NRCB Application No. 2501

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1 Acronyms

The following acronyms are used in this Supplemental Information Request.

AAAQO	Alberta Ambient Air Quality Objectives
ARSA	Aquatic Resource Study Area
BH	Borehole
CBA	Cost Benefit Analysis
CCME	The Canadian Council of Ministers of the Environment
CDA	Canadian Dam Association
CEA	Cumulative Effects Assessment
CH	Borehole
CMIP	Coupled Model Intercomparison Project
COPC	Contaminants of potential concern
CP	Canadian Pacific
DMG	Dry Mixedgrass
DPM	Diesel particulate matter
EC	Electric Conductivity
EIA	Environmental Impact Assessment
EID	Eastern Irrigation District
ESP	Exchangeable sodium percentages
EQG	Environmental Quality Guidelines
FOS	Factors of Safety
FSL	Full Supply Level
GOA	Government of Alberta
HRA	Historical Resources Act
HRV	Historic Resource Value
HHRA	Human Health Risk Assessment
HWY	Highway
IO	Instream Objectives
IPCC	Intergovernmental Panel on Climate Change
km	Kilometre
LSA	Local Study Area
m	Metre
NO2	Nitrogen Dioxide
PAH	Polycyclic aromatic hydrocarbons
PAL	Protection of Freshwater Aquatic Life
PCIC	Pacific Climate Impacts Consortium
PHRIA	Palaeontological Historical Resources Impact Assessment
PMF	Probable maximum flood
PMP	Probable maximum precipitation
PM2.5	Fine particulate matter
RCP	Representative Concentration Pathways
RR	Range Road
RSA	Regional Study Area
RWVAU	Relative Wetland Value Assessment Unit
USBR	United States Bureau of Reclamation
SAR	Sodium absorption ratio
SIR	Supplemental Information Request
SLR	Snake Lake Reservoir
SO2	Sulfur Dioxide

SSP	Shared Socioeconomic Pathways
SSRB	South Saskatchewan River Basin
SSRP	South Saskatchewan Regional Plan
TIA	Traffic Impact Assessment
TKN	Total Kjeldahl Nitrogen
TLSA	Terrestrial Local Study Area
TOR	Terms of Reference
TRSA	Terrestrial Regional Study Area
TRV	Toxicity Reference Value
TSP	Total suspended particulates
TSS	Total suspended solids

2 Natural Resource Conservation Board

The responses to questions in Section 2 will not be considered as part of the EIA completeness decision made by Alberta Environment and Protected Areas.

1. Volume 1, Section 2, Attachment 2, Figure 2A-2
Volume 1, Section 10, Attachment 10, Figure 10A-2
Volume 2, Section 9.4.2.1, Table 9-8, Page 18
Volume 1, Section 6, Attachment 6B, Section 6.1, Table 21, Page 25 and 26
Volume 1, Section 6, Attachment 6B, Section 12.2.4, Page 50

In the *Borrow Material Characterization Report*, Eastern Irrigation District (EID) reports that a considerable proportion of the samples tested are classified as moderately dispersive to dispersive. EID notes a discrepancy between the two methods used to measure dispersivity but does not assess the effect nor the possible interference of soil salinity or sodicity on the measured results, instead concluding that *it may be warranted to conduct further assessment into the specific correlation between SAR and the dispersivity of the clay till*. The EID does, however, note that some till and shale material is dispersive and indicates that *As excavation progresses within the borrow areas, the lower clay till, closer to the weathered shale interface, will be directed toward placement in the downstream shell. This separation is crucial as the lower clay till near the interface is susceptible to potential contamination with the underlying dispersive weathered shale and may have dispersive properties*. However, the presence of Solonetzic soils at the ground surface indicates that sodicity may be an issue above the shale-till interface. Considerable overlap appears to exist in the planned borrow areas to areas of unsuitable subsoil identified in the Conceptual Conservation and Reclamation Plan, and the zones of Solonetzic soils identified in the soil and terrain baseline. EID states these subsoils are classified as unsuitable because they are sodic (i.e., belonging to Solonetzic soil order) and that the clay tills in this area are moderate- to strongly-sodic or saline. These soils are analyzed to have high sodium adsorption ratios (SAR) common to Solonetzic soils and their parent materials, correlating with high exchangeable sodium percentages (ESPs) at values that are indicative of dispersive clays.

a. Provide an assessment of the correlation between sodicity and dispersivity for the planned borrow materials.

b. Provide a tabular summary and correlation analysis of the SAR and electrical conductivity (EC) values, dispersive classification, and double hydrometer results for the specific boreholes (BH) or coreholes (CH) measured for this analysis.

c. Provide an overlay for the plots of the soil test holes for borrow material characterization against those for soil quality characterization and assess the likely salinity and sodicity of the borrow materials.

d. Describe the rating codes applied in Table 21 of Attachment 6B including their relative interpretations and an explanation on their difference or similarity to the United States Bureau of Reclamation (USBR) D-Codes.

e. Describe whether and how the presumed salinity and/or sodicity of the soils may have confounded the interpretations of the dispersity tests used in the borrow material characterization.

f. Describe the risk of clay tills harvested for dam construction to be sodic, the likelihood of dispersion, and the risk of poor structural performance for dam construction owing to high sodicity.

g. Describe the monitoring and mitigation measures being considered to avoid sodic or dispersive soils or that would be required to treat or amend these soils to improve their suitability for dam construction.

2. Volume 2, Section 6, Figures 6-2, 6-3, 6-4, 6-7, 6-7A, 6-7B, 6-11A, 6-12, 6-13, 6-14, 6-15, 6-16, and 6-17

The table naming convention is not consistent between the text and the figures; within the text the figures are referred to as *Figure 6-2* etc. but within the figure labelling, it is labelled *FIGURE: 2*; naming convention becomes correct at Figure 6-5.

a. Review and correct the naming conventions for the referenced figures within Section 6.

3. Volume 1, Section 6
Volume 2, Section 7.5.3.2, Page 29
Volume 2, Section 8.5.3.5, Page 32
Volume 2, Section 9.5.3.1, Page 27

EID states that 93.4 ha of unsuitable topsoil and 473.5 ha of unsuitable subsoil will remain in the flooded area of the reservoir expansion. However, EID also rationalizes that the risk of methylmercury generation will be low in the expanded Snake Lake Reservoir (SLR) because the topsoil and subsoil will be stripped and a layer of clay placed over the sedimentary rock. EID also states that the new reservoir will be lined with or naturally contain clay till materials. However, in the Terrain and Soil Section (Volume 2, Section 9) and the Dam Safety Section (Volume 1, Section 6), the soil and parent material of the reservoir area that will be left in place or used as borrow material to cap the coarse textured deposits is classified as having high salt and sodium content and contain dispersive clays. The possibility of irrigation water being affected by salt mobilization and an increase in turbidity due to dispersion of clays in the natural and disturbed soils used in the dam shell is not discussed.

a. Estimate the area of unsuitable topsoil and subsoil materials to be left in the inundated area, classify the reason for its unsuitability, and identify areas of wetland soils with high organic matter content that may be at greater risk of methylmercury formation.

b. Estimate the proportional areas of the reservoir bottom that will be lined with excavated clay till or shale materials versus natural clay tills as the reservoir substrate.

c. Discuss the quality of the clay materials that occur naturally and the quality of the clay material that will be placed over coarse textured soils or will be used as the interior dam shell in the Project areas with respect to its salt content and sodium adsorption ratio values.

d. Discuss whether exposure to naturally saline and sodic soils in the Project area is expected to increase salts and turbidity of the reservoir water, specifically at the initial flooding and short-term operation stages.

e. Explain how the proposed water quality monitoring plan will be sufficient to assess for short-term changes in water chemistry owing to the mobilization of salt and sodium.

f. Describe the mitigation plans that will be put in place to manage reservoir water if the water quality monitoring indicates that it is unsuitable for irrigation.

4. Volume 1, Section 6, Attachment 6B, Figure 19, Table 31, Page 49
Volume 1, Section 6, Attachment 6B, Table 29-30, Page 42 and 43
Volume 1, Section 6, Attachment 6A-B, Figure 18

EID proposes to excavate coarse-textured materials located along the berm alignment such that the core of the dam (i.e., Zone 1) is overlying low-permeability geologic material. The EID also states that they will use fine-textured borrow materials (clay till or shale) to cap coarse-textured soil materials in the reservoir bottom to mitigate seepage. The EID estimates that the Zone 1 core fill material is approximately 1.7 million m3, and the Zone 3 and 4 shell material is approximately 4.7 million m3, and a total of approximately 7 million m3 of material will be used total. EID further states that approximately 10.6 million m3 of suitable borrow material is available in the borrow source locations. It is unclear whether the estimates of material volumes includes the contingency needed to increase the depth of the dam in the excavated areas, particularly along the east alignment where coarse deposits extend to over 3 m depth, and to provide material for capping coarse-textured deposits in the reservoir area.

a. Confirm whether the total material estimates factors in material required for excavated areas and capping within the reservoir. If not, provide estimates of materials needed to fill the excavated areas along the alignment and to provide source material for capping.

b. Discuss the type and source of borrow material that would be used to cap coarse-textured material within the reservoir.

c. Explain mitigation measures being considered in the event that further monitoring or assessment of the material suitability reduces estimated volumes to below the total material requirements of the Project.

5. Volume 1, Section 6, Attachment 6D, Section 3.5.1.1, Table 3.8, Page 26
Volume 1, Section 6, Attachment 6D, Section 3.5.1.2, Table 3.12, Page 31
Volume 1, Section 6, Attachment 6D, Section 3.5.1.3 Table 3.17, Page 37
Volume 1, Section 6, Attachment 6D, Section 3.5.1.4 Table 3.22, Page 44
Volume 1, Section 6, Attachment 6D, Section 3.5.2.1, Table 3.25, Page 48

Volume 1, Section 6, Attachment 6D, Section 3.5.2.2, Table 3.29, Page 53
Volume 1, Section 6, Attachment 6D, Section 3.5.2.3, Table 3.33, Page 58
Volume 1, Section 6, Attachment 6D, Section 3.5.2.4, Table 3.38, Page 64
Volume 1, Section 6, Attachment 6D, Section 4.5, Page 87-90
Volume 1, Section 6, Attachment 6D, Section 5.0, Page 93-95
EID discusses that a failure of the East Dam or West Dam would result in a maximum water depth at the Canadian Pacific (CP) Railroad from 4.52-4.71 m and 3.5-4.2 m, respectively. However, EID does not account for the impacts to the CP Railroad in their Infrastructure and Economic Impact section.

a. Justify the exclusion of the CP Railroad from the Infrastructure and Economic Impact section given the inundation depths estimated in the dam breach scenarios.

b. Explain how the consequence(s) to society and to the economy have been considered regarding the possible loss of use of infrastructure (e.g., CP Railroad, Highways 1 and 36, JBS Food Plant, etc.) due to flood wave inundation.

