISHERIES MANAGEMENT DIVISION	WDFISH	FISHERY	Kneehills Creek	49,340	-	49,340	-	RED
19750619002	ALBERTA ENVIRONMENT AND PARKS	WDDEWAT	FLOODCNT	Raven River	38,240	-	38,240	-	RED
19890630001	ALBERTA ENVIRONMENT AND PARKS	WDHBTENH	WTLNDS	Red Deer River	37,000	-	37,000	-	RED
19161130001	ALBERTA ENVIRONMENT & PARKS - WMO	WDWMNGT	STBLZTN	Berry Creek	33,300	-	33,300	-	RED
19680131002	FISHERIES MANAGEMENT DIVISION	WDFISH	FISHERY	Medicine River	20,970	-	20,970	-	RED
19760713002	ALBERTA ENVIRONMENT AND PARKS	WDFISH	FISHERY	Sullivan Lake	18,500	-	18,500	-	RED
19350802002	ALBERTA ENVIRONMENT AND PARKS	WDFISH	FISHERY	Parlby Creek	17,270	-	17,270	-	RED
19791129003	ALBERTA ENVIRONMENT AND PARKS	WDCOM	OTHR	Red Deer River	6,160	1,230	1,230	3,700	RED

19850920002	ALBERTA MUNICIPAL AFFAIRS	WDAGR	STCKWT	Coleman Lake	3,700	1,230	2,470	-	RED
19811202002	ALBERTA ENVIRONMENT AND PARKS	WDIRR	CROP	Red Deer River	2,460	2,460	-	-	RED
19350906001	ALBERTA MUNICIPAL AFFAIRS	WDAGR	STCKWT	Red Deer River	2,460	1,230	1,230	-	RED
19350917003	ALBERTA MUNICIPAL AFFAIRS	WDAGR	STCKWT	Red Deer River	2,460	1,230	1,230	-	RED
20020128001	ENVIRONMENT AND PARKS - MEDICINE HAT	WDAGR	STCKWT	Unnamed Stream - Unclassified	2,255	255	2,000	-	RED
20010214003	ALBERTA ENVIRONMENT AND PARKS	WDMUN	CAMPS	Red Deer River	555	555	-	-	RED
19610719001	ALBERTA ENVIRONMENT AND PARKS	WDDEWAT	FLOODCNT	Bullshead Creek	1,234,567	1,234	-	1,233,333	SSA
19600321002	ALBERTA ENVIRONMENT AND PARKS	WDDEWAT	FLOODCNT	Seven Persons Coulee	568,630	-	143,080	425,550	SSA
19700928001	WATER OPERATIONS BRANCH, LETHBRIDGE	WDMUN	COOPD	Ross Creek (012-05-W4 to Elkwater Lake)	246,690	24,670	160,350	61,670	SSA
19600331001	ALBERTA MUNICIPAL AFFAIRS	WDAGR	STCKWT	Easy Coulee	19,730	1,230	18,500	-	SSA
20110426001	ALBERTA ENVIRONMENT AND PARKS	WDAGR	STCKWT	Unnamed Lake - Unclassified	891	354	537	-	SSA
19181206001	ALBERTA ENVIRONMENT AND PARKS	WDWMNGT	STBLZTN	Ross Creek (012-05-W4 to Elkwater Lake)	-	-	-	-	SSA

## List of all active Government of Alberta licenses in the SSRB – groundwater

### Why this table?

This table is intended to address the question how many licenses are held by the Crown and for what purposes.

PRIORITY	APPLICANT	PURPOSE	SPECIFIC	WATER_BODY	QUANTITY	CONSUMPTIVE	LOSSES	RETURN	BASIN
19850110005	ALBERTA ENVIRONMENT AND PARKS   ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	1,314,890	262,978	65,745	986,168	BOW
19850110006	ALBERTA ENVIRONMENT AND PARKS   ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	1,314,890	262,978	65,745	986,168	BOW
19710709009	ALBERTA INFRASTRUCTURE, CALGARY	WDFISH	FISHERY	Aquifer	957,180	-	-	957,180	BOW
19710709007	ALBERTA INFRASTRUCTURE, CALGARY	WDFISH	FISHERY	Aquifer	957,180	-	-	957,180	BOW
19710709006	ALBERTA INFRASTRUCTURE, CALGARY	WDFISH	FISHERY	Aquifer	957,180	-	-	957,180	BOW
19940912001	ALBERTA INFRASTRUCTURE, CALGARY	WDFISH	FISHERY	Aquifer	955,771	955,771	-	-	BOW
19940912003	ALBERTA INFRASTRUCTURE, CALGARY	WDFISH	FISHERY	Aquifer	616,740	-	-	616,740	BOW
19710709008	ALBERTA INFRASTRUCTURE, CALGARY	WDFISH	FISHERY	Aquifer	478,590	-	-	478,590	BOW
19710709011	ALBERTA INFRASTRUCTURE, CALGARY	WDFISH	FISHERY	Aquifer	358,940	-	-	358,940	BOW
19810423001	ALBERTA ENVIRONMENT AND PARKS   ALBERTA TOURISM, PARKS AND RECREATION	WDCOM	PRK	Aquifer	313,300	62,660	-	250,640	BOW

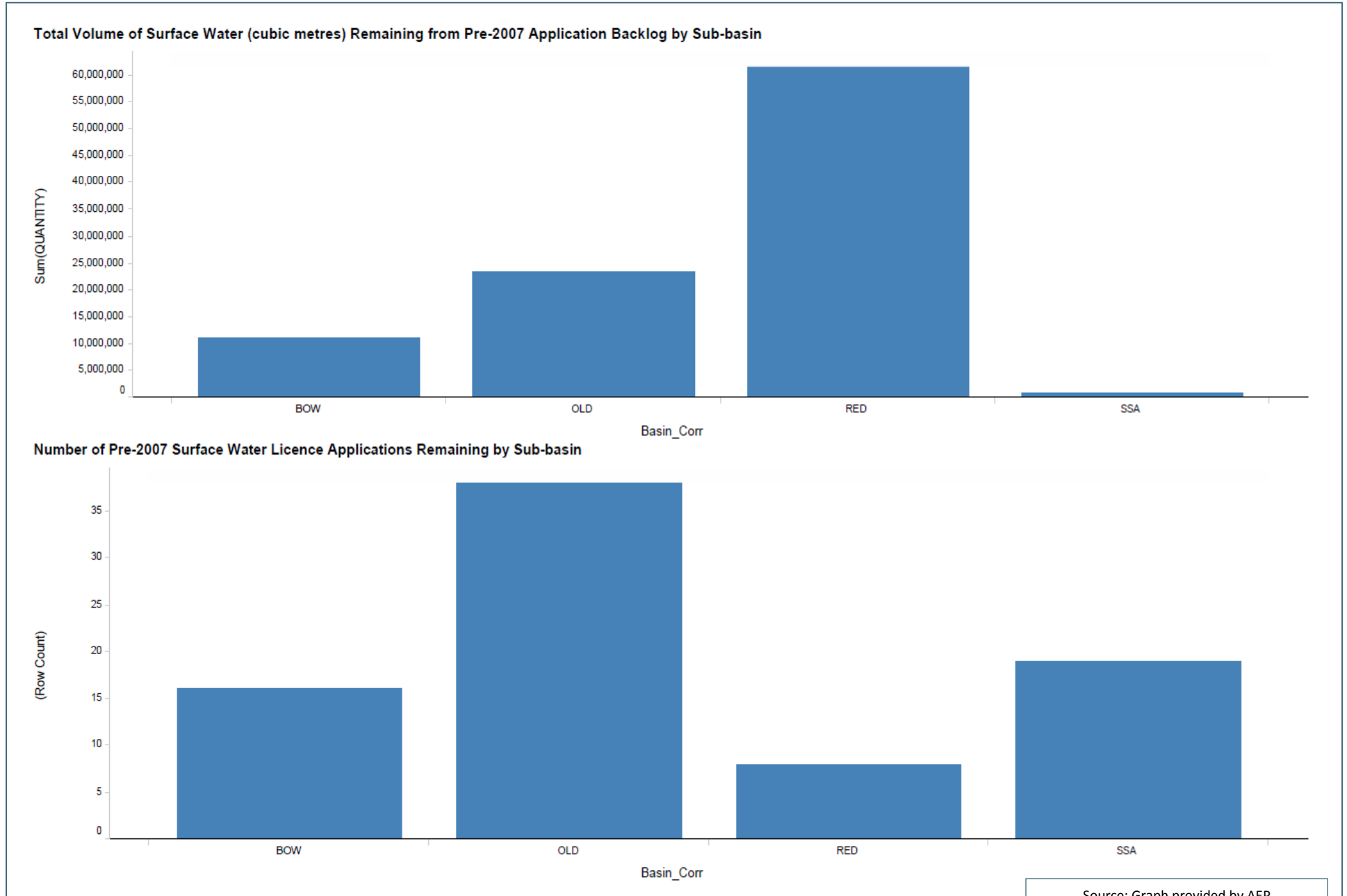
19810423002	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDCOM	PRK	Aquifer	313,300	62,660	-	250,640	BOW
19940912001	ALBERTA INFRASTRUCTURE, CALGARY	WDFISH	FISHERY	Aquifer	283,700	-	-	283,700	BOW
19940912002	ALBERTA INFRASTRUCTURE, CALGARY	WDFISH	FISHERY	Aquifer	283,700	-	-	283,700	BOW
19710709012	ALBERTA INFRASTRUCTURE, CALGARY	WDFISH	FISHERY	Aquifer	239,300	-	-	239,300	BOW
19710709010	ALBERTA INFRASTRUCTURE, CALGARY	WDFISH	FISHERY	Aquifer	239,300	-	-	239,300	BOW
19710709002	ALBERTA INFRASTRUCTURE, CALGARY	WDFISH	FISHERY	Aquifer	239,300	-	-	239,300	BOW
19850110004	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	133,220	26,644	6,661	99,915	BOW
19800603006	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	94,099	94,099	-	-	BOW
19780704008	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	45,640	45,640	-	-	BOW
19800201001	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	35,770	35,770	-	-	BOW
19920515005	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDMUN	COOPD	Aquifer	10,455	10,455	-	-	BOW
19810713001	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	9,080	9,080	-	-	BOW
20041230001	ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	7,000	7,000	-	-	BOW
19940718001	ALBERTA INFRASTRUCTURE, CALGARY	WDMUN	INSTIT	Aquifer	6,170	6,170	-	-	BOW
19811214001	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	4,930	4,930	-	-	BOW
20050526001	ALBERTA INFRASTRUCTURE, CALGARY	WDOTHER	SOTHER	Aquifer	4,920	4,920	-	-	BOW
20000125001	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	4,230	4,230	-	-	BOW
20040527002	ALBERTA CULTURE AND TOURISM	WDREC	RCRTN	Aquifer	4,000	4,000	-	-	BOW
19951108003	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	3,580	3,580	-	-	BOW
19820405001	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	2,470	2,470	-	-	BOW
20071120001	ALBERTA INFRASTRUCTURE, CALGARY	WDCOM	OTHR	Aquifer	2,000	2,000	-	-	BOW
19891108003	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	1,845	1,845	-	-	BOW
19891108003	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	1,845	1,845	-	-	BOW
19951108001	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	1,230	1,230	-	-	BOW
19951108006	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDMUN	COOPD	Aquifer	1,230	1,230	-	-	BOW
19930422001	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	1,230	1,230	-	-	BOW

19800603004	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	1,230	1,230	-	-	BOW
19800606002	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	1,230	1,230	-	-	BOW
19840501001	ALBERTA INFRASTRUCTURE	WDMUN	CAMPS	Aquifer	1,230	1,230	-	-	BOW
19840202001	ALBERTA MUNICIPAL AFFAIRS	WDCOM	OTHR	Aquifer	1,230	1,230	-	-	BOW
19850114001	PRAIRIE REGION, Recreation and Parks	WDREC	RCRTN	Aquifer	1,230	1,230	-	-	BOW
20071120001	ALBERTA INFRASTRUCTURE, CALGARY	WDCOM	OTHR	Aggie Lake	1,000	1,000	-	-	BOW
19951108005	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDMUN	COOPD	Aquifer	909	909	-	-	BOW
20010108001	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	900	900	-	-	BOW
19951108002	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	370	370	-	-	BOW
19780814002	ALBERTA ENVIRONMENT AND PARKS	GVTHB	NHT	Aquifer	-	-	-	-	BOW
19790831001	ALBERTA ENVIRONMENT AND PARKS	GVTHB	NHT	Aquifer	-	-	-	-	BOW
20010108002	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	-	-	-	-	BOW
19800603005	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	-	-	-	-	BOW
19800606003	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	-	-	-	-	BOW
19800603007	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	-	-	-	-	BOW
19800603008	ALBERTA ENVIRONMENT AND PARKS ALBERTA TOURISM, PARKS AND RECREATION	WDREC	RCRTN	Aquifer	-	-	-	-	BOW
19841217001	ALBERTA ENVIRONMENT AND PARKS	WDFISH	FISHERY	Aquifer	481,515	-	48,182	433,333	OLD
19860502001	ALBERTA ENVIRONMENT AND PARKS	WDFISH	FISHERY	Aquifer	348,125	-	34,545	313,580	OLD
19881209010	LETHBRIDGE AREA OFFICE	WDWILD	SRWILD	Oldman River	51,806	51,806	-	-	OLD
19810612001	ALBERTA ENVIRONMENT AND PARKS	WDMUN	CAMPS	Aquifer	8,630	8,630	-	-	OLD
19930105001	WATER, SOUTHERN REGION - CALGARY	WDREC	RCRTN	Aquifer	7,400	7,400	-	-	OLD
20051026002	ALBERTA CULTURE AND TOURISM	WDREC	RCRTN	Aquifer	6,917	6,917	-	-	OLD
19930105002	WATER, SOUTHERN REGION - CALGARY	WDREC	RCRTN	Aquifer	6,780	6,780	-	-	OLD
19930105003	WATER, SOUTHERN REGION - CALGARY	WDREC	RCRTN	Aquifer	6,780	6,780	-	-	OLD
19960109001	WATER OPERATIONS BRANCH, LETHBRIDGE	WDHBTENH	WTLNDS	Aquifer	3,700	3,700	-	-	OLD
19960109002	WATER OPERATIONS BRANCH, LETHBRIDGE	WDHBTENH	WTLNDS	Aquifer	3,700	3,700	-	-	OLD
19960109003	WATER OPERATIONS BRANCH, LETHBRIDGE	WDHBTENH	WTLNDS	Aquifer	3,700	3,700	-	-	OLD
19960109005	WATER OPERATIONS BRANCH, LETHBRIDGE	WDHBTENH	WTLNDS	Aquifer	2,470	2,470	-	-	OLD



19960109006	WATER OPERATIONS BRANCH, LETHBRIDGE	WDHBTENH	WTLNDS	Aquifer	2,470	2,470	-	-	OLD
19960109004	WATER OPERATIONS BRANCH, LETHBRIDGE	WDHBTENH	WTLNDS	Aquifer	2,470	2,470	-	-	OLD
19841219003	ALBERTA INFRASTRUCTURE	WDREC	RCRTN	Aquifer	1,230	1,230	-	-	OLD
19851104002	PRAIRIE REGION, Recreation and Parks	WDREC	RCRTN	Aquifer	1,230	1,230	-	-	OLD
19900420001	PRAIRIE REGION, Recreation and Parks	WDREC	RCRTN	Aquifer	1,230	1,230	-	-	OLD
19920304002	WATER, SOUTHERN REGION - CALGARY	WDREC	RCRTN	Aquifer	1,230	1,230	-	-	OLD
19841217005	ALBERTA ENVIRONMENT AND PARKS	WDFISH	FISHERY	Aquifer	-	-	-	-	OLD
19790831003	ALBERTA MUNICIPAL AFFAIRS	WDMUN	URBAN	Aquifer	7,400	7,400	-	-	RED
19901119006	ALBERTA ENVIRONMENT AND PARKS	WDREC	RCRTN	Aquifer	2,470	2,470	-	-	RED
19801104003	ALBERTA MUNICIPAL AFFAIRS	WDMUN	URBAN	Aquifer	2,470	2,470	-	-	RED
19901119004	ALBERTA ENVIRONMENT AND PARKS	WDREC	RCRTN	Aquifer	1,230	1,230	-	-	RED
19860205002	ALBERTA INFRASTRUCTURE, CALGARY	WDREC	RCRTN	Aquifer	1,230	246	-	984	RED
20100426014	ALBERTA SUSTAINABLE RESOURCE DEVELOPMENT	WDAGR	STCKWT	Aquifer	1,000	1,000	-	-	RED
20100426008	ALBERTA SUSTAINABLE RESOURCE DEVELOPMENT	WDAGR	STCKWT	Aquifer	1,000	1,000	-	-	RED
20100426009	ALBERTA SUSTAINABLE RESOURCE DEVELOPMENT	WDAGR	STCKWT	Aquifer	1,000	1,000	-	-	RED
19961113001	ALBERTA CULTURE AND TOURISM	WDMUN	URBAN	Aquifer	35,046	7,034	-	28,012	SSA
19861223001	PRAIRIE REGION, Recreation and Parks	WDREC	RCRTN	Aquifer	9,870	9,870	-	-	SSA

### Graph of count and volume of pre-2007 application backlog by sub-basin

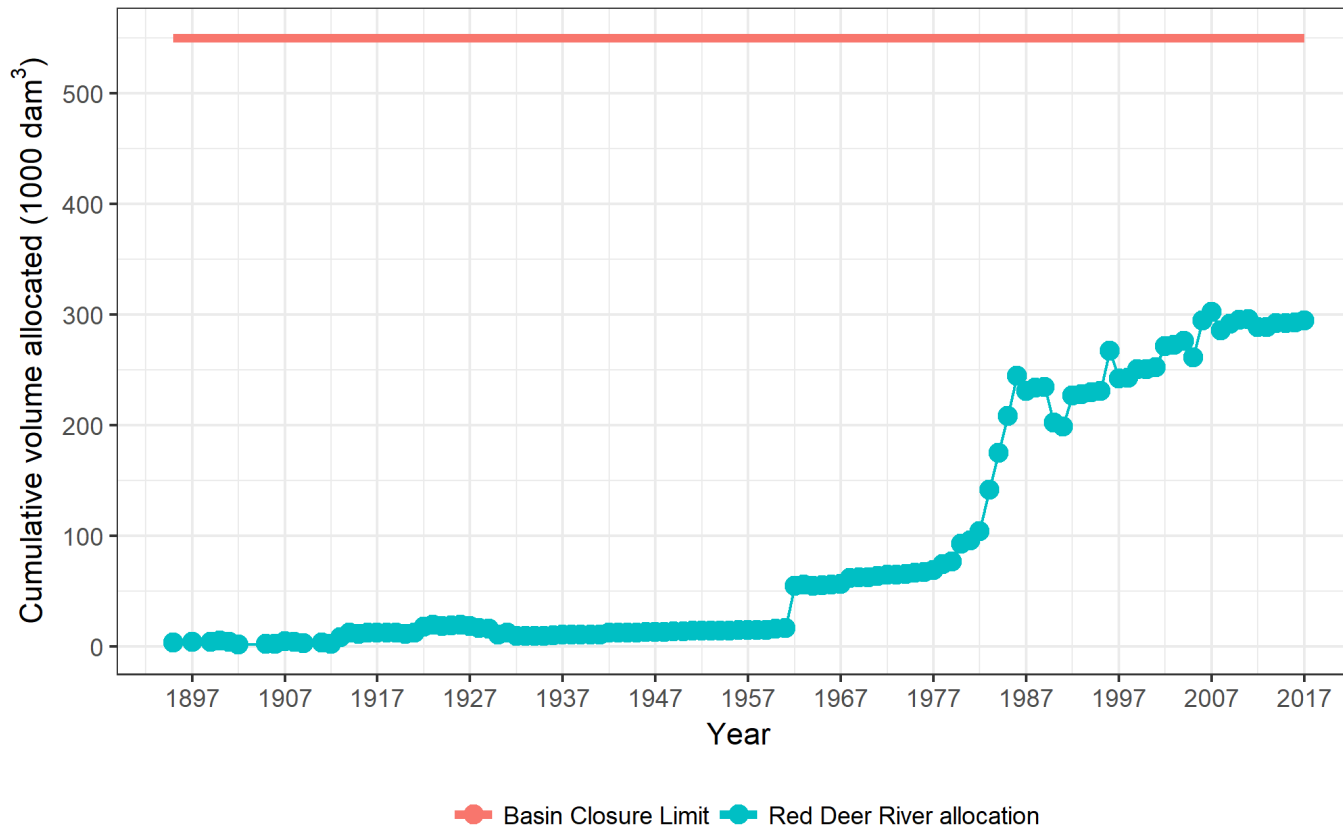


Source: Graph provided by AEP

## Recommendation 2.2: Future Water Allocation Limit in the Red Deer River Sub-Basin

Red Deer River Basin cumulative water allocation over time compared to specified– Surface water

Red Deer River Allocation versus Basin Closure Limit



### Why this graph?

This graph is intended to address the questions of:

**Assessment Question 2.1: How close is the basin to reaching the 550,000 dam<sup>3</sup> limit?**

### Interpretation notes

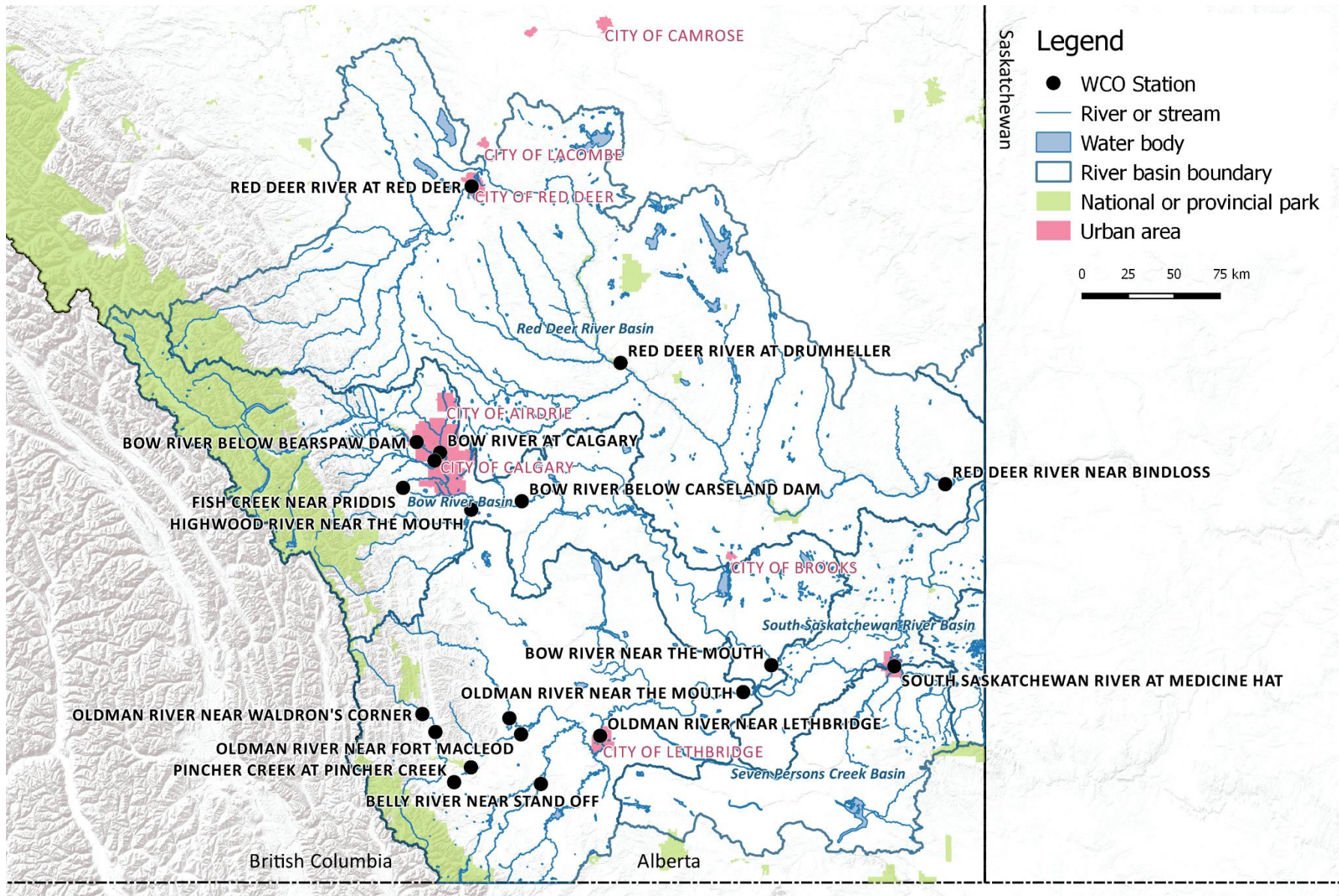
- This graph shows cumulative licenses in the Red Deer River Basin compared to the 550,000 dam<sup>3</sup> limit.
- The x-axis represents the years since records keeping was established for licenses issued.
- A decrease in cumulative allocated volume means that a license has expired, been cancelled or suspended.

### Methods and data

- Based on all water allocation records provided by AEP from the late 1800s to present.
- AEP has many types of licenses. For the purpose of this analysis they were all analysed.
- The line represents the 3-year moving average.

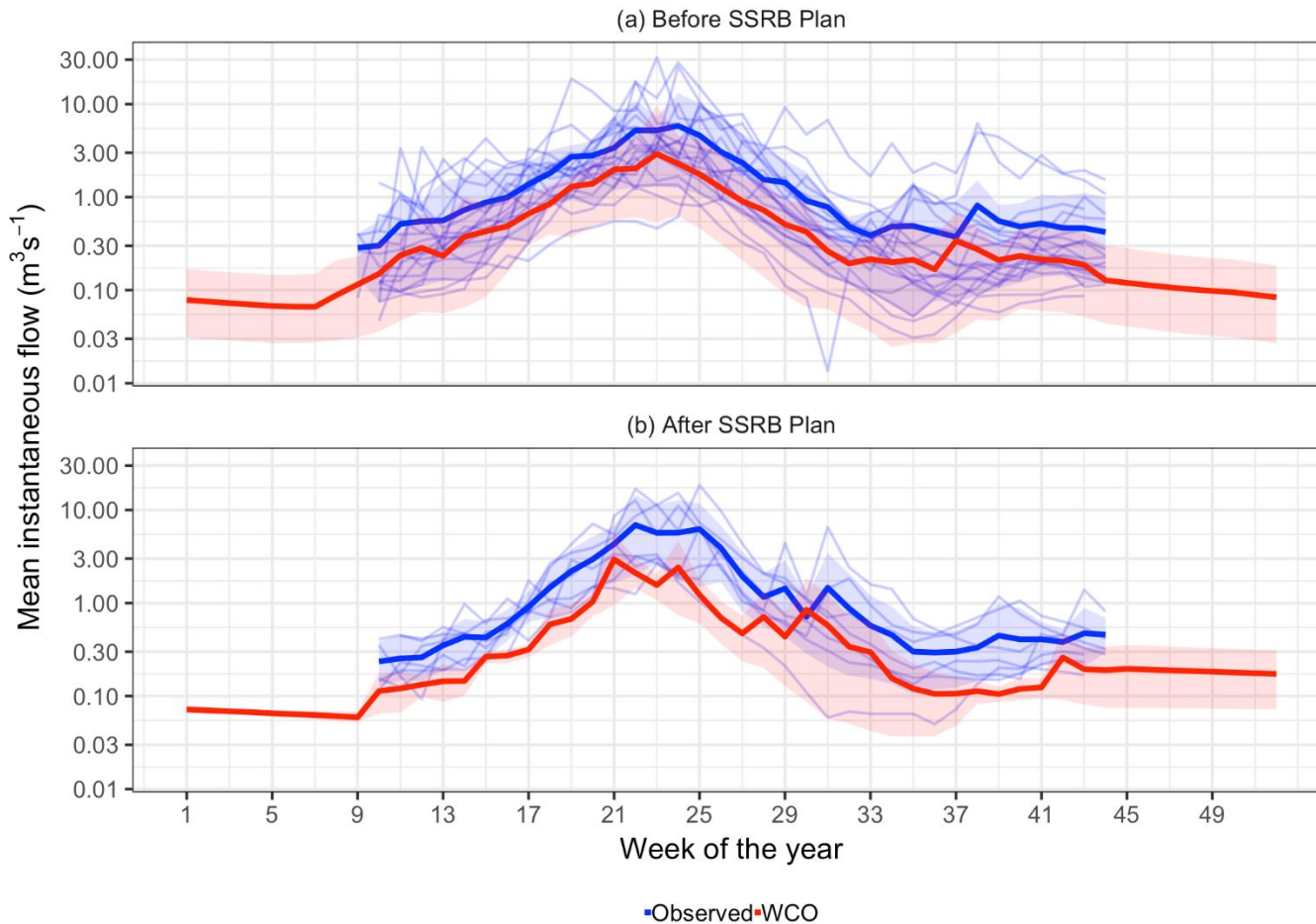
## Recommendation 2.3: Recommended Water Conservation Objectives (WCOs)

### Map of current WCO locations in the SSRB



WCO values compared to observed flow records on a calendar weekly basis – Old Man River stations

Old Man River (PINCHER CREEK AT PINCHER CREEK: 05AA004)



Why this graph?

This graph is intended to address the questions of:

**Assessment Question 3.1: The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?**  
**Assessment Question 3.2a: In a heavily allocated closed basin, how often is a WCO relevant?**

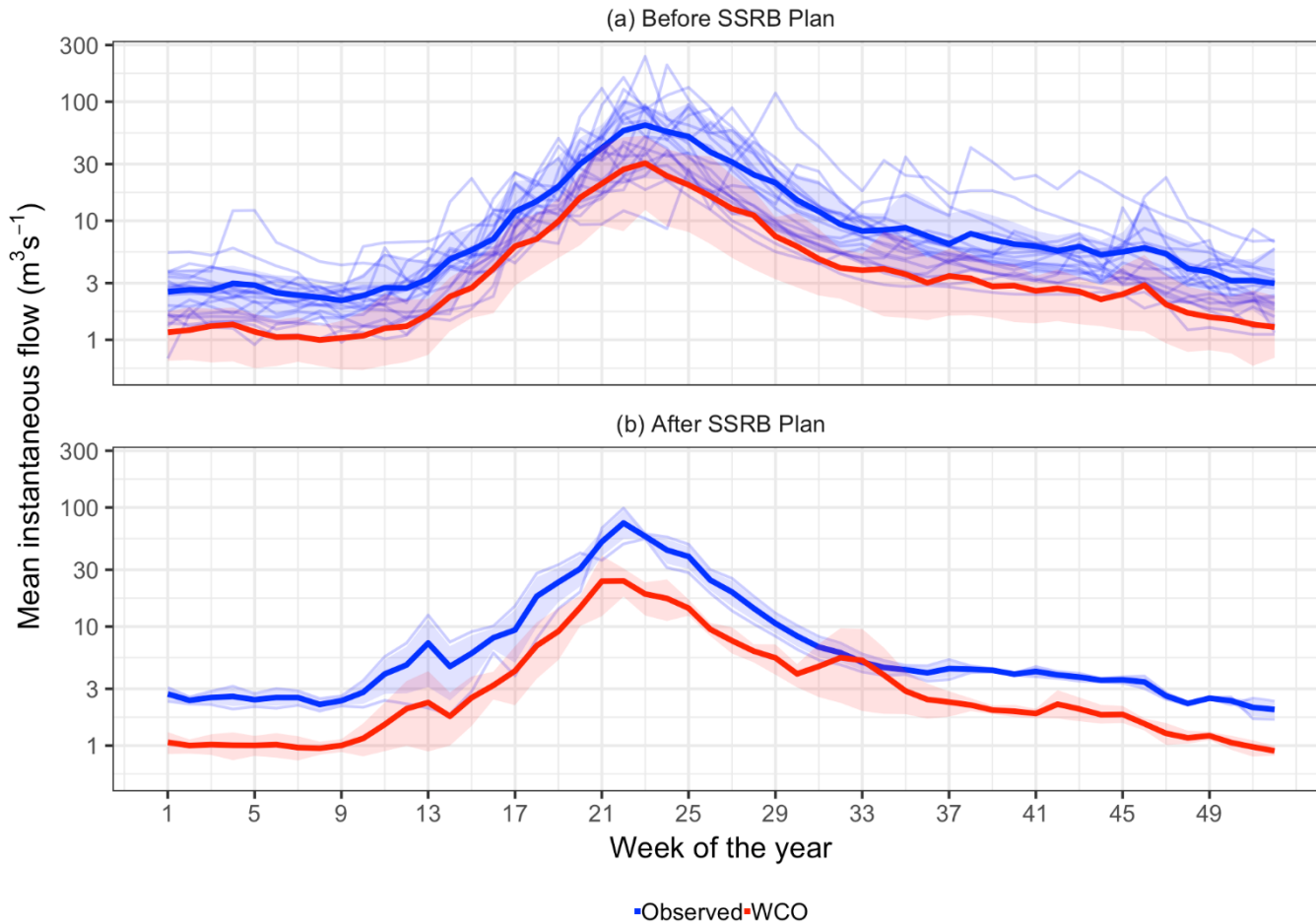
Interpretation notes

- This graph how the range of WCO values over the period of record compares with the flows in question.
- The shaded area of the plot is the 10<sup>th</sup> to 90<sup>th</sup> percentile ranges for each dataset.
- The lightly shaded blue lines represent individual flow years.
- The heavier solid line represents the mean for each dataset.
- Any time when a “blue” line is below a “red” line, a WCO was violated.

Methods and data

- The period of record examined was the 20-years prior to the SSRB plan and the years afterward.
- Observed data was from WSC stations and the WCO data was calculated as 45% of the naturalized instantaneous weekly flow from the AEP Naturalized Flow database, updated to 2009.

### Old Man River (OLDMAN RIVER NEAR WALDRON'S CORNER: 05AA023)



#### Why this graph?

This graph is intended to address the questions of:

**Assessment Question 3.1: The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?**

**Assessment Question 3.2a: In a heavily allocated closed basin, how often is a WCO relevant?**

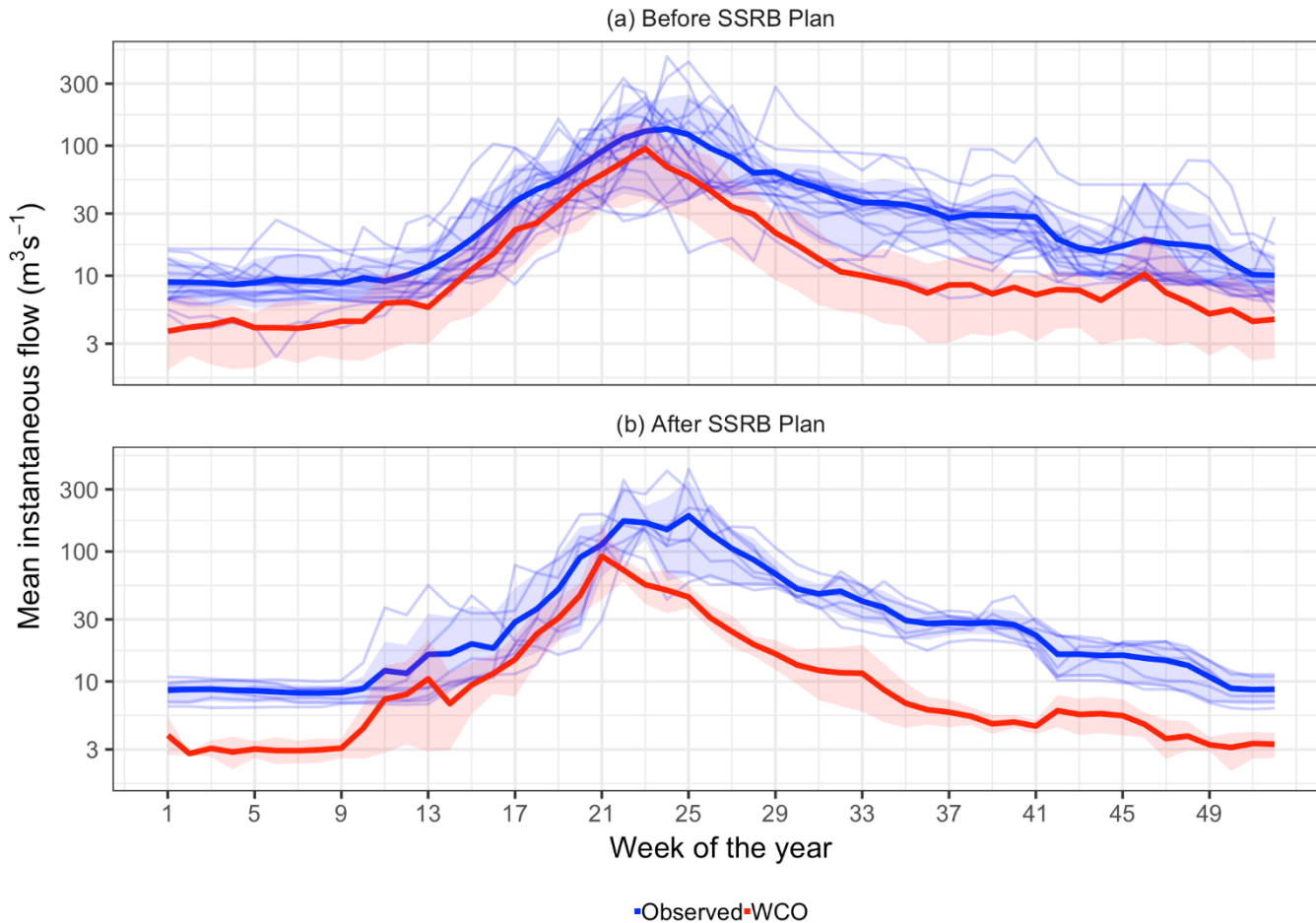
#### Interpretation notes

- This graph shows the range of WCO values over the period of record compared with the flows in question.
- The shaded area of the plot is the 10<sup>th</sup> to 90<sup>th</sup> percentile ranges for each dataset.
- The lightly shaded blue lines represent individual flow years.
- The heavier solid line represents the mean for each dataset.
- Any time when a “blue” line is below a “red” line, a WCO was violated.

#### Methods and data

- The period of record examined was the 20-years prior to the SSRB plan and the years afterward.
- Observed data was from WSC stations and the WCO data was calculated as 45% of the naturalized instantaneous weekly flow from the AEP Naturalized Flow database, updated to 2009.

## Old Man River (OLDMAN RIVER NEAR BROCKET: 05AA024)



### Why this graph?

This graph is intended to address the questions of:

**Assessment Question 3.1: The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?**

**Assessment Question 3.2a: In a heavily allocated closed basin, how often is a WCO relevant?**

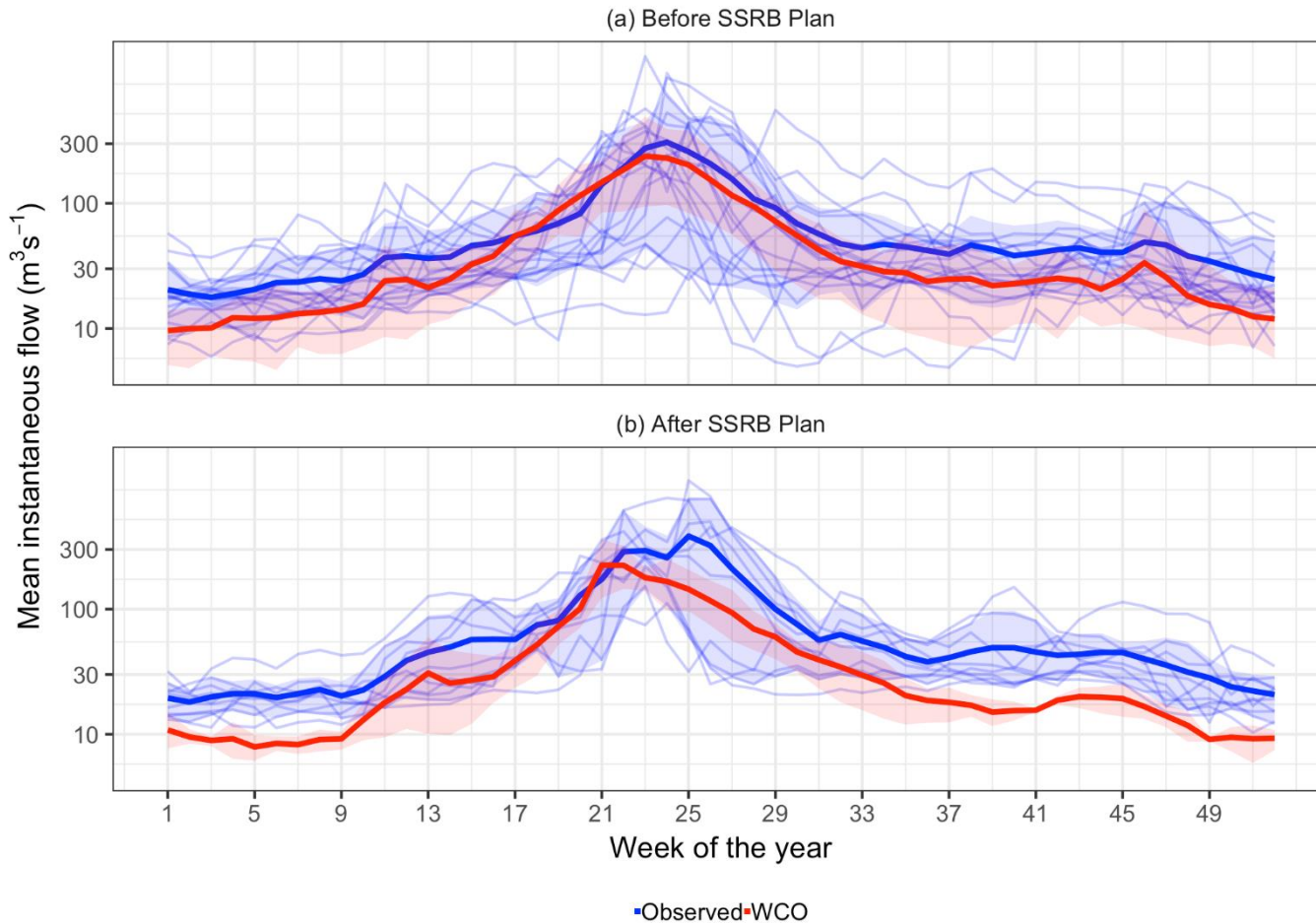
### Interpretation notes

- This graph shows the range of WCO values over the period of record compared with the flows in question.
- The shaded area of the plot is the 10<sup>th</sup> to 90<sup>th</sup> percentile ranges for each dataset.
- The lightly shaded blue lines represent individual flow years.
- The heavier solid line represents the mean for each dataset.
- Any time when a “blue” line is below a “red” line, a WCO was violated.

### Methods and data

- The period of record examined was the 20-years prior to the SSRB plan and the years afterward.
- Observed data was from WSC stations and the WCO data was calculated as 45% of the naturalized instantaneous weekly flow from the AEP Naturalized Flow database, updated to 2009.

