



OFFICE OF THE COUNTY MANAGER

TO: Council
DATE: December 11, 2018 **DIVISION:** All
FILE: N/A **APPLICATION:** N/A
SUBJECT: Springbank Off-Stream Reservoir Report

¹EXECUTIVE SUMMARY:

The 2013 flood of the Elbow River Flood caused severe property damage to Rocky View County and the City of Calgary, and threatened the community of Redwood Meadows. Rocky View County recognizes and accepts the need for downstream flood protection for the City of Calgary. In choosing the Springbank Dry Reservoir (SR1) as the primary means to mitigate flood protection other options and regional needs were not fully evaluated. Since that decision new information on the financial aspects of SR1 and the lack of First Nations consultation have arisen.

INTRODUCTION:

The 2013 flood of the Elbow River Flood caused severe property damage to Rocky View County and the City of Calgary, and threatened the community of Redwood Meadows.

Damages from a new event on the Elbow River are estimated at nearly \$942 million (IBI 2015) for a 1 in 200 year flood event.

In response, the Government of Alberta (GoA) examined a number of ways to mitigate flooding on the Elbow River, but by 2015 had narrowed its focus to the building of the Springbank Dry Reservoir (SR1). As noted in the June 2014 AMEC report, any dam on the Bow or Elbow Rivers is “primarily for the benefit of Calgary, as it would be unfeasible and unnecessary to construct a dam solely for the benefit of properties upstream of Calgary.”

Rocky View County recognizes and accepts the need for downstream flood protection for the City of Calgary. In that context, this report looks at the decisions and background that led to the SR1 project and makes the following observations:

- SR1 impacts are placed solely on the County and specifically the residents of Springbank with no mitigating benefits;
- Other options were not given the same level of technical evaluation as SR1, which resulted in:
 - a skewed cost / benefit comparison, and
 - premature dismissal of other options,
- Value based decisions favouring SR1 were made by technical experts without the input of impacted stakeholders and the public;
- Other mitigation measures identified in the Room for the River Report were no longer implemented and the operational parameters of SR1 were changed, which will result in downstream ecological impacts;
- The need for regional drought protection, water delivery, and recreation were not considered; and

¹ **Administration Resources**

Richard Barss, Intergovernmental Affairs

- First Nations were not appropriately engaged.

This report recommends that the GoA:

- Advance the recommendations of the Room for the River report, which requires an integrated approach along the entire Elbow River to improve conveyance;
- Equally examine all other detention and diversion options with a full technical analysis, including:
 - A re-examination of the value-based decisions and cost / benefit analysis of SR1 / Mclean Creek using a consistent approach; and
 - An examination of the benefit of wet dams with permanent water storage;
- Appropriately consult with the Tsuut'ina Nation and explore water retention options on the Nation's land.

BACKGROUND:

SPRINGBANK DRY RESERVOIR

The Springbank Dry Reservoir (SR1) is located south of Highway 1 and east of Highway 22 (Map 1). SR1 is a dry dam designed to divert water from the Elbow River and retain it during a flood event. When filled, the reservoir would flood Springbank Road and move westward underneath an elevated Highway 22. Once peak flow in the Elbow River has passed, an outlet structure will release water back to the river.

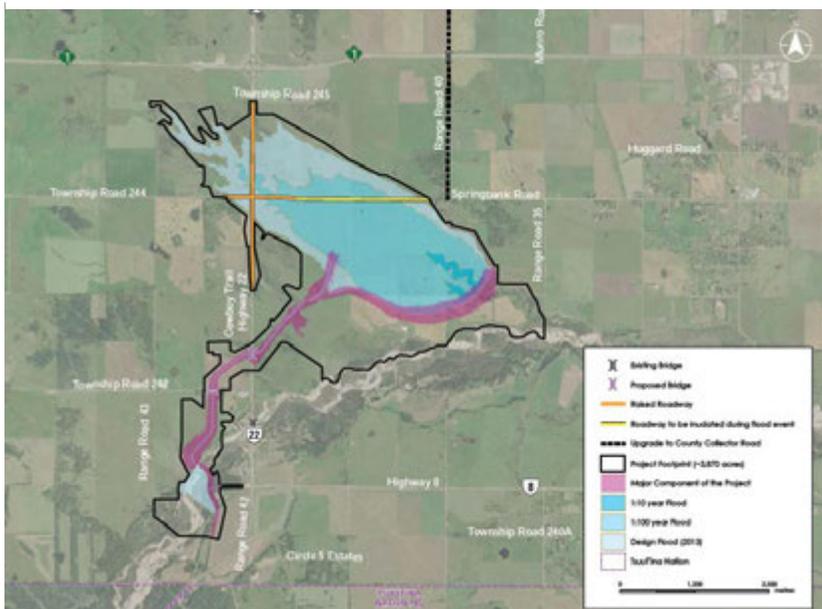
As originally envisioned (AMEC - June 2014), the reservoir was designed to hold 57,000 dam³. It could be a dry pond, or it could include a smaller permanent storage pond (dead storage) to dissipate flood water energy, which could be used for recreational / environmental purposes and/or an additional water supply source for the City of Calgary.