6. Volume 1, Section 6, Attachment 6E, Page v-vi
Volume 1, Section 6, Attachment 6E, Section 6.2.4, Page 30
EID states that *Based on the available information, the West and East Dams do not appear to meet the geotechnical requirements as defined in the 2007 CDA Guidelines and 2013 Update with regards to stability. EID further provides a list of geotechnical recommendations put forth in the 2005 DSR and stated that none of the items below have been addressed*.

a. Describe which of the 2014 and 2005 Dam Safety Review geotechnical recommendations have been acted upon and provide a date of completion.

b. Explain whether increasing the capacity of SLR will increase seepage, affect the integrity of the dam or elevate the risk of dam breach for the West Dam.

c. Discuss the principal factors affecting the geotechnical stability of the existing East Dam and how these factors have been considered and addressed in the design of the new dam.

7. Volume 1, Section 6, Attachment 6E, Section 6.2.6.4, Table 6.5, Page 34-35
Volume 1, Section 6, Attachment 6E, Section 6.2.6.5, Table 6.6, Page 35
Volume 1, Section 6, Appendix 6E-E
Section 6.2.6.4 and Table 6.5 indicates that six residual Factors of Safety (FOS) at East Dam 0+300 did not meet the minimum Canadian Dam Association (CDA) FOS requirement. Section 6.2.6.5 and Table 6.6 indicates that three residual FOS at East Dam 0+482 did not meet the minimum CDA FOS requirement. This includes a residual FOS of 0.070 for Upstream, Seismic, Drawdown. Appendix 6E-E, Geotechnical Assessment (pdf page 741), indicates a residual FOS of 0.70 for Upstream, Seismic, Drawdown.

a. Clarify the residual FOS of Upstream, Seismic, Drawdown at East Dam 0+482.

b. Explain how the recommendations in the 2014 Dam Safety Review for investigations of stability of the existing East Dam have:
   i. been acted on, including the month and year they were completed; or,
   ii. not been acted on, factored into the EID's reasons (financial and/or otherwise) for proposing the expanded SLR.

8. Volume 1, Section 7.1.3, Page 2

EID states that the return flows for the area serviced by the Snake Lake Reservoir are directed toward the Red Deer River. Snake Lake Reservoir is an off-stream reservoir, which enables controlled releases should water quality monitoring reveal that the water is unsuitable for irrigation.

a. Provide a mitigation plan and a possible release schedule for flushing the Snake Lake Reservoir if the water quality monitoring reveals the water is unsuitable for irrigation.

b. Estimate and describe the impacts on the Red Deer River at the return flow locations should monitoring of the reservoir reveal that water quality of Snake Lake is unsuitable for irrigation.

9. Volume 1, Section 7.2.1.4, Page 10
Volume 1, Section 7.2.1.5, Page 10
Volume 1, Section 7.2.1.8, Page 11

EID states the *annual water balance for the Project is expected to average 0.0 m3/y*, as the positive balance occurring in spring during filling will approximate the negative balance leaving for irrigation uses during the growing season. EID states the primary losses from Snake Lake are evaporation and seepage, that the Project *is expected to increase the EID's evaporative losses from 90 million m3 to 97 million, an increase of 7.8% and The predicted water loss for the Project is 10.5 million m3 for an average year, with 82% due to evaporation and 18% due to seepage*. No clear presentation of the specific inputs and outputs of the water balance and the effect of the Project on the water balance is presented.

a. Provide a comprehensive summary of the water balance, including all inputs and outputs, for the SLR before and after the Project in average, wet and dry years.

b. Explain how the additional evaporation and seepage losses will be compensated for in average, wet and dry years.

10. Volume 1, Section 9.4, Table 9-2, Page 2 and 3

Section 9.4 discusses the characteristics, composition, and management of waste materials on site. However, there are no estimates for volumes (quantities) of anticipated hazardous goods and/or waste materials.

a. Estimate the anticipated quantities of these materials.

11. Volume 1, Section 10.6.2, Table 10-3, Page 8

EID presents calculations for reclamation materials, including the estimated volumes of topsoil and subsoil available along with hypothetical replacement depths.

EID states *Using these estimated volumes, even at a minimal stripping depth of 0.1 m, there is enough topsoil at the site for a topsoil replacement depth of approximately 0.6 m and a subsoil replacement depth of approximately 0.2 m, presented in Table 10-3.* However, there is no estimate provided in terms of actual volumes required for topsoil and subsoil.

a. Provide estimated volumes of topsoil and subsoil required for the Project and confirm that the volume of salvaged soil is sufficient to meet reclamation requirements.

12. Volume 1, Section 11
Volume 2, Section 17.4.1, Page 21
Volume 2, Section 13.8, Page 24

EID presents measures for mitigating impacts to land use resources, including utility relocation, drainage ditching, oil and gas site reclamation, soil, vegetation, and waterbody mitigations. EID estimates their construction costs to be approximately $250 million +/-20%.

a. Describe the status of mitigation measures that require relocation and reclamation, particularly those requiring cooperation with other organizations.

b. Discuss whether the estimated cost of land use mitigation measures is included in the construction cost estimate and contingency.

c. Describe the risk of project delays owing to potential delays in realizing land use mitigation measures as they relate to infrastructure relocations or decommissioning.

13. Volume 2, Section 10, Page i
Volume 2, Section 10.5.3, Page 40
Volume 2, Section 10.8, Page 46

The EID states that they intend to consider *shallow wetlands in the reservoir* for wetland replacement under the Wetland Policy, and that the *edge of the new reservoir will contain shallow water of less than 2 m and is expected to partially offset wetland loss by developing into a semi-permanent marsh*. The EID further states that the littoral area wetlands will be considered as offsets for wetland impacts, and that a monitoring program will be instituted to observe and measure wetland indicators in this area.

a. Describe the wetland ecological functions that can be supported by the littoral zone of the reservoir expansion relative to the objectives of the Wetland Policy and the wetlands lost through the Project.

b. Describe how the expected wetland ecological functions will be realized over the estimated compensation wetland area under varying inundation patterns within an irrigation year and between wet, dry and average years.

c. Propose wetland indicators that will be monitored following reservoir construction to measure whether wetland ecological functions are developing as required to meet the objectives of the Wetland Policy.

d. Present mitigation options that could be considered should the wetland offsets fail to develop appropriate wetland ecological function or if the littoral wetland proposal is not accepted in the Wetland Policy application.

14. Volume 2, Section 12.5.4.1, Page 19-21
Volume 2, Section 12.3, Table 12-1, Page 3

EID states that climate change is expected to increase evapotranspiration rates in excess of increases to precipitation, leading to drier summer conditions. A consequence of this, EID notes, is that increased evapotranspiration losses will increase the need for additional storage and use of water.

a. Under the climate change predictions presented, discuss the expected increase to irrigation water demand compared against historical irrigation water demands.

b. Confirm whether the increase in reservoir capacity is sufficient to fulfill future irrigation water demand at the ratio stated (i.e., 100% crop water requirements for 20,000 ha).

15. Volume 2, Section 13.7.4, Page 17

EID states that *All wells and pipelines within the Project area have been abandoned and decommissioned*.

a. Discuss potential risk to the Project should a deleterious substance be released from one or more of the decommissioned gas wells or abandoned pipelines.

b. Discuss whether routine parameters would be sufficient to monitor for the potential risk of substance release.

c. Discuss mitigation measures if there were to be such a release.

16. Volume 2, Section 17.4.1, Page 21

Section 17.4.1 describes the construction phase of the Project as having cumulative labour requirements of *300 to 350 person-years* for the three-year construction period. This requirement is described as being *based on 50 to 75 people working onsite for eight months…and 20 to 25 people working onsite for the other four months of the year during each of the three-year construction period.*

a. Clarify the estimation of 300 to 350 person-years of labour required during the construction period and explain how this aligns with a total of 50 to 75 people working onsite for eight months and 20 to 25 people working onsite for the other four months of each year.

17. Volume 2, Section 17.4.1, Page 21

In footnote 1, the $250 million Project cost is estimated to be accurate to ±20% (contingency).

a. Explain how the ±20% was chosen.

b. Explain how a +20% increase in costs would impact Project viability and how this cost increase would be financed.

c. Provide benefit-cost results for:
   i. construction costs without contingency, and
   ii. construction costs with contingency.

18. Volume 2, Section 17.4.1.13, Page 24

Section 17.4.1.13 states that *native grasslands will need to be removed to facilitate project development and that there will be effects on wildlife, vegetation, and biodiversity related to the Project.*

a. Provide an estimate of the economic value associated with the projected native grassland loss as a result of the Project. This value should be included EID's comprehensive Cost Benefit Analysis (CBA) of the Project requested in the Terms of Reference (ToR) (see ToR Section 7.2, items 11 and 14).

b. If an appropriate economic value cannot be applied, the impacts should be discussed in the context of the CBA qualitatively.

19. Volume 2, Sections 17.4.2.1, Page 25
Volume 2, Section 17.4.2.6, Page 26
Sections 17.4.2.1 and 17.4.2.6 describe the operational benefits of the Project *as increasing certainty of water supply for irrigation…* particularly during drought periods which *will allow irrigators to continue farming fields during drought years, rather than leaving some fields fallow or cutting crops early…*

a. Provide an estimate of the economic value associated with anticipated benefits of the Project. This value should be included in EID's comprehensive CBA of the Project requested in the ToR (see ToR Section 7.2, items 11 and 14).

20. Volume 2, Sections 17.4.2.8 and 17.4.2.9, Page 26
Sections 17.4.2.8 and 17.4.2.9 discuss *Recreation* and *Recreational Infrastructure*, respectively. Section 17.4.2.8 describes the impact rating of recreation during the operational phase as being *High-Positive*; however, Section 17.4.2.9 then states that there will be no additional recreation infrastructure developed and that *the effect on recreation remains neutral during operations.*

a. Clarify the effect of the Project on recreation during the operations and justify the impact rating.

21. Volume 2, Section 17.6, Page 32 and 33
In Section 17.6, EID provides a high-level estimate of annual break-even benefits of $11.9 million/year (or $38/acre/year) stated to represent *a rough estimate of the value of the increased flexibility of the water management benefits that the SLR would provide to the EID*.

a. Clarify how the estimated $11.9 million/year break-even benefit was derived.

b. Clarify how the estimated per acre benefit of $38/year was derived.

3 General

3.1 Noise

22. Volume 1, Section 5.4.2, Page 3
EID states *The County requires that the Project provides mitigation measures for dust and noise control along RR 171 to minimize potential impact on the residents.*

a. Explain what the mitigation plan is for noise control along Range Road 171.

23. Volume 2, Section 5.3, Page 4
EID states *Actual Project schedules will depend on the parties responsible for construction and site conditions (e.g., storms and other weather challenges), so night work is possible*.

a. Explain if any additional mitigation measures or monitoring will be completed for night work.