## Old Man River (OLDMAN RIVER NEAR LETHBRIDGE: 05AD007)



### Why this graph?

This graph is intended to address the questions of:

**Assessment Question 3.1: The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?**

**Assessment Question 3.2a: In a heavily allocated closed basin, how often is a WCO relevant?**

### Interpretation notes

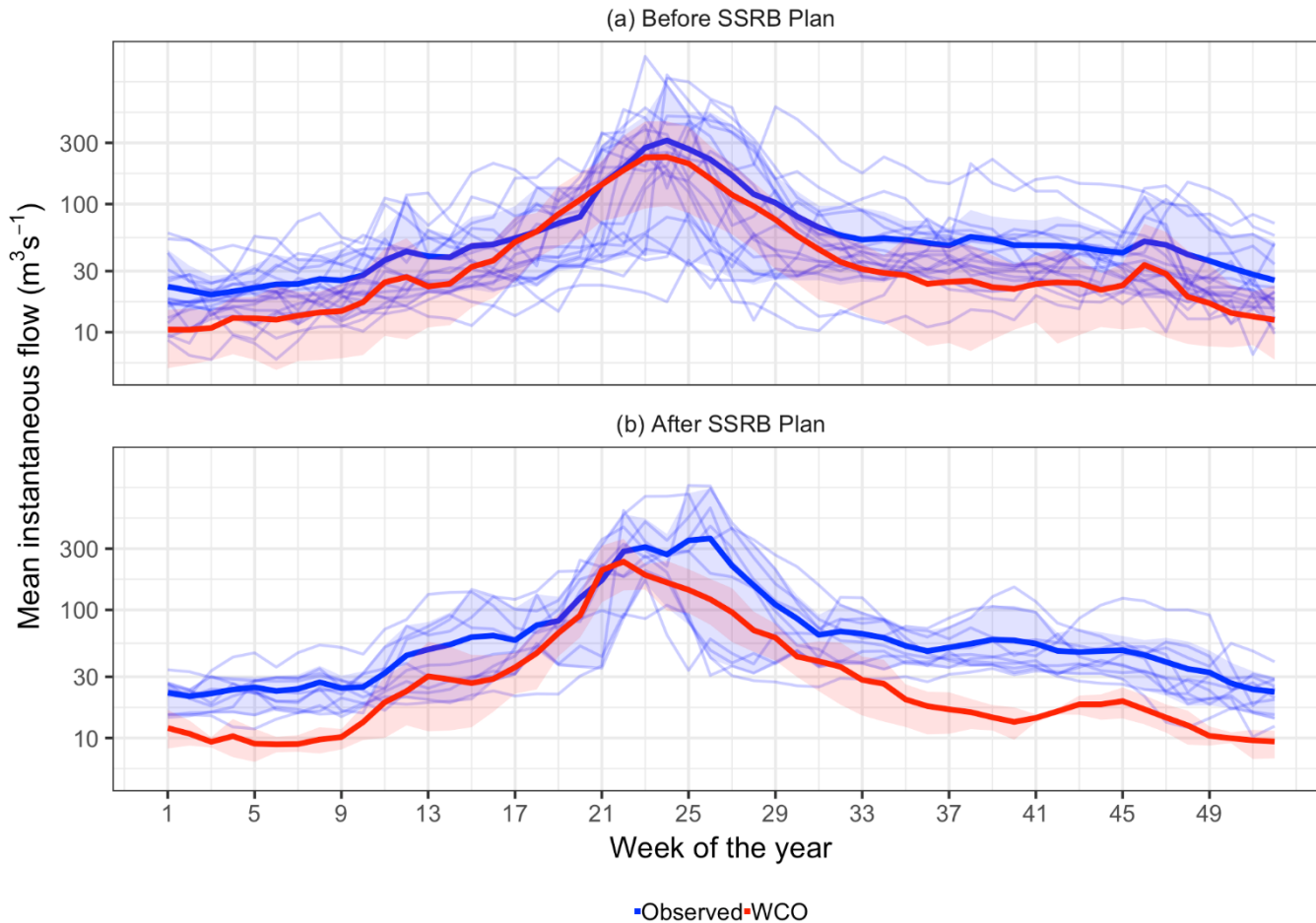
- This graph shows the range of WCO values over the period of record compared with the flows in question.
- The shaded area of the plot is the 10<sup>th</sup> to 90<sup>th</sup> percentile ranges for each dataset.
- The lightly shaded blue lines represent individual flow years.
- The heavier solid line represents the mean for each dataset.
- Any time when a “blue” line is below a “red” line, a WCO was violated.

### Methods and data

- The period of record examined was the 20-years prior to the SSRB plan and the years afterward.
- Observed data was from WSC stations and the WCO data was calculated as 45% of the naturalized instantaneous weekly flow from the AEP Naturalized Flow database, updated to 2009.



## Old Man River (OLDMAN RIVER NEAR THE MOUTH: 05AG006)



### Why this graph?

This graph is intended to address the questions of:

**Assessment Question 3.1: The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?**

**Assessment Question 3.2a: In a heavily allocated closed basin, how often is a WCO relevant?**

### Interpretation notes

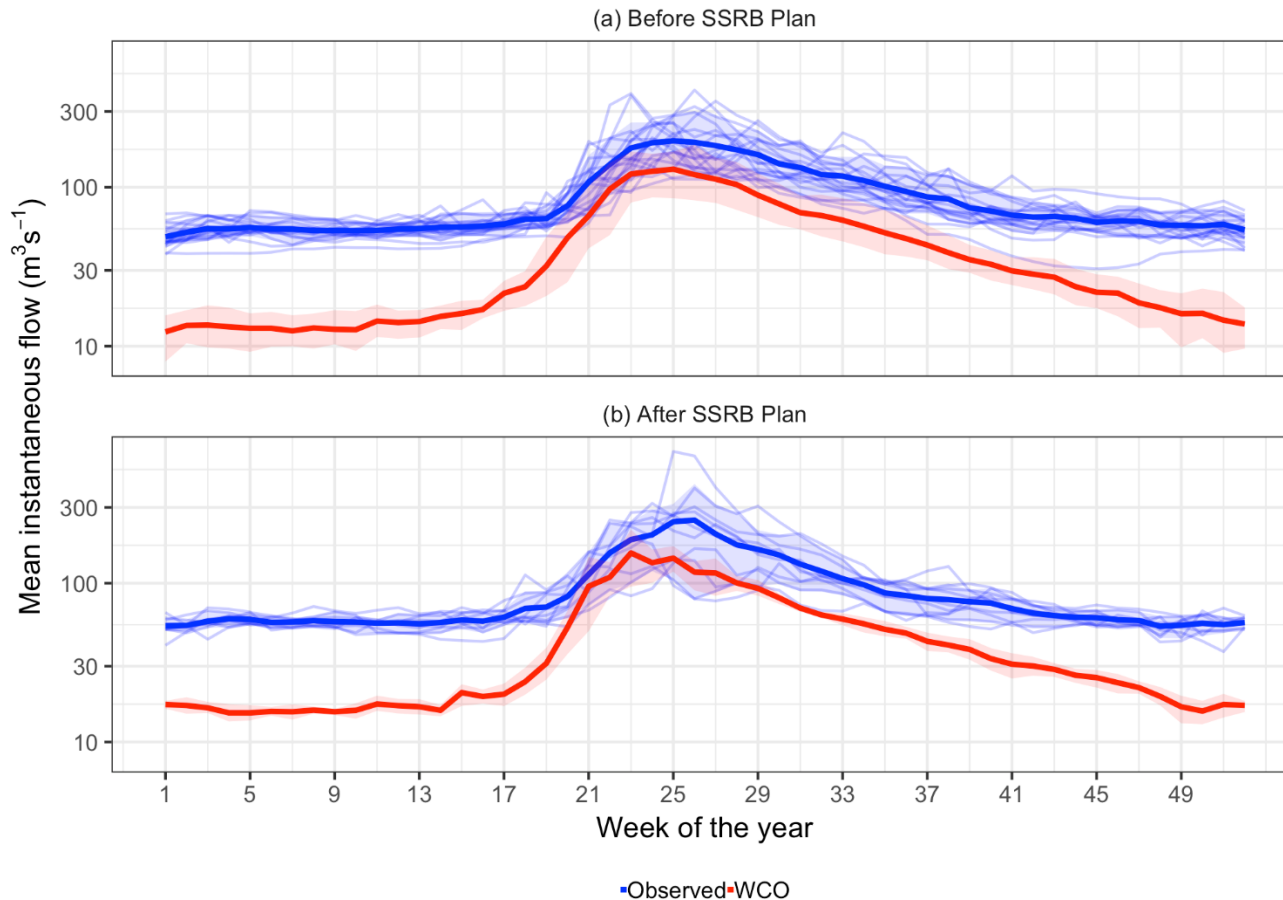
- This graph shows the range of WCO values over the period of record compared with the flows in question.
- The shaded area of the plot is the 10<sup>th</sup> to 90<sup>th</sup> percentile ranges for each dataset.
- The lightly shaded blue lines represent individual flow years.
- The heavier solid line represents the mean for each dataset.
- Any time when a “blue” line is below a “red” line, a WCO was violated.

### Methods and data

- The period of record examined was the 20-years prior to the SSRB plan and the years afterward.
- Observed data was from WSC stations and the WCO data was calculated as 45% of the naturalized instantaneous weekly flow from the AEP Naturalized Flow database, updated to 2009.

WCO values compared to observed flow records on a calendar weekly basis – Bow River stations

**Bow River (BOW RIVER AT CALGARY: 05BH004)**



**Why this graph?**

This graph is intended to address the questions of:

**Assessment Question 3.1: The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?**  
**Assessment Question 3.2a: In a heavily allocated closed basin, how often is a WCO relevant?**

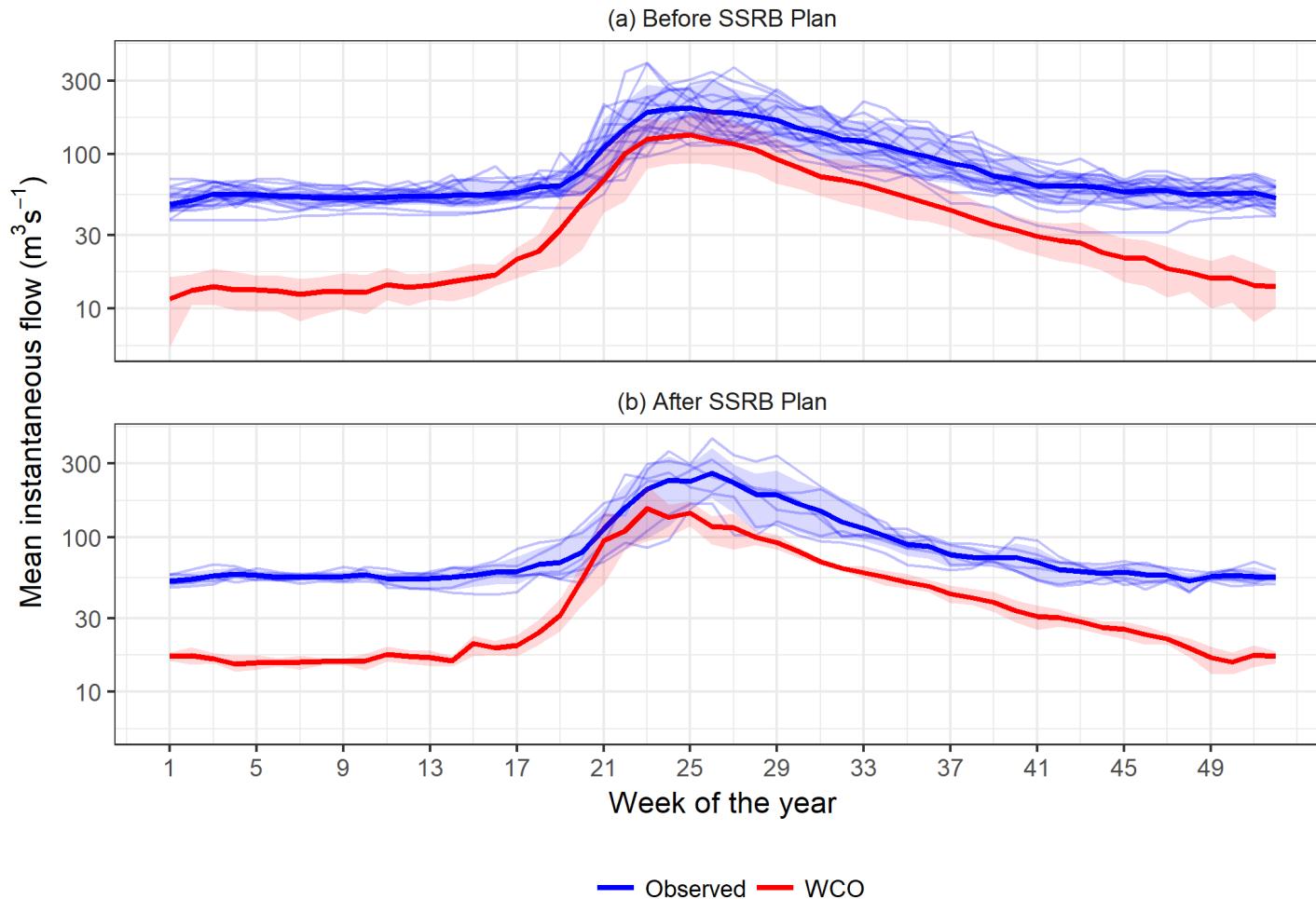
**Interpretation notes**

- This graph how the range of WCO values over the period of record compares with the flows in question.
- The shaded area of the plot is the 10<sup>th</sup> to 90<sup>th</sup> percentile ranges for each dataset.
- The lightly shaded blue lines represent individual flow years.
- The heavier solid line represents the mean for each dataset.
- Any time when a “blue” line is below a “red” line, a WCO was violated.

**Methods and data**

- The period of record examined was the 20-years prior to the SSRB plan and the years afterward.
- Observed data was from WSC stations and the WCO data was calculated as 45% of the naturalized instantaneous weekly flow from the AEP Naturalized Flow database, updated to 2009.

### Bow River (BOW RIVER BELOW BEARSPAW DAM: 05BH008)



#### Why this graph?

This graph is intended to address the questions of:

**Assessment Question 3.1: The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?**

**Assessment Question 3.2a: In a heavily allocated closed basin, how often is a WCO relevant?**

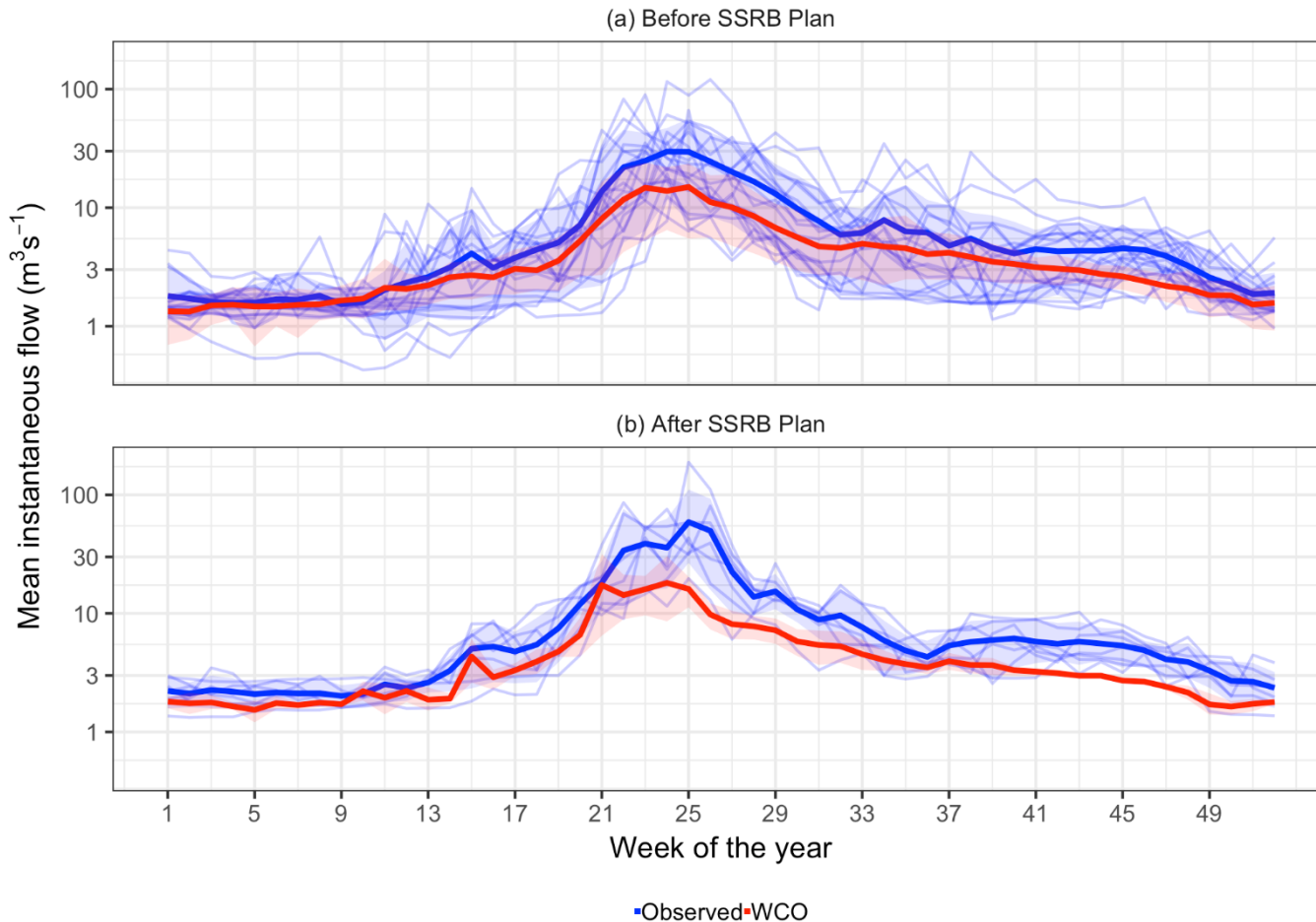
#### Interpretation notes

- This graph shows how the range of WCO values over the period of record compares with the flows in question.
- The shaded area of the plot is the 10<sup>th</sup> to 90<sup>th</sup> percentile ranges for each dataset.
- The lightly shaded blue lines represent individual flow years.
- The heavier solid line represents the mean for each dataset.
- Any time when a “blue” line is below a “red” line, a WCO was violated.

#### Methods and data

- The period of record examined was the 20-years prior to the SSRB plan and the years afterward.
- Observed data was from WSC stations and the WCO data was calculated as 45% of the naturalized instantaneous weekly flow from the AEP Naturalized Flow database, updated to 2009.

## Bow River (ELBOW RIVER BELOW GLENMORE DAM: 05BJ001)



### Why this graph?

This graph is intended to address the questions of:

**Assessment Question 3.1: The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?**

**Assessment Question 3.2a: In a heavily allocated closed basin, how often is a WCO relevant?**

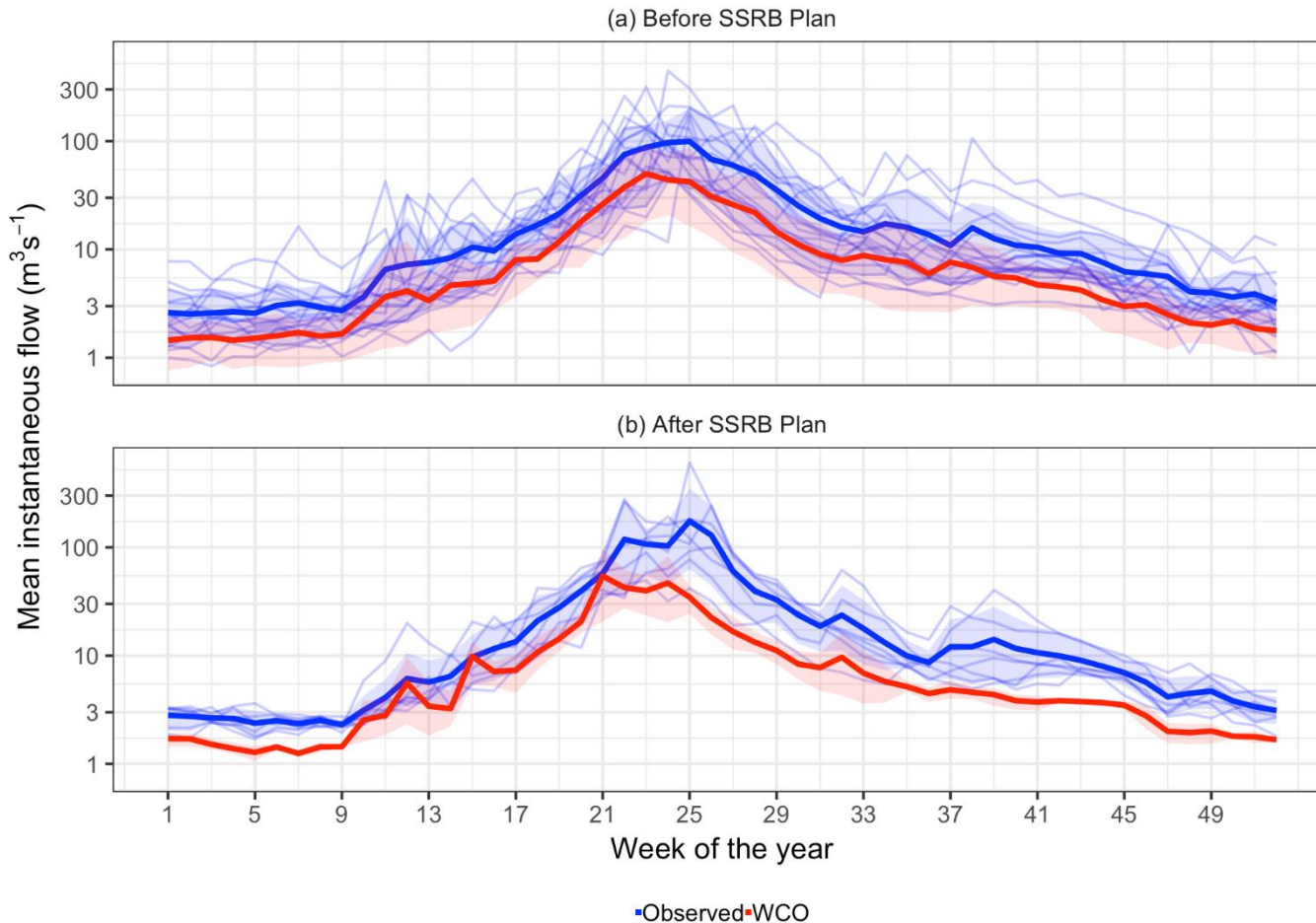
### Interpretation notes

- This graph shows the range of WCO values over the period of record compared with the flows in question.
- The shaded area of the plot is the 10<sup>th</sup> to 90<sup>th</sup> percentile ranges for each dataset.
- The lightly shaded blue lines represent individual flow years.
- The heavier solid line represents the mean for each dataset.
- Any time when a “blue” line is below a “red” line, a WCO was violated.

### Methods and data

- The period of record examined was the 20-years prior to the SSRB plan and the years afterward.
- Observed data was from WSC stations and the WCO data was calculated as 45% of the naturalized instantaneous weekly flow from the AEP Naturalized Flow database, updated to 2009.

## Bow River (HIGHWOOD RIVER NEAR THE MOUTH: 05BL024)



### Why this graph?

This graph is intended to address the questions of:

**Assessment Question 3.1: The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?**

**Assessment Question 3.2a: In a heavily allocated closed basin, how often is a WCO relevant?**

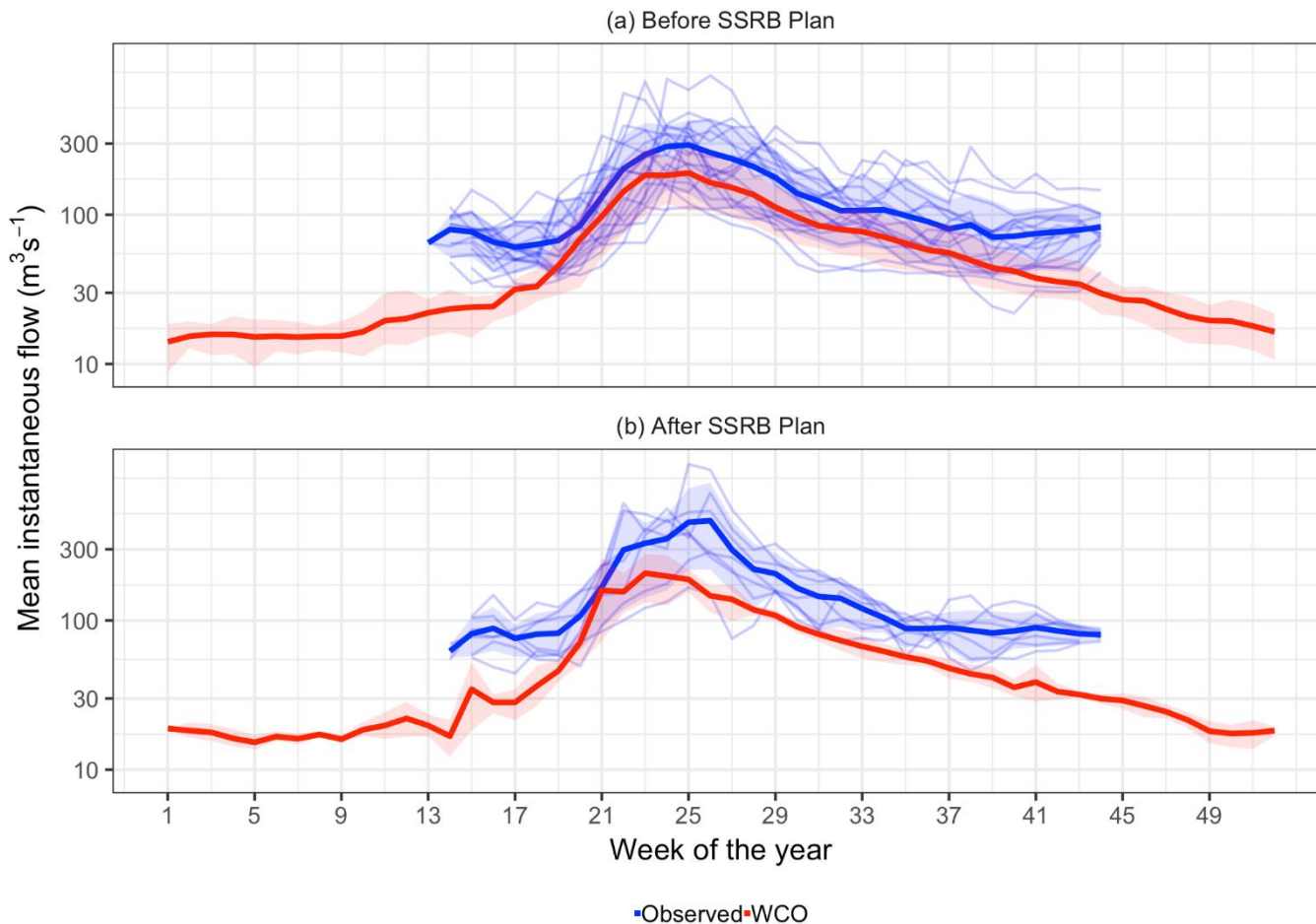
### Interpretation notes

- This graph shows the range of WCO values over the period of record compared with the flows in question.
- The shaded area of the plot is the 10<sup>th</sup> to 90<sup>th</sup> percentile ranges for each dataset.
- The lightly shaded blue lines represent individual flow years.
- The heavier solid line represents the mean for each dataset.
- Any time when a “blue” line is below a “red” line, a WCO was violated.

### Methods and data

- The period of record examined was the 20-years prior to the SSRB plan and the years afterward.
- Observed data was from WSC stations and the WCO data was calculated as 45% of the naturalized instantaneous weekly flow from the AEP Naturalized Flow database, updated to 2009.

## Bow River (BOW RIVER BELOW CARSELAND DAM: 05BM002)



### Why this graph?

This graph is intended to address the questions of:

**Assessment Question 3.1: The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?**

**Assessment Question 3.2a: In a heavily allocated closed basin, how often is a WCO relevant?**

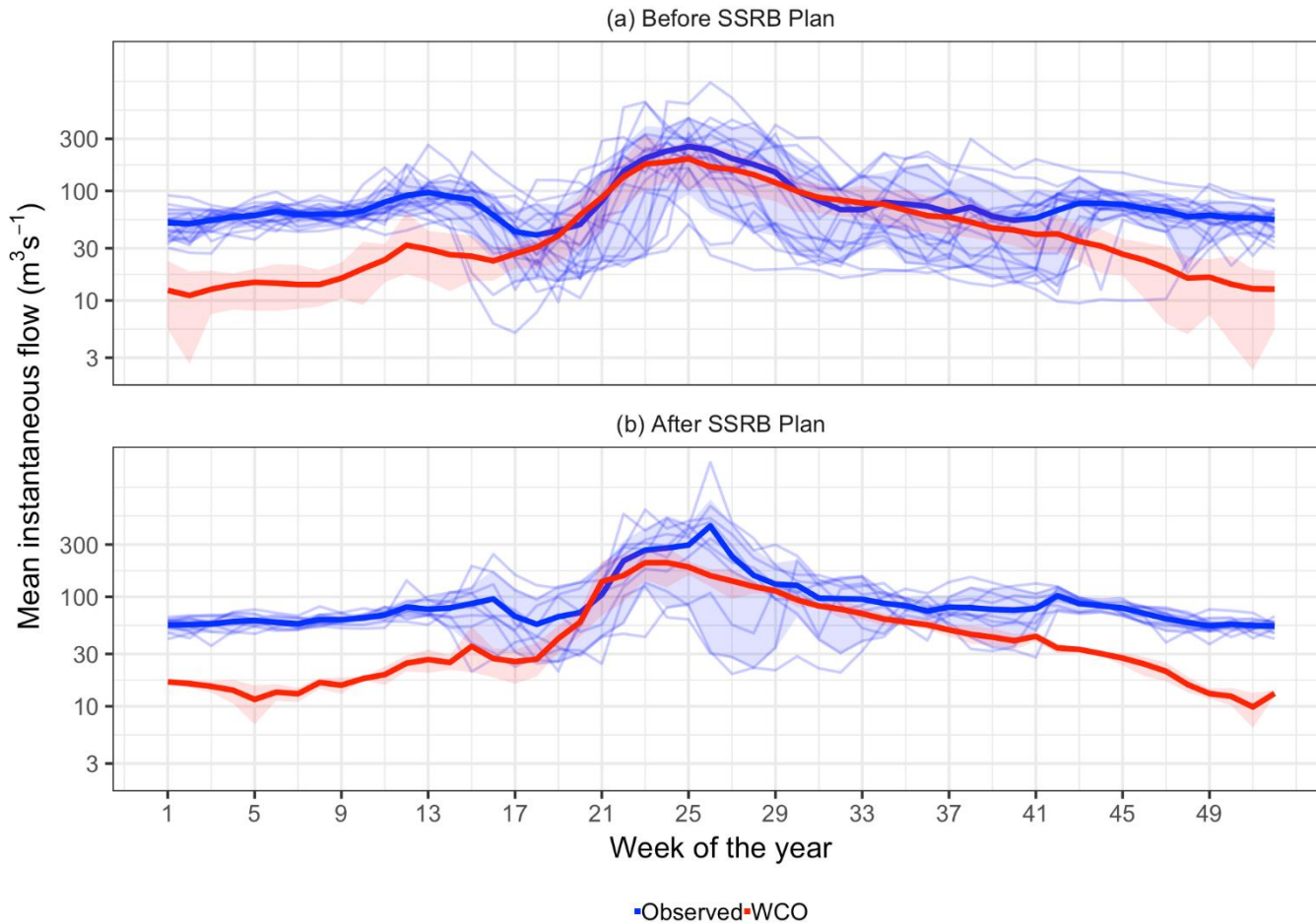
### Interpretation notes

- This graph shows the range of WCO values over the period of record compared with the flows in question.
- The shaded area of the plot is the 10<sup>th</sup> to 90<sup>th</sup> percentile ranges for each dataset.
- The lightly shaded blue lines represent individual flow years.
- The heavier solid line represents the mean for each dataset.
- Any time when a “blue” line is below a “red” line, a WCO was violated.

### Methods and data

- The period of record examined was the 20-years prior to the SSRB plan and the years afterward.
- Observed data was from WSC stations and the WCO data was calculated as 45% of the naturalized instantaneous weekly flow from the AEP Naturalized Flow database, updated to 2009.

### Bow River (BOW RIVER NEAR THE MOUTH: 05BN012)



#### Why this graph?

This graph is intended to address the questions of:

**Assessment Question 3.1: The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?**  
**Assessment Question 3.2a: In a heavily allocated closed basin, how often is a WCO relevant?**

#### Interpretation notes

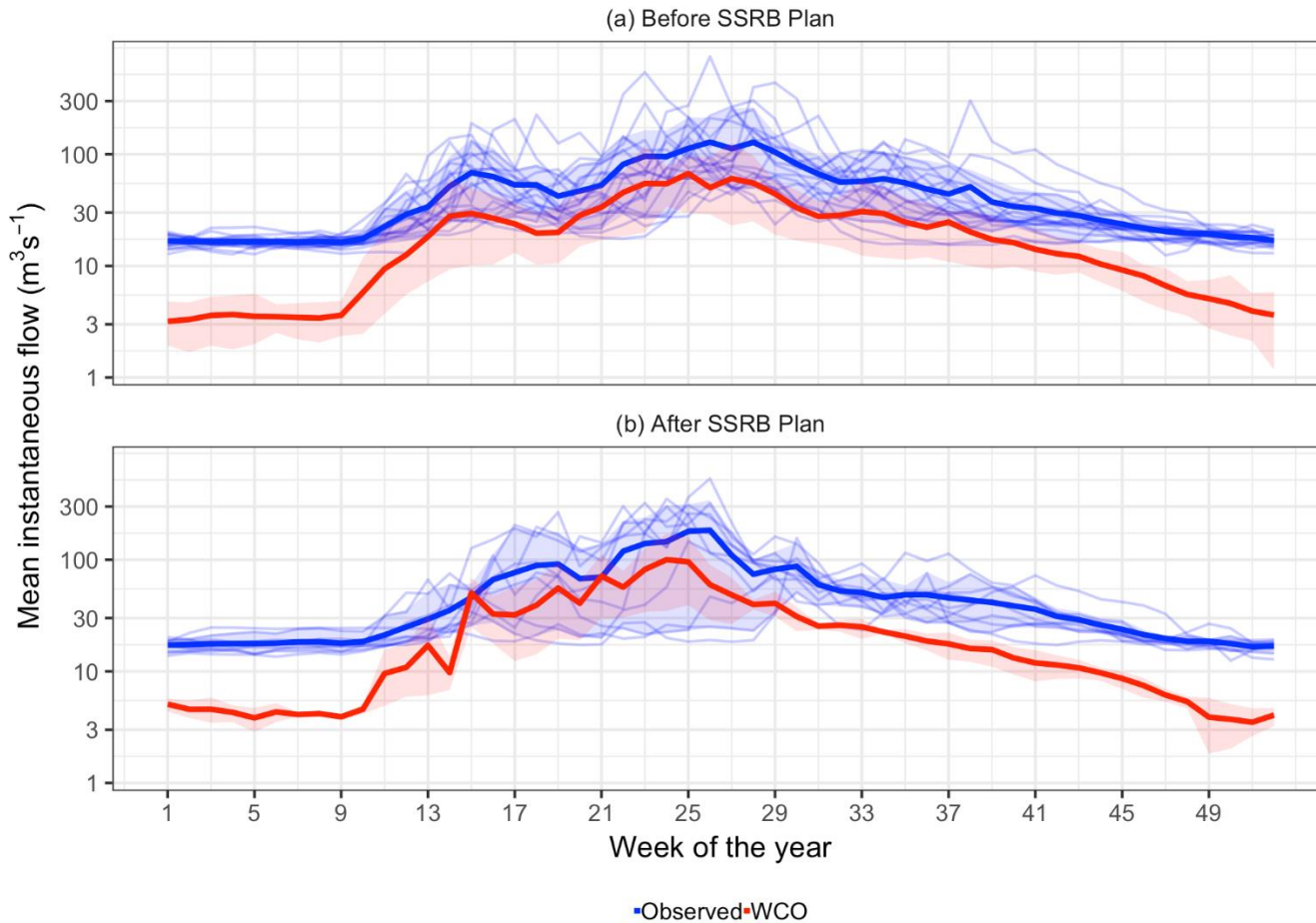
- This graph shows the range of WCO values over the period of record compared with the flows in question.
- The shaded area of the plot is the 10<sup>th</sup> to 90<sup>th</sup> percentile ranges for each dataset.
- The lightly shaded blue lines represent individual flow years.
- The heavier solid line represents the mean for each dataset.
- Any time when a “blue” line is below a “red” line, a WCO was violated.

#### Methods and data

- The period of record examined was the 20-years prior to the SSRB plan and the years afterward.
- Observed data was from WSC stations and the WCO data was calculated as 45% of the naturalized instantaneous weekly flow from the AEP Naturalized Flow database, updated to 2009.

WCO values compared to observed flow records on a calendar weekly basis – Red Deer River stations

Red Deer River (RED DEER RIVER AT RED DEER: 05CC002)



Why this graph?

This graph is intended to address the questions of:

**Assessment Question 3.1: The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?**  
**Assessment Question 3.2a: In a heavily allocated closed basin, how often is a WCO relevant?**

Interpretation notes

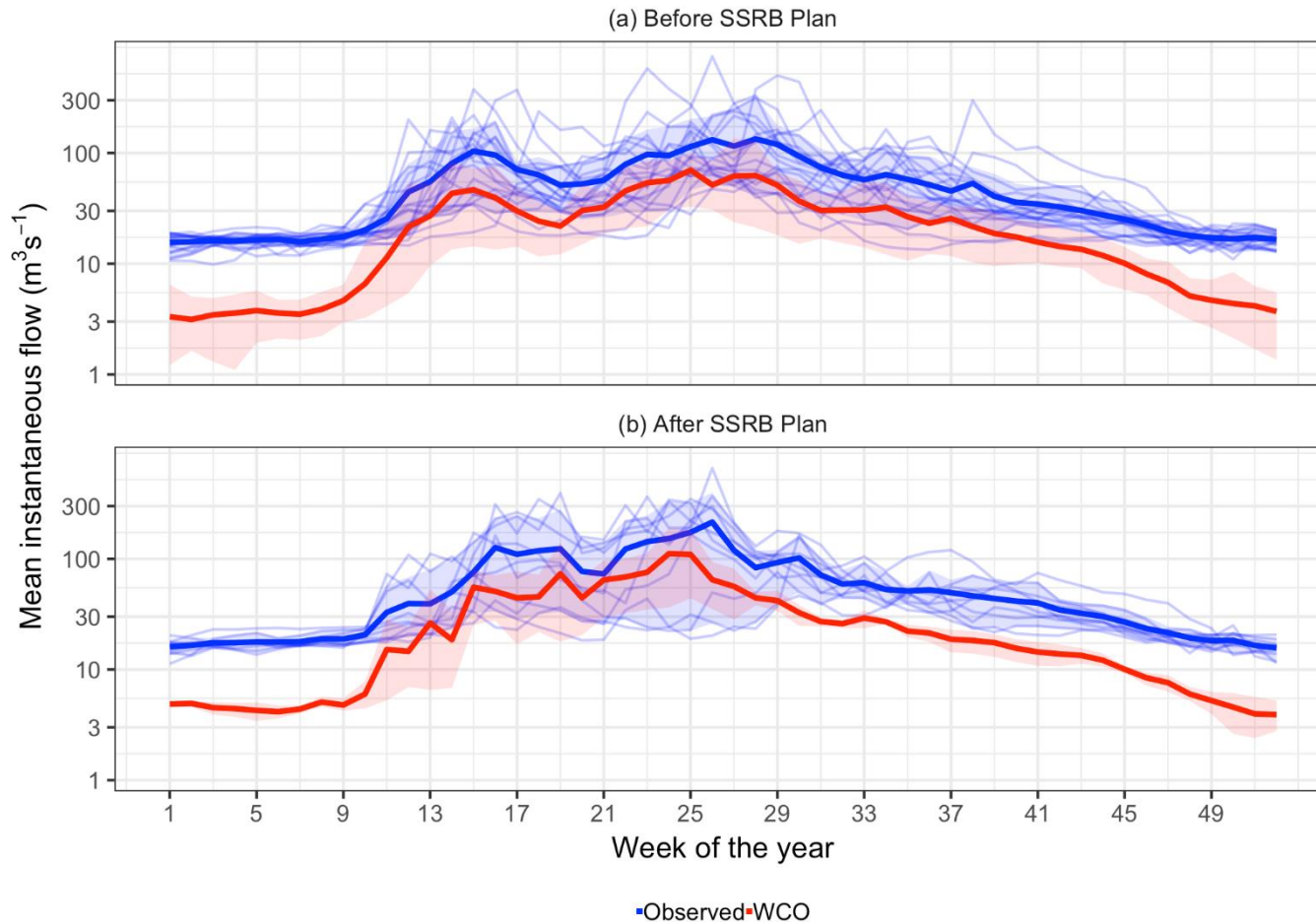
- This graph how the range of WCO values over the period of record compares with the flows in question.
- The shaded area of the plot is the 10<sup>th</sup> to 90<sup>th</sup> percentile ranges for each dataset.
- The lightly shaded blue lines represent individual flow years.
- The heavier solid line represents the mean for each dataset.
- Any time when a “blue” line is below a “red” line, a WCO was violated.

Methods and data

- The period of record examined was the 20-years prior to the SSRB plan and the years afterward.
- Observed data was from WSC stations and the WCO data was calculated as 45% of the naturalized instantaneous weekly flow from the AEP Naturalized Flow database, updated to 2009.



## Red Deer River (RED DEER RIVER AT DRUMHELLER: 05CE001)



### Why this graph?

This graph is intended to address the questions of:

**Assessment Question 3.1: The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?**

**Assessment Question 3.2a: In a heavily allocated closed basin, how often is a WCO relevant?**

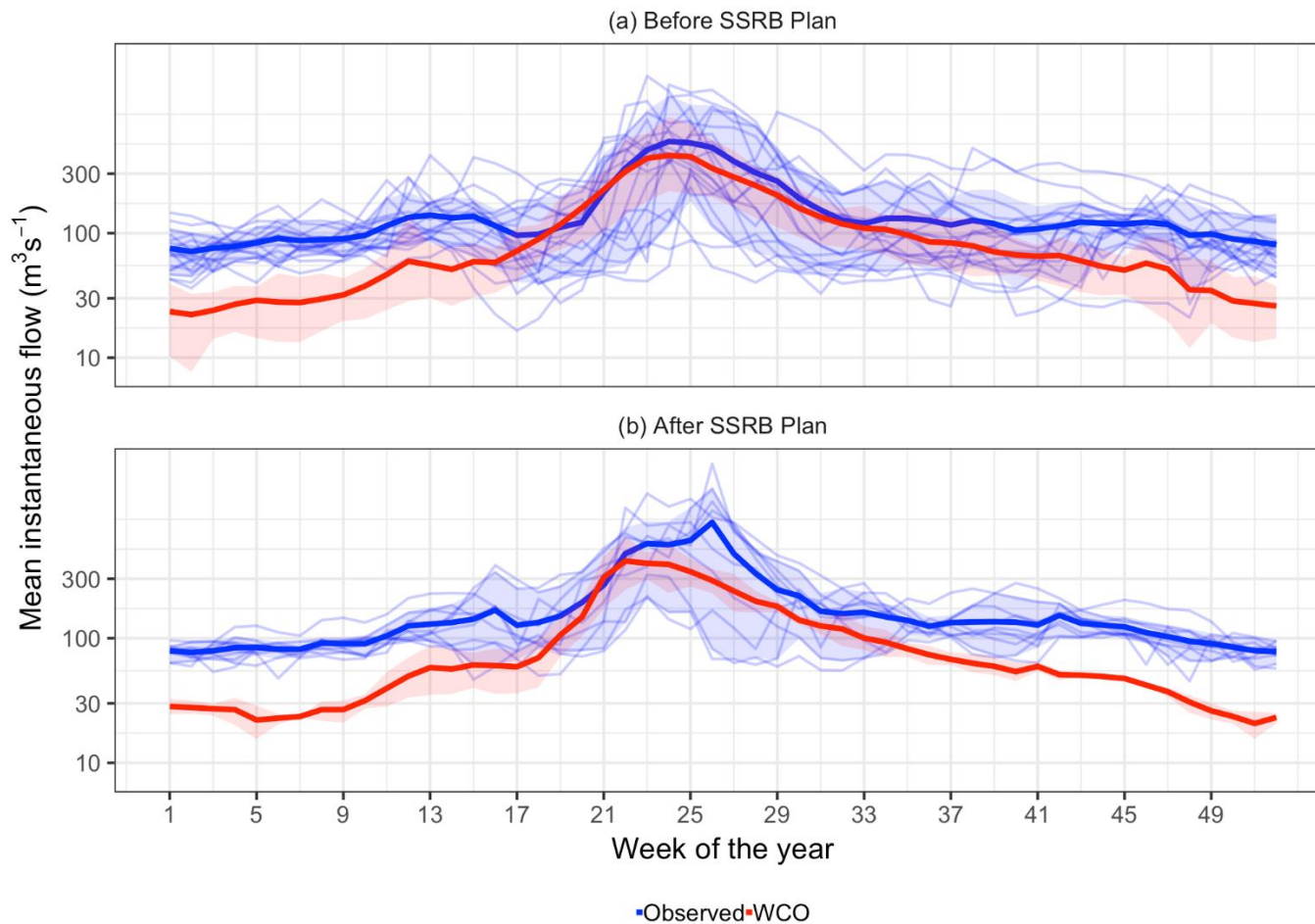
### Interpretation notes

- This graph shows how the range of WCO values over the period of record compares with the flows in question.
- The shaded area of the plot is the 10<sup>th</sup> to 90<sup>th</sup> percentile ranges for each dataset.
- The lightly shaded blue lines represent individual flow years.
- The heavier solid line represents the mean for each dataset.
- Any time when a “blue” line is below a “red” line, a WCO was violated.