Over time, the SR1 reservoir storage capacity increased to 70,000 dam³, and the option for permanent water storage was dropped. This storage capacity would retain the 2013 flood event, which is equivalent to a 1 in 200 flood event, or a 0.5% chance of occurring each year. The project footprint is approximately 3,870 acres and includes land for the maximum extent of any flood event equivalent to the 2013 event. The GoA has committed to negotiate the purchase of all impacted parcels so that landowners are not required to subdivide and sell (total land acquisition approximately 6,800 acres).

Estimated costs have risen to \$432 million, or a net cost of \$372 million assuming the resale of purchased land that is not needed for construction and operation.

Design and operation

Map 1: Dam location and flood limits

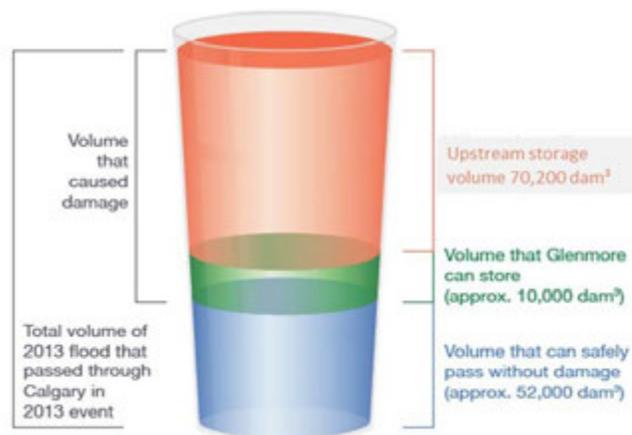


It is proposed that SR1 will divert water when Elbow River water flow reaches 160 m³/s. The intention is to limit flows downstream of Glenmore Dam to less than 170 m³/s. A 160 m³/s flow is about a 1 in 6 year flood meaning that there is a 17% chance the reservoir will be used every year.

Once the flood event is over, the reservoir will drain back into the Elbow River. It is expected that water retention will last for about two months (58 to 82 days) with dead water storage in isolated pockets with an estimated total size of 296 acres (120 hectares).

Upon drainage, 700 acres of land will have 1 to 400 cm. of silt deposits (Appendix 1), and it is reasonable to assume that all land within the reservoir will be subject to some degree of silting. Siltation will make more than half of the reservoir area non-viable for agriculture operations and subject to invasive weeds. The project description notes that reservoir land north of Springbank Road “may remain open to grazing” (Appendix 2).

Figure 1: Water Retention Volumes



DECISIONS

GoA rationale for SR1

Alberta Environment and Parks (October 2015) accepted the Deltares Report, which reviewed previous engineering infrastructure reports and recommended that the GOA proceed with the Springbank Off Stream Reservoir.

The Springbank option was contrasted against Mclean Creek (MC1), one of a number of options. The rationale for choosing the Springbank Option included the following:

- SR1:
 - is further downstream and has a larger catchment area;
 - is less affected by sedimentation and large instream debris flow such as trees and rocks, which can put the operations and structure at risk;
 - is less subject to the risks of flooding during construction and consequent catastrophic failure;
 - is more accessible to Calgary, which means dam operations are less likely to be hampered by damage to access roads;
 - has a more favourable cost / benefit ratio.
- MC1 is more ecologically sensitive to disturbance;
- From a commercial and tourism valuation, SR1 is preferred;
- MC1 would have a direct negative impact on the recreational and social values of the region; and
- While acknowledging the impact on ranching families and stewardship ethic, SR1 affects grazing areas and ranch lands for a small number of Albertans.

SR1 Impact on County Residents

Impacts

SR1 will directly impact 87 residential homes located on or near to the reservoir (Appendix 3), and will result in the loss of Camp Kiwanis, a summer camp for disadvantaged children.



The project will result in the loss of 3,870 acres of high quality ranch land. Approximately 51.5% of the area includes natural and undisturbed water courses, wetlands, shrub lands, forestland and grassland (Appendix 4). A further 28% contains relatively undisturbed tame / improved pastureland, while the rest of the area produces hay, or is annually cropped.

Dam operations will leave a minimum of 700 acres covered in heavy silt deposits. The County believes it is highly likely that post-flood dust will be mobilized by mechanical reseeding, silt removal to prevent loss of reservoir volume, and wind erosion, which may affect air quality and health (County CEAA submission).

Full operation of SR1 will result in the flooding of County infrastructure (Springbank Road). The provincial expectation is that the County will be responsible for repairing damages to its infrastructure and will be compensated post-flood event. The province has not agreed to take over responsibility for the operation and repair of County infrastructure.

Benefits

Regionally, there is a great benefit to mitigating Elbow River flooding through the construction of upstream retention or diversion projects. As noted by AMEC, dams are “primarily for the benefit of Calgary as it would be unfeasible and unnecessary to construct a dam solely for the benefit of properties upstream of Calgary.”

In the County, the benefit of SR1 is limited to approximately ten houses downstream of the dam. The province has also provided funding for flood protection (berming) in the hamlet of Bragg Creek. The decision was made prior to the SR1 approval and provides flood protection for a 1 in 100 year event, while SR1 protects against a 1 in 200 event.

There are no benefits to the Springbank area.