24. Volume 2, Section 5.5.1.1, Table 5-5, Page 9

EID states *The iNoise software includes reference sound power level by frequency (Octave Band) for common construction equipment. This data is used to calculate the noise emission from the Project area for individual sources and collectively modelled for propagation from the Project area to the identified receptors.*

a. Explain what type of equipment operations are included in the reference sound power level calculation. Explain what sirens and back up alarms were included in the sound power level calculation.

25. Volume 2, Section 5.5.2, Page 12

a. Explain if the removal of the east dam is included in the clearing and grubbing or berm construction phase of the noise and vibration assessments? If not, describe and assess the noise and vibration impacts of the east dam removal.

26. Volume 2, Section 5.5.2.1 and 5.5.2.2, Page 12 and 13

Expected noise levels are discussed in Section 5.5.2.1 for clearing and grubbing and Section 5.5.2.2 for berm construction, the duration of time these activities are occurring are not discussed in these Sections.

a. What is the duration of time that the clearing and grubbing and berm construction activities will be occurring?

27. Volume 2, Section 5.9, Page 17

EID states *it is recommended that machinery and factory-supplied noise-abatement equipment (e.g., mufflers) be maintained in good working order during construction and that a complaint response procedure be implemented to address noise complaints, should they arise.*

a. Explain if there are mitigation measures that will be implemented other than mufflers to minimize noise impacts?

28. Volume 2, Section 5.8 and 5.8.1, Page 17

EID states *if any residents have noise or vibration complaints, they can contact the Eastern Irrigation District, who will follow their standard complaint resolution process*.

a. Explain what, if any, monitoring would be implemented through the standard complaint resolution process.

3.2 Socio-Economic

29. Volume 1, Section 5.4.2, Page 3 and 4
Volume 2, Section 17.4.1.4, Page 22
Volume 2, Section 17.4.2.6, Page 26

EID states *there will be no changes in demands for most infrastructure*.

a. Provide a brief explanation summarizing communications and agreements with Newell County on road maintenance given the volume of aggregate and rip rap traffic, incorporating a short summary of Volume 1 Section 5.4.2 *County Communication Summary.*

30. Volume 2, Section 17.4.2.6, Page 26
Volume 2, Section 17.6, Page 32 and 33

EID states *With the project being essentially privately financed, the question of whether Project benefits exceed costs is based on the applicant's assessment of financial feasibility, which is a confidential matter*. The purpose of the CBA is to provide a clear, concise and consolidated accounting of the Project's costs and benefits that helps readers and decision makers to quickly understand the purposes and merits of the Project.

Furthermore, the EID states that the *…Project operations will, for the most part, have no effects on existing agricultural production and returns of the 50,000 acres (20,000 ha) of downstream irrigated agriculture supported by the Project although there are predicted benefits in terms of more reliable water supplies during low flow periods in the Bow River, which, due to the increase in reliability of water, will allow irrigators to continue farming fields during drought years, rather than leaving some fields fallow or cutting crops early, as has been common practice in recent drought years.* Based on this statement, and the lack of a CBA of the Project, it is unclear whether the Project is considered to provide monetary benefit to affected agricultural producers.

a. Clarify whether the Project is anticipated to provide benefits and describe those benefits in detail.

b. If benefits from the Project are expected, quantify these benefits and include them in a cost-benefit analysis that considers all costs and benefits associated with construction and operation of the Project as requested in the ToR (ToR Section 7.2, items 11, 12, 13, and 14).

c. Provide a rudimentary cost-benefit analysis to line-item, cash-flow level of detail including key source data and calculations such that major items are quantitatively but simply estimated.
   i. Provide a first table with the cash flow of costs and benefits summarized at a high-level to when net revenue stabilizes over a defined short-term period (e.g., 5-7 years).
   ii. Provide a table showing the net present value of each cash flow item out 30 years at a specified discount rate (e.g., 5%). This should include named non-monetary benefits or costs with a summary physical impact number if available (e.g. 200 heavy trucks trips per day). Include the go-forward that is no sunk costs for construction, material, labour, equipment, engineering & supervision, and land. The benefits should include the number of irrigated acres and their probable annual revenue with and without the Project.

31. Volume 2, Section 17.5.3.1, Page 27

EID states *there will be no adverse effects on population and demographics, services, infrastructure or government finances … no monitoring is recommended*.

a. Summarize how landowners adjacent to the construction site and hauling roads were consulted, the results of the consultation, how mitigation measures were determined, and how no monitoring is recommended was determined in regard to landowners potentially directly impacted by night construction lighting, construction & road noise, road & construction dust, or any other project related inconvenience due to proximity.

3.3 Waste Management

32. Volume 1, Section 8.2.2, Page 2

Section 8.2.2 discusses wastewater management strategies that may be implement because the exact wastewater types and management options were still being finalized. However, the options considered and the rationale for the selected wastewater treatment, wastewater disposal and why the other options were not chosen is required.

a. Provide the options considered, rationale for the selected options, and why the other options were not chosen.

33. Volume 1, Section 9.3.1, Page 2

Section 9.3.1 discusses waste disposal locations and availability. Location and availability of off-site waste disposal was not provided.

a. Provide location and availability of the transfer site in the nearby region.

34. Volume 1, Section 9.6, Page 5

Section 9.6 discusses hydrocarbon storage. However, estimates for anticipated amounts of on-site hydrocarbon storage have not been provided.

a. Estimate the anticipated amount of on-site hydrocarbon storage.

3.4 Transportation

35. Volume 1, Section 5, Attachment 5B, Section 5.0, Page 13
Volume 1, Section 5, Attachment 5B, Appendix G

The swept path analysis in Section 5.0 of the Traffic Impact Assessment (TIA) (Attachment 5B) for the WB-23 design truck at Highway (Hwy) 539/Range Road (RR)171 and Hwy 539/RR174 intersections indicated wheel path off-tracking onto the opposite lanes (as shown on the schematic drawings in Appendix G of the TIA).

- Hwy 539/RR171 intersection: There is no analysis done for the scenario where the outbound truck turns right from RR171 from a stop position. To make the right turn from a stop position, there may not be enough room to maneuver, or the maneuver would involve significant off-tracking onto the opposite lane of Hwy 539 which is a safety hazard to highway traffic.
- Hwy 539/RR174 intersection: The outbound truck severely off-tracks onto the opposite lane; this is a safety hazard to highway traffic. There is no analysis done for the scenario where the outbound truck turns right from RR174 from a stop position. The intersection geometry appears to be inadequate for the outbound truck to make the right turn from a stop position. The off-tracking of the inbound truck is also too severe due to the geometry of the intersection. This is a safety concern as the inbound truck may trap and pinch any outbound vehicles waiting at the intersection. This intersection was included in the swept path analysis (assuming as an alternative access to the Project site); however, intersection capacity analysis for this intersection is not provided in the TIA.
- The TIA recommendations of separating the construction site's inbound and outbound trips, temporarily reducing highway speed and temporary advance warning signs are not adequate to address the safety concerns for this multi-year Project. The existing intersection geometry cannot accommodate the safe movements of the anticipated truck type used for the Project. EID should decide on which intersection they will use for the project to make any necessary improvements.

a. Determine and explain which intersection EID will be using for the Project, provide the intersection capacity analysis and swept path analysis for the selected intersection, and provide intersection improvement recommendations.

3.5 Climate Change

36. Volume 2, Section 12.3, Page 2
Volume 2, Section 12.5.4, Page 21

The Environmental Impact Assessment (EIA) identifies climate-driven changes in river flow and precipitation timing but lacks a quantitative assessment of impacts on reservoir refill, water supply reliability, release operations, and downstream flow regimes.

a. Explain why a quantitative hydrological modelling of future inflows and storage dynamics under projected climate scenarios was not included in the EIA? If it has been completed provide the modelling.

b. If modelling has not been implemented, or if existing regional models are not being used, provide a scientifically defensible qualitative assessment to describe how future climate variability, particularly how increased drought frequency and altered runoff timing may affect reservoir operations, water supply reliability, and downstream users, including instream flow objectives and aquatic ecosystems.

37. Volume 2, Section 12.4.6, Page 9

EID states *The treed area in the Project area does not represent a considerable sequestration capacity*.

a. Provide evidence for this statement

38. Volume 2, Section 12.5.1, Page 9

The climate change projections used in the EIA report rely on Coupled Model Intercomparison Project 5 (CMIP5) model outputs and Representative Concentration Pathways (RCPs) from the Intergovernmental Panel on Climate Change (IPCC's) Fifth Assessment Report (AR5, 2014). However, the Pacific Climate Impacts Consortium (PCIC) now provides CMIP6-based data, which reflects the most current scientific understanding and scenario development, including updated emissions pathways (Shared Socioeconomic Pathways (SSPs)) and improved regional climate modeling.

a. Provide justification and evidence to support the use of the CMIP5 climate projections when more recent studies have been conducted.

39. Volume 2, Section 12.5.4.1, Page 18 and 19

The climate baseline used in the assessment includes the 1971–1990, 1981–2010, and 1991–2020 normals. However, future climate projections are compared against the 1976–2005 baseline, which is outdated considering that the most recent 30-year normals (e.g., 1991–2020) are now standard and reflect more recent climate trends

a. Explain why the projected climate change impacts are still benchmarked against the 1976–2005 period rather than the updated 1991–2020 climate normals?

40. Volume 2, Section 12.6, Page 33

Cumulative effects are mentioned in the EIA but are not considered in relation to climate change.

a. Describe how projected changes in temperature, precipitation patterns, snowmelt timing, and drought frequency, combined with other human-driven pressures such as land use change, increased water withdrawals, and agricultural intensification may compound impacts on water quantity (e.g., supply risk, altered flow regimes), reduce adaptive capacity across the basin, and potentially degrade water quality.

3.6 Historic Resources

41. Volume 2, Section 14.1.4, Page 4

The EIA discusses the archaeological and palaeontological permits that were acquired to complete Historic Resources Impact Assessment requirements for the project, before a Historical Resources Act Approval with Conditions was issued for the project on January 24, 2025.

a. Discuss the archaeological Stage 1 excavation that was conducted of two archaeological sites (EdPb-28, EdPb-39) under archaeological Permit 22-065, which contributed to the reason the project was granted Historical Resources Act Approval with Conditions in January 2025.

4 Air

4.1 Air Quality Assessment

42. Volume 1, Section 11.2.1, Page 8
Volume 1, Section 11.12.1, Page 26
Volume 2, Section 4.7, Page 32
As per the Alberta Air Monitoring Directive, bulk dustfall container monitoring is considered a crude monitoring method with sites being upgraded to more refined methods over time in Alberta. Other sampling methods for Total Suspended Particulates (TSP) or PM2.5 are more representative and monitoring for finer particulate fractions (e.g., PM2.5) are most appropriate for human health concerns. In Volume 1, Section 11.2.1 the EID suggests PM2.5 and TSP monitoring to inform mitigation and management planning, however, Volume 1, Section 11.12.1 and Volume 2, Section 4.7 recommend dustfall monitoring.

a. Clarify the proposed ambient air monitoring parameters.