### Methods and data

- The period of record examined was the 20-years prior to the SSRB plan and the years afterward.
- Observed data was from WSC stations and the WCO data was calculated as 45% of the naturalized instantaneous weekly flow from the AEP Naturalized Flow database, updated to 2009.

WCO values compared to observed flow records on a calendar weekly basis – South Saskatchewan station (South Sask. River at Medicine Hat - 05AJ001)



Why this graph?

This graph is intended to address the questions of:

- Assessment Question 3.1: The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?**
- Assessment Question 3.2a: In a heavily allocated closed basin, how often is a WCO relevant?**

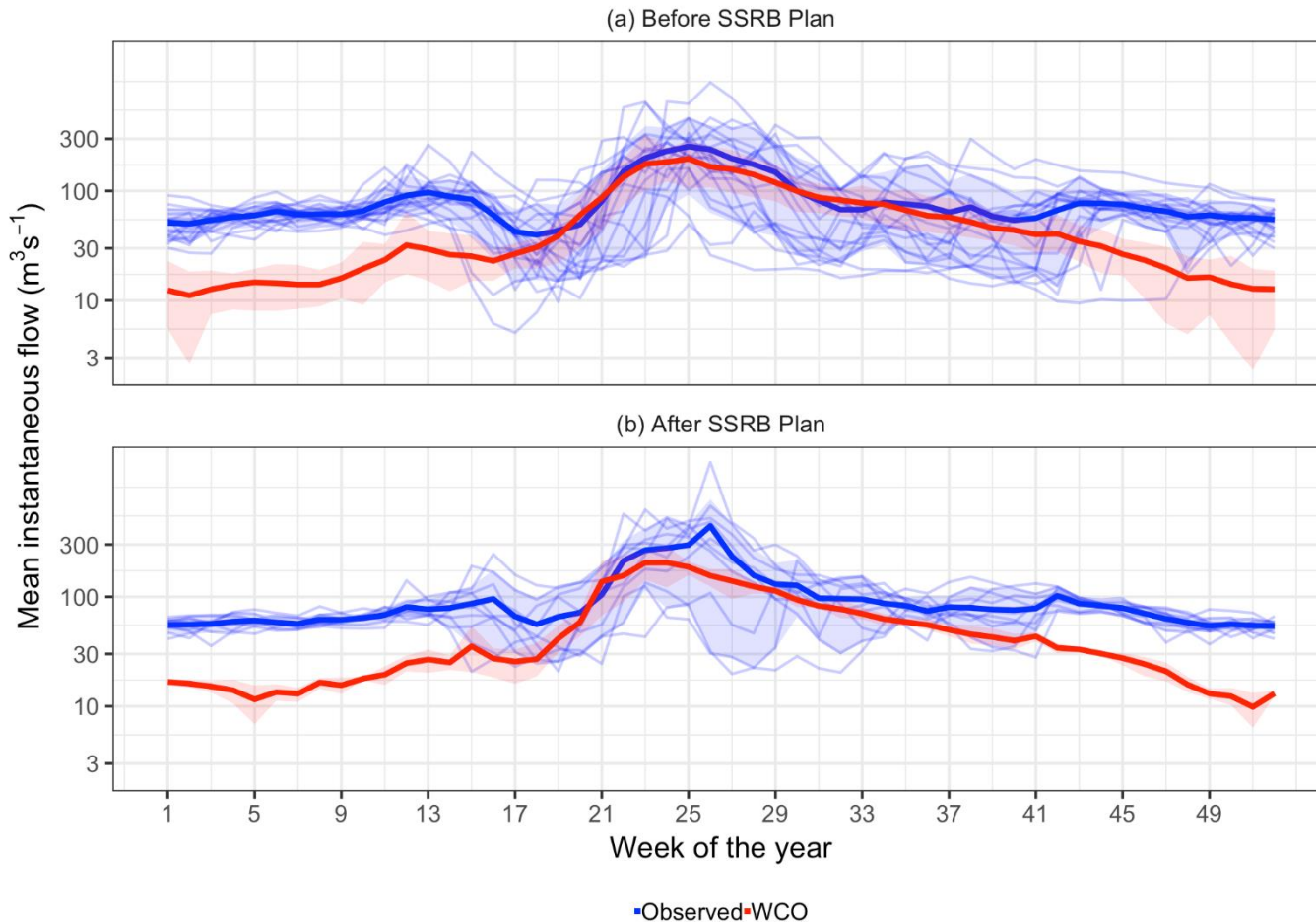
Interpretation notes

- This graph shows the range of WCO values over the period of record compared with the flows in question.
- The shaded area of the plot is the 10<sup>th</sup> to 90<sup>th</sup> percentile ranges for each dataset.
- The lightly shaded blue lines represent individual flow years.
- The heavier solid line represents the mean for each dataset.
- Any time when a “blue” line is below a “red” line, a WCO was violated.

Methods and data

- The period of record examined was the 20-years prior to the SSRB plan and the years afterward.
- Observed data was from WSC stations and the WCO data was calculated as 45% of the naturalized instantaneous weekly flow from the AEP Naturalized Flow database, updated to 2009.

## Bow River (BOW RIVER NEAR THE MOUTH: 05BN012)



### Why this graph?

This graph is intended to address the questions of:

**Assessment Question 3.1: The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?**  
**Assessment Question 3.2a: In a heavily allocated closed basin, how often is a WCO relevant?**

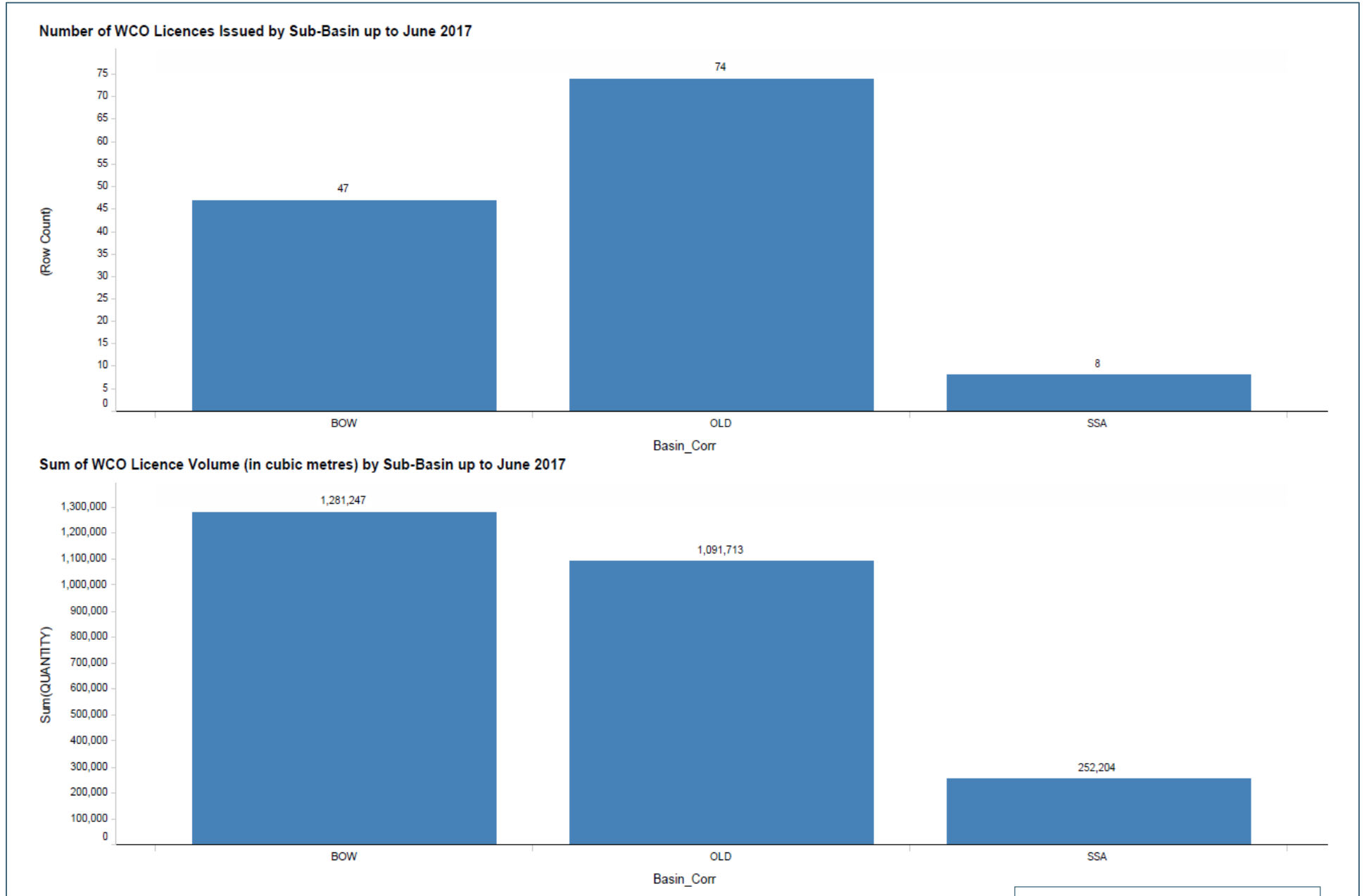
### Interpretation notes

- This graph shows the range of WCO values over the period of record compared with the flows in question.
- The shaded area of the plot is the 10<sup>th</sup> to 90<sup>th</sup> percentile ranges for each dataset.
- The lightly shaded blue lines represent individual flow years.
- The heavier solid line represents the mean for each dataset.
- Any time when a “blue” line is below a “red” line, a WCO was violated.

### Methods and data

- The period of record examined was the 20-years prior to the SSRB plan and the years afterward.
- Observed data was from WSC stations and the WCO data was calculated as 45% of the naturalized instantaneous weekly flow from the AEP Naturalized Flow database, updated to 2009.

### Graph of count and volumes of WCO licenses issued by sub-basin up to June 2017



Source: Graph provided by AEP

## Recommendation 2.7: Use of Water Allocation Transfers, Water Conservation Holdbacks and Factors that Must be Considered When Making Decisions

### Summary table of water transfers in the Bow River Basin and Old Man River Basins

#### Why this table?

This table is intended to address the questions of:

- Assessment Question 5.7: How often have transfers involved a change in purpose/timing/location? (including movement between tributaries and main stem, change from seasonal to year-round use)
- Assessment Question 5.8: Are the 10% holdbacks being used?

#### Interpretation notes

- The following table summarizes the total volume transferred, count of transfers and volume held back by the GoA for various types of transfers in the basin.
- All transfers were after 2006.
- \*Note that the raw data did not code each transfer by basin, but rather by AEP office that processed the application. It was assumed that all transfers from the Calgary office were for the Bow River Basin and those from the Lethbridge office were for the Old Man River Basin.

#### Bow River Basin allocation transfers\*

Transfer from	Transfer to	Volume Transferred (dam <sup>3</sup> )	Volume held back (dam <sup>3</sup> )	Number of transfers
Agricultural (Stock watering)	Irrigation (Crop, Grain)	40	4	1
Agricultural (Stock watering)	Municipal (Village/Summer Village/Town/Hamlet/City)	6	0.6	1
Commercial (Golf Course)	Commercial (Golf Course)	133	15	2
Commercial (Golf Course)	Municipal (Subdivisions, Rural)	167	19	1
Commercial (Parks)	Commercial (Golf Course)	75	8	3
Commercial (Water Bottling)	Commercial (Gardening, Market Gardens, Greenhouses, Sod)	7	0.0	1
Habitat Enhancement (Wetlands)	Agricultural (Feedlot)	1110	123	1
Industrial (Oilfield Injection)	Municipal (Village/Summer Village/Town/Hamlet/City)	216	24	1
Irrigation (Crop, Grain)	Agricultural (Feedlot)	251	0.0	1
Irrigation (Crop, Grain)	Commercial (Aggregate Washing)	158	18	1
Irrigation (Crop, Grain)	Commercial (Golf Course)	64	3	2

Transfer from	Transfer to	Volume Transferred (dam <sup>3</sup> )	Volume held back (dam <sup>3</sup> )	Number of transfers
Irrigation (Crop, Grain)	Commercial (Water Bottling)	62	7	1
Irrigation (Crop, Grain)	Irrigation (Crop, Grain)	647	73	5
Irrigation (Crop, Grain)	Municipal (Single-Multi-Homes/Farmsteads)	1110	123	1
Irrigation (Crop, Grain)	Municipal (Subdivisions (Rural))	771	86	5
Irrigation (Crop, Grain)	Municipal (Village/Summer, Village/Town/Hamlet/City)	2378	264	6
Irrigation (Crop, Grain)	Recreation (Fairgrounds/Entertainment Centres, etc.)	51	0.2	3
Management of Fish (Fish, Fish Farms/Hatcheries)	Municipal (Subdivisions, Rural)	278	31	1
Management of Fish (Fish, Fish Farms/Hatcheries)	Other Purpose Specified by the Director (Specified by the Director)	1149	128	2
Municipal (Condo/Townhouse Complexes, Hotels/Motels)	Municipal (Subdivisions, Rural)	56	6	2
Municipal (Single-Multi-Homes/Farmsteads)	Recreation (Fairgrounds/Entertainment Centres, etc.)	2	0.4	1
Municipal (Subdivisions, Rural)	Municipal (Subdivisions, Rural)	455	11	2
Municipal (Village/Summer Village/Town/Hamlet/City)	Municipal (Subdivisions, Rural)	185	11	6
Municipal (Village/Summer Village/Town/Hamlet/City)	Municipal (Village/Summer Village/Town/Hamlet/City)	3114	247	6
Recreation (Fairgrounds/Entertainment Centres, etc.)	Recreation (Fairgrounds/Entertainment Centres, etc.)	5	0.5	1

**Bow River Basin summary of allocation transfers by transferee type\***

Transferee Group	Volume Transferred (dam <sup>3</sup> )	Number of transfers
Agriculture / Irrigation Swaps	938	7
To Commercial	499	10
To Municipal	8735	32
To Other Purpose Specified by the Director	1149	2
To Recreation	58	5
Habitat Enhancement to Agriculture	1110	1
<u>Total</u>	<u>12488</u>	<u>57</u>

Old Man River Basin allocation transfers\*

Transfer from	Transfer to	Volume Transferred (dam <sup>3</sup> )	Volume held back (dam <sup>3</sup> )	Number of transfers
Agricultural (Feedlot)	Irrigation (Crop, Grain)	12	1	1
Irrigation (Crop, Grain)	Agricultural (Feedlot)	194	17	4
Irrigation (Crop, Grain)	Agricultural (Stock watering)	37	0.8	5
Irrigation (Crop, Grain)	Commercial (Gardening, Market Gardens, Greenhouses, Sod)	17	2	1
Irrigation (Crop, Grain)	Commercial (Golf Course)	44	5	1
Irrigation (Crop, Grain)	Commercial (Other: Abattoirs, Dust Control, Bridge Washing)	280	31	2
Irrigation (Crop, Grain)	Irrigation (Crop, Grain)	13524	769	65
Irrigation (Crop, Grain)	Municipal (Other: Fire protection, etc.)	64	7	2
Irrigation (Crop, Grain)	Municipal (Single-Multi-Homes/Farmsteads (not sub),)	2454	94	7
Irrigation (Crop, Grain)	Municipal (Subdivisions (Rural))	942	105	6
Irrigation (Crop, Grain)	Municipal (Village/Summer Village/Town/Hamlet/City)	749	129	5
Irrigation (Crop, Grain)	Other Purpose Specified by the Director (Specified by the Director)	170	13	6
Municipal (Single-Multi-Homes/Farmsteads)	Agricultural (Feedlot)	26	0	1
Municipal (Single-Multi-Homes/Farmsteads)	Municipal (Single-Multi-Homes/Farmsteads (not sub),)	10	5	1
Municipal (Single-Multi-Homes/Farmsteads)	Municipal (Village/Summer Village/Town/Hamlet/City)	705	0	1
Municipal (Single-Multi-Homes/Farmsteads)	Other Purpose Specified by the Director (Specified by the Director)	8	0	1
Municipal (Subdivisions, Rural)	Agricultural (Stock watering)	6	0	1
Municipal (Subdivisions, Rural)	Municipal (Single-Multi-Homes/Farmsteads)	8	1	7
Municipal (Subdivisions, Rural)	Municipal (Subdivisions, Rural)	571	8	2
Municipal (Subdivisions, Rural)	Municipal (Village/Summer Village/Town/Hamlet/City)	84	0	1
Municipal (Village/Summer Village/Town/Hamlet/City)	Municipal (Single-Multi-Homes/Farmsteads (not sub),)	33	0	1

Transfer from	Transfer to	Volume Transferred (dam <sup>3</sup> )	Volume held back (dam <sup>3</sup> )	Number of transfers
Municipal (Village/Summer Village/Town/Hamlet/City)	Municipal (Subdivisions (Rural))	17	0	2
Municipal (Village/Summer Village/Town/Hamlet/City)	Municipal (Village/Summer Village/Town/Hamlet/City)	6322	312	14
Municipal (Village/Summer Village/Town/Hamlet/City)	Other Purpose Specified by the Director (Specified by the Director)	7	0.7	14

Old Man River Basin summary of allocation transfers by transferee type\*

Transferee Group	Volume Transferred (dam <sup>3</sup> )	Number of transfers
Agriculture / Irrigation Swaps	13799	77
To Commercial	341	4
To Municipal	11959	49
To Other Purpose Specified by the Director	184	21
<u>Grand Total</u>	<u>26283</u>	<u>151</u>

Summary table of spatial movement of water transfers in the SSRB

Why this table?

This table is intended to address the question where transfers are taking place in the SSRB.

Interpretation notes

- The following table summarizes the total volume transferred and held back and count of transfers for transfers moving between water bodies in the SSRB. Based on that information, an initial attempt has been made to interpret the spatial change and directional movement of the transfer.
- All transfers were after 2006.

Basin	Water Bodies	Transfer Volume	Holdback Volume	# of Transfers	Interpreted: Spatial change	Interpreted: Direction
BOW->BOW	Aquifer->Aquifer	91,279	8793	4	No change	-
BOW->BOW	Aquifer->Bow River	98145	10904	5	??	?
BOW->BOW	Aquifer->Sheep River	527790	0	1	??	?
BOW->BOW	Bow River->Bow River	8120792	829505	22	No change	?
BOW->BOW	Bow River->Unnamed Stream - Unclassified	9000	1000	1	Mainstem to trib	?



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BOW->BOW	Elbow River->Elbow River	91984	617	2	No change	-
BOW->BOW	Fish Creek->Fish Creek	98678	11841	1	No change	-
BOW->BOW	Highwood River->Highwood River	1583050	175894	3	No change	-
BOW->BOW	Sheep River->Sheep River	412527	45837	5	No change	-
BOW->BOW	Threepoint Creek->Threepoint Creek	3719	247	2	No change	-
OLD->OLD	Belly River->Belly River	4169480.3	239120	29	No change	-
OLD->OLD	Crooked Creek->Unnamed Aquifer - Unclassified	86309	11235	1	??	?
OLD->OLD	Lee Creek->Lee Creek	1499999	166667	1	No change	-
OLD->OLD	Little Bow River->Little Bow River	1659998.7	129656	21	No change	-
OLD->OLD	Mosquito Creek->Mosquito Creek	61097.25	6788	2	No change	-
OLD->OLD	Oldman River->Oldman River	9273439.1	246795	36	No change	-
OLD->OLD	Rolph Creek->Rolph Creek	22202.7	2467	1	No change	-
OLD->OLD	Springhill Creek->Springhill Creek	33333	0	1	No change	-
OLD->OLD	Sqauw Coulee->Sqauw Coulee	86344	0	1	No change	-
OLD->OLD	St. Mary River->St. Mary River	43333	4815	3	No change	-
OLD->OLD	Unnamed Aquifer - Unclassified->Unnamed Aquifer - Unclassified	7834	0	7	??	?
OLD->OLD	Unnamed Aquifer - Unclassified->Waterton River	5500	1481	1	??	?
OLD->OLD	Waterton River->Waterton River	92222	10247	2	No change	-
OLD->OLD	Willow Creek (009-25-W4 to 014-02-W5)->Willow Creek (009-25-W4 to 014-02-W5)	1599124.7	159925	9	No change	-
SSA->SSA	South Saskatchewan River->South Saskatchewan River	2890340.3	224426	12	No change	-
BOW->BOW	Bow River->Sheep River	124913	13878	3	Mainstem to upstream trib	?
BOW->BOW	Lott Creek->Bow River	732688	81410	1	Upstream trib to mainstem	?
BOW->BOW	Lott Creek->Elbow River	277533	30837	1	Upstream trib to mainstem	?
BOW->BOW	Lott Creek->Highwood River	416307	46256	1	Upstream trib to downstream trib	Downstream
BOW->BOW	Policeman Creek->Bow River	55507	6167	2	Upstream trib to mainstem	?
BOW->BOW	Sheep River->Bow River	111013	12335	1	Central trib to mainstem	?
BOW->BOW	Sheep River->Goat Creek	86344	0	2	Central trib to upstream trib	Upstream
OLD->OLD	Cow Creek (06-008-01-W5)->Oldman River	376529	41837	2	Downstream trib to mainstem	?
OLD->OLD	Rolph Creek->St. Mary River	272222	30247	3	Downstream trib to mainstem	?
OLD->OLD	St. Mary River->Oldman River	2402205	76543	5	Southern trib to mainstem	?

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OLD->OLD	Todd Creek->Oldman River	29975	3330	1	Downstream trib to mainstem	?
OLD->OLD	Waterton River->Belly River	32963	3296	1	Southern trib to southern trib	?
OLD->SSA	St. Mary River->South Saskatchewan River	36960	0	1	Southern trib to mainstem	Downstream
SSA->BOW	South Saskatchewan River->Bow River	140478	15609	2	Downstream mainstem to upstream mainstem	Upstream
SSA->OLD	South Saskatchewan River->Oldman River	648125	53221	4	Downstream mainstem to upstream mainstem	Upstream
Unknown	Unknown	460182	0	5	??	?

## Recommendation 2.8: Water Management Strategies

This recommendation addresses aspects of water management related to water demand and consumption, flow restoration and improvements to the aquatic environment. Several existing official reports on these topics exist and key elements of those have been extracted in this section to provide an overview of water management strategies in the Bow Basin, as follows:

- Appendix C – Summary of Water Use Data by Sector from the Alberta Water Council’s “Looking Back: Evaluating Sector Improvements in Water Conservation, Efficiency and Productivity” report;
- Table 7 showing Gross Annual Diversions, Expansion Limits, and License Allocations to Irrigation Districts and Table 8 showing Irrigation Districts Water Balance in 2016 from AF’s “Alberta Irrigation Information 2016” report; and
- The summary charts from Calgary, Medicine Hat and Lethbridge showing total diversion, allocation and returns – data submitted to AEP.

Water Use Data by Sector

This table is Appendix C from the Albert Water Council's 2016 *Looking Back: Evaluating Sector Improvements in Water Conservation, Efficiency and Productivity* report.

	Chemical	Downstream Petroleum	Forestry	Irrigation	Oil and Gas	Power Generation	Urban Municipalities
Baseline year	2005	2002-2004 average	2000	2005	2002-2004 average	2000-2002 average	2005
Water diversion (Mm <sup>3</sup> )	36.5	11.4	146	2 186	183	Not available*	Not available*
Return flow (Mm <sup>3</sup> )	9.8	3.9	131	459	Not significant	Not available*	Not available*
Net use (Mm <sup>3</sup> )	26.7	7.5	15	1 727	183	100.3	Not available*
Production output	Not available*	22.7 Mm <sup>3</sup> crude oil	2.4 million dry metric tonnes pulp	0.488 million hectares	92.5 Mm <sup>3</sup> oil equivalent	59 TWh	Population = 3,182,178

	Chemical	Downstream Petroleum	Forestry	Irrigation	Oil and Gas	Power Generation	Urban Municipalities
Reporting year	2014	2014	2014	2014	2014	2014	2015
Water diversion (Mm <sup>3</sup> )	28.8	11.2	132	1 612	201	Not available*	Not available*
Return flow (Mm <sup>3</sup> )	5.0	4.0	123	409	Not significant	Not available*	Not available*
Net use (Mm <sup>3</sup> )	23.8	7.2	9	1 203	201	80.3	Not available*
Production output	Not available*	25.4 Mm <sup>3</sup> crude oil	2.6 million dry metric tonnes pulp	0.493 million hectares	168.2 Mm <sup>3</sup> oil equivalent	82 TWh	Population = 4,196,500

Gross Annual Diversions, Expansion Limits, and License Allocations to Irrigation Districts

This table from the GoA's 2016 *Alberta Irrigation Information* report provides a summary of river diversions for irrigation by Irrigation district.

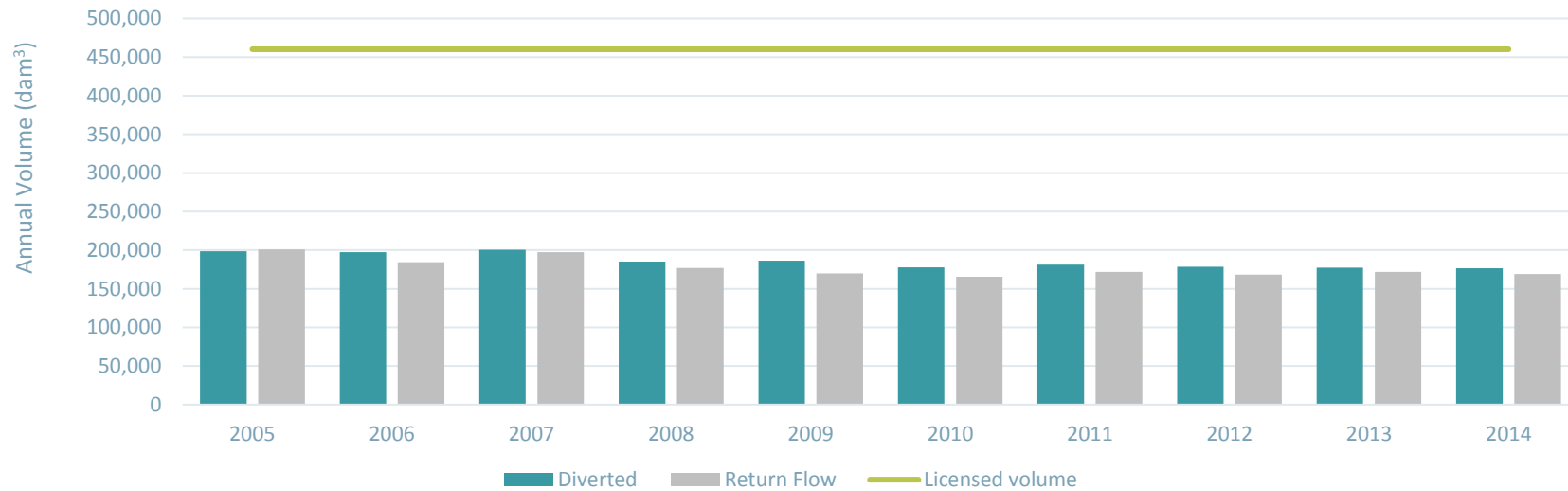
DISTRICT	OLDMAN RIVER BASIN										BOW RIVER BASIN			TOTALS
	AID	LID	LNID	MID	MVID	RCID	RID	SMRID	TID	UID	BRID	EID	WID	
WATER SOURCE	diversion from Belly River	diversion from Belly River	diversion from Oldman River	diversion from Belly, Waterton, St. Mary Rivers	diversion from Belly River	diversion from Gros Ventre Ck.	diversion from Belly, Waterton, St. Mary Rivers	diversion from Belly, Waterton, St. Mary Rivers	diversion from Belly, Waterton, St. Mary Rivers	diversion from Belly, Waterton, St. Mary Rivers	diversion from Belly, Waterton, St. Mary Rivers	diversion from Bow River	diversion from Bow River	diversion from Bow River
EXPANSION LIMITS (acres)	7,500	6,000	227,000	18,300	4,240	1,210	46,500	412,000	92,200	34,400	260,000	311,000	95,000	1,515,350
WATER LICENCE ALLOCATION (acre-feet)	9,000	12,000	334,450	34,000	8,000	3,000	81,000	722,000	158,000	66,210	490,000	761,000	190,500	2,869,160
YEAR	VOLUME OF WATER DIVERTED (acre-feet)													
83			150,790	14,363		1,354	14,955	361,537	97,674	24,078	347,000	580,299	146,737	1,738,787
84			177,543	18,857		67	17,544	492,674	101,643	25,093	361,000	657,640	162,140	2,014,201
1985	5,020	8,500	184,029	18,533	4,250	3,827	27,302	425,500	95,751	24,193	358,722	655,188	158,897	1,969,712
86	4,074	6,858	182,159	14,114	3,212	1,832	22,045	406,536	101,597	20,106	311,000	680,592	131,333	1,885,458
87	4,392	5,644	181,934	14,649	3,180	1,321	40,559	426,434	98,621	19,958	309,000	639,928	129,712	1,875,332
88	6,910	9,398	222,936	22,918	6,066	256	60,531	563,621	121,668	30,462	423,000	730,274	171,868	2,369,908
89	4,613	3,517	198,789	12,338	2,750	122	30,728	504,255	78,396	18,372	333,000	605,148	122,416	1,914,444
1990	3,754	5,328	191,899	13,555	3,290	298	32,000	467,244	98,572	16,133	380,907	689,178	128,091	2,030,249
91	3,556	4,468	184,737	12,712	2,662	1,775	30,702	391,634	94,956	17,003	334,792	629,872	147,547	1,856,416
92	2,170	11,216	136,925	15,695	4,118	0	36,210	441,745	101,122	18,628	336,878	625,650	135,387	1,865,744
93	2,126	1,824	61,753	4,848	988	3,300	13,574	218,375	59,278	8,107	210,340	423,551	114,309	1,122,373
94	4,110	4,319	179,663	13,895	3,325	758	28,328	415,162	103,028	16,827	364,126	559,476	132,104	1,825,121
1995	1,802	1,548	110,114	4,248	861	208	19,953	390,285	79,818	7,710	302,305	602,098	116,254	1,637,204
96	4,035	4,892	206,206	12,506	2,660	1,085	45,527	498,483	127,436	19,832	328,182	615,478	117,065	1,983,387
97	6,051	5,193	188,378	12,564	1,529	1,760	38,043	455,300	115,582	20,364	343,380	593,782	116,740	1,898,666
98	4,874	5,331	157,758	9,671	2,323	1,726	33,834	405,000	116,300	14,895	303,565	638,500	142,367	1,836,144
99	3,485	11,415	196,906	25,178	2,499	1,700	42,960	411,532	105,208	20,900	298,524	426,788	88,410	1,635,505
2000	6,000	11,240	263,413	35,375	6,700	0	58,202	451,700	140,046	37,200	417,897	675,238	156,400	2,259,411
01*	3,952	7,593	308,236	21,173	6,814	0	40,207	325,700	94,770	27,526	413,780	685,000	160,000	2,094,751
02	2,938	9,835	112,143	10,788	3,033	N/A	23,552	466,700	53,324	21,283	333,541	430,000	149,577	1,616,714
03	4,598	7,964	201,812	20,711	5,889	N/A	49,723	330,600	86,500	32,500	279,798	459,700	128,700	1,608,495
04	3,440	5,425	166,276	12,391	2,660	N/A	28,224	367,500	64,399	21,600	230,817	417,370	114,000	1,434,102
2005	4,000	6,243	134,088	8,859	2,067	1,190	27,046	316,200	72,487	13,717	182,819	318,000	120,400	1,207,116
06	3,681	5,341	165,752	14,114	3,987	0	37,049	334,100	82,448	20,390	210,741	335,210	72,000	1,284,813
07	3,235	6,330	235,330	18,238	3,600	N/A	47,322	394,700	100,907	31,801	256,518	417,830	68,000	1,583,811
08	3,584	6,389	178,750	12,659	2,609	200	34,348	381,200	85,829	21,054	238,000	409,400	85,000	1,459,022
09	2,651	5,378	179,945	14,885	2,138	200	45,705	370,100	97,532	17,506	295,557	435,650	120,829	1,588,076
2010	1,938	2,383	71,950	5,351	1,013	116	21,900	201,700	53,135	7,264	156,116	210,500	65,850	799,219
11	2,902	8,028	132,388	15,233	2,393	530	32,534	286,000	84,909	19,073	151,700	310,100	85,985	1,131,775
12	2,761	3,973	176,683	20,720	2,558	0**	35,200	340,800	88,309	19,039	260,000	343,200	103,862	1,397,105
13	3,446	4,101	139,035	17,210	2,297	2,319	39,723	314,600	77,371	18,598	240,000	383,400	99,473	1,341,573
14	3,113	5,928	120,097	13,552	1,801	700	31,448	297,600	71,847	16,565	222,191	371,000	113,666	1,269,535
2015	3,306	4,540	197,000	21,459	2,420	700	50,711	453,300	100,481	25,839	331,900	471,900	136,600	1,800,156
16	3,848	4,564	206,730	20,325	2,233	367	39,704	402,600	84,313	21,864	328,085	371,100	109,865	1,595,598
Percent of Licence (2016)	42.8%	38.0%	61.8%	59.9%	27.9%	12.2%	49.0%	55.8%	53.4%	33.0%	67.0%	48.8%	57.7%	55.6%
***Average Volume	3,761	6,085	167,346	14,671	3,060	1,014	33,398	381,218	91,930	20,117	300,224	513,978	123,364	1,657,333

- Notes: – Data obtained from Alberta Environment and Parks for AID, LID, MVID, RCID, and UID, and from Irrigation Districts for BRID, EID, LNID, MID, RID, SMRID, TID, and WID.  
 – RCID has a second supply from Ross Creek, but data has not been consistently recorded at that location.  
 – Diversion data represent the gross diversion into and through the works of the districts and include volumes used directly for irrigation purposes, reservoir filling and the water supplied or licensed to municipal, domestic, other agricultural, industrial and environmental uses.  
 – \*Water rationing in effect for MID, RID, SMRID, TID, UID, AID, LID, MVID and Blood Tribe Agricultural Project (BTAP) in 2001.  
 – \*\*RCID had zero diversion in 2012 since the diversion structure was under construction; 562 ac-ft was delivered for irrigation from Cavan Lake.  
 – \*\*\*Average Volume 1976 - 2016

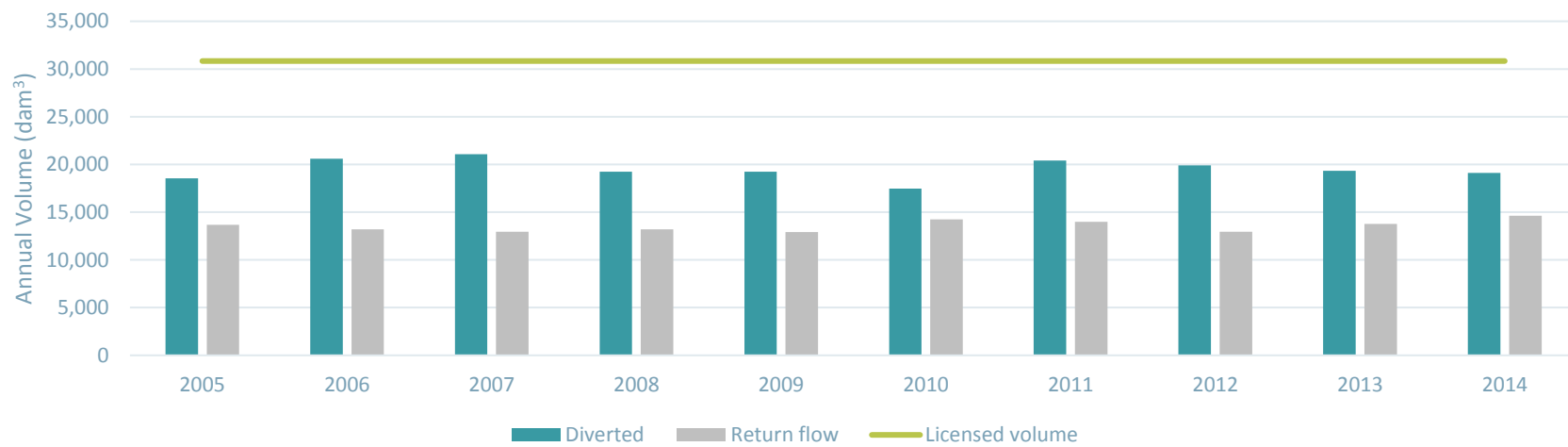
Summary of water diversions, return flows and licensed use for major SSRB municipalities

Estimates of diverted and return-flow volumes, along with licensed allocations were provided by AEP from 2005 to 2014.

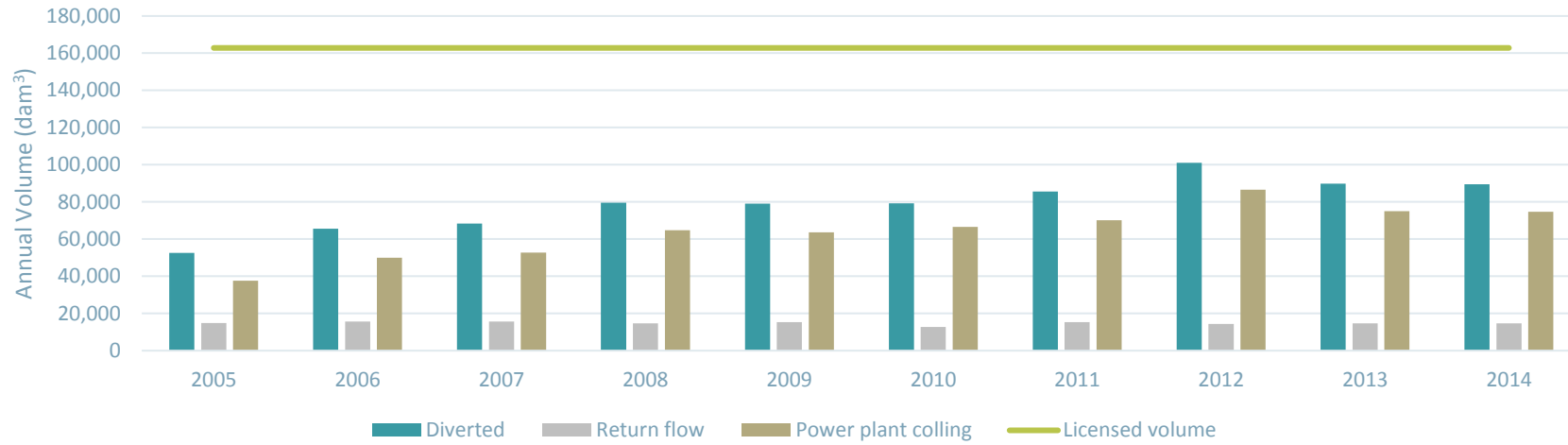
City of Calgary



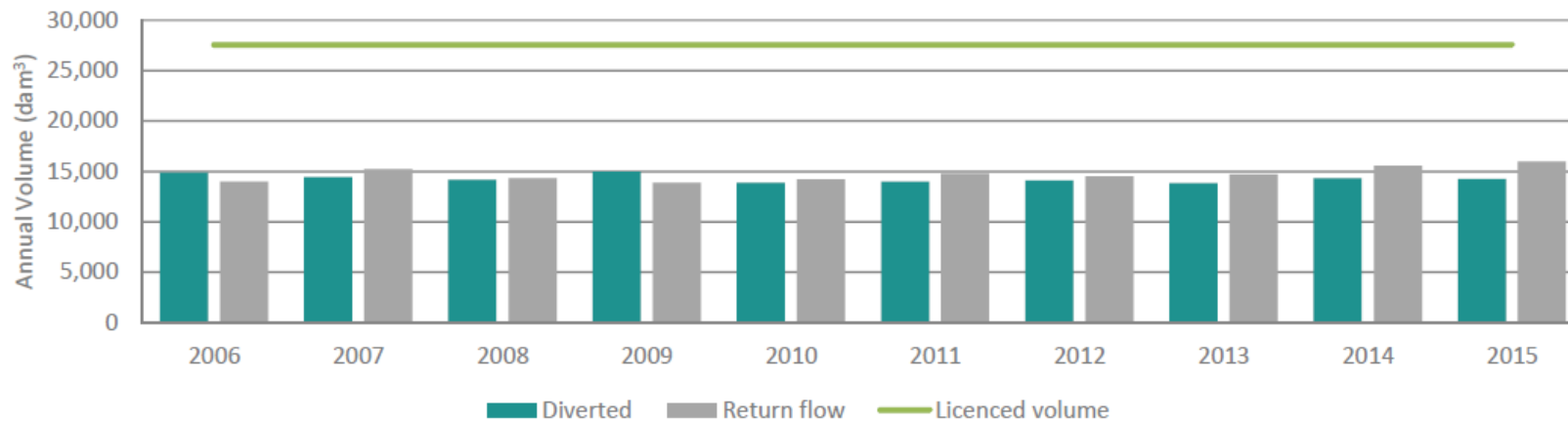
City of Lethbridge



### City of Medicine Hat



### City of Red Deer



## Appendix D – Notable Initiatives



## Notable initiatives

- Government of Alberta
  - [Watershed Resiliency and Restoration Program.](#)
  - Tributary Monitoring Program
  - [SSRP Surface Water Quality Management Framework](#)
  - [Bow River Phosphorus Management Plan](#)
  - [Bow River Water Management Project](#)
  - [Alberta Wetland Policy](#)
  
- WPACS:
  - [State of the Red Deer River Watershed Report](#)
  - [Blueprint: An Integrated Watershed Management Plan for the Red Deer River Watershed \(Phase One: Water Quality\)](#)
  - [Bow Basin Integrated Watershed Management Plan](#)
  - [Oldman River State of the Watershed Report](#)
  
- Watershed Stewardship Groups
  - [Nose Creek Watershed Water Management Plan](#)
  - [Elbow River Basin Water Management Plan](#)
  - [Water Management Plan for the Watersheds of Upper Highwood and Upper Little Bow Rivers 2008 Vol 1&2](#) (Joint HMP-PAC-GOA project)
  
- Alberta Water Council projects, including
  - [Evaluating Water Conservation, Efficiency and Productivity](#)
  - [Provincial Ecological Aquatic Criteria for Health \(PEACH\)](#)
  - [Riparian Land Conservation and Management](#)
  - [Sector Planning for Water Conservation, Efficiency and Productivity](#)
  - [Protecting Sources of Drinking Water in Alberta](#) (new initiative)
  - [Building Resiliency to Multi-Year Drought](#) (new initiative)
  
- [Federal Environmental Farm Plan initiative](#)

## Appendix E - BAC Summaries

## **BOW Basin Advisory Committee**

### **SECTION ONE: Key Findings**

About 16 years ago, the government led a process to consult and communicate with SSRB stakeholders about the proposed SSRB Water Management Plan. Each of the four BACs forwarded recommendations to cabinet. In 2006 the plan was officially adopted and included many of the BACs' recommendations. WPACs were identified as key partners and stakeholders in water and watershed management planning. WPACs continue to be asked to be players in water management planning, and are essential for successful implementation of plans. One recommendation found in the SSRB WMP 2006 was that WPACs could determine the most appropriate time to review the plan. WPACs started the review process in 2017.