Subjective, Value-Based Decision Making

In choosing the SR1 project over the Mclean Creek (MC1) option, Alberta Environment and Parks (AEP) relied on technical experts to make subjective choices on values not linked to the technical merit of either option. The public should have had inputs into these value-based decisions, as other choices are possible (Table 1).

Table 1: Options

Reasons for choosing SR1 over MC1 (AEP (Oct 2015) Deltares (Oct 2015))	Alternative Value-Based decisions
SR1 affects grazing areas and a small number of Albertans	No Albertans live near MC1
MC1 is more ecologically sensitive to disturbance (forest is more important than grasslands)	Native grasslands and shrub lands are equally sensitive to disturbance and have been subject to greater loss throughout the prairies
Choosing SR1 protects the commercial and tourism uses of MC1	Long-term sustainable agriculture has equal value for society Dead storage in McClean Creek may be a recreational amenity similar to what was provided by Allen Bill pond
MC1 would have a direct negative impact on the	Recreational values of the MC1 area are primarily

Reasons for choosing SR1 over MC1 (AEP (Oct 2015) Deltas (Oct 2015))	Alternative Value-Based decisions
recreational values of the region	realized by residents of Calgary. Benefitting communities should share some of the costs of flood mitigation

In summary, the Room for the River report notes larger infrastructure measures (such as SR1 and MC1) place the burden primarily on ranchers' homes and their land, while the benefits are realized downstream, largely in Calgary. This imbalance is not typically favoured under the program in the Netherlands.

- The impacts of SR1 fall on County residents and Tsuut'ina Nation members with no associated benefits.

Room for the River

The Room for the River report was modeled on Dutch flood mitigation efforts, which move away from structural engineering flood defence, shifting the focus from 'fighting the water' to 'living with water'. Living with water takes a multi-dimensional approach to flood mitigation by creating "room for the river" through improved water conveyance, water storage, water diversion, as well as removing obstacles to flow, and holding and retaining water on the landscape.

Room for the River calls for an integrated and shared approach to flood mitigation along the entire Elbow River, including actions upstream and within the City of Calgary. Since the selection of the SR1 project, many of the options identified in the Room for the River report have fallen to the wayside, including:

- purchase of flood-prone properties (Appendix 5);
- support and incentives for voluntary conservation of riparian areas and flood hazard areas within both urban and rural reaches; and
- Identifying locations for the establishment of wetland conservation or restoration.

Conversely, the proposed operating parameters of SR1 trigger diversion early and often (1:10 year flood event) so that flood events would not reach the Glenmore Dam. From an ecological point of view, this would be detrimental to the river and its associated wetlands, which need pulses of water to remain healthy. It also removes incentive to improve conveyance downstream of the Glenmore Dam and share in the impacts of flood mitigation.

It appears the process of choosing SR1 was given to technical experts with limited public input and has moved away from the experience gleaned in the Netherlands, which includes:

- the need for clear, specific objectives that are well defined and communicated;
- relying as little as possible on infrastructure that can fail, and
- taking the time to inform and engage citizens and building the necessary social and political capital to implement measures.

- Important aspects of the Room for the River report have not been achieved.

Drought Protection, Water Deliverability, and Recreation

The decision to build a dry dam as a single-use piece of infrastructure does not address other environmental and service needs.

“Drought ... is a defining characteristic of Alberta, ... at least 40 droughts have affected western Canada over the last two centuries and is something that will continue to occur well into the future” (Alberta Water Portal).

“It is important to consider the relative value of single purpose infrastructure; for example, the dry reservoir at SR1 might provide room for the river, but may not satisfy the broader needs of watershed management in times of drought as well as flood (Room for the River).

The City of Calgary indicated that its instantaneous diversion rate for water withdrawals will be met by the year 2036 (Appendix 6). The potential to increase deliverability by the construction of a wet dam upstream of Calgary should be assessed.

Lake recreation opportunities in the Calgary region are limited. Construction of a wet dam upstream of Calgary should be considered as a recreational amenity.

- There has not been adequate consideration of the benefits of a wet dam as part of the building of flood mitigation infrastructure.

First Nations Consultation

The SR1 diversion structure is located adjacent to Treaty Lands, and the entire reservoir is located on Traditional Lands. Through County participation in the Canadian Environmental Assessment Agency stakeholder meetings and direct conversations with First Nation members, it is clear that First Nations in general, and the Tsuut'ina Nation specifically, do not believe they have been appropriately consulted on the impact of SR1 on Treaty and Traditional Lands. First Nations have made a number of extensive submission to the Federal Government through the Canadian Environmental Assessment process. Anecdotally the County has been told the lack of appropriate consultation leads the SR1 process open to legal challenge.

- Lack of appropriate consultation has the potential to significantly delay or halt the SR1 project.

INFRASTRUCTURE OPTIONS

Three primary options have been identified by various technical reports as having the catchment area sufficient to provide flood mitigation: Springbank dam, Mclean Creek dam, and Priddis diversion.

This report does not recommend one option over another; however, in the review of the literature and discussions with technical experts, the County believes that both the Mclean Creek dam and the Priddis diversion were prematurely dismissed and not given a thorough technical analysis so that objective decisions could be made.

Rocky View County has the following observations on the decision-making process.

Springbank vs Mclean Creek

SR1 and MC1 are the two options that have been contrasted. The County's submission² to the Canadian Environmental Assessment Agency regarding the SR1 Environmental Impact Assessment made the following observations (Table 2).