43. Volume 1, Section 11.12.1, Page 26
EID states *As the likelihood of measurable $PM_{2.5}$ dust is low, monitoring could be established if complaints are received from area residents, agricultural and industrial workers, or members of the public. If monitoring is established, results would be compared with the 30-day Alberta Ambient Air Quality Guidelines to see if exceedances are occurring.* The Alberta Ambient Air Quality Objective for fine particulate matter ($PM_{2.5}$) is a 24-hour metric and the Alberta Ambient Air Quality Guideline for $PM_{2.5}$ is an hourly metric.

a. Confirm that the appropriate benchmark will be applied to the $PM_{2.5}$ monitoring results.

44. Volume 2, Section 4.4.1.1, Page 7
Volume 2, Section 4.4.2.1, Table 4-9, Page 13
Table 4-9 presents the maximum predicted ground level nitrogen dioxide (NO2) concentrations associated with the Baseline Case. The background concentration based on measured ambient monitoring data is presented as 14.3 µg/m3 and the maximum predicted baseline model concentration presented is 1179.9 µg/m3. The background concentration is based on data collected at the Brooks Air Quality Monitoring station, a conservative choice (recognizing it was the best available alternative) as it is located in an urban setting with more surrounding emission sources than in the study area with predominantly rural land uses. Thus, it would be expected that the Baseline Case model predictions, with less sources of air emissions, be reasonably aligned with the measured monitored values from the urban area. There is inherent conservatism in air dispersion modelling; ambient air monitoring data is a tool that is often used to gauge relative accuracy or confidence in model results.

a. Explain the disparity in the model prediction values compared to the Brooks Air Quality Monitoring station values.

b. Identify possible causes leading to the model overestimation.

5 Water

5.1 Water Management

45. Volume 1, Section 2, Figures 2-2 and 2-3, Page 5 and 6
Volume 1, Section 7, Figures 7-2, 7-3, 7-6 and 7-7, Page 3-9
Some of the baseline information on water withdrawals, return flows, and Bow River flows is insufficient.

a. Expand the dataset shown for the historical baseline by providing additional statistics (beyond the mean) for the daily withdrawals, return flows, and flows in the Bow River including the maximums, minimums, and key statistics like the upper and lower quartiles.

b. Plot the year 2023 to show where it fits in terms of the historical baseline on the statistical plots.

c. Confirm if both the 'water withdrawals' and 'EID diversions' data in the EIA are from the Water Survey of Canada flow station, *EID main branch canal near headgate*. If not, explain the differences in the data, and provide the source of the data.

d. Specify from what location and/or Water Survey of Canada station is the discharge *Bow River Above Bassano Dam*. Explain if there are any other differences between the flow at the *above and below* Bassano Dam stations, other than the EID withdrawals.

46. Volume 1, Section 2.16.1, Page 38 and 39
EID describes that the reservoir will be filled over a period of 90 days if the maximum inlet rate into the reservoir can be achieved (11.3 m3/s). EID states that it would likely be filled in either in the spring or the fall.

a. Clarify the proposed timing of filling and discuss if it anticipated that diversions would occur earlier/later than historical diversions.

b. Clarify if and how often will the filling of the reservoir effect the ability of the Bow River to meet its IOs.

47. Volume 1, Section 3.1.2, Page 2 and 3
EID does not reference the Approved Water Management Plan for the South Saskatchewan River Basin (SSRB).

a. Explain how the matters and factors in Table 1 of the Approved Water Management Plan for the South Saskatchewan River Basin (the Matters and Factors that must be considered in making decision on applications for approvals affecting surface water in the SSRB) are being addressed.

48. Volume 1, Section 7.1.2, Page 1
Volume 1, Section 7.1.5, Page 4 and 5
Volume 1, Section 7.2, Figure 7-4, Page 6

EID states that approximately 20% of the water diverted at Bassano Dam is returned to either the Bow or Red Deer Rivers (Figure 7-4), and that all return flows diverted from Bow River into the SLR would go toward the Red Deer River. EID also states that the existing SLR can only supply 20% of the water required to service the 20,000 irrigated acres serviced by the SLR, and the project is intended to ensure 100% of the water demand can be met, without increasing acres. EID also describes that no additional impact would occur to the Red Deer River due to return flows because irrigated acres will not be increased.

a. Explain how, during dry years, an increase in the volume of water being extended into the EID system, and proportionally into return flows, would have no measurable change in return flows if the SLR can support 100% of the irrigation demand instead of 20% of the demand.

b. Provide a description and scenarios of the effects of the Project on the baseline ranges of return flows on the Bow River during construction, reservoir filling and future operations.

c. Discuss any additional return flows expected during the construction phase, due to draining of the existing SLR.

d. Estimate and quantify the change of the return flows to the Red Deer River once the Project is operational.

49. Volume 1, Section 7.1.2, Page 2
Volume 1, Section 7.1.4, Figure 7-2 and Figure 7-3, Page 3 and 4

EID states that there are no new effects to the Bow River downstream of the Project, concluding that no revision or renewal of the water licence would be required. However, EID also refers to a positive impact of the project on the Bow River owing to lower withdrawals during dry periods. EID explains that water diversion to EID infrastructure is only permitted if Instream Objectives (IO) and transboundary objectives are met. EID concludes: *As there is an existing licence for water use that is not being revised or renewed for this Project, there will not be any new effects downstream of the Project on the Bow River*.

a. Describe and provide scenarios of the effects of the Project on the baseline ranges of daily withdrawals, water levels and flows on the Bow River during construction, initial reservoir filling and future operations. The scenario analysis should include:
   i. a comparison and a discussion of the estimated flow and water levels of the Bow River below, at, and above the Bassano Dam during average, wet and dry years when the Project is operational against the expanded baseline data requested in SIR 44.
   ii. the maximum capacity of the diversion structure at Bassano Dam (i.e. the EID main canal), and whether that constrains movement of water to Snake Lake Reservoir.
   iii. any scenarios where the initial filling will take place over more than one year.

b. Explain any effects on the Bow River (positive or negative) of adjusting the timing of water withdrawals, e.g. increases during Bow River freshet and decreasing during drier periods in July and August.

50. Volume 1, Section 7.1.5.1, Page 5 and 6

EID discusses the users downstream of the project (Bow River downstream of Bassano Dam), but the EIA does not discuss effects. There are many water users downstream of the Bassano Dam that are subject to the IO as a condition of their licence, and as such, prolonged periods of minimum flows downstream of the Bassano Dam could impact those licensees.

a. Clarify potential effects downstream of the Bow River downstream of the Bassano Dam, particularly on IOs and other water users.

51. Volume 1, Section 7.2.1.2, Figures 7-6 and Figure 7-7, Page 8 and 9
Volume 1, Section 7.2.1.3, Page 9

Data is presented about the volumes of water needed for the expanded SLR and the existing operations.

a. Compare the changes in water needs and diversion timing between the existing SLR operations and the expanded SLR operations.

52. Volume 1, Section 7.2.1.2, Figure 7-6, Page 8

While data is provided separately for the existing and proposed water use requirements, there is no comparison between the two.

a. Describe the water balance for both existing and proposed using similar axes for comparison.

53. Volume 1, Section 7.2.1.5, Page 10

EID provides overall water losses from evaporation and seepage, and individual losses with the expanded reservoir, but the EIA does not provide the comparison between the existing SLR and the expanded SLR.

a. Compare the amount of water losses from the current SLR against the expanded SLR.

54. Volume 1, Section 7.3.6, Page 15 and 16
Volume 2, Section 7.5.3.1, Page 27

EID states that there will be no effect to IOs as a result of the expanded reservoir, and that there are no conflicts with minimum flow requirements or other licensees as a result of filling/operation of the expanded reservoir.

a. Justify the assumption that there will be no impact to the IOs particularly during initial filling and other dry years where the reservoir is emptied and needs to be refilled.

b. Discuss if periods of minimum flows in the Bow River downstream of the Bassano Dam will occur more frequently:
   i. during dry periods
   ii. during the initial filling of the reservoir
   iii. during subsequent fillings of the reservoir

c. If periods of minimum flows will occur more frequently, describe how the impacts to downstream licensees subject to minimum flow requirements will be addressed.

55. Volume 2, Section 7.1.1, Page 2 and 3

EID states that there will in effect be no hydrological changes due to the total volume of water withdrawal remaining the same and subsequently lists 14 bullet points of the final ToR that are not addressed or answered:

- *3.3.2 2. b) Assess potential changes to channel regime for Bow River (during minimum, average, and peak flows);*
- *3.3.2 2. c) Assess changes to water levels in water courses;*
- *3.3.2 2. e) Assess potential changes to sediment transport and yield;*
- *3.3.2 3. c) Assess the extent of hydrological changes including changes in runoff rates and volumes before, during, and after construction of the Project;*
- *3.3.2 3. d) Assess changes in erosion and sedimentation in watercourses resulting from the Project;*
- *3.3.2 5. Describe how water conservation objectives and instream objectives may be adversely affected with the development of the Project;*
- *3.3.2 6. and 8. d) Describe the impacts on other surface water users (specific to the Bow River) and any potential water use conflicts;*
- *3.3.2 8. a) and b) and 3.4.2 7 a) and b) Describe mitigation measures to address surface quantity and quality impacts during all stages of the Project, including alteration in flow regimes and potential flood events;*
- *3.3.2 8. c) (in part) Describe mitigation measures to address surface quantity impacts (on Bow River) during all stages of the Project, including potential drought events;*
- *3.3.2 10. Discuss the impact of low-flow conditions on water conservation objectives, instream objectives, and water and wastewater management strategies;*
- *3.4.1 1. (in part) Describe baseline water quality of water courses including water quality for high-flow events (1 in 20-year and 1 in 100-year and 1 in 300-year) under current conditions.*
- *3.4.2 2. b) vi) and x) (in part) Describe and predict the potential impacts of the Project on surface water quality on downstream bodies of water including changes in concentrations, loading amounts, and timing of key water quality parameters including routine parameters, including: vi) implications to the health and extent of riparian lands and x) impact on creek banks during flood events;*
- *3.4.2 8. Discuss the impact of the return flow loadings to the receiving water body and water and wastewater management strategies; and*
- *3.4.2 10. a) and b) Describe the potential and implications for organic carbon and nutrient management in the Project, based on the proposed operating regime, to impact treatment of water and downstream bodies of water for drinking water purposes (e.g., disinfection by-products) and to impact productivity of aquatic vegetation (e.g., macrophyte, algae).*

However, final ToR Sections 3.3 and 3.4 do not exclusively ask about water quantity; this should be considered as only one of a number of factors. EID must consider the final ToR and water management in the context of extent, frequency, duration, and seasonality changes in relation to the final ToR Section 3.3-3.4.

a. Answer the 14 final ToR questions.