In the Bow BAC, many members of the original BAC committee were available to contribute to this review and were asked to participate. The committee was intended to be smaller than the original BAC, so may not fully cover all potential interest groups. However, the BAC's membership covers the majority of interests and perspectives addressed in 2006.

The review is limited to the capacity of each BAC and the availability of data to answer the questions found in the scoping document and in the summary document. A large amount of data was received and analyzed on behalf of the WPACs, but there were noted gaps as the project moved through the discussions. The review covers the issues of water quantity only, with quality previously and deliberately uncoupled from the discussions. Data was not provided to cover water quality considerations as that is out of scope for this project. Some of the gaps fell into the category of data. For example: naturalized flow data is available to 2009. More resources should be available to fill these gaps at AEP. This is becoming increasingly important given climate change concerns and increasing demands for water.

Discussion points were grouped into themes where possible:

The SSRB WMP recommended a series of actions to be taken. In particular sections 2.1 to 2.7 (summary table) have been taken by AEP. The plan recommends a moratorium of licenses to be implemented and this has been done (BOSS order). The existing application queue for licenses at the time of the moratorium has almost been emptied with major decisions made for these applications. A water market through license transfer was recommended and was subsequently created. Water Conservation Objectives were applied to new licenses issued after 2006, and the IWCC was established in 2009. Section 2.8 d. Crown licenses were established for the four purposes (WCO, Storage of peak flows, pending, First Nations).

The IWCC has been somewhat active, however, it was recognized that it may not be nimble enough for short term issues and may be better comprised to perform a planning/process role. A proactive forward looking regional water management committee may be of benefit to the basin.

For the WPACs part, in particular the BRBC, this plan was the foundation of consideration and implementation of planning actions. The BRBC developed The Bow Basin Watershed Management Plan to look at water quality which could be done as water quantity had been the focus of the SSRB. WPACs were also involved in providing feedback and insight into provincial regional and watershed scale planning processes, such as SSRP.

During the discussions it became evident that there would be benefit in defining of/or development of clearer language around some of the items outlined in the plan and perhaps some clarification of implementation. Better communications and transparency of process would benefit those who have an interest or are impacted by decisions being made. It was felt that the matters and factors table and how this is implemented in decision making could be further explained. A case study of how the matters and factors could be applied to a water license transfer was suggested as a good process for members of the BAC to further understand the process used by the Director.

The actions appear, in hindsight, to be most effective overall in the main stem portions of the Bow River. It is, however important to look at the details in some areas to check the cumulative impacts in specific areas and at specific times rather than just overall trends. A metric may, for example, be fine overall but low flows times can create challenges for aquatic health and licensed users. For example Bassano to the mouth of the Bow and the Sheep and the Highwood are most impacted reaches in the Bo basin. Smaller tributaries, in particular those with high developmental pressure may not be served as well. WCO 10% holdbacks have the potential of greater effect in smaller systems. An area where this may be evident is in the Sheep and Highwood sub-basins where transfer applications are highlighting the finite capacity of those small rivers and local concerns. 57 transfers have occurred in the Bow Basin with approximately 2/3 of transferred water now being used for municipal purposes

The BAC felt that available data and monitoring activities were limited. and gaps were noted to include actual water use by all licenses (currently larger ones are reporting). Again similar to actions in the plan on the main stem, smaller users who are not monitored may be more significant to smaller systems than those licenses that are on larger ones. Continuing to manage the basin with limited and incomplete data is not optimal. Assumptions exist that licenses, approvals and transfers and other issues of water use will have minimal impact on smaller tributaries but the consequence of not fully monitoring water and water use is an unknown. *You can't manage what you don't measure.*

A significant point in the discussions has been around the water conservation efforts of stakeholders, for example, irrigation districts. They have contributed on average a much larger quantity of water to river systems than the 10% holdback from transfers. The 10% holdback is not insignificant and is not something that should be phased out, but in the short term stakeholders have left significant amounts of water in the river due to conservation. Conservation efforts by irrigation districts have been tremendous in the past 15 years, however it is understood that similar conservation efforts will not be as large going forward. These actions have been undertaken voluntarily.

The recommendations from the plan appear to have reduced the risk of further degradation of the watershed stemming from further water allocations, but do not yet do enough to restore and protect the health of the watershed. The 10% holdback has little impact from a volume perspective. The WCOs are only applied to post-2006 licences. Water quality and riparian habitat were only loosely included in the plan. It is not clear to what extent findings in the ARCA 2007 report have been recognized or acted upon. The mechanisms used in water management today (some recommended in the plan e.g. WCOs, holdbacks) should be reviewed, revised, and as needed, supplemented to do more for the aquatic ecosystem.

The plan focused primarily on licence transfers to manage water supply. It did not address the broader public policy question of how we will match water supply (secure, safe drinking water, water for economy, water for the environment) with planned growth for the region. Water supply, waste water treatment and Stormwater management are limiting factors to growth. These broad policy questions

needs to be addressed for the region. The WPACs have a keen interest in this, as do many municipalities. The newly formed Calgary Metropolitan Region Board may be the forum for this important discussion.

Overall, the review of the plan highlighted the effectiveness of WPACs in addressing water management plan issues. The ability of WPACs to pull together a vast amount of experience and knowledge of stakeholders who live and work in their basins to address common concerns is of great benefit to integrated watershed management. WPACs benefitted their partners who can rely on high quality products to aid in their management decisions. This does not happen by accident, but instead is through dedicated and consistent efforts of WPACs to attract and maintain memberships and build relationships with stakeholders through collaborative, inclusive, problem-solving dialogue.

## SECTION TWO: Analysis

### Recommendation 2.1: Establish a Limit on Water Allocations from the Bow, Oldman, and South Saskatchewan River Sub-basins

**Recommendation: Stop accepting applications for new water allocations until...**

**FINDING:** This has happened; new surface water licence applications in the Bow basin have been stopped.

**OPPORTUNITY:** There is an opportunity to clarify the Plan's language and intent with respect to which allocations and considerations this recommendation specifically refers to. This clarity would include which surface and groundwater resources, which licence types whether term or temporary, and which quantity and quality considerations. Some of this is presented in the 2007 Bow, Oldman and South Saskatchewan River Basin Water Allocation Order (the "BOSS order"), the mechanism used to stop accepting applications. The BOSS order does not speak to temporary diversion licences (TDLs) and speaks only indirectly to groundwater. There remains a need to provide clarity on wording in the Plan to avoid incorrect assumptions.

#### How has the trend in water allocation and/or use changed in the years before and since the implementation?

**FINDING:** More water allocation in the Bow basin has been issued in term licences in the 10 years since closure than in the 10 years before closure in terms of volume. It is unlikely that this trend will continue as the allocation backlog in the Bow basin is almost cleared. The most significant unknown relates to potential First Nations water needs.

#### Have there been any operational adaptations or options that may have had the unintended consequence of negating overall intended planned outcomes? (e.g., changes in TDL use; use of licence amendments and assignments; more of a draw on [unlicensed] groundwater)?

**FINDING:** Temporary Diversion Licence (TDL) volume is small in the Bow basin and has shown little increase since closure.

**FINDING:** Groundwater use was more erratic pre-closure than since closure. Overall, there was a greater increase in groundwater allocations before closure than since closure. There has been a small and steady increase in allocation since closure, approximately 2,000 dam<sup>3</sup>, mostly for commercial and industrial use. It does not appear that groundwater is being used on a high-volume basis to "work around" not being able to access surface water.

**GAP:** There is limited comprehensive and current groundwater mapping in the Bow River basin. The Alberta Geological Society (AGS) released a groundwater atlas for the Edmonton-Calgary corridor in 2011. Additional work was done between Calgary and Lethbridge but not yet published. Groundwater has been identified as a priority area for the BRBC and other WPACs. There may be an opportunity for WPAC collaboration with AGS or AEP to secure current and relevant groundwater data.

#### Recommendation: Crown Reservation be established for four purposes.

**FINDING:** This has happened; the Crown Reservation has been established for four purposes:

- Water conservation objectives;
- Storage of peak flows to mitigate impacts on the aquatic environment and to support existing licences;
- Licences and registrations that may be issued for applications and registrations pending at the date of the Crown Reservation;
- First Nations Reserves.

There is no specified volume tied to the Crown Reservation, rather it is a legal mechanism used to specify for what additional purposes applications could be received and water allocated to, including the pending applications on file in 2006. The Crown Reservation has been used since the Plan was implemented for two of the stated purposes: *Licences and registration that may be issued for applications and registrations pending at the date of the Crown Reservation and Storage of peak flows to mitigate impacts on the aquatic environment and to support existing licences.*

**OPPORTUNITY:** There is an opportunity to revisit whether the four uses of the Crown reservation are still the important and relevant ones for the basin and emergent issues.

#### **How many Crown licences have been issued since Basin closure and for what use?**

**FINDING:** Crown licences have only been issued in the SSRB basin since the Plan was implemented to move 10% holdback volumes on transfers into WCO licences, and for three projects:

- Twin Valley/Little Bow Canal enlargement project in the Bow basin delivering water to Twin Valley Reservoir in the Oldman basin.
- Pine Coulee reservoir and dam project in the Oldman basin.
- Bow Carseland Headworks Canal increased capacity project in the Bow basin.

#### **Who (AEP vs. AER) is making regulatory decisions on water allocations?**

**FINDING:** Since 2014, the Alberta Energy Regulator (AER) has the authority to act as Director for all Water Act provisions for the following sectors (purposes): upstream oil and gas (e.g. hydraulic fracturing, injection), pipelines (e.g. hydrostatic testing), and coal mining and processing. There have been very few applications in these sectors in the closed Bow basin.

#### **Are both agencies (AER and AEP) using the same approval criteria?**

**FINDING:** Yes, both agencies (AEP and AER) use the same Matters and Factors tables that were approved through the Plan. Interpretation and judgement may vary slightly between the agencies including the specific criteria relative to environment as this is somewhat subjective. AEP and AER have identified the need to work more closely together to see how each agency makes these subjective decisions.

**OPPORTUNITY:** There is an opportunity to develop, and share externally, a standardized set of criteria and procedures for AEP and AER's application of the Matters & Factors tables to water allocation decisions. While recognizing that the Director still maintains discretion, this commonality should improve consistency and transparency across regulatory staff, time, and decisions. There is a further opportunity to provide external reporting on decisions, including the procedures and criteria applied to come to them.

### **Recommendation 2.3: Recommended Water Conservation Objectives (WCOs)**

#### **Recommendation 2.3.1: Upstream WCOs not be less than existing IO or the WCO downstream on the mainstem**

**FINDING:** This has been implemented through the Matters and Factors tables approved in the Plan. Transfers will be subject to the WCO/IO at the new location, at the discretion of the Director. The WCO licence for the volume of the 10% holdback would be issued to the Crown at the original location.

**OPPORTUNITY:** AEP is open to working with people in key areas, including WPACs, on what criteria should be applied to applications in those specific areas.

**OPPORTUNITY:** There may be specific indicators that could be monitored over the long run. We have the opportunity to identify those and include them in this report.

#### **Recommendation 2.3.2: Establish WCOs for Bow, Oldman, SSask**

**FINDING:** WCOs were established in the SSRB through the Plan and are applied in two ways:

1. When a 10% holdback is taken, a WCO licence is issued to the Crown at the discretion of the Director with the priority number of the licence being transferred.
2. WCO limitations are applied to new diversion licences.

**OPPORTUNITY:** It remains difficult to understand and remember how each of the related tools (IOs, WCOs, IFNs etc.) are defined, how they are applied, and why they are applied in different locations. Definitions of these terms were included in the Glossary of the original Plan. This Glossary should be replicated as an appendix to this Review's report.

### **The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?**

**FINDING:** In accordance with the Plan, WCOs were not to be applied to existing licenses or to applications made before 2006. Therefore, they were recognized as having little ability to reverse past degradation in the basin. Rather, they are applied where possible to stop further degradation beyond the limit established by the WCO in that location. The intent of a WCO on a new licence is to ensure that the diversion has minimal harmful impact. It is recognized that the WCOs established in the Bow basin are, in many instances, well below the instream flow needs (IFN) identified for those same reaches.

### **Is there a more effective alternative?**

**OPPORTUNITY:** WCOs are a mechanism to ensure new diversions have minimal harmful impact. When the Plan was developed, it was felt that they were the best available mechanism given the allocations already issued in the Bow basin. It is prudent to periodically review and continuously improve such mechanisms. There is an opportunity for an appropriate group with effective membership (WCO experts, scientists, WPACs, AEP, perhaps IWCC etc.) and terms of reference to review whether WCOs could be more effective by being added to, improved upon, or, possibly, replaced. Part of this discussion should include whether there are enough mechanisms available in the system to create opportunities for watershed health. For example, could there be a mechanism for an unused licence to somehow be "given back to the river". This may benefit from looking at mechanisms used or emerging in other jurisdictions. This might introduce a different way of thinking about managing the rivers.

### **How much of a role does unused allocation within existing licences play in the river for healthy aquatic ecosystems?**

**FINDING:** The major licence holders in the Bow basin report actual water usage to AEP through the water use reporting system (WURS), annual water statements filings, or other means. This information is shared publicly and provides insight into how much water is withdrawn and returned by municipalities and irrigation districts compared to their licensed allocation (see the charts under Recommendation 2.8 in the data package). In the Bow mainstem, it is generally recognized that unused allocation of major licences maintains a significant volume of water in the river, having a greater impact compared to the WCO and holdback mechanisms.

**GAP:** We do not know how much water is actually being used by many licencees in the basin. Not all licencees are required to report their usage data. For those that report using WURS, there are quality assurance and quality control challenges which result in sizeable gaps in the data. The WURS system is not yet a reliable one. This gap is a particular concern on tributaries and in rural areas e.g. the Highwood. Better usage data would lead to better understanding of how each licence, region, and sector is performing as well as informing better water quality modelling.

**OPPORTUNITY:** There is an opportunity to further develop current water usage reporting, in particular in rural areas and tributaries, to create a widely used and reliable system for water metering and electronic reporting of water usage. This would ideally include all licence holders and, potentially, private well



users. This is needed to understand the impact of transfer applications, in particular on the smaller and more sensitive reaches in the basin.

**FINDING:** As a basin, we do not know the consequence of not knowing actual water usage beyond the major licence holders.

## **Recommendation 2.5: Establishment of an Interbasin Water Coordinating Committee**

**FINDING:** This has happened. The IWCC was established with WPAC representation and is still in place today. Ten years later, now may be the time to revisit and possibly refresh the purpose, function and form of the IWCC to ensure that it is useful and effective.

### **Is it providing useful information to GoA? Could it be more useful to GoA?**

**FINDING:** There were shortages in the SSRB in 2015. Decisions were made by the department that impacted water users, but AEP couldn't convene the Committee together on short notice. This suggests that it might be better to apply the IWCC to forward looking and proactive discussions, not management of severe events.

**OPPORTUNITY:** Use this Committee to support an active, forward looking, regional discussion of water management e.g. how we manage regionally through drought, water implications of the new Calgary Metropolitan Region Board decisions, Saskatchewan challenges that may impact apportionment, what climate change means for water in the region, what might be the best approach to water sharing in the Southern Tributaries if conditions do not improve in the Oldman basin for 2018.

### **Does it have the right membership, mandate and accountability?**

**FINDING:** The IWCC mandate was specified in the Plan and was used to develop the IWCC Terms of Reference when it was set up in 2009-2010.

**OPPORTUNITY:** Have the IWCC meet more regularly to become an active forum with a gelled and engaged membership.

**OPPORTUNITY:** Have the IWCC increase communications to report to a broader audience on its Terms of Reference and activities e.g. there could be a standing agenda item at the March BRBC Forum for the IWCC to report back to the WPAC membership.

### **Is it representing the WPACs?**

**FINDING:** It is up to the WPACs to select their representatives.

**OPPORTUNITY:** Increase communication between the department and WPACs. This is an ongoing issue. More communication would enable the WPACs to be a more useful support to the government and to identify means for WPACs to advance their work. This remains a critical component to the work of the WPACs.

## **Recommendation 2.7: Use of Water Allocation Transfers, Water Conservation Holdbacks and Factors that Must be Considered When Making Decisions**

### **Recommendation 2.7.1: Water allocation transfers - Director is authorized to consider applications to transfer water allocations**

**FINDING:** This is happening through AEP. In other basins without a Water Management Plan, transfer applications would have to go to Cabinet for decision.

### **How many times has the Transfer system been used? How many times has it been abandoned?**

**FINDING:** As per the Transfers table in the data package, there have been 57 transfers in the Bow. 32 transfers comprising ~8,700 dam<sup>3</sup> out of ~12,500 dam<sup>3</sup> volume are to municipal purposes. That's roughly 2/3 of the transferred volume going to municipal use (which may include residential, commercial and industrial use within the municipality). This is consistent with what was expected to be the biggest user when the Plan was implemented.

#### **Expected vs actual uptake of mechanism? Have there been excessive barriers raised?**

**FINDING:** No one projected how many transfers would happen once the basins closed. There is no means to compare expected vs. actual uptake. What is perhaps more important, is that the transfer system is adequate to ensure no harm and that the department is sufficiently resourced to administer the system.

#### **How onerous is the Transfer system? Should it be simplified or is it appropriately rigorous?**

**FINDING:** Opinion as to whether the transfer system is too onerous will likely vary tremendously and depend on individual experience and situation. This BAC generally found that the transfer system is necessarily rigorous and not too onerous. It takes time and resources to apply for and secure a transfer, however, there have been 57 successful applications in the Bow basin since the Plan was implemented.

**FINDING:** There are barriers that make the transfer system challenging and onerous. These include:

- Difficulty understanding what makes an application complete and what information is required to support the application to help AEP assess harm to the environment and other users.
- Difficulty knowing which processes and requirements will apply to an application.
- Difficulty for some applicants to know whether a licence is "in good standing" until they apply. To help with this, AEP has released a guidance document sharing the AEP criteria to determine "in good standing".
- The time it takes the regulator to make discretionary decisions using the Matters & Factors tables with careful consideration and appropriate analysis.
- Limited transparency into an application's review, supporting analysis and decision.
- In the past, a barrier was the time needed for transfer "buyers" to find potential transfer "sellers". This has been somewhat alleviated by the emergence of transfer intermediaries (brokers). This brokering in an unregulated market function.

**OPPORTUNITY:** AEP could provide further clarity on what processes and information requirements will apply to specific transfer applications.

**OPPORTUNITY:** AEP could provide clarity on the criteria used and applied to make application decisions and document decisions in a manner that is understandable and available to the broader public. This would provide transparency into the decision and enable better understanding of implications to stakeholders.

**OPPORTUNITY:** AEP could provide as much open data and information as possible to the market place to allow equal competition.

#### **How long does a typical transfer take from application to approval?**

**FINDING:** There is no "typical" time for an application. The speed depends on the completeness of the application, the complexity of the transfer applied for, whether any statements of concern are received, whether a public review is required, and Approval staff workloads.

**OPPORTUNITY:** Should applications be incomplete, there is an opportunity for deficiencies to be identified by AEP in full rather one by one. This should reduce cycle time on completing the application and frustration. AEP is looking to do this; there is likely room for improvement.

### **What form of public notice is provided for each application?**

**FINDING:** There is a requirement (in accordance with Section 108 of the Water Act) for public notice to be provided. Generally, a newspaper notice in the location of the recipient of the transfer, and possibly in the location of the source of the transfer, is sufficient to make the public aware and solicit concerns. In the Bow, notice is also provided online for any applications under the Water Act. The template used for the notice in the newspaper offers for a meeting to be requested for discussion of a transfer; this is infrequently asked for.

### **Does AEP offer a public list of water allocation licenses and transfers?**

**FINDING:** All approved water allocations and transfers are publicly listed in the AEP Water Allocation Licence Viewer. This is a map-based tool that shows all active licences with links to licence documents. <http://aep.alberta.ca/water/programs-and-services/south-saskatchewan-river-basin-water-information/water-allocation-licence-viewer.aspx>

### **Is the application and approval process transparent and consistent?**

**OPPORTUNITY:** AEP could provide a Q&A page on its website that addresses many of the questions and clarifications raised in this review and document.

### **How often have transfers involved a change in purpose/timing/location? (including movement between tributaries and main stem, change from seasonal to year-round use)**

**FINDING:** An initial look at the transfer information provided by AEP, and included in the data package, suggests that many of the 57 transfers in the Bow basin involved changing a withdrawal location from downstream mainstem to a higher upstream tributary. A transfer of this nature feels like a new allocation to that upstream tributary. This has implications for the area. As does a change of purpose, for example, from agricultural to municipal use as the seasonality of the water withdrawal likely changes as well as the pattern, volume and quality of return flow. This is a risk in the transfer system. Transfer application reviews must be transparent to ensure all such concerns are addressed in making the decision. A good decision is dependent on how the Matters and Factors are applied.

**OPPORTUNITY:** AEP could put transfer summary information (like the table provided in this report's data package) on the AEP Water Allocation Licence Viewer.

### **Should all Transfers be managed in the same manner, or is there an opportunity to designate different types of transfers?**

**FINDING:** AEP manages transfer applications depending on the nature of the transfer and the completeness of application. This triage is not formalized but is effective in allowing small and simple applications (e.g. same licensee, same location, complete application) to move faster while most attention is given to those that warrant it.

### **Only allocations "in good standing" may be transferred**

**FINDING:** The *Water Act* outlines the Director's ability to cancel a licence if it is not in good standing, not the Plan. AEP has documented criteria for establishing whether a licence is in good standing. These criteria are intended to provide a consistent approach and are available on the AEP website. There is not enough manpower in AEP to proactively review and look for licences that are not in good standing. There are thousands of licences and each circumstance is unique. Any review must carefully work through the process to respect the rights of the licensee. Therefore, the standing of a licence is typically seen and assessed if and when it comes up for transfer.

**OPPORTUNITY:** Create avenues by which licences that are no longer in good standing can be used to the benefit of the watershed. There is currently no incentive to put a licence in good standing if it is not

being used other than to transfer it. Perhaps intermediary brokers could play a role in finding licences not in good standing and putting them in the river rather than to other uses.

#### **Recommendation 2.7.2: Withhold up to 10%**

**FINDING:** The 10% holdback is applied to the vast majority of transfers with some exceptions at the discretion of the AEP Director. If the holdback is taken, a WCO licence is then issued in the name of the Crown.

#### **Are the 10% holdbacks being used?**

**FINDING:** The table in the data package provides this information and shows that for the most part, yes, the holdback is being applied. If there is a compelling reason, the Director can choose not to take the holdback. An example of this in the Oldman basin was when a senior licence with no minimum flow requirement agreed to have a minimum flow put on their licence instead of the 10% holdback.

#### **Are the 10% holdbacks actually putting water back into the river?**

**FINDING:** When a holdback is taken, a WCO licence is then issued to the Crown. This is happening. The table in the data package shows the volume being taken in holdbacks, ~1,200 dam<sup>3</sup> in the Bow basin has been held back across 57 transfers. The volume held back so far in the Bow basin is tiny compared to the volume of the river; likely within the error of measurement of flow. ~1,200 dam<sup>3</sup> of holdback means a continuous flow for one year of 0.038cms. That might be measurable if it was 100 times bigger. The intent of the Plan and holdbacks was, in part, healthy aquatic ecosystems. The amount of water generated from the 10% is negligible compared to typical flow in the river. Unused licence allocation has done more for the rivers than the 10% holdback. This does not suggest taking the 10% holdback away. It is recognized that the holdback is intended to avoid a specific transfer from causing harm. In aggregate, it is evident that the holdback has been ineffectual at improving the health of the watershed because the transfer volumes are so small. Therefore, more must be done through other means.

**OPPORTUNITY:** We need to find better mechanisms to restore resiliency in the watershed, to ensure healthy aquatic ecosystems. It is one of the three legs of *Water for Life* and it needs more attention.

#### **Is there an alternate mechanism to the holdback that would be more beneficial to developers and the aquatic ecosystem?**

**FINDING:** There may be potential alternate mechanisms worthy of further investigation including but not limited to:

- Better water management overall; that means making decisions to improve environmental good without hurting economic good. For example, being proactive on using existing storage when flows are high and forecast/conditions are dry. This seems to have far more benefit potential than the holdback.
- Allowing private/NGO entities (possibly water trusts) to hold water licences for instream flows.
- Establishing a transfer fee that goes into watershed enhancement projects (not general revenues) instead of the 10% hold back.

#### **Recommendation 2.7.3: The Matters and Factors that must be considered - The Director must consider the Matters & Factors in making a decision on a transfer application**

**FINDING:** This is happening. The AEP Director has discretion as intentionally written and provided for through the Plan. The Matters & Factors tables are used. Tables 1 and 2 in the Plan present the Matters and Factors that must be considered in making application decisions and to guide discretionary decisions. These have been implemented and are considered at the discretion of the Director. However,

the process is still insular in how the Matters and Factors are considered as only “directly affected” parties can respond.

**OPPORTUNITY:** AEP could provide more complete information on the criteria, analysis, tools, protocols etc. applied when using the Matters & Factors tables to guide discretionary decisions. This transparency would help applicants and intervenors understand how the Province and consultants are assessing the matters and factors for specific applications. For example, what is the mechanism for assessing the Cumulative Effects line item?

**OPPORTUNITY:** Periodically, the Matters and Factors tables should be reviewed to check whether each line item is adequate, sufficiently described, and effectively implemented. It may be the case that additional items need to be added without overly burdening the system.

**OPPORTUNITY:** Establish and provide relevant benchmarks and baselines for each of the Matters and Factors tables line items. The transfer system is based on third party response but parties with concern currently do not have a good gauge to determine whether they should put in a statement of concern; there are no clear benchmarks to gauge applications. Having good benchmarks and baselines should shorten the application time for all projects.

**OPPORTUNITY:** Conduct a deep dive discussion with WPAC members, AEP, and interested parties from the region to understand how the Matters and Factors table were applied to a specific transfer application decision. Many transfer applications have been in the Okotoks/Sheep River, many of them moving upstream from the Bow River main stem into the tributary. A case study on this reach would be highly relevant and comprehensive given the water quantity, water quality, and fishery management concerns held by landowners and water users in the area. A deep dive would demonstrate the information and evidence used or not used in the application of the Matters and Factors in making transfer decisions.

## **Recommendation 2.8: Water Management Strategies**

### **6.1 Water Demand and Consumption (Recommendation 2.8.1)**

**FINDING:** Improvements in conservation have happened through the Alberta Water Council (AWC) led Conservation, Efficiency and Productivity (CEP) Plans development and reporting by sector. This effort was voluntary and successful. AWC identified the need for this to be done by watershed.

#### **Have modeling capabilities been upgraded?**

**FINDING:** AEP is continually updating the Water Resources Management Model and the historical flow and licence data inputs that go into it; more still needs to be done. We are now able to link flow outputs from WRMM into water quality models for portions of the Bow River, Sheep River and Highwood River and soon portions of the Oldman River below Lethbridge and South Saskatchewan River.

#### **Have innovations and improvements in water licensing and legislation to better match allocations with needs been explored?**

**FINDING:** No policy has been put in place to do this however there has been lots of adaptive learning. Subsequent to the Plan being drawn up, the BRBC hosted a workshop to explore innovations and improvements in the licencing system.

**FINDING:** AEP supported water markets and transfers through the implementation of the Plan and associated legislation and by setting the boundaries for a water market.

**OPPORTUNITY:** Clearly address how water reuse considerations are handled under the Plan.

**OPPORTUNITY:** Do more to match grey water, waste water, different quality of water to different needs given that we have better technology and information now to do more on this. GoA is moving on this already.

**OPPORTUNITY:** As a region, we need to address the broad public policy question of how we will match secure, safe water supply with growth plans. Water supply is a limiting factor to growth. And we need to match waste water treatment and stormwater management to growth. Regional systems to manage each of these can be developed but only once the region's future growth patterns are understood. This is a broader question than water licencing which, to date, has drawn more public and political attention. This question is relevant to all municipalities including Calgary, the major licence holder, and smaller urban centres. The new Calgary Metropolitan Region Board may be the forum to address this important issue.

## 6.2 Improved Dam Management to Protect the Aquatic Environment (Recommendation 2.8.2)

**FINDING:** Changes in dam operations for aquatic habitat have not happened in the Bow as there are no onstream dams owned by GoA on which to do this. Government and other dam owners in the Bow have investigated opportunities to optimize operations for water supply and riparian and aquatic health, e.g. the Bow River Working Group's work, the 2016 interim agreement for flood and drought operations on Ghost and Kananaskis. Conversations happened between Bow operators and functional flow scientists to look at the potential, but the reservoirs in the Bow are private facilities that are being operated for other purposes. Functional flows have not been introduced in the Bow basin, whereas this is happening in the Oldman basin.

## 6.3 Protection and Management of Riparian Vegetation (Recommendation 2.8.3)

**FINDING:** The ARCA study for the SSRB, 2007 was completed. It is unclear to what extent the ARCA recommendations were implemented. The second phase of the IWMP has been completed through the BRBC.

**OPPORTUNITY:** Do more on this recommendation. The WRRP program has had significant impact on riparian protection and enhancement. Keep doing it! Much is being done through small organizations such as Cows and Fish. A priority area for future study is the critical functioning capacity of our riparian habitat, its value, and the comparison between destruction and restoration of riparian habitat. We need more attention on how we collectively treat our riparian habitat; this requires looking at the land and the water. Incentive programs (Growing Forward) and grazing management could do much more to manage land use in riparian areas. Many municipalities have programs specifically targeted to this work. The Aquatic and Riparian Condition Assessment for the main stem rivers of the SSRB (ARCA 2007) report could be used as the baseline to review what has been done since.

## 6.5 Water Quality (Recommendation 2.8.5)

**FINDING:** Many water quality studies have been completed in the SSRB, including:

- SSRP includes provincial policies that address land use aspects related to water
- SSRP Surface Water Quality Management Framework
- Tributary Monitoring Program
- Bow River Phosphorous Management Plan
- Alberta A&F studies throughout Irrigation Districts including return flows
- Alberta Agriculture Operations Protection Act came out after the Plan and implemented many strategies for managing agricultural operations near water bodies.
- the federal Environmental Farm plan came out after the Plan
- the Bow Basin Integrated Watershed Management Plan
- water quality monitoring, evaluation and reporting is being done for the Bow, Oldman and South Saskatchewan rivers through SSRP Water Quality Management Framework for the mainstem rivers.

- additional monitoring and reporting will also be done by the Environmental Monitoring and Science Division. The intent of EMSD is to closely tie their reporting to the watershed and what's happening in the watershed in terms of land use and water quality.

## SECTION TWO: ANALYSIS

### Recommendation 2.1: Establish a Limit on Water Allocations from the Bow, Oldman, and South Saskatchewan River Sub-basins

**Recommendation:** Stop accepting applications for new water allocations until...

**FINDING:** This has happened; new surface water licence applications in the Bow basin have been stopped.

The backlog post May 2006 application queue is being cleared. The queue in the Bow basin is almost cleared; only 15 applications with ~11,000,000m<sup>3</sup> remain. The chart below shows the current queue. The volume in the Red Deer basin is relatively high as it includes the Special Areas Water Supply Plan (SAWSP) application.

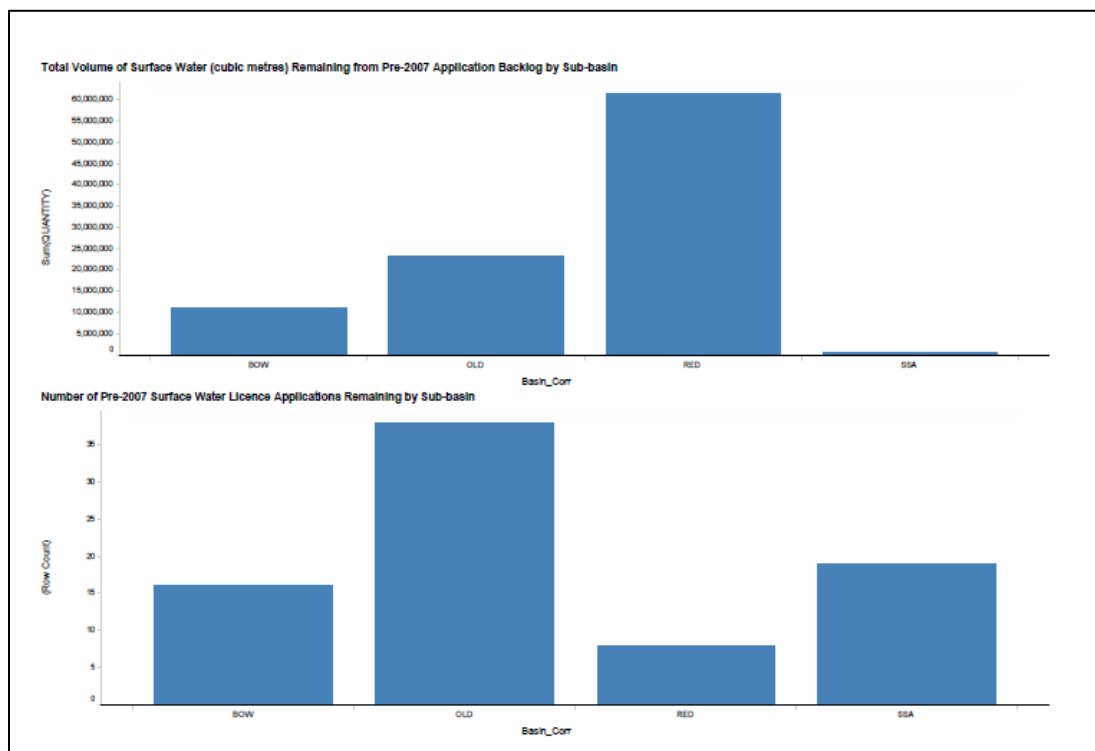


Figure: Remaining Pre-2007 Water Licence Applications by SSRB sub-basin by Volume and Number  
Source: Alberta Environment & Parks, November 2017

It is unclear what the “until the Minister of Environment specifies...” part will actually mean and when. This is addressed in the Bow, Oldman and South Saskatchewan River Basin Water Allocation Order (BOSS Order).

**OPPORTUNITY:** There is an opportunity to clarify the Plan’s language and intent with respect to which allocations and considerations this recommendation specifically refers to. This clarity would include which surface and groundwater resources, which licences types whether term or temporary, and which quantity and quality considerations. Some of this is presented in the 2007 Bow, Oldman and South Saskatchewan River Basin Water Allocation Order (the “BOSS order”), the mechanism used to stop



accepting applications. The BOSS order does not speak to temporary diversion licences (TDLs) and speaks only indirectly to groundwater. There remains a need to provide clarity on working in the Plan to avoid incorrect assumptions.

This section did not include groundwater, except groundwater under the direct influence (GUDI). However, GUDI is related to water quality, not water quantity. Groundwater not considered directly connected to surface water is still available to be applied for and allocated through the licensing process. Water quantity is a concern as well. Particularly when water quality is depleted, the usable quantity of water available typically decreases in quantity. Not to mention water quantity being directly impacted through withdrawals.

Some areas have groundwater withdrawal exceeding replacement. We are seeing a slow erosion of the groundwater resource, in particular in rural areas. This issue is now showing up as vulnerable wells. Therefore, water users come to the MDs for water supply from a pumping station to replace their well supply. Is Q10 pump testing sufficient to properly match water supply to development growth?

**Recommendation: Crown Reservation be established for four purposes.**

**FINDING:** This has happened; the Crown Reservation has been established. There is no actual specified volume tied to the Crown Reservation, rather it is a legal mechanism used to specify what additional purposes that applications could be received, including the pending applications on file in 2006 that water could be allocated through a licence. The Crown Reservation has been used since the Plan was implemented for one of the stated purposes: *Licenses and registration that may be issued for applications and registrations pending at the date of the Crown Reservation.*

**OPPORTUNITY:** There is an opportunity to revisit whether the four uses of the Crown reservation are still the important and relevant ones for the basin and emergent issues.

**Specific questions from Scoping Document**

**1.1 How has the trend in water allocation and/or use changed in the years before and since the implementation?**

**FINDING:** More water allocation in the Bow basin has been issued in term licences in the 10 years since closure than in the 10 years before closure in terms of volume. It is unlikely that this trend will continue as the allocation backlog in the Bow basin is almost cleared. The most significant unknown relates to potential First Nations water needs should they include large irrigation projects.

Page 4 and 5 of the data package presents the Bow River Water surface water allocation volumes for full and temporary allocations from 1987 to 2017. In the ten years before moratorium, allocated volume for full licences rose from ~2,360,000 to 2,490,000 dam<sup>3</sup>; ~130,000 dam<sup>3</sup> of new allocation was issued. In the ten years after the moratorium, it rose from ~2,490,000 to 2,660,000 dam<sup>3</sup>; ~170,000 dam<sup>3</sup> was issued. This volume is mostly accounted by the issuing of two large allocations to Irrigation Districts, both of which were pending before the basin closed was closed.

First Nations water needs are assessed and managed separately from the pre-2007 water allocation queue. This presents a significant unknown in terms for future water needs and allocations. While typical municipal and industrial water needs for First Nations are relatively low volume, large irrigation projects could require relatively large volumes.

There has been a significant change since the basin was closed because the basins were closed to surface water allocation, which included groundwater under the influence. Therefore, there are fewer

junior licences at risk in the time of drought. Temporary water licences have been issued for emergent industry practices such as fracking and in support of aggregate extraction, both industries have blossomed in this region the last ten years. The need for regional scale water servicing has emerged in the last ten years because the municipalities around the city do not have sufficient licence capacity to support growth. Water conservation and efficiencies have resulted in loss of habitat along canals that continue to be replaced by pipelines.

**1.2 Have there been any operational adaptations or options that may have had the unintended consequence of negating overall intended planned outcomes? (e.g., changes in TDL use; use of licence amendments and assignments; more of a draw on [unlicensed] groundwater)?**

**FINDING:** Temporary Diversion Licence (TDL) volume is small in the Bow basin and has shown little increase since closure.

Page 4 and 5 of the data package presents the Bow River Water surface water allocation volumes for full and temporary allocations from 1987 to 2017. The TDL volume is very low relative to full licences and does not appear to have risen since basin closure. This finding is contrary to the concern and misperception that TDL use has increased tremendously as a means to access water without a full licence. In part, TDL use will not have risen substantially as they are a tool designed to meet only specific short term purposes. They can only be issued for less than one year; in some instances they can be reissued for multiple years for example if the applicant is waiting on an application in the queue. TDLs reviewed and approved under the circumstances of that water year. TDLs are the first licences to be suspended and cancelled if water is not available, for example in the Sheep River watershed during portions of 2015, 2016 and 2017.

Even if TDL volume were to increase substantially, the total volume would remain almost insignificant volume on the basin scale. However, locally, TDL volumes may create a cumulative impact. AEP looks at the cumulative watershed impact of a TDL depending on the application volume and source being asked for. For example, if the TDL will be diverting from a large river, likely no analysis would be conducted. If the water is diverted from a wetland, some analysis by the AEP hydrologist or Approval Coordinator would be completed. The approval/licence decisions are made by the designated Director, typically the District Approvals Manager (though for TDL's the decision-maker can be the Water Approvals Team Lead or Water Engineer). Licence holders are notified of the TDL being suspended or cancelled. Verification is complaints driven.

**OUTSTANDING DISCUSSION ITEM:** Where are TDLs happening? Would a map help identify concentrated areas of TDL activity?

**FINDING:** Groundwater use was more erratic pre-closure than since closure. Overall, there was a greater increase in groundwater allocations before closure than since closure. The data package presents the Bow River Water groundwater allocation volumes for full and temporary allocations from 1987 to 2017 in total and by purpose of use. There has been a small and steady increase in allocation since closure, approximately 2,000 dam<sup>3</sup>, mostly for commercial and industrial use. It does not appear that groundwater is being used on a high-volume basis to work around not being able to access surface water.

The balance between groundwater withdrawal and recharge is very complex. Generally speaking, coarse analysis by Jon Fennel of Integrated Sustainability Consultants Ltd. and others suggests that in most parts of the Bow basin, there are orders of magnitude difference between the relatively small

groundwater allocation and relatively large infiltration/recharge. However, there are known issue areas in the SSRB basin where that is not the case. Only some aquifers have the ability to support large withdrawals. Beiseker, as an example, was known to be drawing down its aquifer (now gets water from Red Deer River via a regional pipeline). One of the major issues related to groundwater use is the large number of unregulated domestic wells and the lack of comprehensive groundwater mapping.

**GAP:** There is limited comprehensive and current groundwater mapping in the Bow River basin. The Alberta Geological Society (AGS) released a groundwater atlas for the Edmonton-Calgary corridor in 2011. Additional work was done between Calgary and Lethbridge but not yet published. Groundwater has been identified as a priority area for the BRBC and other WPACs. There may be an opportunity WPAC collaboration with AGS or AEP focused on securing current and relevant groundwater data.

Groundwater - surface water interaction is important. Most groundwater sources at some level over time are connected to surface water. It is unclear how well this is understood. There is a requirement for an applicant, if using a well in close proximity to a surface water source, to show there is no direct connection between the two. AEP is working on a policy to provide better understanding and transparency on the criteria for this, for example, distance, materials, quality. Currently there is no timeline for when the Groundwater Policy Branch will have a final policy ready for review.

Note: Alluvial aquifer water is considered surface water volume under the Plan. This question has been removed from Bow BAC discussion as it's intent is unknown.

#### **1.4 How many Crown licences have been issued since Basin closure and for what use?**

**FINDING:** Crown licences have only been issued in the SSRB basin since the Plan was implemented to move 10% holdbacks on transfers into WCO licences and for three projects:

- Twin Valley/Little Bow Canal enlargement project in the Bow basin delivering water to Twin Valley Reservoir in the Oldman basin.
- Pine Coulee reservoir and dam project in the Oldman basin.
- Bow Carseland Headworks Canal increased capacity project in the Bow basin.

#### **Water Conservation Objectives (WCOs)**

Whenever a 10% holdback is taken on a water licence transfer, a WCO licence is issued to Her Majesty the Queen with the priority number of the licence being transferred. This is the main way that WCOs are implemented. Note: WCOs are also applied as a restrictive condition on some transferred water licences or TDLs. The following chart shows the WCO-licences held in the Bow basin; there are 47 licenses accounting for ~1,300 dam<sup>3</sup> per year.