² Springbank Off-Stream Reservoir Hydrotechnical Review of Environmental Impact Statement – Northwest Hydraulic Consultants, June 15, 2018

Table 2: Observations: SR1 vs MC1

Selection Rationale	Observation
SR1 is more effective than MC1 because it is further downstream and has a larger catchment area.	The catchment area of the SR1 Project is 25% larger than that of the MC1 Project. However, the upper part of the Elbow River basin generally has higher runoff potential than the lower part with approximately 94% of the annual runoff sourced from the watershed upstream of Bragg Creek. Based on historical flow data, the average differences of the annual maximum daily flow and 7-day volumes between Bragg Creek and Sarcee Bridge were less than 10%.
MC1 is on-stream, closer to the mountains, and is more likely to trap rocks and trees, putting the structure and its operation at risk	MC1 is designed to manage debris with a relatively deep dead storage in the reservoir. It would benefit Glenmore Reservoir by reducing sediment inflow into it.
The Project is closer to Calgary and is more accessible. This means that dam operations are more robust, as emergency access to the dam is less likely to be hampered by road damage	It takes about 15 minutes to drive from SR1 to MC1. Flood operation of either Project will be mobilized in accordance with flood forecasting and before the flood wave reaches the downstream area. It is very unlikely that the operation would be affected by flood damage to downstream roads. The advantage of the SR1 Project on the accessibility may be considered insignificant
SR1 is less subject to the risks of flooding and consequent threat of catastrophic failure during construction when compared to MC1, which involves building a dam in the river itself	Although this risk exists, design criteria during construction are determined based on the likelihood and consequence of failure during construction, which is one of the mitigation measures used to reduce this risk. All dams on the Bow and Elbow were built with the MC1 risk potential

SR1-MC1 Cost / Benefit Analysis

The estimated costs of SR1 have increased over time (Table 3).

Table 3: SR1 Costs

Study	Cost (million dollars)
AMEC (June 2014)	\$ 193.8 (no land costs)
IBI (Feb 2015)	\$ 310 (with land)
GOA (Oct 2015)	\$ 297 (with land)
GOA (May 2018)	\$ 372 (assumes re-sale of unneeded land)



GOA (May 2018)	\$ 432 (with land cost and no re-sale)
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SR1 / MC1 cost / benefit comparisons assume the same benefit to both projects (no benefits were attributed to Bragg Creek and Redwood Meadows). However, MC1 would increase the flood protection at Bragg Creek from a 1 in 100 event to a 1 in 200 event.

The cost / benefit has narrowed overtime and is subject to a number of assumptions / observations.

SR1 Cost (million dollars)	MC1 Cost (million dollars)
\$372	\$ 406

- SR1 contingency cost is 12% of the total cost vs 25% for MC1. The higher MC1 contingency cost is due to greater design detail of SR1;
 - SR1 cost estimate does not appear to include costs for some items included in the MC1 estimate, although those items would be required for SR1, including “Wetland Compensation”;
 - SR1 cost estimate does not seem to include costs for the low-level outlet channel improvements that will be required as soon as a major flood occurs.
 - SR1 costs assume the resale of land (\$60 million) at the same price it was purchased at. This is highly unlikely as the land will be devalued by its adjacency to SR1, which will have associated dust, visual detractor, and operational noise.
- Subjective value based reasons form part of the reason for choosing SR1 over MC1.
 - The technical merits of SR1 vs MC1 are not substantially different; however, there is less technical details about the MC1 location and design.
 - Arguably the cost / benefit differences between SR1 and MC1 no longer exist.

Priddis Diversion

The Priddis Creek Diversion was first conceptualized in 1900 to divert water from the Elbow River through the Priddis Creek valley, flowing down into Fish Creek and ultimately into the Bow River. The Priddis Diversion mitigates for flooding upstream of Bragg Creek and the City of Calgary. Room for the River identified that a diversion from the Elbow River into Priddis Creek was discussed in 2013, but was not recommended in the AMEC study (2014), and the Government of Alberta directed no further study for this option.

Concerns with this option include the need for substantial buyouts or an engineered channel through the hamlet to manage risk effectively (AMEC 2014). In making this recommendation, the AMEC report noted flood defenses such as Priddis be supported with sufficient engineering evidence that the downstream flood risk to communities or infrastructure will not be increased, and other reports have noted that it is critical that diversions do not simply transfer flood risk from one community to another³.

- There was insufficient technical analysis of the Priddis diversion to assess whether this option would provide flood mitigation to the City of Calgary without transferring risk to the Priddis community.

³ The Bow Basin Flood Mitigation and Watershed Management Project – WaterSmart, March 2014



The Tsuut'ina Nation has informally raised the possibility of water storage in the southwest portion of their Treaty lands, which would provide drought and recreational opportunities and could potentially reduce peak flows to the Priddis diversion.

- The Tsuut'ina Nation have not been approached as partners to assist in flood mitigation efforts on the Elbow River.