5.2 Hydrogeology

56. Volume 0, Section i-iv, 3.2.2 [3] (f)
Volume 2, Section 6.5, Table 6-14

The final Terms of Reference Section 3.2.2 [3] states *Describe the nature and significance of the potential project impacts on groundwater with respect to:*

f) potential implications of seasonal variations;

a. Describe the nature and significance of the potential project impacts on groundwater with respect to potential implications of seasonal variations

57. Volume 1, Section 2.15.4, Page 34
Volume 2, Section 6.4.2.6, Table 6-7, Pages 37-39
Volume 2, Section 6.5, Table 6-14, Page 64-67
Volume 2, Appendix D7, Section 3.1.2, Page 22-23

EID discusses key findings and provides a summary table (Table 6-14) *on the baseline data collected as part of the hydrogeological baseline study and the results of groundwater flow simulations completed to support the hydrogeological baseline study.* Within the table, temporary groundwater dewatering during the construction phase is discussed briefly, and a brief discussion of the radius of influence of groundwater dewatering is provided in the Groundwater Modelling Study Report conducted by MPE Engineering (Appendix D7). EID describes their mitigation plan for the disposal of pumped groundwater during excavations will be to dispose of the pumped groundwater on the reservoir footprint in areas where it will infiltrate into the soil.

a. Provide mitigation options that are being considered in the event that dewatering of the borrow pits and dam alignment require more pumping than anticipated and above the rate of infiltration for the receiving areas.

b. Discuss the potential impacts that dewatering may have on off-site vegetation, wildlife and aquatic ecosystems.

58. Volume 1, Section 2.15.6, Page 36
Volume 2, Section 6.2, Table 6-2, Page 6-7
Volume 2, Section 6.5, Table 6-14, Page 64
Volume 2, Section 9

EID describes that there is low potential for groundwater infiltration/seepage beneath the base of the reservoir owing to low permeability of the clay till and bedrock aquitards. However, significant areas of coarse-grained soils are described in the Soil and Terrain section that are likely to have higher permeability, and some of the identified clay tills may be associated with types of Solonetzic soil that have hardpans that may reduce permeability. EID proposes to compact a 20-30 cm depth layer of clay till over the coarse textured soil to ensure the coarse-textured deposits are impervious to water seepage.

a. Overlay the location of the percolation test locations with the map of soil types and relate the observed results to the observed soil series.

b. Discuss the effect of the soil types on percolation rates and to what degree the proposed soil salvage for reclamation, borrow excavations for dam materials and capping of the coarse textured material may have on percolation rates.

c. Justify the conclusions drawn from the simplified conceptual hydrogeological models against the proposal to compact clay till soils across the reservoir base to mitigate seepage.

59. Volume 1, Section 6
Volume 2, Section 6

Given the connection between Volume 1, Section 6 – Dam Safety and Volume 2, Section 6 - Hydrogeology, these sections should appear integrated and consistent. The same or similar data has been presented and interpreted differently between Dam Safety and Hydrogeology in certain instances (e.g. cross sections – stratigraphy).

a. Review and provide integrated data from both volumes for clarity and to avoid duplication between both documents.

60. Volume 1, Section 6.12.6, Table 6-23, Page 42
Volume 1, Section 6, Attachment 6B, Table 31, Page 49
Volume 2, Appendix D7, Section 3.2.1, Figure 12
Volume 2, Appendix D7, Section 3.2.2, Figure 13 and Figure 14, Page 27 and Page 31

Both model scenarios (90 days and 2 years) predict increased head values of up to 17 m in layers 1 and 2 of the model (i.e. clay till and fractured shale) as seen in Figures 12 and 13. The model simulations further predict that the radius of influence of these head changes will be restricted to the reservoir expansion area. This correlates with a reduction in hydraulic head of less than 1 m outside the dam area, owing to the dam creating an obstruction to flow to streams downstream.

It appears the model assumes a complete seal of the dam with the Bearspaw unfractured shale, however the unfractured shale unit will not be removed below the dam according to Table 31 and Table 6-23. In addition, Figure 14 used in the modelling shows the weathered shale in place below the reservoir expansion area and dam.

a. Explain how a predicted 17 m change in the hydraulic head on the upstream side of the dam does not translate to an increase in hydraulic head and seepage on the downstream side of the dam but conversely a reduction in hydraulic head.

b. Discuss the validity of the statement that the seal at the dam will be complete with the unfractured shale when the fractured shale unit will be left in place.

61. Volume 1, Section 6, Attachment 6B, Table 31, Page 49
Volume 1, Section 6, Attachment 6B, Appendix 6B-B, Figure 7

Table 31 identifies the rock and sediment types underlying the proposed reservoir expansion area and whether or not they will be removed or left in place beneath upstream of the dam shell, beneath the core, and downstream of the shell. Additionally, Figure 7 indicates a large number of sites on the east dam alignment that contain sand or gravel sediments. Table 31 states that sand, silt and gravel units along with sand and clay units will be removed from beneath upstream of the dam shell and beneath the core. Table 31 indicates that the weathered shale unit will remain in place.

a. Confirm whether or not all sand and gravel sediments will be excavated and removed down to bedrock within the proposed reservoir expansion area.

b. Discuss the risk of leaving the sand and gravel sediments in place in regards to seepage.

c. Discuss the potential for water to infiltrate from surface through the sandy silt surficial sediments and into any remaining sand and gravel deposits and potentially

the underlying unweathered shale unit, thus creating a potential preferred flow path for seepage outside the dam.

62. Volume 1, Section 6, Appendix 6A-B, Figure 16
Volume 2, Section 6.3.2, Figure 6-2 and 6-3, Pages 9-10

A distinct glacial/meltwater channel feature, which is mirrored in Appendix 6A-B (Figure 16 - Bedrock Contour – Top of Shale (Weathered)) was observed on Figure 6-2 and Figure 6-3. This feature underlies the northern portion of the proposed reservoir expansion area and continues beneath the eastern dam alignment and beyond.

a. Explain the potential for this feature to function as a preferential flow path for groundwater and the potential for seepage to occur outside the dam/reservoir area.

b. Provide justification and explain why no additional bore and coreholes were added to better evaluate and characterize the properties of the sediments that subsequently infilled this feature and their ability to act as a preferential flow path.

63. Volume 1, Section 6, Appendix 6A-B, Figure 18
Volume 1, Section 6, Appendix 6A-C
Volume 1, Attachment 6A, Section 2.2, Page 2
Volume 1, Attachment 6E, Section 6.2.7, Page 35
Volume 2, Section 6.2, Table 6-2, Page 6
Volume 2, Section 6.4.2, Figure 6-7A and 6-7B, Page 25-26
Volume 2, Section

EID presents the cross-section stratigraphy of the dam corehole series, showing a consistent layering of clay till overlying weathered shale overlying unweathered shale. However, these results are not concordant with the information provided in the Soil and Terrain section which presents a sandy loam deposit (BVL soil series) of over 1 m deep in the southeastern section of the basin. For example, coreholes 22CH218 through 22CH228 appear to be within the sandy BVL soil deposit, yet no sandy material is presented on the stratigraphic map (Figure 6-7B). More than 20 boreholes in Appendix 6A-C are reported to have over 1 m of sand or gravel at the surface horizon, particularly in the northeast and southeast sections near the dam alignment. Further, EID illustrates sections of sand and gravel material along the eastern alignment of the dam in the Dam Safety section. In Volume 2, Section 6, EID concludes that the surficial geology of the study area is composed of two surface stratigraphic units: clay till overlying weathered shale, which is suggested in Table 6-2 to result in a *low potential for groundwater infiltration/seepage beneath the base of the reservoir basin and through the berms based on the low permeability of the clay till and bedrock aquitards.* This conclusion appears to discount the large surface area of sandy soils evident other sections of the EIA and does not appear to reflect on the seepage that was occurring in the west dam during construction, as identified in the 2014 Dam Safety Review (Attachment 6E) nor on the seepage problem identified along the existing East Dam in July 2019 (Attachment 6A).

a. Overlay the location of the coreholes with the map of soil types and relate the observed results of the coreholes to the soil series information and borehole characteristics along the dam alignment.

b. Explain the consequence of the substantive surface area of coarse textured materials along the dam alignment and reservoir surface area on the conclusions drawn regarding hydraulic interconnectivity of the surficial stratigraphic layers and the

conclusion of limited groundwater infiltration beneath the base of the reservoir basin and berms.

c. Identify the probable causes of the seepage noted in the existing West and East Dams and how these factors were considered in the methods and conclusions drawn from the hydrogeological assessment.

64. Volume 1, Section 6, Appendix 6A-B, Figure 17, Figure 18 and Figure 21
Volume 2, Section 6.4, Figure 6-7A and Figure 6-7B, Pages 25-26

Considerable variations exist between the various cross-sections of Volume 1, Section 6 – Dam Safety (Figures 17 and 18) and Volume 2, Section 6 – Hydrogeology (Figures 6-7A and 6-7B). The Dam Safety cross-section is more detailed in comparison to the Hydrogeology cross-section which is simplified into 3 units. Figure 18 indicates two large zones of sand and gravel deposits along the cross section where in Figure 6-7B it is absent.

a. Explain the rationale behind these discrepancies.

b. Justify the confidence level in the results obtained from the hydrogeologic modelling and the conclusions that result regarding the potential for seepage from the reservoir.

c. Explain why the overburden unit shown in Figures 17 (borehole series 100) and 20 (corehole series 100) as compared to Figures 18 (borehole series 200) and Figure 21 (corehole series 200) does not appear to be identical.

d. Provide cross sections across the middle of the proposed reservoir expansion area (i.e. north-south and east-west) to assess the potential continuity of the various identified sediment and bedrock units and whether they continue under the dam alignments.

e. Expand on the potential for the various identified sediment and bedrock units to create potential seepage pathways for groundwater outside the dam area.

65. Volume 2, Section 6.3.2, Page 8
Volume 2, Section 6.3, Figure 6-2, 6-3 and 6-4
Volume 2, Section 6.4.2.5, Page 36

EID states that the hydrogeologic study undertook the installation of a total of 264 boreholes of which 19 were instrumented with standpipes and 47 completed as monitoring wells (a total of 441 boreholes, coreholes and vibrating piezometers drilled for the geotechnical study. The locations of each of these are documented on Figure 6-2 and Figure 6-3. Later in the study a number of these boreholes were used to conduct various investigations to determine the hydrogeologic parameters of the subsurface sediments and bedrock e.g. hydraulic conductivity test (percolation), hydraulic conductivity test (slug), hydraulic conductivity test (packer) as shown on Figure 6-4. Given the multitude of locations and various naming conventions from the geotechnical and hydrogeologic studies i.e. BH, CH, it is difficult to relate these locations to the various soil types, surficial geology and bedrock geology of the study site to be able to make correlations easily and efficiently.

a. Provide updated compilation maps for the entire proposed reservoir expansion area that overly the various boreholes, coreholes, test pits etc. with that of soil, surficial geology and bedrock geology maps.