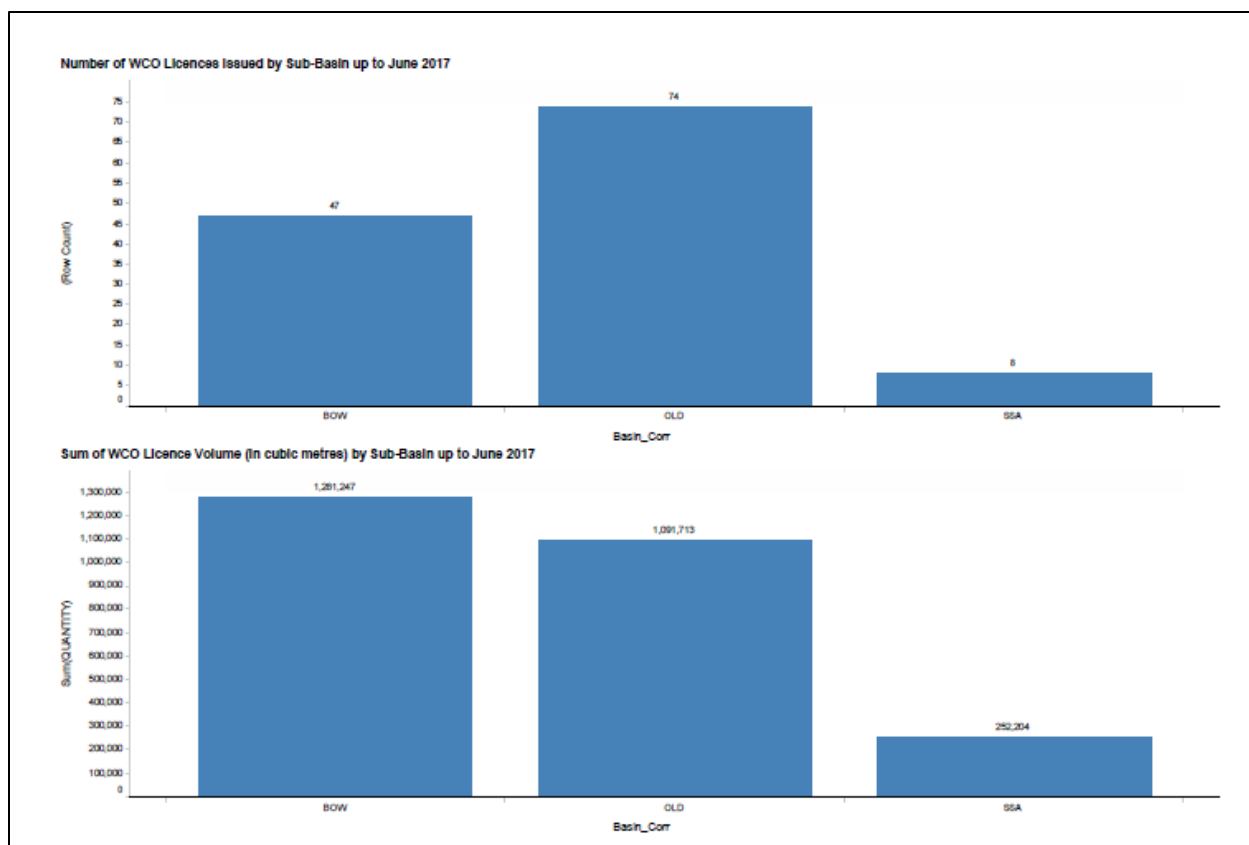


Figure: WCO Licence Number and Volume up to June 2017

Source: Alberta Environment & Parks, November 2017

#### Storage of peak flows.

Two licences were issued for new projects that were already in the queue when the Plan was implemented: Twin Valley/Little Bow and Pine Coulee. No additional water has been allocated through Crown licences by AEP for this purpose. Also, a licence was issued to the department in 2016 (Licence No. 00327957-00-00) that addressed the increased capacity of the Bow Carseland Headworks Canal that was done under the Crown Reservation purpose of storage of peak flows.

#### Pending applications for licences and registrations

As the pre-2007 water application backlog is cleared, pending licences are issued to the applicant whomever that is. These are not issued as Crown licences.

#### First Nations Reserves

Water needs and provision of water to First Nations continues to be discussed and worked on in the Bow basin. Water Needs Assessments are being done for each Treaty 7 First Nation. Some are complete and AEP is now looking at how to implement them. A Crown licence was issued in 2002 for the use of 35,000 acre-feet of water by the Piikani as part of the settlement agreement related to the Oldman Dam being built. Similarly, a settlement agreement was reached with the Siksika Nation for 35,000 acre-feet of water for the construction of the Bassano Dam, but no actual license has been issued for it yet. No others have been issued yet in the SSRB since the Plan was implemented. In terms of water allocations and volume in the basin, a key factor will be the needed amount and where it fits into the priority system to meet treaty obligations.

No Crown licences have been issued for any purposes other than those specified in Recommendation 2.1 of the Approved Water Management Plan. The Crown is bound by the Water Act just as any other applicant. For example, to access water needed to construct a wetland, the Crown must seek a transfer, though usually isn't required to 'restore' a natural wetland that had been drained.

### **1.5 What information is missing (data gaps, legal mechanisms?)**

GAPS are identified in the relevant sections. They will be summarized later.

#### **1.6a Who (AEP vs. AER) is making regulatory decisions on water allocations?**

**FINDING:** Since 2014, the Alberta Energy Regulator (AER) has the authority to act as Director for all Water Act provisions for the following sectors (purposes): upstream oil and gas (e.g. hydraulic fracturing, injection), pipelines (e.g. hydrostatic testing), and coal mining and processing. There have been very few applications in these sectors in the closed Bow basin.

All complaints can be made to the 1-800 Environmental hotline. Complaints are then directed to AEP or AER depending on the sector.

**OUTSTANDING DISCUSSION ITEM:** There is a problem when AER has a directive that freshwater is only to be used in fracking as a last resort and yet fracking companies regularly receive treated water from municipal water treatment plants. These are temporary licences that may not enough attention by either AER or AEP about cumulative effects and the impact on community water treatment supplies and treatment and distribution infrastructure. Water allocations for fracking need to be better understood and very well documented.

#### **1.6b Are both agencies (AER and AEP) using the same approval criteria?**

**FINDING:** Yes, both agencies (AEP and AER) use the same Matters and Factors tables that were approved through the Plan. Interpretation and judgement may vary slightly between the agencies including the specific criteria relative to environment as this is somewhat subjective. The need has been identified to work more closely to see how each agency makes the subjective decisions.

**OPPORTUNITY:** There is an opportunity to develop, and share externally, a standardized set of criteria and procedures for AEP and AER's application of the Matters & Factors tables to water allocation decisions. While recognizing that Director still maintains discretion, this commonality should improve consistency and transparency across regulatory staff, time and decisions. There is a further opportunity to provide external reporting on decisions, including the procedures and criteria applied to come to them.

### **1.7 Have the Environmental Appeal Board decisions influenced any decisions made by AEP since the SSRB was enacted?**

If the EAB supports the department's decision in an appeal, that support typically confirms that the department is using the right processes to make decisions. It de facto becomes "policy" or guidance for the department; it sets a precedent. If the decision falls in the appellants favour, this indicates that AEP needs to review its processes, criteria etc.

The EAB website has all the decisions and findings but the website is difficult to mine to find out what has been appealed and approved or lost. There can be important narrative in those decisions as they provide context for the current and future rulings.

There have not been any EAB decisions (since the AWMP and BOSS came into effect) that have directly led to changes in operational policy. The EAB doesn't (or shouldn't) direct policy development. The following cases (EAB and court cases) of note – have considered transfers, holdbacks, the closed basin, or WCO licences:

- a) The EAB has upheld a number of the Director's decisions for GW connected to reserved surface water:
  - i. Municipality of Crowsnest Pass v. Director (2009 EAB): <http://www.eab.gov.ab.ca/dec/08-016-R.pdf>
  - ii. Alberta Foothills Properties Ltd. v. Director (2013 EAB): <http://www.eab.gov.ab.ca/dec/11-179-R.pdf>
  - iii. Sandstone Springs Development Corporation v. Director (2013 EAB): <http://www.eab.gov.ab.ca/dec/12-043-R.pdf>
  
- a) Two appeals about the 10% holdback were resolved at mediation. Appeals regarding the holdback contributed to the Compelling Reasons Not to Take the 10% Holdback policy:
  - i. Cypress County v. Director (2011 EAB): <http://www.eab.gov.ab.ca/dec/11-169-172.pdf>
  - ii. Town of Okotoks v. Director (2011 EAB): <http://www.eab.gov.ab.ca/dec/10-045-048.pdf>
  
- b) There is one case where the EAB and the courts confirmed the Gov't can only hold a licence to implement a WCO:
  - i. Water Conservation Trust v. Director (2013 EAB): <http://www.eab.gov.ab.ca/dec/10-056-R.pdf>
  - ii. Water Conservation Trust v. Alberta (2015 Queen's Bench): <http://canlii.ca/t/glwpw>
  
- c) The Tsuu T'ina's unsuccessful court challenge of the SSRB AWMP:
  - i. Tsuu T'ina Nation v. Alberta (2010 Court of Appeal): <http://canlii.ca/t/29g5f>

## **Recommendation 2.3: Recommended Water Conservation Objectives (WCOs)**

### **Recommendation 2.3.1: Upstream WCOs not be less than existing IO or the WCO downstream on the mainstem**

**FINDING:** This has been implemented through the Matters and Factors tables approved in the Plan. Transfers will be subject to the WCO/IO at the new location, at the discretion of the Director. The WCO licence for the volume of the 10% holdback would be issued to the Crown at the original location.

It is easier to add a WCO/IO to a licence being transferred if it already had one applied on the original licence. It is more likely to be appealed if the original licence was senior and was not subject to a WCO or IO but the Director feels that the application of a WCO/IO is necessary in the transfer as a means of mitigating the potential impact on the aquatic environment.

Even though volumes are low, the cumulative and local impacts of transfers can be important. The modelling tools used by AEP to support Matters & Factors table decisions are intended to look at the

cumulative impacts periodically e.g. current work is taking place on the Sheep River because of the number of transfers in that area. Modelling is not typically done on individual transfers.

When transfers are moved upstream, the full volume of a licence cannot necessarily be moved upstream. Since 2012, a volume contribution is calculated using natural flows on a year-round or seasonal basis that estimates how much the new upstream source location contributes to the downstream flow at the original licence location. For example, if a transfer involves moving a licence from Redcliff on the SSR main stem to the Sheep River, AEP will calculate for 100 units at Redcliff, how much of that flow volume does the Sheep River contribute the flow at Redcliff. This calculation is used to limit how much of the original licence can be transferred upstream to a new location. In the same example, if the calculation finds that 5 of the 100 units at Redcliff comes from the Sheep River, then only 5 units of the licence can be moved up onto the Sheep River.

It is important to look at the details in some areas to check the cumulative impacts in specific areas and at specific times rather than just overall trends. In the Bow basin, if 2% of average annual flow is used for consumptive use; that metric may be fine overall but low flow times can create challenges for aquatic health and licenced users. Bassano to the mouth of the Bow and the Sheep and the Highwood are the most impacted reaches in the Bow basin. That's where AEP spends most of its effort. The Sheep basin is facing a number of issues and challenges that are additive and locally significant; it could be an indicator area of what we will be seeing on a bigger scale in the future.

**OPPORTUNITY:** AEP is open to working with people in key areas, including WPACs, on what criteria should be applied to applications in those specific areas.

**OPPORTUNITY:** There may specific indicators that could be monitored over the long run. We have the opportunity to identify those and include them in this report.

### **Recommendation 2.3.2: Establish WCOs for Bow, Oldman, SSask**

**FINDING:** WCOs were established in the SSRB through the Plan and are applied in two ways:

1. When a 10% holdback is taken, a WCO licence is issued to the Crown at the discretion of the Director with the priority number of the licence being transferred.
2. WCOs limitations are applied to new diversion licences.

**OPPORTUNITY:** It remains difficult to understand and remember how each of the related tools (IOs, WCOs, IFNs etc.) are defined, how they are applied and why they are applied in different locations. Definitions of these terms were included in the Glossary of the original Plan. Could repeat that Glossary and provide more information as an appendix to this Review's report.

### **Specific questions from Scoping Document**

#### **3.1 The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?**

**FINDING:** In accordance with the Plan, WCOs were not to be applied to existing licenses or to applications made before 2006. Therefore, they were recognized as having little ability to reverse past degradation in the basin. Rather, they are applied where possible to stop further degradation beyond the limit established by the WCO in that location. The intent of a WCO on a new licence is to ensure that the diversion has minimal harmful impact. It is recognized that the WCOs established in the Bow basin are, in many instances, well below the instream flow needs (IFN) identified for those same reaches.

### **3.2a In a heavily allocated closed basin, how often is a WCO relevant (because it is junior to most allocations)?**

Current licences and licences in the queue have WCOs or IOs applied depending on the date of the application and the reach. Pre-2007 backlog applications are subject to IOs.

Many senior licences (Irrigation Districts, City of Calgary, TransAlta) have no, or minimal, IO or WCO restrictions. To the point of the question, WCOs are really only relevant with respect to less senior, typically smaller volume, licences. The answer really reverts back to the discussion immediately above in question 3.1.

### **3.2b Is there a more effective alternative?**

In the Bow, WCOs have been identified for some reaches and applied to recent licences. No WCO licence has been issued to protect the water in the river. It would be a different form of licence than issued before and would be difficult to do.

The 2009 WATSUP Report recommended establishing “Protected Water” in all of the province’s rivers. This would define how much water to leave in the river at different times of year. With that defined, it becomes clear how much water is left to allocate or transfer. The report recommended that the regulatory mechanism for the protected water should continue to be the WCOs i.e. set a WCO for each river in the province and give it a licence. This may be less helpful in highly allocated basins like the SSRB but very important in other basins in the province e.g. for the Smoky River. Establishing protected water should be considered a prerequisite to a water market. This might be a better mechanism to WCOs although may be difficult to apply in the Bow Basin because the basin is already extensively allocated.

#### **OUTSTANDING DISCUSSION ITEM:**

- What is the goal of an effective alternative? Is it to improve the health of the aquatic ecosystem? That means better water management overall. This has been looked at in projects like the 2010 Bow River Project.
- Under the *Water Act*, only AEP can hold WCO licences. Multiple Ministers considered whether these could be held by Water Trust groups. So far, there has been no support in government to allow that therefore all are held by GOA.
- Could it be valuable to look at other jurisdictions? Interestingly, at the time the Plan was developed, the Imperial irrigation district in south California and the Murray darling basin in Australia were both looked at as case studies; and both are struggling today.

### **3.3 How might WCOs need to be relaxed or revised to enable new storage to offer potential benefit to the basin?**

This is part of Question 3.2b

#### **OUTSTANDING DISCUSSION ITEM:**

- There is only a handshake agreement with TA and Calgary for 1200 cfs minimum flow. Therefore, there is still a risk and an open question on how WCOs may impact new storage.

### **3.4 Are WCOs needed on more reaches, for example, some of the upper tributaries as mentioned in the SSRP?**

#### **OUTSTANDING DISCUSSION ITEM:**

- This strategy was identified in the SSRP as something that might need to be looked at in the upper tributaries e.g. Castle, Sheep, Upper Oldman. This work has not hit the priority list yet for AEP. It is unknown whether it would be worth the effort as we don’t yet know how much it



could help to prevent future or “further” degradation. This work would require public consultation. Comment provided by Brian: The idea of reviewing WCO’s for headwater tributaries was mentioned as a potential strategy (4.15) in the SSRP. AEP has not been able to move forward on this to date because of higher importance planning initiatives in support of SSRP. But need to consider if the effort will be worthwhile (i.e. relationship to Question 3.2a)

- Would there be an overall system management plan put in place that this could get in the way of?
- The drive to look at upper tributaries is that we are starting to see species at risk and are asking whether we need to provide more protection, particularly with climate change.

### **3.5 How much of a role does unused allocation within existing licences play in the river for healthy aquatic ecosystems?**

This really depends on the reach. Some reaches are doing OK. Irrigation and municipal use vary considerably depending on the year; if it’s a high-water year, allocations are used less and water remains in the river. The health of the system is often about rate of flow not only annual volume. We have significant seasonal variations. Flow rates matter.

**FINDING:** The major licence holders in the Bow basin report actual water usage to AEP through the water use reporting system (WURS), annual water statements filings or other means. This information is shared publicly and provides insight into how much water is withdrawn and returned by municipalities and irrigation districts compared to their licensed allocation (see the charts under Recommendation 2.8 in the data package). In the Bow mainstem, it is generally recognized that unused allocation of major licences maintains a significant volume of water in the river, having a greater impact compared to all the WCO and holdback mechanisms.

**GAP:** We do not know how much water is actually being used by many licencees in the basin. Not all licencees are required to report their usage data. For those that do report using WURS, there are quality assurance and quality control challenges which result in sizeable gaps in the data. The WURS system is not yet a reliable one. This gap is a particular concern on tributaries and in rural areas e.g. the Highwood. Better usage data would lead to better understanding of how each licence, region, and sector is performing as well as informing better water quality modelling.

**OPPORTUNITY:** There is an opportunity to further develop current water usage reporting, in particular in rural areas and tributaries, to create a widely used and reliable system for water metering and electronic reporting of water usage. This would ideally include all licences holders and, potentially, private well users. This is needed to understand the impact of transfer applications, in particular on the smaller and more sensitive reaches in the basin.

**FINDING:** As a basin, we do not know the consequence of not knowing actual water usage beyond the major licence holders.

replicate

## **Recommendation 2.5: Establishment of an Interbasin Water Coordinating Committee**

### **Recommendation: Establish an IWCC**

**FINDING:** This has this happened. The IWCC was established with WPAC representation and is still in place today. Ten years later, now may be the time to revisit and possibly refresh the purpose, function and form of the IWCC to ensure that it is useful and effective.

### **Refresh the narrative on why the committee exists and whether it is effective.**

**OPPORTUNITY:** Refresh the narrative on why the committee exists and whether it is effective

### **Does it have the right membership, mandate and accountability?**

**FINDING:** The IWCC mandate was specified in the Plan and was used to develop the IWCC Terms of Reference when it was set up in 2009-2010.

**OPPORTUNITY:** Have the IWCC meet more regularly to become an active forum with a gelled and engaged membership.

**OPPORTUNITY:** Have the IWCC increase communications to report to a broader audience on its Terms of Reference and activities e.g. there could be a standing agenda item at the March BRBC Forum for the IWCC to report back to the WPAC membership.

There has been a large turnover in the membership appointed by the 4 WPACs to represent them. The original IWCC membership was built largely by those involved in the original BACs and the recent water management planning (2001 in particular in the Oldman). The current membership doesn't have that same history and understanding.

### **4.3 Is it providing useful information to GoA? Could it be more useful to GoA?**

**FINDING:** There were shortages in the SSRB in 2015. Decisions were made by the department that impacted water users, but AEP couldn't get the Committee together on short notice. This suggests that it might be better to apply the IWCC to forward looking and proactive discussions, not management of severe events.

**OPPORTUNITY:** Add more things to the IWCC mandate to have it support an active, forward looking, regional discussion of water management. Specific topics might include: How do we manage water more effectively? How do we manage regionally through drought? What does climate change mean for water in the region? What might be the best approach to water sharing in the Southern Tributaries if conditions do not improve in the Oldman basin for 2018.

### **Is it representing the WPACs?**

**FINDING:** It is up to the WPACs to select their representatives.

Members are appointed by WPACs. In the Red Deer, the representatives represent the watershed, not just the WPAC. This in part so they can speak for the RDRWA and the RDRMUG.

**OPPORTUNITY:** Increase communication between the department and WPACs. This is an ongoing issue. More communication would enable the WPACs to be a more useful support to the government and to identify means for WPACs to advance their work. This remains a critical component to the work of the WPACs.

## **Recommendation 2.7: Use of Water Allocation Transfers, Water Conservation Holdbacks and Factors that Must be Considered When Making Decisions**

### **Recommendation 2.7.1: Water allocation transfers**

**Director is authorized to consider applications to transfer water allocations**

#### **Has this happened?**

**FINDING:** This is happening through AEP. In other basins without a Water Management Plan, transfer applications would have to go to Cabinet for decision.

### **The Director must consider the Matters & Factors in making a decision on a transfer application**

#### **Has this happened?**

**FINDING:** This is happening. The AEP Director has discretion as intentionally written and provided for through the Plan. The Matters & Factors table are used to guide those discretionary decisions.

There remains some lack of clarity in understanding the criteria used in the discretionary decisions. There is typically a tension as applicants seek fewer conditions but the detailed implications for aquatic habitat and water quality need to be considered; it is unclear how they are considered in detail and what triggers those studies. It is unclear who or what is the advocate for the environment in the process and discretion. And it is unclear specifically what tools (e.g. models) are used to inform the Director's decisions and what state those tools are in.

The Matter and Factors table in the plan requires the Director to decide what is "significant" in terms of harm raised to source water and environment. "Significant" is not defined. It relies on learning and judgement as it cannot be nailed down to such a degree that everyone will agree to.

**OPPORTUNITY:** Provide greater information and transparency into the criteria, analysis, tools and decisions made when using the Matters & Factors tables to guide discretionary decisions.

### **Only allocations "in good standing" may be transferred**

#### **Has this happened?**

**FINDING:** The *Water Act* outlines the Director's ability to cancel a licence if it is not in good standing, not the Plan. AEP has documented criteria for establishing whether a licence is in good standing. These criteria are intended to provide a consistent approach and are available on the AEP website. There is not enough manpower in AEP to proactively review and look for licences that are not in good standing. There are thousands of licences and each circumstance is unique. Any review must carefully work through the process to respect the rights of the licensee. The standing of licences are typically seen and assessed if and when they come up for transfer.

**OPPORTUNITY:** Create avenues by which licences that are no longer in good standing can be used to the benefit of the watershed. There is currently no incentive to put licences in good standing if it is not being used other than to transfer it. Perhaps intermediary brokers could play a role in finding licences not in good standing licences and putting them in the river rather than to other uses.

The WATSUP report suggested defining "in good standing" as three years of activity/ability to draw and use water. But it takes resources for smaller licensees to prove good standing. The principal of "3 years active to prove good standing" sounds good but would be very difficult to implement. And would run the risk of far more appeals which need further resources. There is a tendency to be lenient in allowing in good standing because use is typically real for the current licence holder. This is not always the case with the fringe licences and they are often the ones available for transfer. It is politically difficult to enforce good standing because it may devalue licences; it is tough to enforce "use it or lose it". WATSUP gave general public support to do that.

The WATSUP also recommended a 5 year amnesty to put licences in good standing. One concern is that this might drive more use on the river to prove good standing. Would a review of dormant licences "wake it all up"? If all dormant licences are transferred, what would happen to the river? WATSUP assumed that most of the dormant licences would go away rather than be put in good standing and that water would be put back in the system. And, if needed, GoA has emergency powers to allocate water if absolutely needed.

WATSUP recommended that all/most licence holders put in place a water shortage response plan to address what will be done if water supply is cut off. This requirement could be put on transfers if an WSRP doesn't already exist. AEP provides a guidance document on how to do this.

It is unclear what the cumulative consequences are should many old licences be made to be "in good standing" and then transferred.

**GAP** in not keeping up to speed on reporting and auditing actual water use, in particular in rural areas e.g. the Highwood. If we had good water use data we would know how each licence, region, sector is performing and would have better data for water quality modelling (instead of assuming full allocated use).

**OPPORTUNITY** to enable a system for water metering and electronic reporting in particular in rural areas and tributaries.

**GAP** we do not know the consequence of not knowing actual water use beyond the major licence holders.

#### **Recommendation 2.7.2: Withhold up to 10%**

##### **Has this happened?**

**FINDING:** The 10% holdback is applied to the vast majority of transfers with some exceptions at the discretion of the AEP Director. If the holdback is taken, a WCO licence is then issued in the name of the Crown.

#### **Recommendation 2.7.3: The Director must consider the Matters & Factors in making a decision on a transfer application**

##### **Has this happened?**

**FINDING:** This is happening. The AEP Director has discretion as intentionally written and provided for through the Plan. The Matters & Factors tables are used. Tables 1 and 2 in the Plan present the Matters and Factors that must be considered in making application decisions and to guide discretionary decisions. These have been implemented and are considered at the discretion of the Director. However, the process is still insular in how the Matters and Factors are considered as only "directly affected" parties can respond.

**OPPORTUNITY:** AEP could provide more complete information on the criteria, analysis, tools, protocols etc. applied when using the Matters & Factors tables to guide discretionary decisions. This transparency would help applicants and intervenors understand how the Province and consultants are assessing the matters and factors for specific applications. For example, what is the mechanism for assessing the Cumulative Effects line item?

**OPPORTUNITY:** Periodically, the Matters and Factors tables should be reviewed to check whether each line item is adequate, sufficiently described and effectively implemented. It may be the case that additional items need to be added without overly burdening the system.

**OPPORTUNITY:** Establish and provide relevant benchmarks and baselines for each of the Matters and Factors tables line items. The transfer system is based on third party response but parties with concern currently do not have a good gauge to determine whether they should put in a statement of concern; there are no clear benchmarks to gauge applications. Having good benchmarks and baselines should shorten the application time for all projects.

**OPPORTUNITY:** Conduct a deep dive discussion with WPAC members, AEP, and interested parties from the region to understand how the Matters and Factors table were applied to a specific transfer

application decision. Many transfer applications have been in the Okotoks/Sheep River, many of them moving upstream from the Bow River main stem into the tributary. A case study on this reach would be highly relevant and comprehensive given the water quantity, water quality, and fishery management concerns held by landowners and water users in the area. A deep dive would demonstrate the information and evidence used or not used in the application of the Matters and Factors in making transfer decisions.

### Specific questions from Scoping Document

#### 5.1a How many times has the Transfer system been used? How many times has it been abandoned?

**FINDING:** As per the Transfers table in the data package, there have been 57 transfers in the Bow. 32 transfers comprising ~8,700 dam<sup>3</sup> out of ~12,500 dam<sup>3</sup> volume are to municipal purposes. That's roughly 2/3 of the transferred volume going to municipal use (which may include residential, commercial and industrial use within the municipality). This is consistent with what was expected to be the biggest user when the Plan was implemented.

There is no data available on how many transfers are abandoned. It is believed that no transfer applications in the Bow have been rejected.

#### 5.1b Expected vs actual uptake of mechanism? Have there been excessive barriers raised?

**FINDING:** No one projected how many transfers would happen once the basins closed. There is no means to compare expected vs. actual uptake. What is perhaps more important is that the transfer system is adequate to ensure no harm and that the department is sufficiently resourced to administer the system.

#### 5.2 How onerous is the Transfer system? Should it be simplified or is it appropriately rigorous?

Comment provided by AEP: The process is guided by the requirements of the Water Act Sections 81 through 83 and requirements to provide Notice under Sections 108 to 111. See Administrative Guideline to the Transfer of Water Allocations on AEP website here <http://aep.alberta.ca/water/legislation-guidelines/documents/GuidelineTransferWaterAllocation-Nov2014.pdf>

**FINDING:** Opinion as to whether the transfer system is too onerous will likely vary tremendously and depend on individual experience and situation. This BAC generally found that the transfer system is necessarily rigorous not too onerous. It takes time and resources to apply for and secure a transfer. However, there have been 57 successful applications in the Bow basin since the Plan was implemented.

**FINDING:** There are barriers that make the transfer system challenging and onerous. These include:

- Difficulty understanding what makes an application complete and what information is required to support the application to help AEP assess harm to the environment and other users.
- Difficulty knowing which processes and requirements will apply to an application.
- Difficulty for some applicants to know whether a licence is "in good standing" until they apply. To help with this, AEP has released a guidance document sharing the AEP criteria to determine "in good standing".
- The time it takes the regulator to make discretionary decisions using the Matters & Factors tables with careful consideration and appropriate analysis.
- Limited transparency into an application's review, supporting analysis and decision.
- In the past, a barrier was the time needed for transfer "buyers" to find potential transfer "sellers". This has been somewhat alleviated by the emergence of transfer intermediaries (brokers). This brokering in an unregulated market function.

The 2009 WATSUP Report presented that the transfer market needs to have a system of rigorous regulation. It suggested that largely isn't in place and that little more has been introduced since plan was implemented to make a free market system possible.

However, AEP has learned a lot by doing. It has focused on adaptive management rather than rigorous regulation given that many of the necessary rules are already in place. The system has a lot of rigour and process but each transfer is a one-off therefore it is challenging to over regulate the process. Instead of a manual, sufficient resources are needed to apply discretion, make decisions and provide transparency on the final decision.

As presented by AEP in September 2017, AEP has developed a range of policy, standards and guidance documents to support the Plan including:

- Administrative Guideline for Transfer of Water Allocations
- Guidelines regarding Appurtenance
- Guide to Compelling Reasons to not take the 10% Holdback for Water Transfers within the South Saskatchewan River Basin
- Preparing Water Shortage Response Plans
- Water Allocation Policy for Closed River Basins in the South Saskatchewan River Basin
- Water Licence Change of Purpose Administrative Licensing Criteria
- Fact Sheets:
  - Transferring Water Allocations Under a Licence
  - Water Act Licences
  - Water Licence Cancellations for Non-Use
  - Water Priority System

**OPPORTUNITY:** AEP could provide further clarity on what processes and information requirements will apply to specific transfer applications.

**OPPORTUNITY:** AEP could provide clarity on the criteria used and applied to make application decisions and document decisions in a manner that is understandable and available to the broader public. This would provide transparency into the decision and enable better understanding of implications to stakeholders.

**OPPORTUNITY:** AEP could provide as much open data and information as possible to the market place to allow equal competition.

**FINDING:** Opinion as to whether the transfer system is too onerous will likely vary tremendously and depend on Individual experience and situation. This BAC generally found that system is necessarily rigorous and but not too onerous. Applying for transfers take resources however there have been 57 successful applications in the Bow basin since the Plan was implemented.

Prior to closure, there was not a lot of discussion of what is being looked at in transfers. There is more scrutiny, diligence and attention to water reallocation now than there was on new licence allocations. This may be partly due to more information being available now and more groups being involved in the decision making. It may be partly due to there being more attention on cumulative effects and new ways of thinking that puts focus on small applications that could add up to major effects in the future. Cumulative effects have changed the dialog from thinking the system is not rigorous enough to now welcoming more rigour from government. It's a system change. It requires managing the whole system.

The uncertainty of the outcome of the transfer process is a significant barrier. Ideally applicants would know What's out of bounds, what cannot be done etc. This would have saves substantial effort,

frustration and applications cycles for some applicants e.g. Okotoks. It is recognized that a manual cannot be written that would guide every possible application. However, clear principles and useful precedents should help. These take time develop and maybe cannot be developed until decisions on new application are made. This is a process of discovery.

**OPPORTUNITY** Put more transparency on the rigour that's already in the transfer application system.

### **5.3 How long does a typical transfer take from application to approval?**

**FINDING:** There is no "typical" time for an application. The speed depends on the completeness of the application, the complexity of the transfer applied for, whether any statements of concern are received, whether a public review is required, and Approval staff workloads.

**OPPORTUNITY:** Should applications be incomplete, deficiencies would be identified in full rather one by one. This should reduce cycle time on completing the application and frustration. AEP is looking to do this; there is likely room for improvement.

### **5.4 What form of public notice is provided for each application?**

**FINDING:** There is a requirement (in accordance with Section 108 of Water Act) for public notice to be provided. Generally, a newspaper notice in the location of the recipient of the transfer and possibly in the location of the source of the transfer is sufficient to make the public aware and solicit concerns. In the Bow, notice is also provided online for any applications under the Water Act. The template used for the notice in the newspaper offers for a meeting to be requested for discussion of a transfer; this is infrequently asked for.

### **5.5 Does AEP offer a public list of water allocation licenses and transfers?**

**FINDING:** All approved water allocations and transfers are publicly listed in the AEP Water Allocation Licence Viewer. This is a map-based tool that shows all active licences with links to licence documents. (<http://aep.alberta.ca/water/programs-and-services/south-saskatchewan-river-basin-water-information/water-allocation-licence-viewer.aspx>)

### **5.6 Is the application and approval process transparent and consistent?**

Process is guided by the requirements of the Water Act and assessment of the Matters and Factors required as outlined in the Administrative Guideline to the Transfer of Water Allocations. See other comments in this document that speak to transparency.

**OPPORTUNITY:** AEP could provide a Q&A page on its website that addresses many of the questions and clarifications addressed in this review and document.

### **5.7 How often have transfers involved a change in purpose/timing/location? (including movement between tributaries and main stem, change from seasonal to year-round use)**

**FINDING:** An initial look at the transfer information provided by AEP, and included in the data package, suggests that many of the 57 transfers in the Bow basin involved changing a withdrawal location from downstream mainstem to a higher upstream tributary. A transfer of this nature feels like a new allocation to that upstream tributary. This has implications for the area. As does a change of purpose, for example, from agricultural to municipal use as the seasonality of the water withdrawal likely changes as well as the pattern, volume and quality of return flow. This is a risk in the transfer system. Transfer application reviews must be transparent to ensure all such concerns are addressed in making the decision. A good decision is dependent on how the Matters and Factors are applied.

**OPPORTUNITY:** More tributaries may need minimum flows to protect their environment health. There are already some IOs on tributaries but they are frequently not met.

**OPPORTUNITY:** The Transfer Summary table in the data packages provides the information for the change in purpose. A table of this manner is helpful. It should be included in this report. AEP could put transfer summary information (like the table provided in this report's data package) on the AEP Water Allocation Licence Viewer.

#### **5.8a Are the 10% holdbacks being used?**

**FINDING:** The table in the data packages provides this information and shows that for the most part, yes, the holdback is being applied. If there is a compelling reason, the Director can choose not to take the holdback. An example of this in the Oldman was when a senior licence with no minimum flow requirement agreed to have a minimum flow put on their licence instead of the 10% holdback

#### **5.8b Are the 10% holdbacks actually putting water back into the river?**

**FINDING:** When a holdback is taken, a WCO licence is then issued to the Crown. This is happening. The table shows the volume being taken in holdbacks, ~1,200 dam<sup>3</sup> in the Bow basin has been held back across 57 transfers.

**FINDING:** The volume held back so far in the Bow basin is tiny compared to the volume of the river; likely within the error of measurement of flow. ~1,200 dam<sup>3</sup> of hold back means a continuous flow for one year of 0.038cms. That might be measurable if it was 100 times bigger.

**OPPORTUNITY:** The intent of the Plan and hold backs was, in part, healthy aquatic ecosystems. We know that the amount generated from the 10% is negligible and we don't know if it will have any benefit to the resilience of the watershed. Unused licence allocation has done more for the rivers than the 10% hold back. The 10% in many ways is a red herring. What are the other things having more benefit? The 10% is causing concern but is not doing enough. This doesn't suggest taking the 10% away but recognizing that it has been ineffectual at improving the health of the watershed because the transfers are so small and therefore doing more through other means.

**OPPORTUNITY:** We need to find better mechanisms to restore resiliency in the watershed, to ensure healthy aquatic ecosystems. It is one of the three legs of *Water for Life* and it needs more attention.

#### **5.8c Is there an alternate mechanism to the holdback that would be more beneficial to developers and the aquatic ecosystem?**

**FINDING:** There may be potential alternate mechanisms worthy of further investigation including but not limited to:

- Better water management overall; that means making decisions to improve environmental good without hurting economic good. For example, being proactive on using existing storage when flows are high and forecast/conditions are dry. This seems to have far more benefit potential than the holdback.
- Allowing private/NGO entities (possibly water trusts) to hold water licences for instream flows.
- Establishing a transfer fee that goes into watershed enhancement projects (not general revenues) instead of the 10% hold back.

The concept of flow restoration in the SSRB rivers raises the question of how do we take water currently being diverted for irrigation to enhance river flows, and should we?



Holdbacks on licence transfers are one way, and as we saw yesterday they have taken 1.2 million m<sup>3</sup> of water from licences for many purposes to enhance flow in the Bow River. An even larger volume has been returned to the Oldman River, for a total of perhaps 3 million m<sup>3</sup> of flow restoration through transfer holdbacks, which is certainly impressive, provided one has no concept of just how large river flows are.

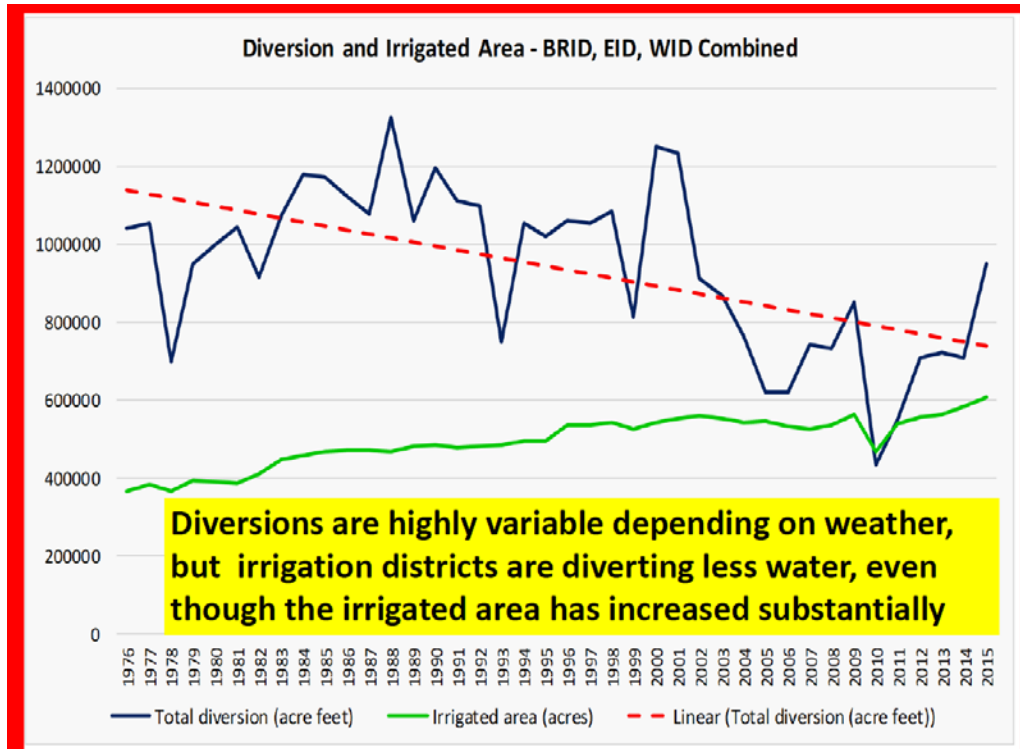
A more impressive amount of flow restored to the rivers is referenced on page 66 of the Data Analysis Package (Version 2), taken from an AWC CEP report, which was distributed prior to our last meeting. It shows that from 2005 through 2014, the 10-year rolling average net use (net diversion, withdrawals minus return flows) for irrigation districts decreased from 1.727 billion m<sup>3</sup> to 1.203 billion m<sup>3</sup>, a 524 million m<sup>3</sup> annual savings of water returned to the rivers. That is far more than 10% of the total allocation in the SSRB, so in 10 years we accomplished more through conservation and efficiency efforts than would be accomplished by transferring every licence and holding back 10% every time. Not bad. A variety of tools were used to accomplish this, but by far the most significant one is the conversion to more efficient on-farm irrigation systems by farmers. Most other sectors also reported decreases in net use, but since their water use is much smaller, their savings are small compared to irrigation. This again emphasizes the reality that the only way to restore a significant volume of river flow is to take water away from irrigation.

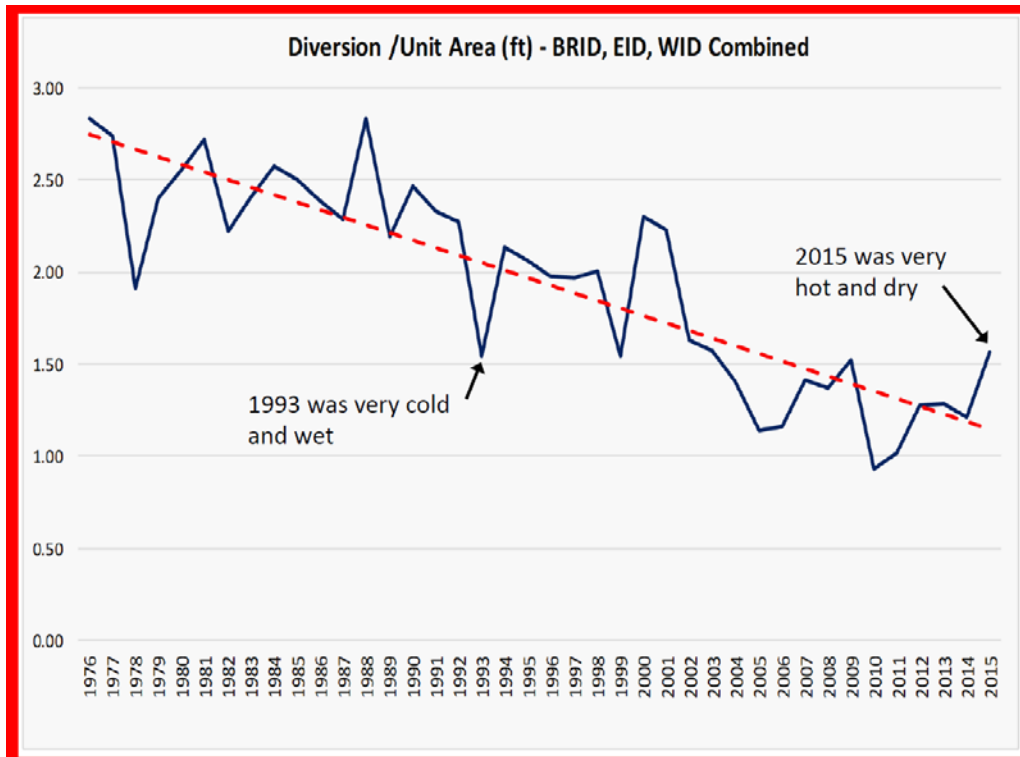
So do we need to take even more water from irrigation to leave in the rivers, given that irrigation farmers and irrigation districts have already saved and continue to save more water than they are using to irrigate new land (and more than would have been returned had every licence in the SSRB been transferred)? Irrigators of course say no, while I am sure that some people say yes. At this point, critics of irrigation would rightly point out that although this water has been saved and returned to the rivers, there is no obligation to keep it there, and we might use it all in the future to greatly expand irrigation. That is technically possible, but extremely unlikely given the process of expanding the limit of an irrigation district's area, which I will not bore you with. This issue of the fate of the saved water is the primary reason that I am such a huge fan of water trusts being able to hold instream flow licences. If they truly believe that instream flow is a better use of water than irrigation, they should be prepared to purchase a portion of our licences to guarantee that there is more water in the rivers, and if the public agrees, they should easily raise sufficient money to purchase them. If it becomes more lucrative to sell water licences to enhance instream flow than it is to expand irrigation, or to sell them to industries or municipalities, instream flow will be the winner.

Is irrigation really a relatively low value use for water, as is often suggested, and what is value? There is no doubt that many other industries create more economic activity per unit of water used (manufacturing smart phones might be an example), but these other industries need very little water compared to irrigation, and we can easily provide enough for them through transfers or other mechanisms. Given that over 40% of the world's food supply relies on irrigation, and 100% of the world's population relies on food, perhaps irrigation is in fact an extremely valuable use of water, and if so, irrigating locally while thinking globally may be a good thing. Irrigation in Alberta contributes about \$3.6 billion annually to the GDP, and creates about 56,000 fulltime equivalent employment positions, and to the thousands of people employed thanks to irrigation, and to those who like eating locally grown food, local irrigation is good. This also illustrates a potential weakness in my plea for water trusts to hold licences: perhaps the government would decide that the public interest is better served by limiting how much water currently apportioned to economic purposes

can be transferred and reserved for environmental purposes, especially if the market, rather than the government, is making the decision on reallocation.

The attached file contains several slides from a presentation I made two years ago which I think are relevant to this issue. The first two slides illustrate the growth of the irrigated area in the three districts on the Bow, combined with the decrease in our diversions.