CONCLUSION:

While recognizing the need for downstream flood protection for the city of Calgary, this report makes the following observations regarding the decision to build the Spring Bank Dry Reservoir (SR1):

- SR1 impacts are placed solely on the County and Tsuut'ina Nation, and specifically the residents of Springbank, with no mitigating benefits:
 - Downstream and other mitigation measures to share the impacts have been neglected,
- Other options were not given the same level of technical evaluation as SR1, which:
 - Resulted in a skewed cost / benefit comparison; and
 - Resulted in the premature dismissal of other options;
- Value-based decisions favouring SR1 were made by technical experts without the input of impacted stakeholders and the public; and
- The need for regional drought protection, water delivery, and recreation was not considered.

The Tsuut'ina Nation does not believe it was appropriately consulted on SR1 with respect to its Treaty and Traditional lands. This has the potential to delay or halt the SR1 process - it also provides an opportunity to:

- Step back, evaluate, and reconsider all options on an equal technical basis;
- Fully engage the public and stakeholders on value-based decisions within the context of sharing the impact of flood mitigation;
- Implement other flood control measures as identified in the Room for the River report, such as improving conveyance, purchasing flood-prone properties, conserving riparian areas, and establishing new wetland and flooding areas; and
- Appropriately consult with the Tsuut'ina Nation and engage them as partners who may bring a new solution to the table.

OPTIONS:

- Option #1 THAT Council prepare a letter to the Government of Alberta requesting a halt to the SR1 process so that all options can be equally be considered for the reasons detailed in the Springbank Off-Stream Reservoir Report of December 11, 2018.
- Option #2 THAT this report be accepted for information.
- Option #3 THAT alternative direction be provided.

Respectfully submitted,

"Rick McDonald"

Interim County Manager

RB/BR/rp



APPENDICES:

APPENDIX 1: Sediment Map

APPENDIX 2: SR1 Future Land Use

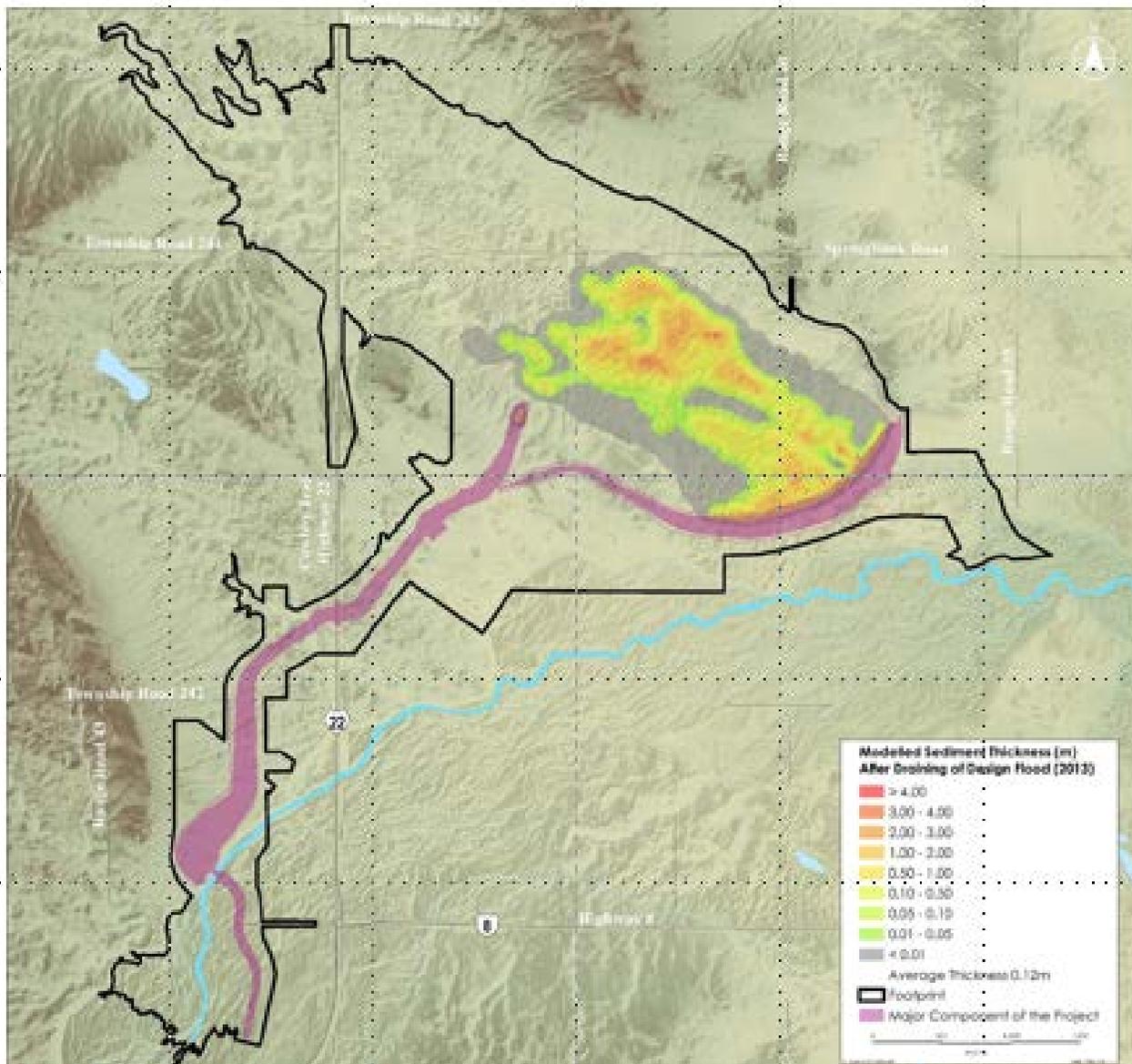
APPENDIX 3: Dwellings

APPENDIX 4: Land Cover

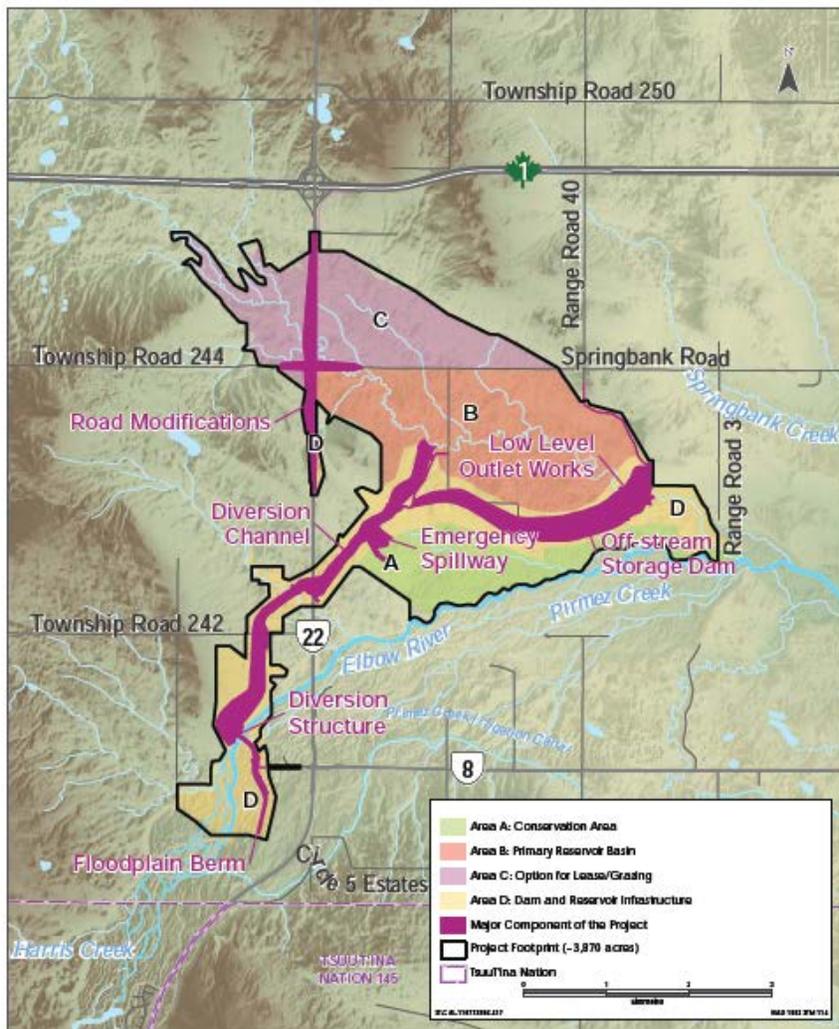
APPENDIX 5: Land Acquisition Map

APPENDIX 6: Calgary's Water License Capacity

Appendix 1: Sediment Map (GoA Website 2018-05)



Appendix 2: SR1 Future Land Use (GoA Website 2018-05)



The Land Use Plan divides the project footprint into four distinct areas:

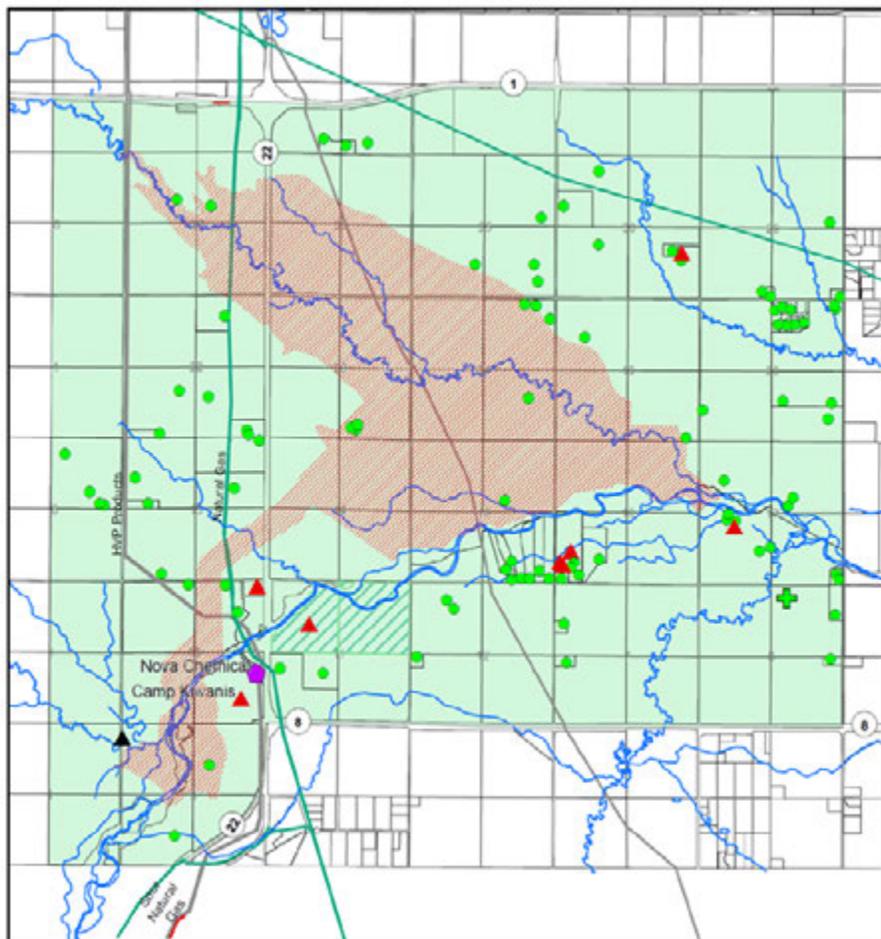
Area A - Conservation Zone: The area south of the reservoir and diversion channel north of the Elbow River, would provide low-impact recreational opportunities and have limited improvements beyond restoration after construction.