66. Volume 2, Section 6.3.3, Table 6-3, Page 12
Volume 2, Section 6.3.3, Figure 6-4, Page 13
Volume 2, Section 6, Appendix D2

14 slug testing locations are noted in the EIA and in Table 6-3, however, only 8 bedrock locations with analyses are provided in Appendix D2.

Slug test analyses were not conducted on the identified sand and gravel sediments which are important to assess the potential for seepage from the dam/reservoir. Slug testing was also restricted to the dam alignments (i.e. Figure 6-4),

a. Provide the missing slug test analysis reports for the 6 remaining locations.

b. Justify the choice of the slug testing locations and how the sampling is considered representative of the area without any samples in the sand and gravel sediments.

c. Explain why the locations selected for the slug testing were restricted to the dam alignments (i.e. Figure 6-4) while none were tested in the proposed reservoir expansion area.

67. Volume 2, Section 6.3.3, Figure 6-4, Page 13
Volume 2, Section 6.3.5, Pages 14-15
Volume 2, Section 6.4.2.7, Pages 48-49

EID reported that packer tests were conducted for a total of 23 boreholes, however only 10 produced usable data.

EID states that *The permeability of rock with low effective porosity being essentially fracture controlled, the flow regime is generally turbulent therefore it falls outside of the parameters where Darcy's Law applies. As a consequence, the Lugeon Test, which is conducted under high pressure, is considered a qualitative permeability test rather than a measurement of hydraulic conductivity*. Longer pump tests would have directly obtained hydraulic conductivity and transmissivity values and not have had to rely on qualitative or proxy methods to obtain this information, given the Lugeon applicability being limited to bedrock.

EID states *An approximate estimate of equivalent hydraulic conductivity can be determined using the typical correlation established by Houlsby (1976).*

EID states that *injection of water in packer tests may also have, to a lesser extent, contributed to the higher apparent hydraulic conductivity results.*

EID also states that *packer tests are short duration and can only influence a modest volume of bedrock around the tested zone and estimated hydraulic conductivity values are only representative of the zone tested.*

EID states the results of the packer test produced apparent hydraulic conductivity values higher that those obtained during the in-situ slug and short duration pump tests by up to three orders of magnitude. One explanation provided for these differences were the locations of the units that were tested, those being the most fractured.

a. Explain the validity and applicability of the packer tests to produce reliable hydraulic conductivity values based on the above cited statements on this method.:

b. Justify why longer duration pump tests (i.e. 24 hours) were not conducted.

c. Explain the confidence level of the results given majority of the test locations were limited to the dam alignment area with only 2 locations in the proposed reservoir expansion area.

d. Explain why the results from the fractured bedrock unit should not be of primary interest given its high hydraulic conductivity values and therefore used in the hydrogeologic model to best assess potential seepage outside of the dam.

68. Volume 2, Section 6.3.3, Figure 6-4, Page 13
Volume 2, Section 6.3.6, Page 15
Volume 2, Section 6, Appendix D4

EID states that percolation tests were conducted at a total of 18 sites.

EID noted that *the percolation rate is related to, but not equivalent to, the infiltration rate. While an infiltration rate is a measure of the speed at which water progresses downward into the soil, the percolation rate measures not only the downward progression but the lateral progression through the soil as well. This reflects that the surface area for infiltration testing would include only the horizontal surface. In contrast, the percolation test includes both the bottom surface area and the sidewalls of the test hole. However, a relationship exists between the percolation test and infiltration rate. Based on the inverse auger-hole method (also referred as Porchet Method) (Hoorn, 1979), the following equation was used to convert percolation rates to the tested infiltration rate.*

In Appendix D the percolation test data is presented, however, each test lists the soil class as default. Appendix D4 lists only 14 of the percolation test results.

Results from the percolation tests correspond to sandy silt sediments as opposed to silty clay sediments that were expected in the study area. One explanation proposed to explain the results was attributed to the soil being dry at the time of testing and that under saturated condition when the clay was allowed to swell would have reduced percolation rates to values that were expected. There is little evidence to support the conclusion that once the reservoir is full that underlying sediments will be fully saturated.

a. Provide the missing 4 percolation tests and the soil class of each of the 14 test locations

b. Clarify what soil class was the default classification referring to and why was the default classification used.

c. Justify the applicability of the percolation tests to produce reliable hydraulic conductivity values based on the above cited statements on this method.

d. Discuss whether the horizontal component of flow in the percolation tests may have skewed the results, given that typically the vertical component of hydraulic conductivity in a sediment is 1-2 orders of magnitude less than the horizontal component.

e. Explain how the vertical and horizontal components of flow were separated in this test method to determine the contribution of each to the final percolation value.

f. Explain why percolation tests were restricted to the upper 20 cm at all the test sites despite the thickness of the various surficial sediments from the borehole logs and report (e.g. 0.1-7.5 m clay till average, sand and gravel 1-4 m).

g. Describe the confidence level of the percolation test results corresponding to sandy silt sediments

h. Describe what effects will the filling of the reservoir and the additional water pressure on these sediments have in regards to the potential to enhance the vertical gradient and drive water into the underlying weathered shale unit, and the potential implication for seepage through these surficial sediment into the underlying weathered shale unit.

i. Discuss the likelihood that the filling of the reservoir will subsequently enhance the vertical gradient and thus water movement between the surficial sediments and the underlying weathered shale unit.

69. Volume 2, Section 6.3.4, Page 14

EID states that only two corehole locations (i.e., 23CH700B and 23CH709B) had short duration pump tests conducted. The two corehole locations are not mapped.

The two pump test lengths in both cases are generally less than those at which the slug tests were conducted and appear to add minimal additional information to the characterization of the aquifer properties.

The EIA speaks to the use of observations wells in this section and that no responses were observed during the pump tests.

a. Provide the appropriate Figure(s) where the location of these two coreholes are identified.

b. Discuss the confidence level and validity of the results to provide a reasonable estimate of the hydraulic conductivity, especially for the proposed reservoir expansion area, when the values are limited to two locations.

c. Explain why pump tests were not conducted at additional locations and distributed more evenly over the area.

d. Discuss the confidence level and validity of the results given the short duration (i.e. 60- and 75-minute test length) of each of the two pump tests.

e. Explain why the pump test lengths were below the minimum 2-hour standard required in the Government of Alberta Guide to Groundwater Authorization for pump tests on water wells.

f. Discuss the confidence level and validity of the results given the very low pump rates (i.e. approximate 5 L/min)?

g. Provide the pumping test plots and analyses as only the recovery test plots were provided in the EIA.

h. Provide the locations of the observation wells used and provide the data to verify the conclusions.

70. Volume 2, Section 6.3, Page 8-18

Although there was an overall large number of boreholes that cover the study area, borehole and corehole locations used to characterize the hydrogeology of the study site focused primarily on locations along the dam alignment sections in the north, east and south and less so on the actual proposed expanded reservoir area.

a. Explain why more of these locations were not utilized and instrumented to better characterize the hydrogeology of the proposed expanded reservoir area.

b. Justify the level of confidence that the hydrogeologic modelling and conclusions drawn from the data and analyses are truly representative of the study site.

71. Volume 2, Section 6.3, Page 8-18

A variety of geotechnical testing methods were used to determine the hydrogeologic parameters of the subsurface sediments and bedrock.

a. Provide the rationale for choosing each of the geotechnical testing methods (i.e. Hydraulic Conductivity Testing (Packer/Lugeon Tests) and Hydraulic Conductivity Testing (Percolation Tests)) and the resulting confidence and validity in their results.

b. Justify why the methods were used over other alternative hydrogeologic methods.

72. Volume 2, Section 6.3.2, Figure 6-3, Page 10
Volume 2, Section 6.3.7 Pages 15-16
Volume 2, Section 6.4.2.1, Page 27
Volume 2, Section 6.4.2.6, Table 6-7, Pages 37-39
Volume 2, Section 6.4.5, Page 59

EID shows the monitoring wells completed for the drilling program in Figure 6-3, 66 in total. These monitoring wells were variably screened in the clay till, weathered shale or unweathered shale or siltstone bedrock; groundwater was generally detected in all deposits except for a few instances of dry wells. Groundwater samples were collected from three monitoring wells completed in the upper Bearpaw Formation Shale.

a. Justify how analyzing groundwater chemistry from three wells establishes a representative baseline for an area of ~920 ha.

b. Explain the significance of characterizing groundwater chemistry exclusively in the unweathered shale unit and why the other units such as the weathered shale, clay till, sand or gravel were not assessed in the groundwater analysis.

73. Volume 2, Section 6.4.2, Figure 6-6, Page 21

Surficial geology of the area indicates fluvial deposits covering a large area of the proposed reservoir expansion area in the east and southeast. These deposits are characterized as containing poorly to well sorted, stratified to massive sand, gravel silt and clay deposits occurring in channels and overbank deposits.

A Surficial Sand and Gravel Deposits GIS layer from Alberta Environment and Protected Areas indicates this same area to have sand and gravel at surface. This zone of coarse material also coincides with a portion of the glacial/meltwater channel feature noted previously. The coarse sand and gravel sediments are noted in several of the boreholes in the study site and extend below the proposed eastern portion of the dam alignment.

a. Discuss the potential for these units to act as a preferential flow path for groundwater and the potential for seepage outside the dam area.

74. Volume 2, Section 6.4.2.1, Page 27
Volume 2, Section 6.4.2.1, Table 6-6, Page 28

Two water levels are shown on various borehole/core hole logs such as Table 6-6.

EID states that well screens were used to sample groundwater at two interface zones in eight boreholes:

- *Between the weathered clay till and weathered shale bedrock; and,*
- *Between the unweathered clay till and shale or siltstone bedrock.*

a. Explain why three of the eight boreholes were screened across sand and/or sand/shale units (22BH207, 22BH217 and 22BH225).

b. Explain the rationale behind placing the screens in the boreholes across multiple sediment/rock units and how can it be determined what unit these water levels are related to.

c. Explain how vertical gradients between units can be determined given the current screen positioning.

d. Provide vertical gradient values between the various sediment and bedrock units and discuss the potential for flow to be upwards or downwards between these units.

e. Explain why two water levels are shown on various borehole/core hole logs, for example, 22BH102, 321, 22CH320, while others only indicate one water level, for example, 22BH303, 405, 22CH313.

f. Justify why the majority of the boreholes used to monitor water levels at the two interface zones are along the dam alignment with only three wells (22BH417, 22BH478 and 22BH48l) located in the proposed reservoir expansion area. Provide the confidence level in the use of these water wells given the limited number of sampling sites.

g. Provide a figure depicting all boreholes and coreholes that were water bearing and those that were dry to better understand water availability and spatial distribution of the locations between the various units.