Please pay particular note to the fact that our diversion per unit area in a hot dry year is now what it was 25 years ago in a cold wet year, thanks to efficiency improvements. The remainder of the slides deal, quite simplistically, with some environmental impacts of irrigation. They really are a bit of a rant on my #1 pet peeve, which is that irrigation districts often gets at least full credit for any negative environmental impacts, and minimal credit for our positive impacts. As a nature-loving fanatical angler (see the slides) I cannot imagine anything more destructive than taking all of the water used for irrigation and returning it to the rivers. I know that this is not being suggested, but how far do we go with flow restoration? We must not forget that along with growing food and providing jobs, water diverted for irrigation supports fish and wildlife habitat and recreation on a regionally massive scale.

My simple answer to this complicated issue is to simply manage our water better, diverting more when it causes no harm or minimal harm, and storing it so we can divert less when the rivers really need the flow. Although new reservoirs would be valuable in achieving this (and would provide even more fish and wildlife habitat), existing reservoirs are not being used as beneficially as they could be.

**5.9 There are water licence sharing assignments originally proposed as short term water shortage solutions between parties that do not go through approval process. Some of these are now becoming long term and should be looked at as permitted temporary transfer but this is not happening until someone complains. Allowing these long term assignments also raises some questions about the criteria for licences held in 'good standing'.**

Assignments are only done between existing licencees. They are outlined in the Water Act as a short term tool for specific purposes. For example, in 2001, assignments were used to manage water shortages in that water year. They are not commonly used. AEP unaware of misuse of this tool.

#### **5.10 Is the Matters and Factors table useful in guiding decision making. Should the Matters & Factors tables pertaining to amendments and transfers be revisited?**

Comment from AEP: There may need to be some clarification of what is meant by the term 'useful'. Overall, the Matters and Factors do put some bounds and transparency to what the Director needs to consider when making a decision. How the Matters and Factors were applied would also form the basis for defending any decisions in front of the Environmental Appeal Board.

More on this is covered elsewhere in the discussion.

#### **5.11 What information is missing (data gaps, legal mechanisms?)**

This is covered elsewhere in the discussion.

#### **5.12 Should all Transfers be managed in the same manner, or is there an opportunity to designate different types of transfers (as per the Water Allocation Transfer System Upgrade Project WATSUP 2009 Report)?**

**FINDING:** AEP manages transfer applications depending on the nature of the transfer and the completeness of application. This triage is not formalized but is effective in allowing small and simple applications (e.g. same licencee, same location, complete application) to move faster while most attention is given to those that warrant it.

The 2009 WATSUP report suggested designating three classes of transfer application: (1) tiny, quick review 2) some discretion 3) full review.

The consideration of cumulative effects of multiple transfers is currently looked at through the AEP modelling using WRMM.

#### **5.13 Does there need to more clarity on the different between an Amendment and a Transfer?**

A guidance document on the AEP website explains this.

## **Recommendation 2.8: Water Management Strategies**

### **6.1 Water Demand and Consumption (Recommendation 2.8.1)**

#### **Has this happened?**

**FINDING:** Improvements in conservation has happened through the AWC led CEP Plans development and reporting by sector. This effort was voluntary and successful. AWC identified the need for this to be done by watershed.

**FINDING:** AEP supported water markets and transfers through the implementation of the Plan and associated legislation and by setting the boundaries for a water market.

It is unclear how return flow/reuse relates to the Plan for example transfers between consumptive and non-consumptive uses change return flow therefore is the transfer an improvement? Is this being looked at? How is this being handled? This is a growing issue for municipal applicants in particular and was not well addressed in the Plan.

**OPPORTUNITY** to clearly address how water reuse considerations are handled under the Plan.

**OPPORTUNITY** to do more to match grey water, waste water, different quality of water to different needs given that we have better technology and information now to do more on this. GoA is moving on this already.

### Specific questions from Scoping Document

#### a. Have modeling capabilities been upgraded?

**FINDING:** Water quality monitoring, evaluation and reporting is being done for the Bow, Oldman and South Saskatchewan rivers through SSRP Water Quality Management Framework for the mainstem rivers. Additional monitoring and reporting will also be done by the Environmental Monitoring and Science Division.

There has been a continual upgrading of AEP's Water Resource Management Model (WRMM). This has been partly to be more user friendly and accessible. Other pieces have been upgraded too e.g. inputs from the Irrigation Demand Model (IDM) which is also being updated, updating natural flow information to include more years. AEP is still working on having sufficient data on hydrologic conditions given climate change going forward; the 90 year record 1926 to early 2000s may not cover sufficient range for looking at WRMM from a climate change perspective. More still needs to be done.

The Bow River Operational Model (BROM) was developed through an exhaustive process in the SSRB and was deemed worthy for flood mitigation planning. This happened with support from AEP. This is part of the increased modelling capabilities.

Water quality models for the Bow from Bearspaw to Bassano are in place. Bassano to the mouth is under development as well as for the lower Highwood and lower Sheep. This will allow AEP to take WRMM output into water quality models for scenario planning.

#### b. Have innovations and improvements in water licencing and legislation to better match allocations with needs been explored?

**FINDING:** No policy has been put in place to do this however there has been lots of adaptive learning. Subsequent to the Plan being draw up, the BRBC hosted a workshop to explore innovations and improvements in the licencing system.

**OPPORTUNITY:** As a region, we need to address the broad public policy question of how we will match secure, safe water supply with growth plans. Water supply is a limiting factor to growth. And we need to match waste water treatment and stormwater management to growth. Regional systems to manage each of these can be developed but only once the region's future growth patterns are understood. This is a broader question than water licencing which, to date, has drawn more public and political attention. This is relevant to all municipalities including Calgary, the major licence holder, and smaller urban centres. The new Calgary Metropolitan Region Board may be the forum to address this important question. Small urbans have been limited by the focus on how to get Calgary to provide water for growth. Perhaps instead we need to limit growth and address each municipality's lack of water. Source

water protection planning is not only a water quality issue; it is also part of water quantity and therefore supply.

**c. Has the development of water markets and transfers been supported?**

This is covered elsewhere in the discussion.

**d. Have improvements in water conservation methods been encouraged?**

This is well addressed in the Alberta Water Council's Looking Back report

**6.2 Improved Dam Management to Protect the Aquatic Environment (Recommendation 2.8.2)**

**Has this happened?**

**FINDING:** Changes in dam operations for aquatic habitat have not happened in the Bow as there are no onstream dams owned by GoA on which to do this. This is happening in the Oldman basin. Government and other dam owners in the Bow have investigated opportunities to optimize operations for water supply and riparian and aquatic health, e.g. the Bow River Working Group's work, the 2016 interim agreement for flood and drought operations on Ghost and Kananaskis.

**Specific questions from Scoping Document**

**a. Are post flood functional flows being released on GoA reservoirs?**

**FINDING:** Conversations happened between Bow operators and functional flow scientists to look at the potential. But the reservoirs in the Bow are private facilities that are being operated for other purposes. Functional flows have not been introduced.

**6.3 Protection and Management of Riparian Vegetation (Recommendation 2.8.3)**

**FINDING:** The ARCA study for the SSRB, 2007 was completed. It is unclear to what extent the ARCA recommendations were implemented. The second phase of the IWMP has been completed through the BRBC.

**OPPORTUNITY** To do more on this recommendation. The WRRP program has had significant impact on riparian protection and enhancement. Keep doing it! Much being done through small organizations.... Cows and Fish. A priority area for future study is the critical functioning capacity of our riparian habitat – its value and the comparison between destruction and restoration of riparian habitat. We need more attention on how we collectively treat our riparian habitat; this requires looking at the land and the water. Incentive programs (Growing Forward) and grazing management could do much more to manage land use riparian areas. Many municipalities have programs specifically targeted to this work. Use the Aquatic and Riparian Condition Assessment for the main stem rivers of the SSRB (ARCA 2007) report as the baseline to review what has been done since.

**Specific questions from Scoping Document**

**a. The intent of the Aquatic and Riparian Condition Assessment for the main stem rivers of the SSRB (ARCA 2007) is to assist Alberta Environment and its partners in determining where to focus management efforts. To what extent has this been happening particularly from the perspective of effectively managing reach specific flow and water quality?**

**b. Review how AEP has worked in partnership with the WPACs to prepare watershed management plans to encourage healthy riparian environments.**

The ARCA 2007 report sets a baseline for water quality, riparian health and degree of hydrological change for reaches and sites throughout the SSRB using defined criteria and indices accepted by

government. Detailed coloured charts flag areas of concern. The general trend for the Bow is that water quality is overall good however nutrients are an issue in some reaches during some parts of the year. Looking forward, the report alludes to the need for nutrient loading management.

**OPPORTUNITY:** Shirley Pickering is preparing a summary presentation to identify the trouble areas in the Bow basin to show how things were at the time of the report. This could be presented at an upcoming BRBC Forum.

**OPPORTUNITY:** To use the Aquatic and Riparian Condition Assessment for the main stem rivers of the SSRB (ARCA 2007) report as the baseline to review what has been done since.

#### 6.4 **Flow Restoration on the Bow, Oldman, and South Saskatchewan River Sub-basins (Recommendation 2.8.4)**

It is unclear what “flow restoration” is actually referring to. Is it the hold backs, is it flow supplement, is it conserved water, is it water restrictions? What was the intent of this recommendation? Is it about working together to manage system in times of stress?

It is unclear what progress has been made on this. Are there examples? Depending on how “flow restoration” is defined, examples might include:

- The Bow River Project which was an effort, in part, to look at options to supplement low flows through voluntary efforts. But voluntary efforts often hit barriers e.g. BRID trying to fill while river is high. Agreements with TA GOA may be a step in this direction.
- municipal conservation efforts
- Irrigation District declaration re water for people first
- The Eastern Irrigation District actions that have quadrupled the minimum flow below Bassano

OPPORTUNITY to take this back to the IWCC

#### **Specific questions from Scoping Document**

- a. Are license holders taking voluntary flow restoration actions, particularly during critical periods?
- b. Are discussions with senior priority license holders held?
- c. Has research been conducted to determine how flow restoration benefits the aquatic environment?
- d. Have operating licenses for government dams and WCO conditions on diversion licenses been assessed?

#### 6.5 **Water Quality (Recommendation 2.8.5)**

- a. Has water quality been studied in more detail throughout the SSRB to assess land use impacts and develop beneficial management practices to mitigate these impacts?

**FINDING:** Many water quality studies have been completed in the SSRB, including:

- SSRP includes provincial policies that address land use aspects related to water
- SSRP Surface Water Quality Management Framework

- Tributary Monitoring Program
- Bow River Phosphorous Management Plan
- Alberta A&F studies throughout Irrigation Districts including return flows
- Alberta Agriculture Operations Protection Act came out after the Plan and implemented many strategies for managing agricultural operations near water bodies.
- the federal Environmental Farm plan came out after the Plan
- the Bow Basin Integrated Watershed Management Plan
- Water quality monitoring, evaluation and reporting is being done for the Bow, Oldman and South Saskatchewan rivers through SSRP Water Quality Management Framework for the mainstem rivers.
- Additional monitoring and reporting will also be done by the Environmental Monitoring and Science Division. The intent of EMSD is to closely tie their reporting to the watershed and what's happening in the watershed in terms of land use and water quality.

There is a continuing question of how well these efforts are they integrating. The BRBC WMP, for example, started with a thorough scan of other reports to try to achieve that integration.



## SECTION THREE: PARKING LOT

This section should capture any topics or questions identified during BAC meetings that are tangential or peripheral to the Review and that warrant further discussion or input from others, but were deemed to be out of scope of the SSRB WMP 10-Year Review.

### **Recommendation 2.1: Establish a Limit on Water Allocations from the Bow, Oldman, and South Saskatchewan River Sub-basins**

1.3 ~~Is adaptation happening without transparent identified performance monitoring / assessment or partner (WPAC) consultation?~~

### **Recommendation 2.2: Future Water Allocation Limit in the Red Deer River Sub-basin**

**Recommendation: Establish an initial total allocation target (600,000 dam<sup>3</sup>) for the Red Deer basin.**

FINDING: Yes this was done through the Plan.

UNCLEAR how the Red Deer basin will manage water challenges associated with growth. Don't want what happened in the closed basins to happen in the Red Deer. Hope this is a question the Red Deer BAC will address.

OPPORTUNITY to close the basin to allocations before holdbacks need to be implemented for transfers.

**NO FURTHER DISCUSSION PLANNED – LEAVE TO RED DEER BAC**

~~Specific questions from Scoping Document~~

2.1 ~~How close is the basin to reaching the 550,000 dam<sup>2</sup> limit?~~

2.2 ~~When is the right time for closing the basin and what influence might that have on whether a 10% holdback is required?~~

### **Recommendation 2.3.2: Establish WCOs for Red Deer**

**NO FURTHER DISCUSSION PLANNED – LEAVE TO RED DEER BAC**

### **Recommendation 2.6: *Master Agreement on Apportionment (1969)***

This section had been marked as out of scope, however the following observations were made:

- The Plan states “The public should be provided with information on a regular basis as to the committee’s recommendations.” This is not being done.
- The Plan states “AENV should submit an annual report to the public in its activities with respect to meeting apportionment.” This is being done.

### **2.8.6: Maintenance of the Red Deer River Sub-basin’s Aquatic Environment**

**NO FURTHER DISCUSSION PLANNED – LEAVE TO RED DEER BAC**

## **ADDITIONAL NOTES FROM BAC MEETING 1**

### **Attendees:**

- Andrea Czarnecki, BRBC
- Dave Barrett, UofC, BRBC
- Harpreet Sandhu, City of Calgary, BRBC
- Judy Stewart, BRBC
- Mark Bennett, BRBC
- Megan Van Ham, Alberta WaterSMART
- Mike Kelly, BRBC
- Mike Murray, BRBC
- Patrick Jabokowski, SEAWA
- Richard Philips, BRID, BRBC
- Rob Wolfe, AEP, BRBC
- Roger Drury, BRBC
- Shirley Pickering, BRBC

### **Meeting Objectives**

1. Agree on how to work through the questions posed in the scoping document
2. Identify data questions or requests to be addressed
3. Begin to work through the questions in the scoping document
4. Agree on agenda and actions for next Bow BAC meeting

### **Participant Expectations**

- Consider how transfers might be changing the system, including moving them upstream and downstream, bringing transfers upstream from the Bow and onto tributaries, transfers from storage to instream flow. This includes change in purpose and change in use. May need to zoom in to look at specific areas, not only the whole basin.
- Develop clear recommendations for GOA to work on using “GoA should consider.....” language to provide suggestions with supporting rationale.
- Build the general interest and knowledge in water management in the basin.
- Bring in the water reuse discussion that was not on the radar during the development of the Plan but is important now e.g. implications for Nose Creek watershed management.
- Identify what was achieved from original plan and where the opportunities are to advance.
- Capture the full range of innovative ideas put forward (possibly in Parking Lot) so we don’t lose the range of ideas even if not supported by the majority.
- Review the WMP; it is one of the most important and innovative things that has happened in Alberta in a long time.
- Hear the perceptions from different parties on how well the plan has been working.

### **Roles**

Chair: Steer the group through the discussion questions. Help document the discussion and findings for the final report.

BAC Member: Bring your knowledge and perceptions to the open BAC discussion; provide extra information to the group via Mike Murray.

Observers: Keep communication lines open between all the BACs.

### **Reminder of scoping document**

- The Scoping document was written to focus on what the plan says and what would be required to do a review
- It identified what data might be needed to support answering the questions
- Many publications were released by AEP at the time of the plan; these could be used in the review. Example: Summary sheet of how BACs each correlated with the draft Plan.

### **How to tackle this work:**

Go through questions in order (as per the Plan and the Scoping document).

First ask: For each item that the Plan recommended:

- Did it happen? (Yes, No, Sort of...)
- Is any part unclear?
- Are there gaps or opportunities?

Do not answer questions specific to another BACs; leave them to that BAC.

Possible, do not answer questions that have no supporting data.

### **Next steps following Bow BAC Meeting 1**

1. Summary document (this one) will be updated to include today's discussion and circulate for you review.
2. Using this document, each person will begin to formulate their answers to the questions posed under each Plan Recommendation; bring your answers/thinking to the next meeting (Nov 30).

### **ADDITIONAL NOTES FROM BAC MEETING 2**

Attendees:

- Andrea Czarnecki, BRBC
- Brian Hills, AEP
- Dale Christian, RDRWA
- Dave Barrett, UofC, BRBC
- Harpreet Sandhu, City of Calgary, BRBC
- Jeff Hanger, RDRWA
- Mark Bennett, BRBC
- Megan Van Ham, Alberta WaterSMART
- Mike Kelly, BRBC
- Mike Murray, BRBC
- Richard Philips, BRID, BRBC
- Rob Wolfe, AEP, BRBC
- Roger Drury, BRBC
- Rosemarie Ferjuc, RDRWA
- Shirley Pickering, BRBC
- Steve Meadows, BRBC

### **Meeting Objectives**

1. Provide update on other BAC activities
2. Work through the remaining questions in the scoping document
3. Identify any outstanding data or information requests to be addressed

#### 4. Agree on agenda and actions for next Bow BAC meeting

##### **Next Steps following Bow BAC Meeting 2**

- Mike Murray to circulate all meeting documents and meeting summaries (raw and summarized) after the meeting.
- Mike Murray to schedule Bow BAC meetings 3 and 4.
- Shirley to review the ARCA Report see if there's anything to pull and reference in this report.
- Mike Kelly to review the WATSUP Report see if there's anything to pull and reference in this report.
- WaterSMART to update the data package to include the tabular data tables requested and noted in this document.
- Brian Hills to follow up with Kevin Wilkinson on how many AEB appeals have resulted in a change in policy at AEP.

##### **Suggested agenda for Bow BAC Meeting 3 – late January**

- Work through questions related to Recommendation 2.7
- Work through questions related to Recommendation 2.8
- Have a focused discussion on “3.2b WCO - Is there a more effective alternative?”

##### **Suggested agenda for Bow BAC Meeting 4 – late February**

- Case study on a specific area to identify findings and implications locally in addition to the basin wide review. Suggestion: Consider the Matters & Factors related to a specific application on the Sheep River (Okotoks)
- Overall findings to be shared at the all-BAC workshop

#### **ADDITIONAL NOTES FROM BAC MEETING 3**

##### Attendees:

- Andrea Czarnecki, BRBC
- Brian Hills, AEP
- Mark Bennett, BRBC
- Megan Van Ham, Alberta WaterSMART
- Mike Kelly, BRBC
- Mike Murray, BRBC
- Richard Philips, BRID, BRBC
- Rob Wolfe, AEP, BRBC
- Roger Drury, BRBC
- Steve Meadows, BRBC
- Janna Casson, OWC
- Pamela Duncan, City of Calgary
- Dave Barrett, UofC, BRBC

##### **Meeting Objectives**

1. Provide update on other BAC activities
2. Work through the remaining questions in the scoping document
3. Have a focused discussion on improvement/alternatives to WCOs
4. Agree on agenda and actions for next Bow BAC meeting

### **Suggested agenda for Bow BAC Meeting 4 – late February – Feb 21**

- Review summary findings (findings, gap, opportunity/recommendations etc.) in preparation for all BAC workshop at the end of March / early April
- WCO deep dive discussion (on today's agenda but ran out of time)
- Possibly: case study on a water licence – what information goes into a decision. Could be joint last meeting for Oldman and Bow. ACTION: Shirley to provide an outline on a potential Case study on a specific area to identify findings and implications locally in addition to the basin wide review.

### **ADDITIONAL NOTES FROM BAC MEETING 4**

#### Attendees:

- Andrea Czarnecki, BRBC
- Brian Hills, AEP
- Harpreet Sandhu, BRBC
- Mark Bennett, BRBC
- Megan Van Ham, WaterSMART
- Mike Kelly, BRBC
- Mike Murray, BRBC
- Richard Philips, BRID, BRBC
- Rob Wolfe, AEP, BRBC
- Roger Drury, BRBC
- Rosemarie Ferjuc, RDRWA
- Shirley Pickering, BRBC, HWMPAC
- Steve Meadows, BRBC
- Dave Barrett, UofC, BRBC

#### **Meeting Objectives**

1. Provide update on other BAC activities
2. Review and refine summary findings from Bow BAC
3. Address outstanding discussion items
4. Solicit Bow BAC suggestions for all BAC workshop
5. Solicit Bow BAC suggestions for final report

#### Suggestions for Agenda for all BAC workshop:

- Presentation from each BAC. Each BAC is drafting a 2-4-page summary narrative. That should be the focus on the presentation.
- Prioritization of findings for to be included in the final report. Risk of overload if there are too many. At the moment, the Bow BAC appears to have 80 findings and gaps!
- Major themes coming from the BAC presentations – hold small table discussion to identify key findings and opportunities.
- How to deal with the parking lot.
- The broader roll out plan for the report including whether and how to share report with WPAC Committees etc.

Request to the Bow BAC members: Pick the top 2 points that you want to pull out of the summary and make sure is clear!

Ideas for the final report:

- Current thinking is to present the story for each BAC and the commonalities – will depend on the summaries coming from each BAC.
- The draft Table of Contents will be circulated; suggestions welcome.

# OLDMAN Basin Advisory Committee

## SECTION ONE: Key Findings

The Oldman Review Committee (ORC) included six Oldman Watershed Council (OWC) Directors, two past OWC Directors/Team Chairs, an Alberta Environment and Parks (AEP) Resource Manager and the Executive Director of the OWC. Two of the ORC team members participated in development of the original South Saskatchewan River Basin (SSRB) Water Management Plan (WMP). The overall interests that were represented by the ORC included municipal, agricultural/irrigation industry, human health, and environmental interests. The ORC attended four meetings, held from October 30, 2017 to March 22, 2018 and there was correspondence by email throughout the review process. This was the first OWC project for a number of people on the committee, and therefore, it was a great learning and team building experience for many on the team. In fact, most of our discussion points during our four SSRB WMP meetings were related to new findings and learnings that we read up on or heard about from our committee members or from John Mahoney, who spoke to us at our third meeting that was held on January 28, 2018.

### Key Observations

The ORC reviewed the data package provided by WaterSmart and made a number of key observations during our review meetings: the surface water allocation and issuing approved licence trend in the Oldman watershed has still been increasing (1.5%) since 2008; groundwater applications have also increased slightly since 2008; temporary diversion licence (TDL) use is minimal in the Oldman basin; and there have been 151 transfers in the Oldman (52.5% agriculture/irrigation swaps, 45.5% municipal, 1% commercial and 0.7% other). Eight of these 151 transfers did not take a 10% holdback at all and about 5.7% was held back. There is still a backlog of surface water applications filed pre-2007 (for 26,000 dam<sup>3</sup> and involving 48 applications) from the Oldman River and its tributaries. Additionally, about 16,000 dam<sup>3</sup> of water is still available for allocation to the Pine Coulee Project on Willow Creek (6,080 dam<sup>3</sup>) and the Oldman Reservoir Area upstream of the dam (10,207 dam<sup>3</sup>). First Nations entitlement is held in Crown reservation, but there is no amount specified. The Piikani Settlement Agreement (2002) related to the Oldman Dam project allocated 48,172 dam<sup>3</sup> for projects that have not yet been developed by the Piikani Nation.

The ORC discussed unintended consequences of the water transfer system establishment in Alberta. One of the consequences discussed was that there were applications submitted by large licence holders to amend their licences in order to allow large amounts of water to be used for other purposes. In 2010, the Director implemented the *Change of Purpose Administrative Licencing Criteria* that established a 1,000 acre feet (1,230 dam<sup>3</sup>), plus 2% of the remaining licence, limit on the amount of water that could be considered in a change of purpose decision.

Irrigation District licence amendments for additional purposes since 2010:

2010 AETNA ID: 700 acre-feet of total 3500 acre-feet 1991 priority licence

2010 Leavitt ID: 1000 acre-feet of total 7750 acre-feet 1991 priority licence

2010 Magrath ID: 740 acre-feet of total 4000 acre-feet 1991 priority licence

2011 United ID: 200 acre-feet of total 17,000 acre-feet 1993 priority licence (from Waterton River)

2013 Mountain View ID: 340 acre-feet of total 500 acre-feet 1991 priority licence

Irrigation District licence amendments for additional purposes prior to 2010:

2004 SMRID: 12,000 acre-feet of 222,000 acre-feet 1991 priority licence

## Oldman Watershed Council BAC Summary Document

2006 Raymond ID: 4,500 acre-feet of 26,000 acre-feet 1991 priority licence  
2006 Taber ID: Entire 8,000 acre-feet of 1991 priority licence  
2007 LNID: 39,068 acre-feet of 50,000 acre-feet 1991 priority licence

### **Data Gaps**

The ORC identified a number of SSRB WMP gaps that exist in the water licence approval process or in the amount of data that has been used to assess the SSRB WMP recommendations. One such gap discussed by the ORC was the lack of clear guidelines for applicants in determining if their water source is from groundwater or groundwater that is directly connected to surface water. The information requirements to support a determination as to whether a water source is groundwater or groundwater directly connected to surface water that falls under the restriction on acceptance of new licence applications is unclear for applicants.

Another identified gap is that there does not seem to be a systematic approach to evaluating what licences are “in good standing” prior to entering the application process. Currently, “in good standing” applications are assessed when they are received by AEP and the Water Act specifies the process to cancel a licence. A determination of whether or not a licence is “in good standing” is completed by the Director prior to considering an application for transfer of an allocation of water. The applicant must attach a Licensee Declaration Form to the application to assist in determination of “in good standing”.

The team discussed at length what a water conservation objective (WCO) “violation” really means as we have not been provided with climate data to compare to the flow data that was provided in this review. In order to answer the question on whether a WCO was violated or not in a given year, climate data (precipitation, temperature, evapotranspiration loss) needs to be compared with flows each year so that we know when WCO “violations” were avoidable or were out of human control. Also, concerns were expressed by the ORC that naturalized flow data is missing from 2010-2016 because AEP did not have the funding to compile and process the data (approximate cost of \$250,000). However, this data is needed to conduct a proper SSRB WMP review of WCO performance.

Another identified gap was that the water transfer process needs more clarity, transparency and efficiency overall and this was one of the key messages of the Water Allocation Transfer System Upgrade Project (WATSUP) report. Taking advantage of current technology would be a good place to start e.g. using email notifications, upgrading the licence viewer. The AEP Licence Viewer could be improved to allow more query types and provide results that can be downloaded in a spreadsheet.

The ORC would like clarity on what modelling work has been done in the SSRB and what the capabilities and limitations are of the various models. We would like to understand where we are at now in the SSRB. We need to understand what the limitations of the Water Resources Management Model (WRMM) are and how the modeling outputs are being used to make water management decisions. Also, cumulative effects and climate change need to be considered and modelled in the Oldman basin.

Current monitoring and reporting on riparian health and flow restoration efforts seem to be lacking in the Oldman basin. John Mahoney presented on restoration flow opportunities in the Oldman Basin and he referred to two successful cottonwood recruitment periods since 1995 (one every 15-20 years would be considered “natural”). He let the committee know that the Redd surveys and poplar counts indicated success; however, he said that this data has not been officially reported on and the team acknowledged that there is public interest in these results.



### **Opportunities and Suggestions for Improvement**

Based on ORC findings and the gaps mentioned above, some key opportunities and suggestions for improvement were identified through the review process:

#### *Groundwater*

- AEP Groundwater Policy Branch should commit to a timeline for development of policy guidance to more clearly define when and how to assess groundwater/surface water interaction for basins where applications for new surface water licences can no longer be accepted.

#### *Water Allocation, Licencing and Transfer Approvals*

- AEP should develop clear and defined criteria for application acceptance and rejection. AEP will need to be stricter about rejecting incomplete applications right up front.
- To enable a better functioning water transfer system, some improvements should be made to the public list of water allocation licences that is in the AEP Water Allocation Licence Viewer. Additional flexibility in searching and querying the list would be helpful. An even better improvement would be if AEP could proactively identify those licences that are considered to be in good standing in their public list.
- AEP should improve its water use reporting system and provide regular summary reporting on a sector basis.

#### *Water Conservation Objectives (WCOs), Instream Objectives (IOs), Instream Flow Needs (IFNs), and 10% Hold backs*

- A review of the WCOs for the headwater tributaries should be done. The ORC suggested there is an opportunity to protect these streams now and an assessment of whether new WCOs could effectively be used within the transfer approval system would be required.
- Additional river holdback options could include allowing third parties to hold in stream licenses and/or the establishment of water trusts. However, the Water Act would need to be amended in order to allow someone outside government to hold a WCO licence.
- Live reporting of flow in comparison to aquatic environment needs to incent people to leave water in the river could be a great public education and engagement project for WPACs, AEP and others to work together on. Sharing real time flow information through the AEP app and providing information on whether IOs and WCOs are being met would be a great way to keep the public informed.

#### *The Interbasin Water Coordinating Committee (IWCC)*

- The IWCC could provide advice to AEP during water shortage in order to help meet apportionment and discuss aquatic health needs. AEP is interested in receiving proactive advice on water sharing from the IWCC and other water management issues. The IWCC should meet more often (i.e. particularly during dry years) and should include discussions at WPAC Forums and post discussions on GOA website in order to be more effective.

#### *Modeling and Collaboration*

- Forecasting future water demand and consumption in the Oldman River is critical for assessing how future water management activities will be matched to growth in the basin. Establishment of criteria to standardize modelling is needed so that we can compare and integrate results from multiple models. The results of modelling could be used to make management decisions that take cumulative effects and climate change into account. Also, monitoring and modelling would need to be directly linked in order to ensure robust model calibration.

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- AEP should continue to work with universities and other researchers who are doing climate change modelling in order to improve water management decisions and increase capacity and knowledge sharing in the SSRB.
- The OWC would like to complete a 2020 State of the Watershed (SOW) report. This was perceived as a good opportunity and it was suggested that GoA should provide support to the OWC on this project. It was suggested that a simple desktop exercise to compare Oldman River instream flow needs with actual flow on test reaches is a good opportunity that could be incorporated into the SOW.

### **Areas for Future Work**

The first and foremost future work suggestion by the ORC is that the Oldman River naturalized flow data from post-2009 needs to be compiled and processed in order to conduct a proper SSRB WMP review. A second future work suggestion is that it is extremely important that future population and industry growth (and associated water demand increases) needs to be modeled and evaluated in the Oldman watershed, particularly because our sub-basin is one of the most allocated sub-basins in Alberta. We want to understand what flows might look like in the future under different climate change scenarios and with future population and industry growth. The WRMM could be used to determine growth impact and climate variability scenarios on flows in the Oldman basin. Also, in order to adequately evaluate population and industry growth impacts on water management and watershed health in the Oldman basin, better linkages need to be made with land use and water use changes over time. As mentioned in the opportunities and suggestions for improvement section above, a review of all SSRB modeling work and collaboration with universities and other researchers would be beneficial. Another suggestion is that there should be further exploration into, in a collaborative and holistic manner, the compensation systems and incentives for water to be left in the river. The last future work suggestion is that current water licence transfer process limitation of not being able to attach amendments and new conditions to transferred licences should be reviewed, and perhaps relaxed, such that new conditions can be added. It has been acknowledged that additional AEP resources may be needed to conduct future SSRB WMP work projects.

### **Additional Irrigation Adaptive Management Opportunity**

The irrigation districts, through the Alberta Irrigation Projects Association (AIPA), have made a formal resolution that they support people first, animals second, and crops last. Similar to other irrigation districts in the SSRB, the Lethbridge Northern Irrigation District (LNID) has conserved more water than it has used for expansion. This has left more in the river in wet or average years. The irrigation industry has made significant water conservation gains through on-farm and conveyance system upgrades and efficiency gains. All industries are encouraged to conserve through Conservation Efficiency Productivity Plans (CEPPs). AEP is getting support from the irrigation districts to take actions to benefit the environment. Licence holders are accepting a higher risk to their operations, however, only in years when that risk can be minimized because water supply is high. If there is no risk, AEP will go ahead and take action without discussion. Licence holders have become more comfortable over time, now that these actions have been tested for a few decades and trust has been built. Irrigation districts were approached for support to take actions to benefit the environment. AEP and the irrigation districts discuss water allocation and management regularly throughout the growing season, and thus, there are opportunities for environmental considerations to be brought up, discussed, and planned for during those discussions

## SECTION TWO: Analysis

Notes in red from March 22, 2018 meeting

\*Highlight importance of WPACs to facilitating these types of processes and helping with the future work that is identified during the review process.

### **Recommendation 2.1: Establish a Limit on Water Allocations from the Bow, Oldman, and South Saskatchewan River Sub-basins**

**How has the trend in water allocation and/or use changed in the years before and since the implementation?**

**OBSERVATION:** Surface water allocation in the Oldman River Basin continues on an upward trend and has increased by 1.5% between 2008 and 2017.

**OBSERVATION:** As of June 2017, approximately 2,266,000 dam<sup>3</sup> of surface water and 18,000 dam<sup>3</sup> of groundwater has been allocated in the Oldman basin.

**FINDING:** Although Alberta Environment (AENV) stopped accepting applications in 2007 the *Oldman River Basin Water Allocation Order (2003)* and the *Bow, Oldman and South Saskatchewan River Basin Water Allocation Order (2007)* allowed allocating water for applications completed prior to the Order and for applications relating to the Little Bow/Highwood Diversion Project, the Pine Coulee Water Management Project and the Oldman River Reservoir Area Projects.

**FINDING:** There is still a backlog of surface water applications filed pre-2007 (for 26,000 dam<sup>3</sup> involving 48 applications) from the Oldman River and its tributaries.

**FINDING:** Additionally, about 16,000 dam<sup>3</sup> of water is still available for allocation to the Pine Coulee Project on Willow Creek (6,080 dam<sup>3</sup>) and the Oldman Reservoir Area upstream of the dam (10,207 dam<sup>3</sup>).

**FINDING:** First Nations entitlement is held in Crown reservation, but there is no amount specified. The Piikani Settlement Agreement (2002) related to the Oldman Dam project allocated 48,172 dam<sup>3</sup> for projects that have not yet been developed by the Piikani Nation.

**Have there been any operational adaptations or options that may have had the unintended consequence of negating overall intended planned outcomes? (e.g., changes in temporary diversion licence use; use of licence amendments and assignments; more of a draw on [unlicensed] groundwater)?**

**OBSERVATION:** Groundwater applications have increased slightly since 2008.

**FINDING:** When there is doubt about whether the water source is surface water or groundwater, the onus is on the applicant to prove it is groundwater and not groundwater directly connected to surface water and this can be a lengthy process.

**GAP:** The information requirements to support a determination as to whether a water source is groundwater or groundwater directly connected to surface water that falls under the restriction on acceptance of new licence applications is unclear for applicants.

**OPPORTUNITY:** The Alberta Environment and Parks (AEP) Groundwater Policy Branch has been asked to develop policy guidance to more clearly define when and how to assess groundwater/surface water interaction for basins where applications for new surface water licences can no longer be accepted, so that applicants are able to provide the right information for review and decision-making. Groundwater Policy Branch has yet to commit to a timeline to develop the policy guidance.

**FINDING:** Temporary diversion licence (TDL) use has been minimal in the Oldman basin.

**FINDING:** An unintended consequence was that there were applications by irrigation districts to amend licences to allow large amounts of water to be used for purposes other than irrigation. An amendment, instead of a transfer, meant there was no conservation holdback. In 2003-2006, amendments were

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granted, totalling approximately 63,568 acre feet, in four irrigation districts (SMRID, TID, RID, LNID) in the Oldman Basin. If transfers had been required, that would amount to 6,357 acre feet held back to meet a water conservation objective (WCO). The Eastern Irrigation District (EID) applied to amend one of its large licences entirely for change of purpose. Because of public concern (there were appeals to the Environmental Appeal Board), the Director stopped granting amendments until there was a policy regarding it. The Director was concerned “that this would undermine the intentions of the Act, stimulate water speculation, impact water markets and transfer applications, and allow large users to be water brokers or co-ops”. In 2010, the Director implemented the *Change of Purpose Administrative Licencing Criteria* that establishes a limit on the amount of water that will be considered in a change of purpose decision:

<http://aep.alberta.ca/forms-mapsservices/directives/documents/WaterLicenceChangePurpose-Apr23-2014.pdf>. Water volume for new purposes is limited to 1,000 acre feet (1,230 dam<sup>3</sup>), plus 2% of the remaining licence. In 2010, 2,440 acre feet was approved for change of purpose in AID, LID and MID; 5,000 acre feet for EID.

**GAP:** We do not know the number of amendments and volume in the change of purpose category.

**FINDING:** These doubled up private licences would not be considered in “good standing”; however, they are not being investigated by AEP, **except when a transfer application is received.**

**GAP:** There is not a systematic approach to evaluating what licenses are in good standing. What is actual use vs. potential use? Irrigation districts and municipalities have to report their use annually - all users should have to do this. This will help eliminate water prospecting.

**FINDING:** Currently, “in good standing” applications are assessed when they are received by AEP. The Water Act specifies the process to cancel a license. A determination of whether or not a licence is “in good standing” is completed by the Director prior to considering an application for transfer of an allocation of water. The applicant must attach a Licensee Declaration Form to the application to assist in determination of “in good standing”.

**OPPORTUNITY:** AEP should develop an easy to use system for evaluating if licenses are in good standing and require mandatory annual reporting. If reports are missed, licences can be cancelled.

### How many Crown licences have been issued since Basin closure and for what use?

**FINDING:** Pine Coulee and Little Bow Crown licences have been issued in the Oldman basin. There has been 71 WCO licences allocating the 10% holdback volumes from transfers issued to the Crown in the Oldman basin up to June 2017.

### Who (AEP vs. AER) is making regulatory decisions on water allocations?

**FINDING:** The Alberta Energy Regulator (AER) has the authority to make decisions regarding allocations for upstream oil and gas, pipelines, and coal mining and processing since 2014.

### Are both agencies (AER and AEP) using the same approval criteria?

**FINDING:** Yes, both AEP and AER use the same Matters and Factors tables approved through the plan.

### What information is missing (data gaps, legal mechanisms?)

**GAP:** Naturalized flow data is missing from 2010-2016 because AEP did not have the funding to compile the data (approximately \$250,000). We need this data to do a proper 10-year review.

**FUTURE WORK:** Compile and process naturalized flow data post 2009.

**OPPORTUNITY:** Municipalities and irrigation districts report on consumptive water use, but other water users do not. A mandatory reporting system for all water users needs to be developed.

**GAP:** It is difficult to answer the question about whether a WCO has been met or not with the data provided. Other data, such as climate variability (precipitation, temperature,

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evaporation/evapotranspiration loss) data is needed in order to assist with the interpretation of whether WCO violations were avoidable or not in particular years.

**GAP:** Relationships between flow and climatic data (precipitation, temperature and evapotranspiration losses) need to be determined for different climatic scenarios (dry, wet and normal flow years).

**FUTURE WORK:** Develop and evaluate relationships between flows and climatic data (precipitation, temperature and evapotranspiration losses) in the Oldman basin. Evaluation of dry, wet and “normal” year modeling scenarios in the Oldman basin using the Water Resources Management Model (WRMM) or other models. *We want to understand what flows might look like in the future under different climate change scenarios and with future population and industry growth.*

**OPPORTUNITY:** AEP should work with universities and other researchers (John Pomeroy, WaterSmart, Dave Sauchyn) who are doing climate change modelling that could benefit management decisions and increase capacity.

**GAP:** Need clarity on current modelling and capabilities to understand where we are at now. We need to understand what the limits of AEP modelling are and how are WRMM and other modeling outputs being used to make management decisions.

**OBSERVATION:** There appears to be a lack of resources to implement the plan the way it was intended. More resources are needed for AEP.

### **Recommendation 2.3: Recommended Water Conservation Objectives (WCOs)**

#### **Recommendation 2.3.1: Upstream WCOs not be less than existing IO or the WCO downstream on the main stem**

**FINDING:** This has been implemented through WCO’s designated by the Director in 2007 as recommended in the Plan.

**FINDING:** The low instream objective values for the three southern tributaries and high level of water allocation in those watersheds limits how often the WCO’s can be met and therefore its effectiveness.

**OPPORTUNITY:** Review the WCOs for the headwater tributaries is a water management strategy recommendation in the South Saskatchewan Regional Plan (SSRP). There is an opportunity to protect these streams now and an assessment into whether new WCOs could effectively be used within the transfer approval system is needed.

#### **Recommendation 2.3.2: Establish Water Conservation Objectives (WCOs) for Oldman**

**FINDING:** There are limitations on the effectiveness of the WCO in the Oldman River basin given the level of existing license allocation at the time the plan was implemented. A WCO cannot be routinely added when transferring, if not present already, as senior licenses do not include them.

**FINDING:** The Province cannot modify an existing licence (e.g. add conditions to a licence to protect the environment) without the consent of the licensee and the Water Act can require the department to compensate the licensee. The Director can add meeting the flow requirement of a WCO a condition of a new licence created as the result of a transfer as a means to mitigate an adverse effect on the aquatic environment, but that could be subject to appeal.

**OPPORTUNITY:** There is confusion about instream objectives (IOs), WCOs and instream flow needs (IFNs) for specific locations in the Oldman, a summary table with definitions of each and how they are determined and applied in each location would be beneficial.

#### **The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?**

**FINDING:** We do not have evidence of this and the WCOs were not applied to existing licences or to new applications before 2006.

**FUTURE WORK:** It would be beneficial to increase the WCOs on the headwater tributaries *to over 45% in order to protect these source waters as growth pressure increases in the future. Increasing the WCOs in*

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the Oldman River basin headwaters to 80% of natural flow was suggested in the 2011 report *A Desk-top Method for Establishing Environmental Flows in Alberta Rivers and Streams* by Allan Locke and Andrew Paul and prepared for AEP:

<http://aep.alberta.ca/water/programs-and-services/water-for-life/healthy-aquatic-ecosystems/documents/EstablishingEnvironmentalFlows-Apr2011.pdf>

### Is there a more effective alternative?

**OPPORTUNITY:** Options could include allowing **third parties** to hold in stream licences, and ensuring that 10% holdbacks could be taken on all transfers without exception. However, the Water Act would need to be amended in order to allow someone outside government to hold a WCO licence.

**FUTURE WORK:** Explore, in a collaborative and holistic manner, the compensation systems / incentives for water to be left in the river (e.g. Trans Alta payments for flood mitigation).

### How much of a role does unused allocation within existing licences play in the river for healthy aquatic ecosystems?

**FINDING:** The irrigation districts do not divert (and use) their full water licence allocation volumes on the Oldman River and this unused water is therefore left in the river.

### **Recommendation 2.5: Establishment of an Interbasin Water Coordinating Committee**

#### Is it providing useful information to Government of Alberta (GoA)? Could it be more useful to GoA?

**FINDING:** This IWCC has been established.

**OPPORTUNITY:** This committee could provide advice to AEP during water shortage in order to help meet apportionment and **discuss aquatic health needs**. AEP is interested in receiving proactive advice on water sharing from the IWCC and other water management issues.

#### Does it have the right membership, mandate and accountability?

**FINDING:** The membership includes the WPACs and AEP.

**OPPORTUNITY:** This Committee should meet more often (i.e. particularly during dry years) and should include discussions at WPAC Forums and **post discussions on** GOA website in order to be more effective.

#### Is it representing the WPACs?

**FINDING:** Yes. The WPACs select their representatives on the IWCC.

### **Recommendation 2.7: Use of Water Allocation Transfers, Water Conservation Holdbacks and Factors that Must Be Considered When Making Decisions**

#### **Recommendation 2.7.1: Water allocation transfers - Director is authorized to consider applications to transfer water allocations**

**FINDING:** This process happens through AEP. In other basins without a Water Management Plan, transfer applications go to Cabinet for decision.

#### How many times has the Transfer system been used? How many times has it been abandoned?

**OBSERVATION:** There have been 151 transfers in Oldman basin (52.5% agriculture/irrigation swaps, 45.5% municipal, 1% commercial and 0.7% other). A total volume of 26,284 dam<sup>3</sup> has been transferred in the Oldman basin and 5.7% of this volume has been held back.

#### Expected vs actual uptake of mechanism? Have there been excessive barriers raised?

**FINDING:** No projections on expected vs. actual uptake were done since the plan was initiated.

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### How onerous is the Transfer system? Should it be simplified or is it appropriately rigorous?