Area B – Primary Reservoir Basin: This area would be maintained for the intended functionality of the Springbank Project. No public access would be permitted. During non-flood periods, this zone may provide opportunities for scientific study of flooding and ecological resiliency, which would provide for ongoing improvement to the stewardship of the lands within this area.

Area C – Grazing: The area north of Springbank Road may remain open to grazing.

Area D – Dam and Reservoir Infrastructure: These lands would be owned and operated by the Government to support the operations and maintenance of the Springbank Project. No public access would be permitted.

Appendix 3: Dwellings



SR1 - Dwellings

-  Area of Interest
-  SR1 Springbank Off-Stream Reservoir
-  Crown Land
-  Commercial
-  Golf Course
-  Industrial
-  Monument
-  Residential
-  Natural Gas
-  Sour Natural Gas
-  Other

Appendix 4: Land Cover (EIS submitted to CEAA by Alberta Transportation, vol. 4, Append. N)

Project development area (PDA) is the anticipated area of physical disturbance associated with construction and operation of the Project and is 1,440 hectares (3,560 acres).

Local assessment area (LAA) encompasses the PDA and a 1 km buffer centered on the PDA. The LAA is 4,860 hectares (12,009 acres) in extent.

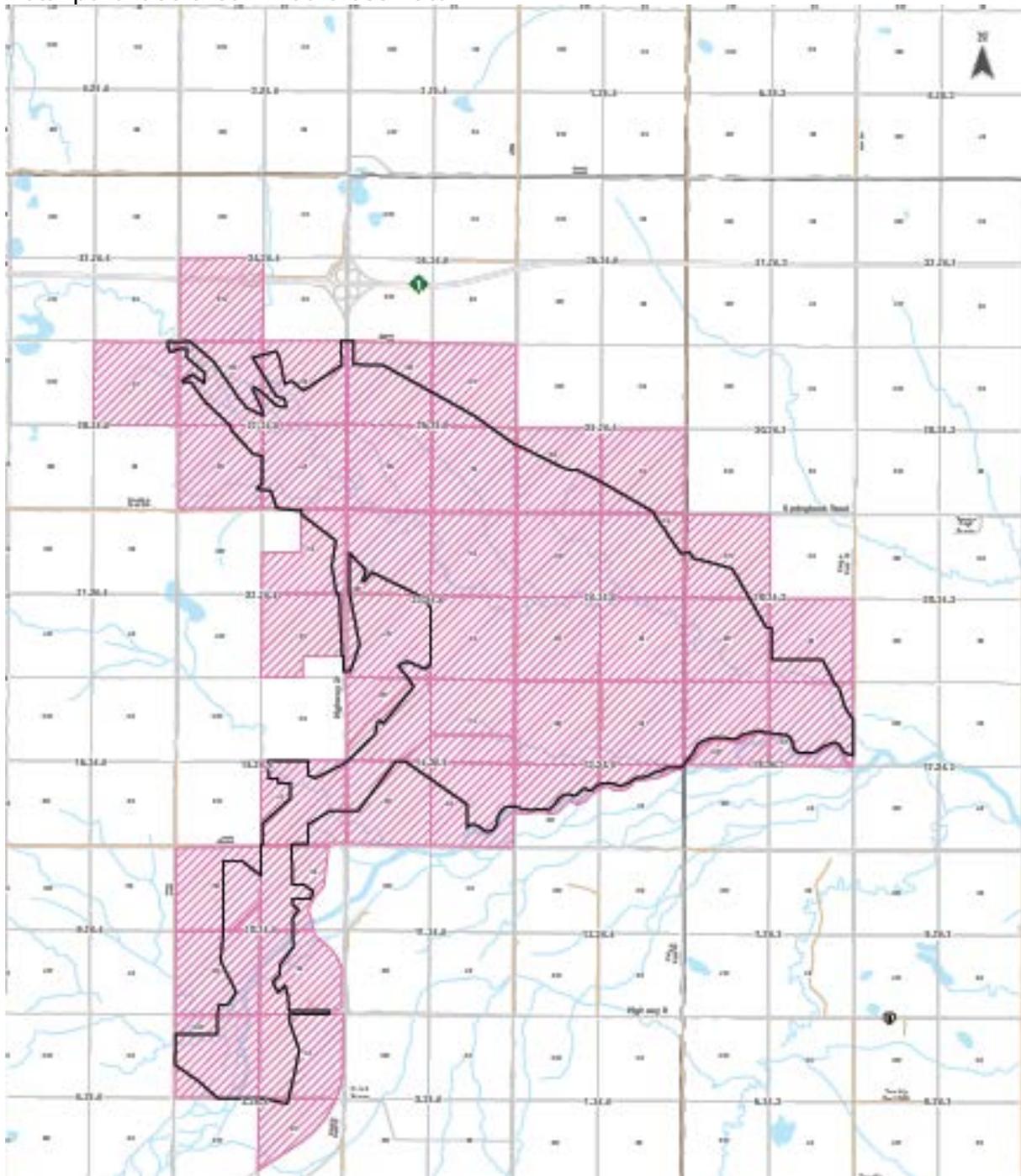
Table 12A-6 Land Cover Classes in the LAA and PDA