75. Volume 2, Section 6.4.2.1, Page 29
Volume 2, Section 6.4.2.2, Page 30

EID states *groundwater is confined to the thin and discrete interface zone comprising a weathered portion of clay till or a weathered portion of bedrock and directly overlying the bedrock interface, these small discrete units do not typically provide significant groundwater yield. Additionally, EID states during the field investigations, there was some free water that was observed in the test pits within the sand and gravel layers along the east alignment of the planned reservoir expansion area. Locally, these types of sand and gravel layers do not provide sufficient yield to serve as aquifer for water supply purposes.*

The lack of water well logs in this area does not necessarily directly correlate to the lack of aquifer hosting sediment in the surficial deposits. Additional factors that may explain this include: i) the study area being located in the EID and therefore, farmers, ranchers etc. already have access to a water source (i.e. surface water), ii) the lack of people in the area, iii) a large number of the wells in the area may be associated with households and therefore, the well logs not reported in the Alberta Government Water Well Database.

The weathered shale bedrock unit observed in the majority of the borehole/corehole logs appears extensive and continuous beneath the study site and of an average thickness of 8 m. Based on the borehole/corehole logs the weathered shale appears neither small nor discrete.

a. Explain how the cited statements can be verified when no pump tests have been conducted on a majority of the sediment/bedrock units.

b. Explain how significant groundwater yield and aquifer are defined in the EIA in this context.

c. Explain if and what additional methods of subsurface examination were used across the study area in addition to those discussed that collaborate the EIA`s conclusion.

d. Discuss the potential for the weathered shale bedrock unit to act as a significant aquifer in the study site and its potential to act as a conduit for seepage outside the dam area.

76. Volume 2, Section 6.4.2.6, Figure 6-11A, Page 41

Groundwater flow contours are shown in the EIA.

a. Justify the confidence level in the results indicated on the figure and the overall contour positioning, given that the contours on based on a very limited number of observations points in the proposed reservoir expansion area, most notably in the west.

77. Volume 2, Section 6.4.2.6, Figure 6-13, Page 43

EID shows the groundwater levels along the eastern dam alignment.

a. Discuss the potential for groundwater seepage in the areas of corehole 22CH209 and in the vicinity of 22CH213 where water levels appear at or slightly below ground level.

b. Discuss the proposed mitigation strategies to lower the water table in these areas to prevent stability issues with the dam and prevent seepage outside the dam area in these two locations.

78. Volume 2, Section 6.4.2.6, Page 36-47

EID states that 58 borehole/corehole locations were monitored 6 times over a full year, with only three (i.e. 22BH102, 22BH117, 22BH123) monitored continuously over a one-year period to assess seasonal variability.

a. Provide figures for each of the six groundwater sampling events with flow direction indicated and discuss whether flow direction changes throughout the year as a result of gradient changes.

b. Discuss the confidence level of these result given that the majority of the monitoring locations are along the dam alignment and relatively few spatial distributed over the proposed reservoir expansion area, other than in the southwest.

c. Justify the validity of the water level measurements and their relevance in the ability to associate these levels to a specific unit as the screens in 22BH102, 22BH117, and 22BH123 were constructed across multiple units.

79. Volume 2, Section 6.4.2.6, Figure 6-15, Figure 6-16 and Figure 6-17, Pages 45-47
Volume 2, Section 6.5, Table 6-14, Page 67

EID depicts temporal variations in groundwater levels in boreholes 22BH102, 22BH117 and 22BH123. EID states that *groundwater level response (in 22BH123) to the seasonal variations is similar to the trends noted at 22BH102, however, groundwater response to seasonal variations is rather muted when compared to the groundwater response noted at 22BH102.*

Figure 6-15 and Figure 6-17 appear to indicate a correlation between precipitation events in the late spring and summer with increases in water levels. While there are precipitation events in the late fall and winter noted on the figures, these are likely snowfall events as the Environment and Climate Change Canada website states that its precipitation values include snow, which unlike rain would not infiltrate into the subsurface until spring snowmelt.

a. Discuss the previous statements in Table 6-14 of the EIA that conclude that the clay and clay till materials that overly the bedrock form a good confining unit that prevent the vertical infiltration of surface water into the bedrock.

b. Discuss any implications these observations may have on the assumptions built into the groundwater flow model.

80. Volume 2, Section 6.4.2.8, Page 51

EID discusses the horizontal gradients throughout the study site and potential flow between various sediment and rock units, however there is no discussion on vertical gradient.

a. Provide vertical gradient calculations between the various sediment and rock units and discuss how these gradients may impact recharge or discharge between the various units and the potential for these to create groundwater seepage.

b. Confirm if vertical gradients were considered in the groundwater flow model.

81. Volume 2, Section 6.4.2.11, Page 55

EID states that vertical leakage from the underlying aquifer into the overlying aquitard is possible but likely limited and therefore, the potential is low.

a. Justify this claim as calculations of vertical conductivities do not appear to have been reported on in the EIA.

82. Volume 2, Section 6.4.3, Page 55

EID states that the proposed conceptual hydrostratigraphic framework serves as a good foundation for the numerical modelling since it is based on site specific information and the occurrence and properties of the main layers of the numerical groundwater flow model. The data is based on a limited number of sample locations that were not equally distributed between the dam alignments and the proposed reservoir expansion area.

a. Justify the confidence level in the values obtained from the various testing methods that were subsequently input into the numerical groundwater flow model.

83. Volume 2, Section 6.4.5, Table 6-13, Page 59-61

EID discusses groundwater chemistry and Table 6-13 provides results. While there is some basic discussion regarding the results, there is no context provided regarding results in comparison to groundwater quality guidelines. Maximum Acceptable Concentration exceedances (from the Canadian Drinking Water Quality Guidelines) were observed for including, but not limited to, uranium, strontium, manganese, chromium, arsenic.

a. Compare water chemistry sample results to relevant groundwater and surface water quality guidelines and identify any limit exceedances (e.g., Alberta Tier 1 Soil and Groundwater Remediation Guidelines; Environmental Quality Guidelines for Alberta Surface Waters, Canadian Drinking Water Quality Guidelines).

b. Discuss the implications of potential surface water and groundwater interactions in relation to water quality with references to the relevant end uses (e.g., irrigation, protection of aquatic life).

84. Volume 2, Section 6.4.5, Page 59-62

a. Explain what the B designation on various coreholes e.g. 23CH700B represents and how do these boreholes compare to the boreholes without this designation (e.g. 23CH700).

b. Explain why does the B series coreholes not have a soil description associated with the log.

85. Volume 2, Section 6, Appendix D1

Review of the corehole (CH) logs from Appendix D1 appears to suggest those screened within the weathered shale unit are predominantly under unconfined conditions while those screened in the slightly weather/unweathered shale/siltstone are predominantly under confined conditions.

a. Discuss the implications of this observation to the overall interpretation to groundwater flow in these two units and between adjacent units, conceptualization of the groundwater model and potential seepage outside the dam area from the unweathered shale unit.

86. Volume 2, Appendix D7, Section 3.3.1, Page 28

EID states that the model simulations predict an increase in hydraulic conductivity of the weathered shale unit by 2 orders of magnitude which will result in lower hydraulic heads within the reservoir.

a. Explain the validity of such predictions given it would be anticipated that with higher hydraulic conductivity values in the bedrock unit that water would be more able to readily flow through the weathered shale unit, therefore creating less buildup of water and thus less head increases in the proposed reservoir expansion area.

b. Given the potential for increased flow in the weathered shale unit, explain if this would potentially lead to increased seepage outside the dam area.

87. Volume 2, Appendix D7, Section 3.3.4, Page 29

EID states uncertainty in hydraulic conductivity values has the greatest impact on modelling seepage into the reservoir expansion area and excavation. To address this concern the EIA proposes a factor of safety of 3 to compensate for the uncertainty in regard to the calculations of the radius of influence of dewatering and seepage into excavation during construction. The EIA, however, does not speak to or discuss potential seepage outside the dam area.

a. Evaluate and discuss the uncertainty of the hydraulic conductivity values used in the model and the potential for seepage outside the dam area.

b. Explain how the safety factor of 3 was determined.

88. Volume 2, Appendix D7, Section 3.4.4, Page 31

The EIA suggests should gaps in the clay till exist that this may potentially allow infiltration directly to the weathered shale unit and flow through this layer, which could increase and create some zones where potential impacts are greater.

a. Discuss the probability of this occurrence and the risks posed by increased seepage both within the proposed reservoir expansion area and outside the reservoir area, where:
   i. more permeable sediments were excavated and replaced with clays; and
   ii. isolated areas of coarse material were left in place or missed during excavation.

5.3 Hydrology

89. Volume 0, Section i-iv, 3.9.2 [7] (a), (b) and (c), Page 42
Volume 2, Section 3.3.9, Page 16

The final Terms of Reference Section 3.9.2 [7] states *Describe potential effects of climate change on water demands and supply, including:*

a) changes in water demand for irrigation;
b) potential changes in flow and impacts on downstream watercourses and waterbodies; and
c) a description of adaptations (e.g., reservoir operation) to climate change for sustainable water resource management.

It is unclear where these terms of reference are addressed in the EIA.

a. Provide the section of the EIA where this information is located.

b. If they are not in the EIA, provide the applicable information.

90. Volume 2, Section 3

The EIA summary report should include suitable maps to identify the components of the Project, the existing conditions, and the environmental and the socio-economic implications of the development.

a. Provide the required maps.

91. Volume 2, Section 3.1.2, Page 2

EID states *This would supply 0.08 m per ha (approximately 3 inches), which is about 1/5 of the needed water.*

a. Explain how the amount of needed water was calculated.

92. Volume 2, Section 7

According to the Guide to Preparing Environmental Impact Assessment Reports in Alberta, EIA assessment scenarios should include Baseline Case, Application Case, and Planned Development Case. It is unclear in the EIA where the three scenarios are described.

a. Provide the relevant sections in the EIA where each development scenario for hydrology is addressed.

b. If a development scenario is missing, provide a rationale for why.

93. Volume 2, Section 7.1.1, Page 2

EID states The EID's Water Licence allows it to extract water, subject to:
• Ensure discharge in the Bow River meets or exceeds the minimum IO required to protect aquatic resources downstream from Bassano Dam (400 ft3/s = 11.3 m3/s);
• Ensure water extracted does not compromise Alberta's ability to meet apportionment requirements with Saskatchewan;

a. Discuss the Project`s impact on meeting Alberta`s water-sharing obligation with Saskatchewan as required by the Master Agreement in Apportionment.

94. Volume 2, Section 7.1.3, Page 4

EID states that *The climate of this subregion is warm and dry with a mean annual temperature of 4.2°C. In summer, the mean temperature is 18.5°C, and in winter the mean temperature is -10.2°C.*

a. Provide a reference to this statement.