**FINDING:** Some applicants feel the system is too onerous and some of the water transfer application backlog is due to incomplete applications.

**OPPORTUNITY:** AEP needs to develop clear and defined criteria for application acceptance and rejection. AEP will need to be stricter about rejecting incomplete applications right up front.

### How long does a typical transfer take from application to approval?

**FINDING:** There is no such thing as a typical transfer time. The processing speed depends on the completeness and complexity of the applications.

### What form of public notice is provided for each application?

**FINDING:** Public notice requirements are in the administrative guidelines and the time requirements are legislated.

**GAP:** A problem is that the public notice advertisements in the newspapers are not necessarily received unless those interested know when to look.

**OPPORTUNITY:** An email notification system that people can sign up to. All potentially affected parties are sent notification directly. AER has a sign up email, AEP does not. **CEAA has a bulletin you can subscribe to and receive an email each week – AEP can use as an example.**

### Does AEP offer a public list of water allocation licenses and transfers?

**FINDING:** The water license information is available through the AEP Water Allocation Licence Viewer: <http://waterlicences.alberta.ca/>

**OPPORTUNITY:** **The AEP Water Allocation Licence Viewer is onerous and inadequate to allow meaningful engagement. It should be improved to be easily searchable and allow for simple queries and all results can be downloaded in a spreadsheet.**

### Is the application and approval process transparent and consistent?

**FINDING:** The application and approval guidelines and process is relatively transparent. However, there is not consistency because every situation is unique. There is also Director Discretion.

**FINDING:** Legislation is silent on licensees who have multiple licences and are holding onto senior licences with no conditions until they need them. The Matters and factors look at these issues.

**FUTURE WORK:** **Public review is required but only for those directly affected. Unless those who are directly affected submit a Statement of Concern, there is no public review. Parties with legitimate concerns should be allowed to participate and public reviews should be mandatory.**

**OPPORTUNITY:** **People who are not directly affected can be encouraged to submit an Expression of Interest to try to voice their opinions and ask questions.**

**OPPORTUNITY:** **If AEP wants to have a transparent process the current system is inadequate and needs to offer more opportunities for public input and discussion of these important decisions.**

### How often have transfers involved a change in purpose/timing/location? (including movement between tributaries and main stem, change from seasonal to year-round use)

**FINDING:** There have been 151 transfers in Oldman basin (52.5% agriculture/irrigation swaps, 45.5% municipal, 1% commercial and 0.7% other).

### Should all Transfers be managed in the same manner, or is there an opportunity to designate different types of transfers?

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**OPPORTUNITY:** Oldman Basin Review Committee needs to review and discuss whether or not they support the WATSUP report recommendation of designating different types of transfers.

**GAP:** Process needs more clarity, transparency and efficiency overall. This was one of the key messages of the WATSUP report. Taking advantage of current technology would be a good place to start (using email notifications, upgrading license viewer).

### **Recommendation 2.7.2: Withhold up to 10%**

#### **Are the 10% holdbacks being used?**

**FINDING:** Yes, but not all of the transfers included a 10% holdback. A total volume of 26,284 dam<sup>3</sup> has been transferred in the Oldman basin and 5.7% of this volume was held back.

#### **Are the 10% holdbacks actually putting water back into the river?**

**FINDING:** When a holdback is taken, a WCO licence is issued to the Crown. The WCO licenses are issued, but cumulatively these licenses account for a small amount of water i.e. approximately 1,500 dam<sup>3</sup> has been held back in the Oldman basin.

#### **Is there an alternate mechanism to the holdback that would be more beneficial to developers and the aquatic ecosystem?**

**OPPORTUNITY:** An alternative to the 10% holdback could include water trusts or other third parties. However, the Water Act would need to be amended in order to allow someone outside government to hold a WCO licence. In the USA, Trout Unlimited pays farmers not to withdraw water and this could be tested here.

**OPPORTUNITY:** Live reporting of flow in comparison to aquatic environment needs to incent people to leave water in the river right now, because they know it is low. A great education and engagement project for WPACs, AEP and others to work together on. Could improve the existing app.

### **Recommendation 2.7.3: The Matters and Factors that must be considered - The Director must consider the Matters & Factors in making a decision on a transfer application**

**FINDING:** The Matters & Factors tables are used in the transfer application decision-making process. The AEP Director has discretion as written and provided for in the Plan.

**GAP:** Net diversion data\* is sometimes missing and yet is listed in the Matters and Factors tables.

\*Net diversion data takes into account return flows and these are not accounted for in licence (Medicine Hat and Okotoks want recognition that they are only using part of what they have).

**GAP:** Cumulative effects and climate change need to be considered and modelled.

### **Recommendation 2.8: Water Management Strategies**

#### **6.1 Water Demand and Consumption (Recommendation 2.8.1)**

**FINDING:** All industries are encouraged to conserve water through Conservation Efficiency Productivity (CEP) Plans.

#### **Have modeling capabilities been upgraded?**

**FINDING:** The Water Resources Management Model (WRMM) is being used for Oldman River modeling. Changes are added to the model regularly, including water quality modelling capabilities for the Bow, Highwood and Sheep Rivers. The Oldman River model component has been developed, but it has not been fully vetted yet. The focus has been on the Bow River because that is where the majority of population growth and change is happening.

**GAP:** Future water demand and consumption modelling in the Oldman basin is needed as this basin is more allocated than any other basin in Alberta.



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**OPPORTUNITY:** Forecasting future water demand and consumption in the Oldman River is critical for assessing how future water management activities will be matched to growth in the basin.

**OPPORTUNITY:** Establish criteria to standardize modelling so we can compare and integrate results from multiple models.

**OPPORTUNITY:** Use the results of modelling to make management decisions that take cumulative effects and climate change into account.

**OPPORTUNITY:** Ensure monitoring and modelling are directly connected to ensure robust calibration.

### Have innovations and improvements in water licensing and legislation to better match allocations with needs been explored?

**FINDING:** The irrigation industry has made significant water conservation gains through on-farm management and efficiency gains and irrigation conveyance system upgrades.

**FUTURE WORK:** Link land use and growth to impacts on water management and watershed health.

### 6.2 Improved Dam Management to Protect the Aquatic Environment (Recommendation 2.8.2)

**FINDING:** The IOs can be released at a dam, but that does not mean that released water will reach the mouth of the river. In winter, in particular, released water can turn into ice, and in summer evaporation rates are higher and users are withdrawing more water. Dam operators are considering IOs and flow further downstream and not just at the dam. Return flows have to be taken into consideration too.

**FINDING:** There are limited opportunities to reach WCOs on the southern tributaries, unless water demand can be reduced.

**OPPORTUNITY:** There is intent to add water to the rivers whenever possible, but it depends on water availability. We need to identify some clear recommendations on this.

**FINDING:** Need to be clear about the difference between IFN, IO and WCO. They are vastly different.

**OPPORTUNITY:** Share real time flow information through the AEP app and provide information on whether IOs and WCOs are being met.

### 6.3 Protection and Management of Riparian Vegetation (Recommendation 2.8.3)

**GAP:** The Redd surveys and poplar counts indicated success, but there has been no reporting on this.

**OPPORTUNITY:** There have two successful cottonwood recruitment periods since 1995 flood (one every 15-20 years would be considered natural). There is public interest in these results, so sharing them would be beneficial.

**GAP:** Monitoring and reporting on riparian health in the Oldman basin is lacking. No reports have been released publicly since the ARCA Study for the SSRB, 2007, other than OWC's State of the Watershed (SOW) report, 2010. ARCA, 2007 showed that the downstream reaches were the most impacted.

**OPPORTUNITY:** The OWC is pushing for a 2020 SOW from the GoA and would like AEP support on this.

**OPPORTUNITY:** A simple desktop exercise to compare IFN to actual flows on test reaches could be done.

### 6.4 Flow Restoration on the Bow, Oldman, and South Saskatchewan River Sub-basins (Recommendation 2.8.4)

**FINDING:** The irrigation districts do not divert their full water licence allocation volumes on the Oldman River. The Alberta Irrigation Projects Association (AIPA) and the irrigation districts have made a formal resolution that they support people first, animals second and crops last in terms of allocated water during times of drought.

**FINDING:** The irrigation industry has made significant water conservation gains through on-farm and conveyance system upgrades. The Lethbridge Northern Irrigation District (LNID) has conserved more water than it has used for irrigation expansion and this means that more water has been left in the Oldman River in wet or average years.

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**FINDING:** AEP is receiving support from irrigation districts to take actions to benefit the environment. Licence holders are accepting a higher risk to their operations in years when risk can be minimized because water supply is high. When the risk is low, AEP will take action without discussion. Licence holders have gotten more comfortable with this over time, particularly now that these actions have been tested for a few decades and trust has been established. Regular communications on water management occur as AEP and the irrigation districts meet weekly, **on southern tributaries**, during the growing season. Environmental considerations can be brought up during these meetings.

**GAP:** Operating licences for government dams and WCO conditions on diversion licences have not been assessed **to look for ways to restore flows**.

### 6.5 Water Quality (Recommendation 2.8.5)

**FINDING:** There are many water quality studies that have been completed in the SSRB, including:

- Bow River Phosphorous Management Plan
- Alberta Agriculture and Forestry (AAF) studies on agricultural impacts on water quality, agricultural beneficial management practice (BMP) evaluation, irrigation district water quality monitoring.
- SSRP Surface Water Quality Management Framework monitoring and reporting
- A salinity report coming out soon showing increasing trend downstream of Calgary and the Environmental Monitoring and Science Division (EMSD) is currently working on a similar report for nutrients.

**OPPORTUNITY:** There is enough data to look at water quality trends in the Oldman basin.

## SECTION TWO: ANALYSIS

This section should be submitted in bullet form, organized according to the SSRB Recommendations and numbered Assessment Questions presented below. These questions are consistent across all sub-basins and BACs. Simply fill in your key discussion points under each Assessment Question. If any question is not applicable in a BAC/sub-basin, this should be noted in the appropriate location.

### Oldman Watershed Review Committee meeting notes:

In blue: notes taken on October 30, 2017 (In attendance:

Alan Harold – Lethbridge Northern Irrigation District, OWC Director, Irrigation perspective  
Terence Hochstein – Potato Growers of Alberta, OWC Director (Alternate), Agriculture perspective  
Janna Casson – Alberta Agriculture and Forestry, OWC Director, GoA perspective  
Mike Murray – Bow River Basin Council  
Mark Bennett – Bow River Basin Council  
Doug Kaupp – City of Lethbridge, OWC Chair  
John Younger – Alberta Health Services, OWC Director, Health perspective  
Shirley Pickering – Highwood Management Plan Public Advisory Committee Chair  
Cheryl Bradley – Southern Alberta Group for Environment  
Shannon Frank - Oldman Watershed Council staff  
Lori Goater – OWC Director, Wildlife and Habitat Conservation perspective  
Henk De Vlieger – OWC Director, Member at Large perspective)

In green: notes taken on November 20, 2017 (in attendance: Brian Hills, Alan Harold, Doug Kaupp, Terence Hochstein, Shirley Pickering, Cheryl Bradley, Lori Goater, Shannon Frank, Mike Murray, Mark Bennett, and Janna Casson)

In orange: notes taken on January 26, 2018 (in attendance: Brian Hills, Alan Harold, John Younger, Doug Kaupp, Henk De Vlieger, Shirley Pickering, Cheryl Bradley, Lori Goater, Shannon Frank, Mike Murray and Janna Casson. Presentation by John Mahoney.

### Recommendation 2.1: Establish a Limit on Water Allocations from the Bow, Oldman, and South Saskatchewan River Sub-basins

1.1 How has the trend in water allocation and/or use changed in the years before and since the implementation?

- **GAP:** Are First Nations licenses exempt from the limit? It's a commitment that isn't being used, is earmarked within the limit. Amount is known – will ask Brian.
- **OBSERVATION:** Trend increasing slightly since 2008.
- **GAP:** There is a limit in the plan but there are some licenses that were given out after the closure because there was a queue. Are there still license applications in the queue today?
- **FINDING:** Data given to WaterSmart included applications for surface water in a worksheet. AEP still dealing with these. 35-36 applications still outstanding in Oldman. Most of allocation is in Red Deer because of Special Areas Project. Volume 20,000 dam<sup>3</sup> of water in Oldman. Push to get backlogs cleaned up. A lot is First Nations, number for Blood Tribe, individuals from Blood Tribe have applied but because they don't own the land, the tribe does, can't issue license to person. Lower Little Bow between Travers Reservoir and mouth of Oldman. Dates back to 1980s. Scope of projects only up to Travers, not downstream. Looking at water availability to see what's

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possible. 6-12 months should have a decision. These are within allocation limits of the reservoir design.

- **FINDING:** First Nations entitlement is held in Crown reservation – but no specific amount. BOSS order said any unallocated water is held under Crown reservation but none been allocated this way because haven't agreed on how much water they need yet.
- **FINDING:** Clear Lake 4-6 applications, exceeded project allocation, will be decisions soon.
- **OBSERVATION:** After plan went in, licenses were approved – the graph is accurate, it is increasing.
- **FINDING:** Still allocating upstream of Oldman dam.
- **FINDING:** Oldman water allocation order – shows how much available for allocation upstream of Oldman dam – about 13,000dam<sup>3</sup>
- **GAP:** Bow Oldman South Saskatchewan Water Allocation Order (BOSS) Order says all unallocated water is held under Crown reservation and can be used for new allocations specified in the BOSS, could it impact WCOs? Unallocated water reserved for First Nations, needs of aquatic environment, storage-existing applications on file prior to closure to accepting new applications and other specified exceptions in the BOSS.
- **FINDING:** No specified amounts for First Nations held in Crown Reservation, amounts for WCOs is available and data was given to WaterSmart.
- **FINDING:** Do licenses in the queue have to show need for water so they can't just sell it off? Yes – approvals people will verify there is a need.
- **OPPORTUNITY:** Could we forecast allocation trends to see if increase will continue? Statistically significant increase is concerning. Data is lacking. Would like to know minimum and maximum volume that could be allocated and how close to that limit we currently are.
- **FINDING:** Currently around 2,000,000 dam<sup>3</sup> is allocated, around 20,000 dam<sup>3</sup> left to allocate – 1% so we are near the limit.
- **FINDING:** Piikani allocation has 35,000 acre feet but a large portion of that was for an irrigation project that has yet to be developed.
- **GAP:** Expect more low flows in future as more licenses use water that is currently not being withdrawn.

1.2 Have there been any operational adaptations or options that may have had the unintended consequence of negating overall intended planned outcomes? (e.g., changes in TDL use; use of licence amendments and assignments; more of a draw on [unlicensed] groundwater)?

- **OBSERVATION:** Groundwater applications have increased. Is this just a work around to continue issuing licenses that are clearly GUDI?
- **GAP:** Most groundwater use comes from GUDI – how is this dealt with? GUDI guideline very unclear, more about quality than quantity, so it is not really considered. Has been legal issue in Okotoks vs MD Foothills. Decision making unclear. Ask AEP to comment.
- **GAP:** Change of purpose amendments were not subject to Director review prior to around 2012, therefore no opportunity to see how it impacts the watershed and other users. For example, year round use instead of seasonal use – what are consequences of this change?
- **FINDING:** Storage used to help get these users through the winter. SMRID, LNID got change of purpose amendments with water they saved by being more efficient, prior to 2012. AEP stopped this practice about 5 years ago and now there is a cap and transfers are required above that cap.
- **FINDING:** TDL use is minimal, goes up and down a bit. TDL use must be less than one year.
- **FINDING:** Assignments are between existing licensees only.

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- **FINDING:** Crystal Lake, Okotoks – ask for large amount on TDL, waiting for transfer to be approved, not going to keep doing it every year.
- **OBSERVATION:** Groundwater licenses are increasing. One study by Worley Parsons shows there is water available that is not connected to surface water.
- **FINDING:** Highly variable depending on geology. Recharge can be too slow in some formations to support industry.
- **OBSERVATION:** Page 20 graph incorrect – shows WCOs for groundwater (**corrected in latest WaterSmart data package**).
- **FINDING:** When there is doubt about whether source is surface water or groundwater, onus is on applicant to prove it is groundwater and not groundwater directly connected to surface water that then falls into the closure for new licence applications. Can be lengthy process to determine.
- **OPPORTUNITY:** Need to provide more clear, defined requirements around GUDI to applicants so they can provide the right information for review and a decision. On the books but slow because oilsands is the priority. This is not a big issue across the province, only in Southern Alberta.
- **FINDING:** Alberta Geological Survey has released a Groundwater Atlas for the Calgary to Lethbridge corridor – its on their website.
- **GAP:** Sand and gravel mining policy allows mining within river valleys and alluvial aquifers, no cumulative effects considered, lack of understanding of surface-groundwater connection – storage, flooding, ecological health. Approvals people in Oldman are requiring a transfer of water license for at least evaporative losses of pit lakes – would be called “other” on graphs?
- **OPPORTUNITY:** Aggregate Resource Plans, Rocky View County initiated. Alberta Transportation started something?
- **GAP:** What are the “other” uses that are increasing? Can we get a list?
- **GAP:** Who’s asking for water now? Are we denying future opportunities for economic development? Will we be able to continue accommodating growth?
- **GAP:** Where in watershed are transfers occurring? Can we break it out by area?
- **FINDING:** Example, Okotoks this has been a problem. Can’t find people to sell them transfers so they are looking all over the place – even way downstream. Approvals group assesses this - would be considered as matters and factors. Try to address issues with conditions – for example, can put on winter IOs but aren’t being met 80% of the time. Part of why taking 10% holdback is important in some cases.

### 1.3 Is adaptation happening without transparent identified performance monitoring / assessment or partner (WPAC) consultation?

- **GAP:** Appears to be no performance monitoring. There hasn’t been any reports or consultations.
- **GAP:** Transfers are not transparent. Amounts paid unknown. Market is not open.
- **GAP:** Is “use it or lose it” policy being enforced? Should people who are not using any of their water license for long periods of time be allowed to sell it, since they got it for free? As more water gets used, shortages are more likely. “In good standing” was supposed to address this but has it? Brokers are taking advantage of the system to activate an inactive license for a short period of time then selling it. How is “good standing” being assessed? How many have been declared “not in good standing” since 2006? Had compliance officers checking at one point but unclear what has happened over the years.
- **GAP:** Not all licenses have IOs so users with multiple licenses are using this to their advantage. Given all these changes, are we protecting the aquatic environment? Will we be able to continue to meet our commitment to Saskatchewan?

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- **FINDING:** Look at license viewer online – might help answer some of these spatial questions. Here is the AEP Water Allocation Licence Viewer description link:  
<http://aep.alberta.ca/water/programs-and-services/south-saskatchewan-river-basin-water-information/water-allocation-licence-viewer.aspx>

Here is the Licence Viewer link:  
<http://waterlicences.alberta.ca/>

- **FINDING:** Temporal questions also valid – are looked at by approvals group and dealt with through conditions on their license. Every application is unique.
- **FINDING:** “In good standing” is being assessed when applications come to AEP. Water Act specifies process to cancel a license – not simple. If can show they can get themselves “in good standing” then not worth the fight. WaterSmart was given cancelled license spreadsheets.
- **GAP:** Occasionally some people have water from an irrigation district and a private license from the river on their property – doubling up. Would not be in good standing but not being investigated by AEP unless transferred. Irrigation district may tell applicants no, they can’t have district water, unless transfer their private license to the irrigation district. Fear is people are capitalizing on financial windfall.

### 1.4 How many Crown licences have been issued and for what use?

- **FINDING:** Pine Coulee, Little Bow, aquatic environment (WCOs) for 10% holdbacks are put here.

### 1.5 What information is missing (data gaps, legal mechanisms?)

- **GAP:** Unclear what WCO violations means when we don’t have climate variability data to compare. Need to know what Mother Nature gave us first, so we know which WCO violations were avoidable or natural.
- **GAP:** Relationships between flow and climatic data (precipitation, temperature and evapotranspiration losses) need to be determined for different climatic scenarios (dry, wet and normal flow years).
- **FUTURE WORK:** Develop and evaluate relationships between flows and climatic data (precipitation, temperature and evapotranspiration losses) and this can be used for future forecasting.
- **GAP:** Flow data missing from 2010-2016 because AEP said they don’t have the funding to compile the data for us (approximately \$250,000). Need this to do proper 10-year review.
- **FUTURE WORK:** Need to process flow data post 2009 and this can be used for future forecasting.
- **GAP:** Has closure of the basin resulted in intensification of water use?
- **GAP:** Have there been any legal actions questioning the allocation limit, Director’s decisions?
- **FINDING:** Surface Water Quality Management Framework annual reports have not been released. We need those.

**The first AQMF and Surface WQMF report was released in June 2017:**

<http://aep.alberta.ca/land/cumulative-effects/regional-planning/south-saskatchewan/documents/SSRP-StatusAirSurfaceWaterQuality-May2016.pdf>

### 1.6a Who (AEP vs. AER) is making regulatory decisions on water allocations?

- **FINDING:** AER is upstream oil and gas and mines only – such as Grassy Mountain coal mine is Crowsnest Pass. They deal with transfers and TDL, still abide by all GOA policies on closure of basin, same matters and factors.

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- **FINDING:** Will need to do a referral to AEP as part of transfer review process if it involves a license that is not for a purpose under the purview of the AER.
- 1.6b Are both agencies (AER and AEP) using the same approval criteria?
- **FINDING:** Yes, have to use the same matters and factors.
- 1.7 Have the Environmental Appeal Board decisions influenced any decisions made by AEP since the SSRB was enacted?
- **FINDING:** If AEP decisions are supported by EAB, then no need to change, process and decision upheld.
  - **OPPORTUNITY:** If lose appeal, then have to figure out how future decisions are made. For example, Okotoks currently challenging the 10% holdback decision. Arguing that return flow (wastewater) is adding water that wasn't returned before.

### Recommendation 2.2: Future Water Allocation Limit in the Red Deer River Sub-basin

2.1 How close is the basin to reaching the 550,000 dam<sup>3</sup> limit?

N/A

2.2 When is the right time for closing the basin and what influence might that have on whether a 10% holdback is required?

N/A

### Recommendation 2.3: Recommended Water Conservation Objectives (WCOs)

3.1 The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?

- **FINDING:** No because there hasn't been enough monitoring but we should not expect them to because we know they are too low from all the science. Major weakness in the plan.
- **GAP:** Are WCOs adequate for the purpose? Because we know they are not science based. 2010 State of the Watershed showed some stretches are in poor condition.
- **OPPORTUNITY:** Has there been any evaluation or reporting? 2007 condition report might be a starting point but is over simplified but unfortunately it is one of few reports we have at this point.
- **FINDING:** WCOs were set based on existing allocations, flushing flows, not river health.
- **GAP:** 3.1 assumption is incorrect in Oldman, only true in Red Deer. Were benchmarks to be assessed for performance monitoring when making decisions on TDLs, transfers, etc?
- **FINDING:** Cannot routinely add a WCO when transferring, if not present already (senior licenses don't have them).
- **FINDING:** Province cannot just modify an existing license, like add conditions to a license to protect the environment, the Water Act would require the department to compensate the licensee. Cost would be calculated as lost economic value of the change.
- **FINDING:** Part of it came from court decision on Little Bow River, got sued by irrigator and had to compensate them, when AEP shut down water for environmental reasons.
- **FINDING:** Storage helps meet WCOs in some cases.
- **FINDING:** Licensee can be required to have a Water Shortage Plan to assess risk, when applying for a transfer.

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- **FINDING:** AEP assesses supply at beginning of year, post warnings online, talk to users about potential shortages. Good opportunity for education – people could willingly conserve if knew what was happening.
  - **FINDING:** Only have detailed naturalized flow data up to 2009. River forecast data, advisories are on website.
  - **FINDING:** Brian provided a graph of natural estimate flow versus recorded flow volume at the Oldman River Lethbridge station from 2001 to 2017 (from Water Supply Outlook reports). See hardcopy.
  - **OPPORTUNITY:** Write recommendations on what we'd like to see from AEP as part of this report.
- 3.2a In a heavily allocated closed basin, how often is a WCO relevant (because it is junior to most allocations)?
- **FINDING:** Very seldom.
- 3.2b Is there a more effective alternative?
- **FINDING:** Of course but difficult to manage given existing use and allocation.
- 3.3 How might WCOs need to be relaxed or revised to enable new storage to offer potential benefit to the basin?
- **FINDING:** Cannot be relaxed because already too low to protect watershed health.
  - **FINDING:** Not all licenses are subject to WCOs, only junior licenses.
  - **SUGGESTIONS FOR IMPROVEMENT:** Options include allowing environmental interests to hold in stream licenses, subject all licenses to WCOs, 'saved water' through efficiency could be left in the river, 10% holdbacks could be taken on all transfers.
- 3.4 Are WCOs needed on more reaches, for example, some of the upper tributaries as mentioned in the SSRP?
- **FINDING:** Do exist on tributaries (110% of existing IO's) but they are lower than main stem for the Southern Tributaries.
  - **OPPORTUNITY:** "Review WCOs for headwater tributaries" is in the SSRP as a water management strategy – could discuss doing this. May be an opportunity to protect these rivers now, before there is pressure to withdraw water from these streams. But need to assess whether new WCO's could effectively be used within the transfer approval system.
  - **SUGGESTIONS FOR IMPROVEMENT:** Might be helpful to increase the WCOs on tributaries to 45%, if only to highlight the fact that we are "in the red" and acknowledge it. Also to give reservoir managers a bit more impetus to release more water when able.
  - **FINDING:** Southern tributaries recognized to be an issue.
- 3.5 How much of a role does unused allocation within existing licences play in the river for healthy aquatic ecosystems?
- **OBSERVATION:** Irrigation: 1.2 million is max ever used by irrigation districts in the Oldman, max allocation is 1.7 million – about half a million unused.
  - **OBSERVATION:** Municipal use similar – usually unused, winter especially.

### Recommendation 2.5: Establishment of an Interbasin Water Coordinating Committee



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- 4.1 Refresh the narrative on why the committee exists and whether it is effective.
- **OPPORTUNITY:** Ensure it is kept up so that we are ready in terms of drought.
  - **OPPORTUNITY:** Would like this committee to help create ways to capitalize on opportunities to keep water in the river. General guidelines to encourage this activity.
  - **OPPORTUNITY:** Is in the plan itself. Says this committee will provide advice to AEP during shortage, to meet apportionment. Membership is WPACs and AEP. Brian Chairs since 2014. Huge turnover in last couple years. Was not been a big need for it because there were 5 years of high flow. Does need a revamping of membership and terms of reference.
- 4.2 Does it have the right membership, mandate and accountability?
- **GAP and OPPORTUNITY:** Unclear reporting. Suggest discussion at WPAC Forums, on GoA website.
  - **OPPORTUNITY:** Could meet more on an as needed basis. In wet years not really necessary.
  - **FUTURE WORK:** Focus on apportionment is not needed right now, maybe in future as demand increases and supply decreases.
- 4.3 Is it providing useful information to GoA? Could it be more useful to GoA?
- **OPPORTUNITY:** Interested in proactive advice on water sharing. Can happen quickly, easy to be reactive. Opportunity to be more proactive.
  - **FINDING:** Irrigation districts through AIPA have formal resolution that they support people first, animals second and crops last.
  - **GAP:** What would happen to the river in a dry year? It would be very stressed.
  - **FINDING:** LNID has conserved more water than it has used for expansion. This has left more in the river in wet or average years.
- 4.4 Is it representing the WPACs?
- **SUGGESTION FOR IMPROVEMENT:** Helpful to hear snowpack, flow, forecast information from AEP so we can share it with our members. WPACs get asked questions and doesn't have current information to answer them. Could get this information through email or phone call though, don't necessarily need a meeting.

### **Recommendation 2.7: Use of Water Allocation Transfers, Water Conservation Holdbacks and Factors that Must Be Considered When Making Decisions**

- 5.1a How many times has the Transfer system been used? How many times has it been abandoned?
- **OBSERVATION:** 151 transfers in Oldman.
- 5.1b Expected vs actual uptake of mechanism? Have there been excessive barriers raised?
- **FINDING:** Some applicants feel it is too onerous (see 5.2 comments below).
- 5.2 How onerous is the transfer system? Should it be simplified or is it appropriately rigorous?
- **FINDING:** Some applicants feel it is too onerous.
  - **FINDING:** Is getting a little bit easier over time.
  - **OPPORTUNITY:** Some of backlog is incomplete applications, need to be stricter up front about rejecting incomplete applications right away.

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### 5.3 How long does a typical transfer take from application to approval?

- **FINDING:** Over 2 years in one case.
- **FINDING:** Depends on response from public review.
- **FINDING:** No such thing as typical. Staff shortage is sometimes an issue, such as after 2013 flood staff had to re-direct their time.

### 5.4 What form of public notice is provided for each application?

- **FINDING:** In administrative guidelines. Time requirements is in legislation so can't be changed. Here is a link to the Administrative Guidelines for Transfer of Water Allocations (and Agreements to Assign Water, and Licence Amendments)  
<http://aep.alberta.ca/water/legislation-guidelines/documents/GuidelineTransferWaterAllocation-Nov2014.pdf>
- **GAP:** Problem is you won't see the advertisement unless you know to look. Not widely advertised, not even put online by AEP. Put online on license viewer if it is approved, after the fact.
- **SUGGESTION FOR IMPROVEMENT:** Need an email notification system that people can sign up to. All potentially affected parties should be sent notification directly. AER has a sign up email, AEP does not. Ideally it would be sorted geographically. Include a recommendation on this.

### 5.5 Does AEP offer a public list of water allocation licenses and transfers?

- **FINDING:** Yes, the license information is available through the Licence Viewer.

### 5.6 Is the application and approval process transparent and consistent?

- **FINDING:** Guidelines and process is transparent.
- **FINDING:** Not very transparent when it comes to particular decisions.
- **FINDING:** No consistency because every situation is unique. There is also Director discretion.

### 5.7 How often have transfers involved a change in purpose/timing/location? (including movement between tributaries and main stem, change from seasonal to year-round use)

- **OBSERVATION:** See transfer data in data package
- **FINDING:** Legislation is silent on licensees who have multiple licenses and are holding onto senior licenses with no conditions until they need them. Creative ways around the legislation.
- **FINDING:** Matters and factors look at these issues. Brian provided the Matters and Factors table in hardcopy at the meeting and a pdf via email.

### 5.8a Are the 10% holdbacks being used?

- **OBSERVATION:** In some cases, they're not. Why? GoA staff said they are, except once. But data shows it's not being used. Need clarification.
- **FINDING:** We think it's because exceptions were common at first, but have now become rare, over time.
- **GAP:** It matters which reach is being impacted. Can make a big difference in some places.
- **FINDING:** 8 out of 151 transfers did not take a 10% holdback at all; however, some took greater than 10% and some took less than 10%.
- **FINDING:** In one case there was a bigger benefit to the aquatic ecosystem to put an amendment on the license instead of a holdback.
- **FINDING:** WCO licenses are issued but cumulatively still for a small amount of water.-

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5.8b Are the 10% holdbacks actually putting water back into the river?

- **FINDING:** Such an insignificant amount, likely not helping.
- **FINDING:** Demonstrates an intent at least.
- **FINDING:** If coming from inactive licenses becoming active, it may actually result in a 90% net increase in use.

5.8c Is there an alternate mechanism to the holdback that would be more beneficial to developers and the aquatic ecosystem?

- **FINDING:** Is it a barrier to transfers? Not really. People just buy extra water because they expect to lose 10%.
- **OPPORTUNITY:** Water trusts could help. Previous government was not interested in modifying the Water Act to allow someone outside government to hold a WCO licence. Could recommend this again.
- **OPPORTUNITY:** In the USA, Trout Unlimited pays farmers not to withdraw water. Could test something like this here. Could target particular users in particular years, not all the time because of "use it or lose it". Challenging to assure it stays in the river.

5.9 There are water licence sharing assignments originally proposed as short term water shortage solutions between parties that do not go through approval process. Some of these are now becoming long term and should be looked at as permitted temporary transfer but this is not happening until someone complains. Allowing these long term assignments also raises some questions about the criteria for licences held in 'good standing'.

- **FINDING:** Unclear where this is happening.
- **FINDING:** Assignments generally get a user extra water in a particular year, not for long term.
- **FINDING:** Few and far between, not a big problem as far as AEP knows.
- **FINDING:** Example is Cargill uses water license from Town of High River, Frank Lake and Ducks Unlimited Canada (transferred half their license to Cargill), diversion broke down in 1995. Went on for 7 years, now have 10-year agreement. One off situation.

5.10 Is the Matters and Factors table useful in guiding decision making. Should the Matters & Factors tables pertaining to amendments and transfers be revisited?

- **GAP:** Net diversion piece missing.
- **GAP:** Okotoks issue is new, no policy around net diversion.
- **FINDING:** Brian emailed a PDF of the Matters and Factors to the Review Committee. Action – go through for next meeting.

5.11 What information is missing (data gaps, legal mechanisms?)

- **GAP:** What tools does Director use to assess cumulative impact on aquatic environment?
- **GAP:** If models and data are outdated/missing, monitoring and reporting is lacking, how are these decisions being impacted? License use data not even up to date, individual license holders are not even reporting their use or are reporting on hard copy because online system is a mess. Decisions seem to be mainly based on not impacting other users.
- **GAP:** What barriers does the Director have to making decisions?
- **GAP:** How can we help ensure the job is possible realistically?
- **FINDING:** Every application is unique. It is a learning process.

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- **OPPORTUNITY:** AEP is responsible for assessing cumulative impact, could use more transparency and guidance and discussion with WPACs.

5.12 Should all transfers be managed in the same manner, or is there an opportunity to designate different types of transfers (as per the Water Allocation Transfer System Upgrade Project WATSUP 2009 Report)?

- **GAP:** Clarity needed on this. What does it mean?
- **GAP:** Someone would need to go through the WATSUP report and report back. It's on the Alberta Water Council website.

Here is the link for the Water Allocation Transfer System Upgrade Project:

<https://www.awchome.ca/Projects/CompletedProjects/WATSUP/tabid/107/Default.aspx>

- **FINDING:** Looks like WaterSmart made some recommendations in the scoping document. **Summary presentation on the WATSUP report and recommendations was emailed to the review committee.**

5.13 Does there need to be more clarity on the difference between an Amendment and a Transfer?

- **FINDING:** Clarity for who? Is in the administrative guideline. Section 54 of the Water Act when an amendment can be done.

Provided the administrative guideline link above under 5.4 and here is the link to the Water Act:

<http://www.qp.alberta.ca/documents/Acts/w03.pdf>

### Recommendation 2.8: Water Management Strategies

#### 6.1 Water Demand and Consumption (Recommendation 2.8.1)

a. Have modeling capabilities been upgraded?

- **FINDING:** SSRB WMP done using WRMM (Water Resources Management Model, still used and upgraded.

Here are a couple of links to descriptions of the WRMM:

<http://www.unitechsolutionsinc.com/water-resources-management-model-wrmm/>

<http://aep.alberta.ca/water/programs-and-services/river-management-frameworks/south-saskatchewan-river-basin-approved-water-management-plan/documents/WaterResourcesManagement-SSRB-InfoSheet.pdf>

- **FINDING:** Changes are added to model regularly, added water quality modelling capabilities for Bow, Highwood and Sheep. Main stem of Oldman developed but not fully vetted yet. Haven't identified need yet to urgently model something specific. Focus is on Bow because that's where growth and change is happening.

b. Have innovations and improvements in water licensing and legislation to better match allocations with needs been explored?

- **FINDING:** Have looked at municipal use.
- **FINDING:** Conservation Efficiency Productivity Plans have helped provide guidance.

c. Has the development of water markets and transfers been supported?

- **GAP:** AEP doesn't track how market is working.
- **GAP:** Not transparent. Recommend more transparency around transactions.

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- **GAP:** Unregulated market – GST? Income tax?
- **FINDING:** Public resource has become a private resource. Not buying the “good or service” but the right.
- **FINDING:** Water brokers are out seeking licenses for sale, investing in fixing up diversion points.

d. Have improvements in water conservation methods been encouraged?

- **FINDING:** Yes, in irrigation industry. All industries through CEPP.

### 6.2 Improved Dam Management to Protect the Aquatic Environment (Recommendation 2.8.2)

a. Are post flood functional flows being released on GoA reservoirs?

- **GAP:** We know the Oldman, Waterton and St. Mary dams are releasing water to benefit cottonwoods and fish but don't have a definitive report on how successful it has been. Are there any reports available demonstrating success? Likely articles published by Dr. Stewart Rood.
- **OPPORTUNITY:** There is intent to add water to rivers whenever possible, but it depends on water availability. Not written in stone. Need to identify some clear recommendations on this.
- **FINDING:** Janna will ask John Mahoney to present at our next meeting. **John Mahoney presented on dam management strategies to protect the aquatic environment on January 26, 2018.**
- **GAP:** Redd surveys, poplar counts are done by John and Mike Bryski to indicate success but there is no reporting on this. There is public interest so sharing these results would be beneficial. It's difficult to track and prove scientifically, for now just assuming there is a benefit.
- **FINDING:** 2 successful cottonwood recruitment periods since 1995 flood, so about 'normal'. One every 15-20 years would be natural.
- **FINDING:** IOs can be released at a dam, but that doesn't mean it will reach the mouth. In winter in particular it takes water to make ice, in summer evaporation is higher, users are withdrawing water, channel update, etc. Operators are now looking at IO and flow further downstream and not just at the dam. In flows, return flows would have to be taken into consideration too. Gauges aren't always precise either and so operators will release a bit more to make up for it. These things are written as 'other factors to consider' in the operational plan and has been the case for around 25 years.
- **FINDING:** No opportunities to reach WCO on southern tributaries, unless demand can be reduced.
- **GAP:** Updated IO charts for all rivers have been requested. Brian will look into it. Likely only available up to 2016.
- **FINDING:** Autumn spike can still occur to lower reservoir levels either for maintenance reasons, if a mistake was made or if there was a fall storm. These are rarer than they were 10+ years ago. These spikes cause challenges for water treatment plants.

### 6.3 Protection and Management of Riparian Vegetation (Recommendation 2.8.3)

a. The intent of the Aquatic and Riparian Condition Assessment for the main stem rivers of the SSRB (ARCA 2007) is to assist Alberta Environment and its partners in determining where to focus management efforts. To what extent has this been happening particularly from the perspective of effectively managing reach specific flow and water quality?

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- **GAP:** Unknown. Monitoring and reporting is lacking. No reports released publicly since this one in 2007 other than OWC's State of the Watershed (SOW). OWC is pushing for a 2020 SOW from GoA.
- **FINDING:** ARCA showed downstream reaches most impacted. Not further degraded but not vastly improved either.
- **FINDING:** Downstream Waterton have had some cottonwood recruitment. Not on St. Mary.
- **OPPORTUNITY:** Recommend another SOW through this process. Support OWC's efforts to push for this.
- **OPPORTUNITY:** Could look at simple desktop exercise to compare IFN to actual flow on test reaches.

b. Review how AEP has worked in partnership with the WPACs to prepare watershed management plans to encourage healthy riparian environments.

- **GAP:** In 2016 WPACs were told GoA would no longer pay for watershed management plans and instead want WPACs to support regional plans.
- **FINDING:** WPACs are continually underfunded by GoA but are making slow progress by raising outside funds.

### 6.4 Flow Restoration on the Bow, Oldman, and South Saskatchewan River Sub-basins (Recommendation 2.8.4)

a. Are license holders taking voluntary flow restoration actions, particularly during critical periods?

- **FINDING:** Somewhat – AEP is getting support from irrigation districts to take actions to benefit the environment. Licence holders are accepting a higher risk to their operations, however, only in years when that risk can be minimized because water supply is high.
- **FINDING:** Licence holders have gotten more comfortable over time, now that these actions have been tested for a few decades and trust has been built.

b. Are discussions with senior priority license holders held?

- **FINDING:** Yes, irrigation districts were approached for support to take actions to benefit the environment.
- **FINDING:** AEP and irrigation districts meet weekly during irrigation season, environmental considerations may be brought up here.
- **FINDING:** If there is no risk, AEP will go ahead and take action without discussion.

c. Has research been conducted to determine how flow restoration benefits the aquatic environment?

- **FINDING:** Yes lots exists if we are willing to actually use it.

d. Have operating licenses for government dams and WCO conditions on diversion licenses been assessed?

- **GAP:** Not as far as we know.

### 6.5 Water Quality (Recommendation 2.8.5)

a. Has water quality been studied in more detail throughout the SSRB to assess land use impacts and develop beneficial management practices to mitigate these impacts?

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- **GAP:** Need clarity on how GoA is addressing this first in terms of regional planning. Land Footprint Management Plan has not been released yet. CEMS in progress but not clear. In cases where clear targets were set, reports not available showing if we're meeting them or not (SWQMF, SSRB WMP post 2009).
- **FINDING:** 2014-15 Water Quality Management Framework report was released before Christmas.  
The first AQMF and Surface WQMF report was released in June 2017:  
<http://aep.alberta.ca/land/cumulative-effects/regional-planning/south-saskatchewan/documents/SSRP-StatusAirSurfaceWaterQuality-May2016.pdf>
- **FINDING:** Salinity report coming out soon showing increasing trend downstream Calgary.
- **FINDING:** EMSD working on similar report on nutrients, coming out in about a year.
- **FINDING:** AAF has many reports on agricultural BMPs, agricultural impacts on water quality, irrigation district water quality.

Alberta Agriculture has conducted a fair bit of agri-environmental evaluation research and monitoring in Alberta. Here are links to a few of these projects/studies: Agricultural Impacts on Water Quality in Alberta study a.k.a. Canada-Alberta Environmentally Sustainable Agriculture (CAESA, 1992-1996):  
[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/irr15532](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/irr15532)  
[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/wat2442](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/wat2442)

Crowfoot Creek Watershed Study (1996-1999)  
[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/irr7191](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/irr7191)

Assessment of Environmental Sustainability in Alberta's Agricultural Watersheds study a.k.a. Alberta Environmentally Sustainable Agriculture (AESA, 1997-2006):  
[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/irr12647](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/irr12647)

Alberta Soil Phosphorus Limits Project (1999-2006)  
[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/sag11864](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sag11864)

Livestock Manure Impact on Groundwater in Alberta project (2008-2011):  
[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/irr14241](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/irr14241)

Nutrient Beneficial Management Practices Evaluation Project (2006-2012):  
[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/epw11955](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/epw11955)

Alberta Phosphorus Watershed Project (2013-ongoing):  
[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/irr14541](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/irr14541)

Water Quality in Alberta's Irrigation Districts study (2006-ongoing):  
[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/irr14080](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/irr14080)

Nutrient Objectives for Agricultural Streams: Measures of Success for Watershed Management study (2016-ongoing):  
[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/irr16339](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/irr16339)

## Oldman Watershed Council BAC Summary Document

- **OPPORTUNITY:** Have enough data to look at trends.
- **FINDING:** ALCES mapping found BMPs are not enough to stop declines in overall water quality at Oldman watershed scale – restoration and further change would be needed if people want to improve water quality.
- **FINDING:** The scale of BMP change matters a lot too – can see either at farm edge for small change but not further downstream.
- **FINDING:** Water quality wasn't considered much in the SSRB WMP. Was not intent of the planning process.
- **GAP:** For example, is water quality considered when irrigation is expanded? Is irrigated land at higher risk of contaminating the river than unirrigated areas?
- **FINDING:** AAF has many reports on agricultural BMPs, agricultural impacts on water quality, irrigation district water quality.

Here are links to the CAESA and AESA reports mentioned above (both irrigated and non-irrigated watersheds were evaluated):

Agricultural Impacts on Water Quality in Alberta study a.k.a. Canada-Alberta Environmentally Sustainable Agriculture (CAESA, 1992-1996):

[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/irr15532](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/irr15532)

[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/wat2442](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/wat2442)

Assessment of Environmental Sustainability in Alberta's Agricultural Watersheds study a.k.a. Alberta Environmentally Sustainable Agriculture (AESA, 1997-2006):

[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/irr12647](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/irr12647)

### 2.8.6: Maintenance of the Red Deer River Sub-basin's Aquatic Environment

No Questions posed.