Cultivated Lands	LAA (ha/%)	PDA (ha/%)
Annual cropping	547.2/11.3	138.5/9.6
Hayland	469.5/9.7	82.8/5.8
Tame/Improved Pasture	1325.2/27.3	411.5/28.6
Subtotal	2341.9/48.2	632.8/44.0
Natural/Undisturbed Lands		
Forested	793.0/16.3	105.6/7.3
Shrubland	409.2/8.4	197.6/13.7
Grassland	425.1/8.8	213.0/14.8
Wetlands	310.9/6.4	121.8/8.5
Subtotal	1,938.2/39.9	638.0/44.3
Anthropogenic Features		
Transportation Corridors	156.3/3.2	30.4/2.1
Settled/Rural Residential	137.6/2.8	35.2/2.4
Mineral Development	0.6/<0.1	0.0/0.0
Dugouts	2.0/<0.1	0.5/<0.1
Subtotal	296.5/6.1	65.5/4.5
Water		
Subtotal	283.5/5.8	103.1/7.2
Total	4,860.0/100	1439.9/100

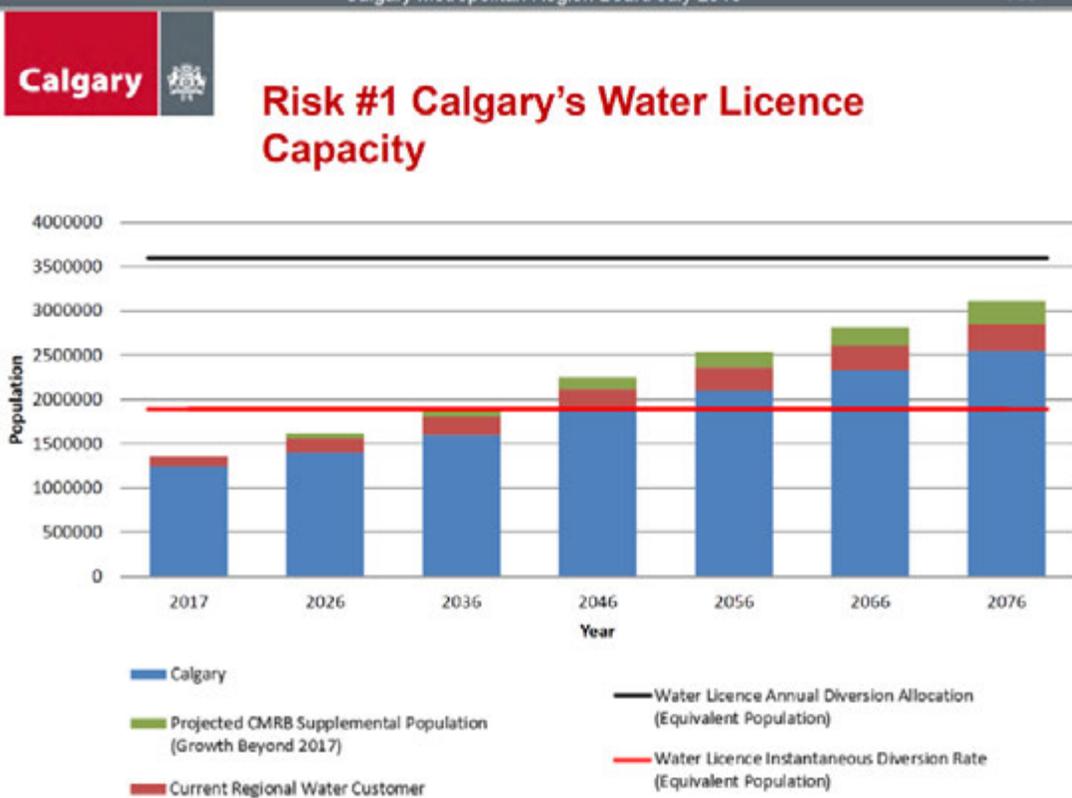


Appendix 5: Land Acquisition Map (GoA Website 2018-05)

Total purchase area in red cross hatch.



Appendix 6: Calgary's Water License Capacity (CMRB Intermunicipal Servicing Committee July 2018)



CMRB Intermunicipal Servicing Committee Meeting July 5 2018 Agenda Page 75 of 86