### SECTION THREE: PARKING LOT

This section should capture any topics or questions identified during BAC meetings that are tangential or peripheral to the Review and that warrant further discussion or input from others, but were deemed to be out of scope of the SSRB WMP 10-Year Review.

- **PARKING LOT:** Naturalized flow data not official, have “working data” but can’t release it to us.
- **PARKING LOT:** More linkage is needed to water quality – something we need to work on in future.
- **PARKING LOT:** Still need to look at WATSUP report (a WATSUP summary presentation was emailed out and the link to the online report was made available).
- **PARKING LOT:** A case study analysis has been suggested by Shirley to understand the process of a water licence transfer, how matters and factors are considered in particular. Mike will find out more information for Brian, to see if this would be possible.
- **PARKING LOT:** Table needed to show what has been allocated since the plan was approved and what is still outstanding. This would show if there has been a limit on allocation or not. Allocation tables by year were added to the WaterSmart data package, outstanding allocations were not included.
- **PARKING LOT:** Some concerned that little water returns to the river, even though some conservation practices paid for with public resources. Debate about global food production, how healthy is the food produced, does it actually feed the hungry.
- What more incentives could we recommend for improving the health of the aquatic ecosystem?
- **PARKING LOT:** Question about where we want to go as a province – bigger debate than this project.

# **RED DEER Basin Advisory Committee**

## **SECTION ONE: Key Findings**

### **Introduction**

This document contains the Summary Narration for the Red Deer Basin Advisory Committee, for the SSRB Management Plan 10-year review

For the Committee List, comprising the Red Deer Basin Advisory Committee, support staff and technical advisors, please refer to Appendix 1 (at end of document). The Committee met three times on 1/12/17, 9/2/2018, and 2/3/2018. Discussions focussed on questions listed in the BAC summary Document. A summary of discussions held during the meetings are outlined below, ordered by the following headings: Observations; Opportunities; Data Gaps, and; Areas for Future Work. Key Findings are listed in Table 1.

### **Observations:**

The Red Deer Basin Advisory Committee found that with regard to the 550,000 dam<sup>3</sup> limit, charts say we are currently at 336,000 dam<sup>3</sup> at April 21, 2017. We are currently at 61 % of the 550,000 dam<sup>3</sup> limit. 550,000 cubic decameters (dam<sup>3</sup>) is the trigger for a temporary closure to applications for water allocation to permit a review of the aquatic environment and allocations. It is currently estimated to take 30 years to reach the 550,000 dam<sup>3</sup> limit. However, all of the work to get to the 550 dam<sup>3</sup> stage was based on the assumption of a healthy watershed, with reduced erosion of river banks etc.

Considerable growth is predicted in the Red Deer River corridor over the next 30 years. Challenges related to infrastructure improvements, space, population, closing of coal-fired plants, in addition to peri-urban development. As we approach 500 there will be more users; possibly industry, municipalities, agriculture, as well as more overall development which will have as great an impact on the water quantity and quality, as well as how the water will be allocated. This is in addition to climate change and less rainfall, potentially. These combined factors have the potential to accelerate pressures within the watershed. As such, we recommend that this figure be reviewed at 500 dam<sup>3</sup>.

Red Deer has approximately 2000 licenses – the largest 20 users would have half the total allocation. Only the large users are currently reporting water quantity use. (e.g. Larger irrigators and large feedlots). Municipalities and large industries are required to report return flow. Usage is self reported and return is also reported. Water use reporting system has info on every licence but there is a large amount of data, which has not been checked for accuracy. Determining the accuracy of these numbers would require considerable time and resources.

Inter-basin transfers are currently happening. Until the regional sewage line is complete, some water is being transferred to the Battle River Basin as a result of the Shirley McLellan Regional Potable water line to the North. This will decrease when the regional sewage line is put into operation. Others are planned for the future (Special Areas with no return)

WCO is a compromised value and built upon existing IO. It is attached as condition to licence when applicable, and is intended to raise the bar from IO to WCO through transfer holdbacks, license

cancellation etc. With regard to WCO's, the original design of Dickson Dam is to meet existing IO, supplement flow apportionment at AB-Sask. border as well as to meet existing and future water demand in the basin. The Dam is operated to ensure the WCO is always met downstream. The WCO only looks at main stream and not tributaries. Monitoring tributaries would require substantial resources. Upper tributaries are not very busy (in terms of water allocations). Monitoring the lower tributaries would be more helpful as that's where most action (allocation) is.

The purpose of the intrabasin water coordinating committee (IWCC) is to advise the government and share messaging during periods of water shortages. The committee meets annually, plus they convene during times of drought. The committee is established and needs to continue to meet regularly or as needed. This committee has not been tested as shortages have not been experienced that would require intrabasin transfers. The committee is only called to action at times of drought, so there is not so much planning is involved. However, in times of drought the committee may have to shut permit holders on the Red Deer River off because they are junior with regard to date the permit was granted (Re: Terms of Reference for Intra-basin committee).

The transfer system has only been used once. There is only one example to date of a farmer that moved from one quarter section to another. The Matters and Factors Table is useful for us to refer to because, for example, there was one day in 2010 we didn't meet objectives. It should be noted also that holdbacks aren't necessarily that effective; Licences have to be transferred multiple times. Essentially a WCO is a Crown Reservation, which gives you base protection. WCO helps us put a better priority on this. With regard to legal mechanisms, it was agreed to leave this aspect to the Bow to determine what these mechanisms are.

With regard to modelling capabilities, yes they have been upgraded. Innovations and improvements in water licensing and legislation to better match allocations with needs is not an issue in this basin. Allocations currently match need. However, it was discussed that although irrigation districts are becoming more efficient, this doesn't mean there is more water in the system. For example, while there have been efforts to improve water conservation methods, there remains much work to be done. There may be greater efficiencies, but this not reflected in a noticeable reduction in consumption.

With regard to the Aquatic and Riparian Condition Assessment, Red Deer County has been doing some work relating to this. Information is currently for all tributaries as well as the main stem and wetlands is currently available on their website. Refer to background technical report developed for this and also new funding initiatives through the Watershed Resilience and Restoration Program. If we ask 'what is future of Water For Life and what will future players look like' - the Government of Alberta is currently reviewing the roles and responsibilities of WPACs around planning and monitoring.

With regard to Water Quality (Recommendation 2.8.5), there are point based studies occurring – such as AB Forestry, and work on BMP's. What is the trend of water quality (better, similar, poorer) in the various reaches of the Red Deer River? It was found that:

- RDRWA has an approved and published IWMP on water quality- 'Blueprint'
- The IWMP presents goals, targets and recommendations to maintain and improve surface and groundwater quality and to address emerging issues. It addresses surface and groundwater maintenance/improvement and promotes groundwater mapping, monitoring, protecting recharge areas.

- The RDRWA has adopted a new “action Pathways Approach to its work which includes ‘Promoting Ecological Function (focussing on hydrological connection and ecological value; RDRWA has recently applied for a WRRP to this purpose) and Strengthening Water Security.

To answer a question on whether the Red Deer has any tributaries included in AEP monitoring, it was found Jason Kerr submitted a list of the stations currently monitored in the Red Deer River watershed. Samples are collected at a monthly frequency. Additional information is attached for the Tributary Monitoring Network (TMN). For the Long-Term River Network stations there are (water quantity) flow stations located along the river at Red Deer, Nevis, Drumheller and Bindloss. These are either co-located (Red Deer and Nevis) or located downstream of water quality sites (Morrin and Drumheller and Jenner and Bindloss).

With regard to what is being done to contain whirling disease in Red Deer, AEP is addressing and managing this on an ongoing basis.

To better understand how the aquatic ecosystem is doing in regard to potential trends and issues, Minimum flows etc. Please refer to the background technical reports that the RDRWA developed a few years ago for information on the health of the aquatic ecosystem (e.g. benthic invertebrates and riparian areas). Here is the link to those reports: <http://www.rdrwa.ca/node/200>.

#### **Opportunities:**

RDRWA understands that if they are interested in knowing when water allocations are approved, they have to check the water application process online. However, WPAC’s would like to be kept in loop and receive earlier notice regarding significant applications i.e., Special Areas.

Convene a broader discussion regarding how the 550,000 dam<sup>3</sup> limit was reached from a scientific perspective and whether that figure is still relevant. As climate change may or may not affect the area, it is recommended that this figure be reviewed every 5 years. With regard to future water allocation limit in the Red Deer River Sub-basin, we need to get planning right the first time - and we need to know exactly how much is being used, put back, and where these users are physically located in the watershed. Cumulative impacts for future approvals and planning also need to be considered. This is especially important if a future drought scenario occurred.

With regard to how AEP has worked in partnership with the WPACs to prepare watershed management plans to encourage healthy riparian environments, AEP works in support of planning process and action on the ground to support if and when these processes happens at regional level with respect to water management planning. However, the regional plans are a step backwards as they do not address all lands properly, as 90% of lands are privately held. There is not adequate protection for the majority of lands as a result. Need more top down for ALL lands, public and private.

With regard to water quality (Recommendation 2.8.5), The formation and disbandment of AEMERA has been disruptive to data flow. Pilot-based studies been done in detail here in the Red Deer River basin, but they have not been widespread or well-connected. Modeling could be incorporated. RDRWA conducted a literature review on BMPs between 2009-2014.

There is a current lack of actual monitoring of WCO’s and the tributaries. Also an all-round lack of monitoring for water and riparian quality. More monitoring is required throughout system to reflect

what happens as water goes downstream. How the aquatic ecosystem is managed, and to understand water and ecosystem health. Monitoring is currently piecemeal. It's a problem going back decades in the Red Deer. RDRWA Blueprint report identified gaps in knowledge as to what is being monitored, where monitoring is taking place and who is doing the monitoring. A primary recommendation from Blueprint is a request for more monitoring. It is understood that monitoring is expensive. We need to be very specific about where the gaps in data exist, what it would cover and what would be done with data. Also who would do the monitoring – Universities, citizen science etc.

### **Data Gaps:**

There is an Integrated Application Registry for water approvals, but mechanisms for notification are unclear. Will RDRWA be notified for applications?

There is great need more transparency on current water use data. There are many unknowns surrounding what is going back into the Red Deer system and small user usage.

We need to know withdrawal AND return flow. Return flows are often not provided. Point of return to help with dilution. It helps with aquatic health over meeting quantity only.

With regard to the Intrabasin Water Coordinating Committee, what is the Province's drought management strategy and how does the role of the IWCC fit into this?

There are currently no post flood functional flows being released on GoA reservoirs from Glennifer Reservoir (Dickson Dam).

Where does Alberta's new Wetland Policy fit in with the Aquatic and Riparian Condition Assessment for the main stem rivers of the SSRB (ARCA 2007)?

With regard to water quality and State of the Aquatic Ecosystem: Are there studies being conducted? Such as those assessing benthic invertebrate health, any conducted by DFO? Whirling disease and Invasive Species also mentioned. It was found that yes there is by AEP, but are there links to SSRB?

First Nations water limit. What that would mean in 5, 10, 15 years. Allocations for First Nations. A lot of discussion of what this would look like as new applications for communities occur.

### **Areas For Future Work:**

WCO's only focus on water quantity and not quality or groundwater. It is strongly recommended that all three components be considered in the Report. Aquatic/riparian ecosystems and water quality issues should be considered in addition to quantity. Incorporating information on groundwater interactions and surface water under the influence of groundwater should also be considered.

There is therefore necessity for more monitoring of WCOs in more locations including tributaries before we can release land or approve urban development or industry. It would be beneficial to work with the Federal Government to get year-round stations that are monitored few times per year instead of once annually. It is understood that there would be trade-offs in doing this – for example it would be harder to meet WCO's if riparian and water quality are a WCO indicator. However, it should still be considered because further WCO's could be required in the future.

With regard to the IWCC, it was questioned how communications would be made during drought/flooding events. Alberta Environment calls meetings based on need. AEP currently does not send minutes to WPAC's. Improved communications would be helpful between Alberta Environment members and WPAC's. Suggested that all WPACs receive copies of the minutes to ensure accurate sharing and coordination of information. Recommendation is that the IWCC needs resources to run drought simulation scenarios to prepare for times of emergency. The IWCC should also continue to seek input from WPACs on its Terms of Reference and activities. Important to work together to address a need if a severe drought. While the ToR is currently under review, additional review of the committee membership and mandate is recommended.

With regard to protection and management of riparian vegetation and wetlands, we should identify areas that are not healthy or where health is impacted within local riparian areas and wetlands. Also work towards identifying environmentally sensitive areas. It seems that the majority would be done at municipality level. RDRWA could assist AEP in determining where to best focus management efforts.

With regard to Water Quality (Recommendation 2.8.5), it would only make sense to incorporate both our published IWMP and the current Action Pathways into our Basin Advisory Committee to address what the other BACs have discussed as shortcomings.

### **Suggestions for improvement**

We strongly recommend that the BAC be re-visited in 5 years, rather than 10 years with regard to next review, as conditions change. Bow BAC are open to that recommendation. If this something a group wants to look at in the parking lot a year or 2 from now, we can do that. It is worth noting that costs currently come from WPACS for review. Staff time and data are only provided by government. So any future review, as well as necessary resources should be considered.

Key areas of concern were discussed that pertain to the 'parking lot':

1. Special Areas Water Use. This is of concern for the health of the Red Deer Basin, especially in any future drought conditions.
2. Groundwater. It is strongly recommended that groundwater use be considered with water quality and quantity in the Report.
3. WCO's with regard to a second Dam
4. Drought management action plan

Table 1: Key findings (from six RDRWA BAC member's responses):

#	Item	Number of votes by BAC members
1.	As climate change may or may not affect area. 550,000 trigger amount should be reviewed before we get to that 500 stage	2
2.	Review of how we came up with the 550- and the In Flow Needs (given climate change etc)	2
3.	More monitoring is required to better understand water and ecosystem health. There is currently not enough monitoring of WCO's and the tributaries. Water quality should be combined with quantity.	4
4	Better idea to check in in 5 years than 10 years with regard to next SSRB review.	4
5	Need a water storage strategy. I.e. dam or other. May need to provide personal water use. On and off stream 2 options plus private storage	1
6	Protection and management of riparian vegetation and wetlands. Quality should be coupled with quantity in report.	2
7	Net use – take a serious look at determining (revising) water allocation limits when net use (net diversion) are taken into account	1

## **SOUTH SASKATCHEWAN Basin Advisory Committee**

### **SECTION ONE: Key Findings**

In the South Saskatchewan River Sub-basin (SSA), an increasing trend is present in the cumulative allocated surface volume following implementation of the SSRB WMP plan (Figure 34 in Data Package 02-13). Despite a bump in allocated volume in 2004, the cumulative allocated volume appears to have increased at a similar rate following implementation of the plan. This trend will likely not continue as the backlog in applications is cleared (Figure 53 in Data Package 02-13). The rate of increase in 'Interim' and 'Full' groundwater allocations appears to follow a similar, or slightly lower rate compared to the allocated surface water (Figure 39 in Data Package 02-13). This suggests that there has not been a shift towards groundwater in place of surface water following the closure of the basin. Temporary diversion licences of both surface, and groundwater do not appear to be a significant allocation within the SSA sub-basin (Figures 34 and 39 in Data Package 02-13).

The proportion of allocated volume that is withdrawn, utilized or returned by individual licence holders was identified as a data gap (outside of the municipal level). This data gap is likely not as pressing within the SSA sub-basin as the municipal allocation constitutes the largest proportion of the cumulative allocated volume (Figure 36 in Data Package 02-13) and is reported to provincial regulators.

Adaptation by irrigators, municipalities, and industry within the South Saskatchewan sub-basin has increased water use efficiency. These adaptations are not necessarily occurring with WPAC consultation in the South Saskatchewan sub-basin. Indicators of performance efficiency should be apparent, at least at the municipal level through required reporting of water diversion, use and return. Certain municipalities have invested in water conservation education programs (Hatsmart), subsidizing the purchase of high-efficiency fixtures, household metering, and smaller lots in newer area structure plans require less watering. Regional industry (greenhouses, methanol production) continues to improve standards and practices to increase production efficiency. These measures are reflected in the downward trend in water use by the City of Medicine Hat (Figure 82 in Data Package 02-13), despite the area footprint of the city and the population increasing. Adoption of technology (pivot irrigation) by irrigators has allowed more production, with less water. At Canadian Forces Base Suffield, fire fighting is the major use of water, aside from the day-to-day use. The amount used during a given year depends on weather conditions, and base activities.

Relatively few crown licences have been issued within the SSA sub-basin. These have been small in comparison to the other basins in the South Saskatchewan Region (Tables 44 and 49 in Data Package 02-13). Six surface water crown licences have ranging in status and effective date from 1971-2017. These licences were used for stockwatering (2), floodcontrol (2), lake level stabilization (1), and cooperative, farmsteads, single-multi homes, colonies (1). Two crown groundwater licences were issued in 1994, and 1998 for the purposes of municipal diversion (urban, villages, summer villages, towns, cities, hamlets) and recreational diversion (fairgrounds, entertainment centres, sporting complexes, halls, zoos, restaurants, cafes, clubhouses, stables)

AEP (ESRD) is predominant approval agency for both surface and groundwater allocation within the SSA sub-basin (Figure 38 and 43 in Data Package 02-13). It was noted that in practical terms, the approval agency for some industrial water use is the municipality (an industry may hold a separate licence, but



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water could also be sold by the Municipality to that industry as part of the municipal licence). As this does not constitute a formal transfer of licence, it is not evaluated by AEP.

Following implementation of the SSR WMP, Water Conservation Objectives (WCOs) are not a significant proportion of allocated flow volume within the SSA sub-basin (Figures 36 and 71 in Data Package 02-13). Establishing functional flow minimums was suggested as a method of reversing basin degradation. WCOs enacted on headwaters will likely have a larger impact than downstream reaches that are already heavily allocated.

Limitations to new storage in the SSA sub-basin have been due to environmental impact (Meridian Dam). There are few areas within the region that are suitable for holding large volumes of water without a significant loss due to evaporation, and impact to land use.

The Interbasin Water Coordinating Committee (IWCC) reports are provided as to projections of water supply to the participating stakeholders. These reports have been very positive about the supply of water in reservoirs but have had to be readjusted due to drought conditions. This could potentially pose a major problem for the City of Medicine Hat, as they require minimum flows to maintain infrastructure (power plant cooling). The job of the IWCC is undoubtedly difficult because coordinating the timing and quantity of flow releases among many different reservoirs is a complex process. Currently, the group meets at least once per year. As drought conditions become more common, meeting more than once per year could be beneficial. As an advisory committee, it's makeup of municipalities AEP, WPACS, irrigation districts is satisfactory. To effectively participate in this committee, a significant technical understanding is required. Are their opportunities for the IWCC to better communicate, and interpret data to it's stakeholders? Could more coordination between basin stakeholders at IWCC meetings lead to improved water conservation at the stakeholder scale?

Currently, there is no publication of water transfer applications on the South Saskatchewan River. The City of Medicine Hat does publish approvals to operate its water treatment plants in the newspaper. Water licences, and approved transfers are publicly viewable on the Alberta Water Portal website (<http://waterlicences.alberta.ca/>) as well as (<https://avw.alberta.ca/ApprovalViewer.aspx>). The SSA sub-basin made up a relatively small proportion of transfers in the South Saskatchewan River Basin. 12 transfers occurred within the SSA Sub-basin. These transfers did not involve movement of allocated volume between tributaries and mainstem. A single transfer occurred from the St. Mary River to the South Saskatchewan river, shifting allocation from a southern tributary to a mainstem. 2 transfers occurred from the SSA sub-basin to the Bow River sub-basin, shifting allocation from downstream->upstream. 4 transfers occurred from the SSA sub-basin to the Oldman River sub-basin shifting allocation from downstream->upstream. Post 2006, 41% of transferred volume occurred between crop (grain) irrigation to crop (grain) irrigation; 36% of transferred volume went from municipal (single-multi homes/farmsteads [not subdivisions]) to municipal (village/Summer village/Town/Hamlet/City) use; 15% of transferred volume went from crop (grain) irrigation to municipal (single-multi homes/farmsteads [not subdivisions]).

The 10% holdback appears not to be applied across all transfers within the SSA sub-basin. A situation might arise in which an under-utilized licence is transferred and becomes fully utilized. In this case, an increased volume of water would be withdrawn from the waterbody despite a 10% holdback being applied.

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Staff at Alberta Environment and Parks have personally pushed for and undertaken increased water quality monitoring efforts in the South Saskatchewan river tributaries (Seven Persons, Ross Creek, etc....). This data has been presented to SEAWA membership at informational meetings, but it is unclear if it is being used to specifically develop beneficial management practises to mitigate land use impacts.

## SECTION TWO: Analysis

### Recommendation 2.1: Establish a Limit on Water Allocations from the Bow, Oldman, and South Saskatchewan River Sub-basins

- 1.1 How has the trend in water allocation and/or use changed in the years before and since the implementation?
- Cumulative allocated volume in the SSRB as 'Interim' and 'Full' licences (Long standing) have had a statistically significant trend in the years after the SSRB plan was implemented (Figure 22).
  - This trend appears to be largely driven by 'Agriculture and Irrigation' class allocations (Figure 23).
  - Though the **cumulative volume allocated** in the South Saskatchewan river sub-basin is statistically significant, the **net change** allocated only accounts for ~1000 dam<sup>3</sup>. (<1% of cumulative volume allocated).
  - Agricultural and irrigation applications before the SSRB Plan are the only significant trend.
  - Municipal allocations are by far the largest allocation in the South Saskatchewan Sub Basin
  - Charts should include some level of statistical significance R<sup>2</sup> or trend line included.
  - Being that the temporary licence is almost 0, may be necessary to remove
  - Because there hasn't been a statistical change in the data, there may not be an affect of the plan on the change in allocation.
- 1.2 Have there been any operational adaptations or options that may have had the unintended consequence of negating overall intended planned outcomes? (e.g., changes in Temporary Diversion Licence (TDL) use; use of licence amendments and assignments; more of a draw on [unlicensed] groundwater)?
- The largest single increase in 'Interim' and 'Full' groundwater allocations occurred in 1991.
  - The relative increase in 'Interim' and 'Full' groundwater allocations appears to follow a similar trend to the allocated surface water. This suggests that there has not been a shift towards groundwater in place of surface water following the closure of the basin.
  - Are unlicensed groundwater users increasing? We don't have this data. Transfers of existing allocations have been sufficient, in the future this might change.
  - Brian Hills: not a lot of places where groundwater can be taken out at a sufficient draw rate.
- 1.3 Is adaptation happening without transparent identified performance monitoring / assessment or partner (WPAC) consultation?
- To discuss in stakeholder meeting.
  - John Michalopolous: over last 5 years there has been a trend downwards in water use by the City of Medicine Hat, despite the area footprint of the city and the population increasing. 100-120 million L per day (mostly for irrigation), peaks are now 90 million L per day. 20-25% decrease, this was most likely due to becoming metered, as well as smaller lots in newer area structure plans.
  - Yearly reports of water use are provided by the City of Medicine Hat to GoA.

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- Some municipalities are heavily invested in water conservation. Conservation message is beginning to take hold (incentives provided for low flow fixtures have been a successful tool in this).
- City of Medicine Hat (Hatsmart efficiency program) has rolled out conservation measures compensating people for low flow fixtures.
- Who regulates the efficiency of fixtures? 0.6 gal toilets, energy star rated appliances are also being funded.
- Xeriscaping adoption is increasing, turfs also have been developed that require less watering. Medicine Hat college, City, SEAWA had a xeriscape demonstration garden at the College. Newer developments have smaller footprints, some level of green space/grass is required to provide infiltration.
- Amy Moores: At Suffield Base, fire fighting is the major use of water, aside from the day-to-day household use of water. The amount depends on the dryness of the year. Also used in the Hamlet of Ralston.
- Hamlet of Suffield? The base does supply, but that agreement is ending.
- Ryan Hornung: Methanex: A member of responsible care community, stewardship of environment is a part of this. [The Responsible Care Ethic and Principles for Sustainability is a United Nations recognized initiative adopted by the global chemical industry to enhance community safety employee health and safety]. They are attempting to decrease the amount of water required at the methanol production stage, as well as the amount of waste water produced. When the plant runs well, it usually uses less water.
- In the past, Methanex has used aquifer well water. Now, the plant uses chlorinated from the City. Despite costing somewhat more to purchase water from the city, it does not need that level of treatment as aquifer water does.
- Greenhouse industry has also increased efficiency. May be a cause of the decrease in municipal water use.
- There was general agreement that irrigators have been adopting technologies to increase water efficiency (e.g. pivot irrigation)

### 1.4 How many Crown licences have been issued and for what use?

- From Brian Hills (AEP):
  - 6 surface water crown licences have been issued within the South Saskatchewan River Sub-Basin ranging in status and effective date from 1971-2017. These licences were used for stockwatering (2), flood control (2), lake level stabilization (1), and cooperative, farmsteads, single-multi homes, colonies (1)
  - 2 crown groundwater licences were issued in 1994, and 1998 for the purposes of municipal diversion (urban, villages, summer villages, towns, cities, hamlets) and recreational diversion (fairgrounds, entertainment centres, sporting complexes, halls, zoos, restaurants, cafes, clubhouses, stables)

### 1.5 What information is missing (data gaps, legal mechanisms?)

- Is there data for who is over/under using their licences? (Refer to response from Mike Murray's comment in section 3.5)
- Better tracking of the proportion of used and returned components of individual water licences.
- The gap between what is being allocated and what is used is going to close.
- Medicine Hat draw is used for power plant cooling, the majority of which is returned to the SSRB.

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- The withdrawal, use and return of water is tracked by all municipalities, and provided to Government of Alberta.
- 1.6a Who (AEP vs. AER) is making regulatory decisions on water allocations?
- AEP (ESRD) is overall the largest issuer/approval agency in the South Saskatchewan River Sub-basin.
  - Though the trend in cumulative **volume allocated** in the South Saskatchewan river sub-basin is statistically significant, the **net change** allocated only accounts for ~1000 dam<sup>3</sup>. (less than 1% of the total volume)
- 1.6b Are both agencies (AER and AEP) using the same approval criteria?
- Yes
  - AER has a small section of licences for mining and OnG, The Bow minutes include this discussion.
  - Methanex's practical regulatory body is the City of Medicine Hat, as they purchase water from them.
  - An industry may hold a separate licence, but water could also be sold by the Municipality to that industry as part of its licence.
  - All municipal licences have room for growth in population.
  - Sales of licences occur frequently (anecdotally) those transfers must be evaluated and approved by AER, or AEP.
- 1.7 Have the Environmental Appeal Board decisions influenced any decisions made by AEP since the SSRB was enacted?
- No apparent challenges among the stakeholder group.
  - From Brian Hills (Alberta Environment and Parks): There have not been any EAB decisions (since the AWMP and BOSS came into effect) that have directly led to changes in operational policy. The EAB doesn't (or shouldn't) direct policy development. The following cases (EAB and court cases) of note – have considered transfers, holdbacks, the closed basin, or WCO licences:
    - (1) the EAB has upheld a number of the Director's decisions for GW connected to reserved surface water:
      - i. Municipality of Crowsnest Pass v. Director (2009 EAB): <http://www.eab.gov.ab.ca/dec/08-016-R.pdf>
      - ii. Alberta Foothills Properties Ltd. v. Director (2013 EAB): <http://www.eab.gov.ab.ca/dec/11-179-R.pdf>
      - iii. Sandstone Springs Development Corporation v. Director (2013 EAB): <http://www.eab.gov.ab.ca/dec/12-043-R.pdf>
    - b. Two appeals about the 10% holdback were resolved at mediation. Appeals regarding the holdback contributed to the Compelling Reasons Not to Take the 10% Holdback policy:
      - i. Cypress County v. Director (2011 EAB): <http://www.eab.gov.ab.ca/dec/11-169-172.pdf>
      - ii. Town of Okotoks v. Director (2011 EAB): <http://www.eab.gov.ab.ca/dec/10-045-048.pdf>
    - c. There is one case where the EAB and the courts confirmed the Gov't can only hold a licence to implement a WCO:

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- i. Water Conservation Trust v. Director (2013 EAB): <http://www.eab.gov.ab.ca/dec/10-056-R.pdf>
    - ii. Water Conservation Trust v. Alberta (2015 Queen's Bench): <http://canlii.ca/t/glwpw>
  - d. The Tsuu T'ina's unsuccessful court challenge of the SSRB AWMP:
    - i. Tsuu T'ina Nation v. Alberta (2010 Court of Appeal): <http://canlii.ca/t/29g5f>

### Recommendation 2.2: Future Water Allocation Limit in the Red Deer River Sub-basin

- 2.1 How close is the basin to reaching the 550,000 dam<sup>3</sup> limit?
  - Beyond the scope of the South Saskatchewan River Sub-Basin discussion.
- 2.2 When is the right time for closing the basin and what influence might that have on whether a 10% holdback is required?
  - Beyond the scope of the South Saskatchewan River Sub-Basin discussion.

### Recommendation 2.3: Recommended Water Conservation Objectives (WCOs)

- 3.1 The WCOs are intended to stop further degradation of the basin. Do we have evidence of this?
  - Refer to figures 43, and 44. Mean Instantaneous Flow at the South Saskatchewan River Station (05AJ001) at Medicine Hat appears to drop below the WCO values in the last half of May prior to the SSRB Plan.
  - In the experience of stakeholders, there is no evidence that WCOs stop further degradation of the basin.
- 3.2a In a heavily allocated closed basin, how often is a WCO relevant (because it is junior to most allocations)?
  - Following the closure of the South Saskatchewan River sub-basin, there is no significant trend in the Cumulative allocated volume to WCO (Figure 41 and Red Deer Graph)
- 3.2b Is there a more effective alternative?
  - Mike Murray:
    - Whatsup Report (protected water) in other basins, applying a WCO in less heavily allocated regions may be more beneficial. In a heavily allocated basin, it is not as relevant (like here).
    - Oldman basin is fluctuating river to stimulate cottonwood recruitment.
    - 'Brahm' wholistic watershed management. The water that is left in the river though irrigation conservation is important, most years this is being left in the river.
  - Establishing functional flow minimums for the stream was suggested as a possible alternative.
- 3.3 How might WCOs need to be relaxed or revised to enable new storage to offer potential benefit to the basin?

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- WCO is what we are looking at right now, but we can't have recommended new mechanisms (parking lot)
- Meridian dam: Environmental impact was what prevented its construction more than anything else.
- Coulee river valleys during flood conditions were suggested to be used as temporary storage areas, they looked at these plans for flood mitigation.
- Drought storage that is longer than 1-2 years is not feasible in this location. There are simply not a lot of areas within the region that are suitable for holding large volumes of water without a significant loss due to evaporation.
- It has been suggested in the past that water could be stored underwater and pumped out when required. We are nowhere near understanding the subsurface conditions to enact this type of project at a large enough scale.
- Currently, we should be training people to use less water as a method of reducing our footprint.

3.4 Are WCOs needed on more reaches, for example, some of the upper tributaries as mentioned in the SSRP?

- Would WCOs have more impact on upper reaches rather than on the downstream mainstem of streams?
- As an example: Seven Persons Creek baseflow depends on the timing of irrigation during dry months.

3.5 How much of a role does unused allocation within existing licences play in the river for healthy aquatic ecosystems?

- What are the usage rates within the SSRB? Is this data available?
- Mike Murray:
  - AEP has a water use reporting system (WURS); reporting is a requirement for some, not all, licences. There are quality assurance and quality control challenges which result in sizeable gaps in the data. The WURS system is not a reliable one yet.

### **Recommendation 2.5: Establishment of an Interbasin Water Coordinating Committee**

4.1 Refresh the narrative on why the committee exists and whether it is effective.

- Reports are provided as to projections of water supply to the participating stakeholders.
- Anecdotally, reports have been very positive about the supply of water in reservoirs, but have had to be readjusted during drought years (2009, 2011)
- This is a problem for the City of Medicine Hat, as they require flow for infrastructure.
- Difficulty comes from coordinating the timing of flow releases and quantities among many different reservoirs.
- Perhaps meeting only once per year, is insufficient as drought conditions become more common.
- SEAWA and City of Medicine Hat representatives submitted their comments on the terms of reference and have not yet received comment.

4.2 Does it have the right membership, mandate and accountability?

- Yes

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- Just an advisory committee, municipalities AEP, WPACS, irrigation districts.
- To effectively participate in this committee, a significant technical understanding is required.
- **Opportunity:** How to communicate this effectively to the stakeholders. Data needs some interpretation.
- Could more coordination lead conservation at the stakeholder scale.

4.3 Is it providing useful information to GoA? Could it be more useful to GoA?  
yes

4.4 Is it representing the WPACs?  
yes

### **Recommendation 2.7: Use of Water Allocation Transfers, Water Conservation Holdbacks and Factors that Must be Considered When Making Decisions**

5.1a How many times has the Transfer system been used? How many times has it been abandoned?

- Mike: There is no tracking of how many transfers are abandoned, or attempted to be transferred

5.1b Expected vs actual uptake of mechanism? Have there been excessive barriers raised?

- We do not have knowledge of this.
- Mike: Applicant may not be fully providing the required information to the GoA. Applications come in but are not complete.

5.2 How onerous is the Transfer system? Should it be simplified or is it appropriately rigorous?

- The BAC did not have insight into this question.

5.3 How long does a typical transfer take from application to approval?

- The BAC did not have knowledge of this.

5.4 What form of public notice is provided for each application?

- These types of postings do not occur to the knowledge of the BAC.
- Approvals to operate the municipal water plants are publicized in newspapers.

5.5 Does AEP offer a public list of water allocation licenses and transfers?

- Mike: AEP does not have a taskforce to check the use of water licences, except during transfers.

5.6 Is the application and approval process transparent and consistent?

- Water portal is public. But somewhat esoteric.

5.7 How often have transfers involved a change in purpose/timing/location? (including movement between tributaries and main stem, change from seasonal to year-round use)

- In the years following 2006,
  - 12 transfers occurred within the SSA Sub-basin. These transfers did not involve movement of allocated volume between tributaries and mainstem.



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- A single transfer occurred from the St. Mary River to the South Saskatchewan river (Oldman river sub-basin to the SSA sub-basin) (36960 dam<sup>3</sup>) shifting allocation from a southern tributary to a mainstem.
- 2 transfers occurred from the SSA sub-basin to the Bow River sub-basin (140478 dam<sup>3</sup>) shifting allocation from downstream->upstream.
- 4 transfers occurred from the SSA sub-basin to the Oldman River sub-basin (648125 dam<sup>3</sup>) shifting allocation from downstream->upstream.
- Data provided by the AEP of transfers officiated by the Lethbridge office, cross referenced with the **available** online transfer database (some records that may have occurred within the SSA sub-basin were not available within the online transfer database) showed that within the SSA sub-basin, transfers between purposes occurred as the following table

Transfer From	Transfer To	Volume Transferred (dam <sup>3</sup> )	Volume Held Back (dam <sup>3</sup> )
Irrigation (Crop (Grain))	Irrigation (Crop (Grain))	810487.3	73494.7
Irrigation (Crop (Grain))	Agricultural (Stockwatering)	20105	0
Irrigation (Crop (Grain))	Municipal (Single-Multi-Homes/Farmsteads (not subdivision))	296667	32963
Municipal (Single-Multi-Homes/Farmsteads (not subdivision))	Municipal (Village/Summer Village/Town/Hamlet/City)	704938	0
Municipal (Village/Summer Village/Town/Hamlet/City)	Municipal (Village/Summer Village/Town/Hamlet/City)	118071	0
Municipal (Subdivisions (Rural))	Municipal (Village/Summer Village/Town/Hamlet/City)	8445	0
	<b>Total</b>	1958713.3	106457.7

5.8a Are the 10% holdbacks being used?

Yes; In general transfers within basin have had a 10% holdback applied to them. The proportion of licence held back is relatively small compared to the volume of the water in the river.

5.8b Are the 10% holdbacks putting water back into the river?

- If the unused portions of the traded/exchanged licences are now coming online, more water might be being removed from the river.

5.8c Is there an alternate mechanism to the holdback that would be more beneficial to developers and the aquatic ecosystem?

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- Establishing functional flow minimums for the stream was suggested as a possible alternative.
- 5.9 There are water licence sharing assignments originally proposed as short-term water shortage solutions between parties that do not go through approval process. Some of these are now becoming long term and should be looked at as permitted temporary transfer but this is not happening until someone complains. Allowing these long-term assignments also raises some questions about the criteria for licences held in 'good standing'.
- This did not strike the committee as a problem.
- 5.10 Is the Matters and Factors table useful in guiding decision making. Should the Matters & Factors tables pertaining to amendments and transfers be revisited?
- They appear thorough enough, how well it is applied is something else.
- 5.11 What information is missing (data gaps, legal mechanisms?)
- What is concerning to a municipality is the First-in-time, first-in-right as a municipality who has recently expanded may have its licence revoked.
  - Principal of first in first out is understandable, but some other yardstick could be used to designate need.
  - Priority will always be given to the municipal water. Statements have been made by various irrigation districts in the past that during drought periods, "people before produce" will trump "First-in-time, first-in-right."
  - First in First out was adopted when there was generally an abundance of stream flow, we are now moving into a drought period.
- 5.12 Should all Transfers be managed in the same manner, or is there an opportunity to designate different types of transfers (as per the Water Allocation Transfer System Upgrade Project WATSUP 2009 Report)?
- There does not appear to be any complaint specifically with the current transfer system.
- 5.13 Does there need to more clarity on the different between an Amendment and a Transfer?
- Yes, the amendment does not change hands but could
  - Amendment requires some level of approval from government, assignment is like a temporary amendment.
  - No licence amendments required in Oldman water shed council during a drought period.

### **Recommendation 2.8: Water Management Strategies**

#### **6.1 Water Demand and Consumption (Recommendation 2.8.1)**

- a. Have modeling capabilities been upgraded?
- City of Medicine hat does not specifically use water models.
  - Unclear
  - There have been updates to the WRM model, other models are being used in parallel or in conjunction.

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b. Have innovations and improvements in water licensing and legislation to better match allocations with needs been explored?

- The Committee could not provide insight into this question.

c. Has the development of water markets and transfers been supported?

- The Committee could not provide insight into this question.

d. Have improvements in water conservation methods been encouraged?

- Conservation methods have increased in uptake. Conservation is increasing. (as discussed in question 1.3)

### 6.2 Improved Dam Management to Protect the Aquatic Environment (Recommendation 2.8.2)

a. Are post flood functional flows being released on GoA reservoirs?

Unclear, I don't think we have any. Some operation on the Oldman, are used to promote recruitment of Cottonwood.

### 6.3 Protection and Management of Riparian Vegetation (Recommendation 2.8.3)

a. The intent of the Aquatic and Riparian Condition Assessment for the main stem rivers of the SSRB (ARCA 2007) is to assist Alberta Environment and its partners in determining where to focus management efforts. To what extent has this been happening particularly from the perspective of effectively managing reach specific flow and water quality?

- The Committee could not provide insight into this question.

b. Review how AEP has worked in partnership with the WPACs to prepare watershed management plans to encourage healthy riparian environments.

- The SEAWA has adopted the South Saskatchewan Regional Plan as its working watershed management plan.

### 6.4 Flow Restoration on the Bow, Oldman, and South Saskatchewan River Sub-basins (Recommendation 2.8.4)

a. Are license holders taking voluntary flow restoration actions, particularly during critical periods?

- The Committee could not provide insight into this question.

b. Are discussions with senior priority license holders held?

- The Committee could not provide insight into this question.

c. Has research been conducted to determine how flow restoration benefits the aquatic environment?

- The Committee could not provide insight into this question.

d. Have operating licenses for government dams and WCO conditions on diversion licenses been assessed?

- The Committee could not provide insight into this question.

### 6.5 Water Quality (Recommendation 2.8.5)

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- a. Has water quality been studied in more detail throughout the SSRB to assess land use impacts and develop beneficial management practices to mitigate these impacts?
- Natalie Kromrey at Alberta Environment has personally undertaken increased water quality monitoring efforts in the South Saskatchewan river tributaries (Seven Persons, Ross Creek, etc...)
  - This data has been presented to SEAWA membership at informational meetings, but it is unclear if it is being used to specifically develop beneficial management practises to mitigate land use impacts.

**SECTION THREE: PARKING LOT**

This section should capture any topics or questions identified during BAC meetings that are tangential or peripheral to the Review and that warrant further discussion or input from others but were deemed to be out of scope of the SSRB WMP 10-Year Review.

Drought storage that is longer than 1-2 years will likely become a more pressing issue in the coming years due to climate change. This issue will likely be exasperated by physical limitations to surface storage, as well as uncertainty in the effectiveness of below-ground storage of surface water.

## Appendix F - BAC Members

## Appendix F – BAC members

### **Bow River Sub-basin BAC Members**

Mike Murray – Program Manager, BRBC  
Mark Bennett – Executive Director BRBC  
Richard Phillips – General Manager, Bow River Irrigation District  
Shirley Pickering – Individual (Watershed Stewardship Groups)  
Judy Stewart – Individual  
Steve Meadows – Industry, Oil and Gas  
Rob Wolfe – Alberta Environment and Parks  
Dave Barrett – Academia (University of Calgary and University of Victoria)  
Roger Drury – Individual (Former TransAlta)  
Harpreet Sandhu – City of Calgary  
Mike Kelly – Chair, BRBC (past chair now)

### **Oldman River Sub-basin BAC Members**

Alan Harold (Lethbridge Northern Irrigation District; LNID)  
Brian Hills (Alberta Environment and Parks; AEP)  
Cheryl Bradley (Southern Alberta Group for the Environment; SAGE)  
Doug Kaupp (City of Lethbridge)  
Dwayne Rogness (Lethbridge County)  
Henk de Vlioger (Agricultural Producer; OWC Member at Large)  
Janna Casson (Alberta Agriculture and Forestry; AAF)  
John Younger (Alberta Health Services; AHS)  
Lori Goater (Southern Alberta Group for the Environment; SAGE)  
Shannon Frank (Oldman Watershed Council; OWC)  
Shirley Pickering (Highwood Water Management Plan Public Advisory Committee)  
Terence Hochstein (Potato Growers of Alberta; PGA)

### **Red Deer River Sub-basin BAC Members**

#### **RDRWA Staff**

Jeff Hanger  
Rosemarie Ferjuc  
Kelly Dodds (took minutes at meetings)

#### **Red Deer River BAC Members and Affiliation**

Bill Shaw -Red Deer River Municipal Users Group (RDRMUG)  
Brandon Leask -Alberta Agriculture and Forestry  
Chris Israelson- Alberta Beef Producers  
Dale Christian- RDRWA Board Member and BAC Chair

Doug Thompson- City of Red Deer  
JoAnne Volk- Repsol  
Jordon Christianson- Special Areas Board  
Keith Ryder- Red Deer River Municipal Users Group (RDRMUG)  
Kent Dyck- NOVA Chemicals  
Warren Robb- Ducks Unlimited Canada  
Christine Campbell- ALUS Canada  
Natasha Wright- Parkland Planning  
Phil Boehme- Alberta Environment and Parks  
Anna Lewis- Red Deer College (initial BAC coordinator, moved to Australia)  
Pat Churchill – Former Councillor (Innisfail)

**South Saskatchewan River Sub-basin BAC Members**

Marilou Montemayor - SEAWA  
Patrick Jablkowski - SEAWA  
John Michalopolous – City of Medicine Hat  
Larry Leipert – Councillor, City of Redcliffe  
Ryan Hornung – Methanex  
Kennedy Fandruck – Cypress County  
Amy Moore – Canadian Forces Base (Suffield)