95. Volume 2, Section 7.2, Page 6

EID states *The study areas for waterbodies and their characteristics were defined as:*
• Aquatic Local Study Area (ALSA; Appendix E1, Figure E1-1).
• Aquatic Regional Study Area (ARSA; Appendix E1, Figure E1-2).

a. Define and describe the Project Area in Section 7.2.

96. Volume 2, Section 7.5.3.1, Page 27

EID states *By nearly quadrupling the surface area of the reservoir once filled to FSL, increased evaporation will occur, estimated as an increase of 6 million m3.*

a. Explain what methods and data were used to estimate the evaporation rate, and if the evaporation value is estimated per year.

97. Volume 2, Section 7.5.3.1, Page 27

EID states However, this will be more than offset by the increased efficiency in water use throughout the EID per the Project Description (Volume 1, Section 2.11) including reduced seepage from canal to pipeline improvements (12.5 million m3), improved water management (12.4 million m3) and improved on-farm watering methods (9.3 million m3) which total up to 34.2 million m3/year.

The effectiveness of implementing various water efficiency strategies across the EID remains uncertain.

a. Explain how the resulting gains in water efficiency would offset the increased evaporative loss.

5.4 Surface Water Quality

98. Volume 0, Section i-iv, 3.4.1 [1], Page 28
Volume 0, Section i-iv, 3.4.2 [3], Page 30
Volume 2, Section 7.4.1.3, Page 9 and 10
Volume 2, Section 7.4.2.1, Page 11
Volume 2, Section 7.4.2.3, Page 13
Volume 2, Section 7.5.2, Page 23
Volume 2, Section 7.5.3.1, Page 25
Volume 2, Section 7, Appendix E2, Table E2-2, Page 18 and 19

The final ToR states *Describe the baseline water quality of water courses and water bodies (existing reservoir and downstream (natural or man-made) bodies of water.*

Bow River downstream of the EID diversion point was not included in the summary of baseline water quality. Downstream Bow River impacts may result from diversion operations, such as changes in dilution. The EID also states that they will respect the South Saskatchewan Region Surface Water Quality Management Framework which also includes oversees the Bow River downstream of the EID diversion.

The final ToR also states *Describe the water quality expected in the Project and downstream (natural or man-made) bodies of water. Include water quality for both high-flow and low-flow events (1 in 20-year and 1 in 100-year and 1 in 300-year) under expected reservoir conditions.*

While there is discussion on changes to reservoir water quality, information regarding impacts on downstream bodies of water cannot be found.

a. Include any relevant water quality data for the reach that may be impacted by diversion operations.

b. Provide further details on the frequency, timing, rates and other information related to water diversion from the Bow River into the EID to support filling of SLR.

c. Answer the final ToR 3.4.2 [3] with regards to downstream bodies of water, including the Bow River downstream of the diversion.

d. Discuss potential impacts on water quality in the Bow River downstream of the diversion point, including but not limited to changes in dilution from diversion operations throughout different stages of the Project.

e. Predict water quality in the Bow River downstream of the diversion and discuss comparisons against the South Saskatchewan Region Surface Water Quality Management Framework.

f. Discuss expected water quality in the Project and downstream bodies of water for all general chemistry, metals, nutrient and hydrocarbon parameters listed in Volume 2, Section 7.4.1.3, Page 10 as well as Volume 2, Section 7, Appendix E2, Table E2-2, page 18-19.

99. Volume 0, Section i-iv, 3.4.1 [1], Page 28
Volume 2, Section 7.4.1.3, Page 10
Volume 2, Section 7, Appendix E2, Table E2-2, Page 18 and 19
Volume 2, Section 7.4.2.4, Page 17 and 18

The final ToR states *Describe the baseline water quality of water courses and water bodies (existing reservoir and downstream (natural or man-made) bodies of water), and consider appropriate water quality parameters*.

The description by EID on Snake Lake Reservoir *In-situ* Sampling Results on Page 17-18 provides descriptive details for select parameters, but it does not cover all analyzed parameters (e.g., parameters without guidelines). In addition to guideline exceedances, descriptive details should include (but are not limited to) notable patterns and detects/non-detects. Page 10 as well as Table E2-2 provide a list of analyzed parameters that should be used in providing summaries and descriptions.

EID states *Phosphorus concentration was also low with a mean of 0.011 mg/L*. It is unclear how this was derived; Table E2-2 lists three values for Phosphorus (P)-Total in the reservoir: 0.0126 mg/L, 0.017 mg/L, and 2 mg/L. These three values do not produce a mean of 0.011 mg/L. Later down the table there is another entry for Phosphorus (P) -Total, with values <0.050 mg/L, 0.017 mg/L and <0.050 mg/L (also not averaging to 0.011 mg/L).

Total phosphorus (TP) was much higher in the Winter 2022 Snake Lake Reservoir East/West with a mean concentration of 2 mg/L Table E2-2) relative to Spring 2021 and Fall 2021 (no Fall 2023 value available), which were 0.0126 mg/L and 0.017 mg/L respectively.

The EID states *Inorganic nitrogen concentration in SLR was below detection limit, and TKN values were generally low (average of 0.89 mg/L)*. It is also unclear how this was derived. Table E2-2 lists three values for Total Kjeldahl Nitrogen (TKN) in the reservoir: 0.35 mg/L, 0.37 mg/L, and 0.330 mg/L. These three values do not produce an average (mean or median) of 0.89 mg/L.

a. Describe baseline water quality for all analyzed parameters in a consistent manner.

b. Explain how the means calculated for total phosphorus and TKN were derived, and why total phosphorus is listed twice in Table E2-2.

c. Identify values inconsistent with other sampled values of the same parameter (e.g., the higher TP in Winter 2022 relative to Spring 2021 and Fall 2021 TP) and discuss potential explanations for the inconsistencies.

d. Provide the raw data for each sampling location as Table E2-2 only provides an average (mean) of multiple sampling locations.

e. Explain the missing values in Table E2-2 (e.g., why was total phosphorus and total nitrogen not measured in Fall 2023 Snake Lake Reservoir East/West, when it was measured in the other sampling events).

100. Volume 0, Section i-iv, 3.4.1 [2], Page 28
Volume 2, Section 7.4.1 and Section 7.4.2, Page 8-20
Volume 2, Section 7.4.2.1, Page 11
Volume 2, Section 7.5.3.2, Page 29

The final Terms of Reference states *Identify, describe, and map current point sources and non-point sources that may influence water quality in the Project area*.

EID provided limited identification and description of current point sources and non-point sources that may influence water quality in the Project area. EID states *Input from agriculture (e.g., pesticides, herbicides, fertilizers) will not occur since the surrounding upland is grazed, but not continuously*.

a. Identify, describe, and map where applicable, all point sources and non-point sources that may influence water quality in the Project area.

b. Clarify and describe if and how the various land uses described on Page 11 (*E*ID states *The Aquatic Regional Study Area (ARSA) represents a mix of natural landscapes (i.e., regional water bodies and canals) and modified lands for agriculture transportation, oil and gas, utilities, and other industrial and municipal land uses*) may influence water quality.

101. Volume 0, Section i-iv, 3.4.2 [2] (b) (vii), Page 29
Volume 1, Section 6.7, Page 32-36
Volume 1, Attachment 6D, Page 26

The final ToR states *Describe and predict the potential impacts of the Project (during site preparation, construction, operation, maintenance, decommissioning, and reclamation) on surface water quality of the existing reservoir and downstream (natural or man-made) bodies of water using modelling or another scientifically defensible approach, including:*
(b) changes in concentrations, loading amounts, and timing of key water quality parameters including routine parameters that could impact the current Snake Lake reservoir and downstream (natural or man-made) waterbodies, including:
(vii) impacts in the event of a catastrophic failure of the structure.

There is no prediction made on the potential impacts of the Project (during all stages) on surface water quality of the existing reservoir and downstream bodies of water.

There is no information found on the impact of a catastrophic failure of the structure on surface water quality.

a. Answer the final ToR 3.4.2 [2] (b) (vii) with regards to impacts to surface water quality of the existing reservoir and downstream (natural or man-made) bodies of water.

102. Volume 0, Section i-iv, 3.4.2 [6] (a) and (b)
Volume 2, Section 7.5.3.2, Page 28

The final Terms of Reference states *Describe the potential and implications for cyanobacteria/microcystin in the proposed Snake Lake Reservoir to:*

a) impact recreation of the Project and downstream (natural or man-made bodies of water.
b) impact treatment of water from the Project and downstream bodies of water for drinking water purposes if applicable.

While there was text discussing the absence of cyanobacteria observed during late August 2023, discussion on the potential and implications for future cyanobacteria/microcystins impacts was not found.

a. Answer the final Terms of Reference 3.4.2 [6] with regards to potential and implications for cyanobacteria/microcystin impacts in the proposed Snake Lake Reservoir.

103. Volume 0, Section i-iv, 3.4.2 [9], Page 30
Volume 2, Section 7.5.2, Page 23 and 24
Volume 2, Section 7.5.3.2, Page 27-29

The final ToR states *Provide a summary of the management plan to prevent or reduce impacts to surface water, and a spill response plan in the event of an accidental release*.

This summary cannot be found in the EIA. There is some discussion on if the source water is poor quality, but this term is also referencing scenarios where reservoir water quality is poor and may impact downstream bodies of water.

a. Answer ToR 3.4.2 [9] when the reservoir water is of poor water quality.

104. Volume 0, Section i-iv, 3.4.2 [10], Page 31
Volume 2, Section 7.1.1, Page 2 and 3
Volume 2, Section 7.3, Page 6
Volume 2, Section 7, Appendix E2, Table E2-2, Page 18

The final Terms of Reference states *Describe the potential and implications for organic carbon and nutrient management in the Project, based on the proposed operating regime, to:*

a) impact treatment of water and downstream (natural or man-made) bodies of water for drinking water purposes (e.g., disinfection by-products); and
b) impact productivity of aquatic vegetation (e.g., macrophyte, algae).

EID states this term was *not applicable to this impact assessment and was not discussed further*. There is some discussion throughout Volume 2, Section 7 on anticipated lack of impacts on quality of return flow downstream as well as identification of the reservoir not being a direct source of potable water. There is no mention of organic carbon in this section.

a. Explain the perceived irrelevance of organic carbon in the context of this Project on downstream bodies of water as well as productivity of aquatic vegetation.

b. Explain why nutrient management is not applicable to this impact assessment and downstream bodies of water given the high total phosphorus value measured in Winter 2022 (mean over Snake Lake Reservoir East/West measurements of 2 mg/L) (Table E2-2).

105. Volume 2, Section 7.1.1. Pages 2 and 3
Volume 2, Section 7.5.2. Pages 23 and 24

EID listed three major reasons for not addressing the required items listed in the final ToR, which primarily requests to describe the quantification of the effects of the Project. The three reasons are summarized as follow:

1. No increase in water withdrawal beyond existing allocations.
2. No increase in irrigated land base resulting no new source of loading.
3. Project is not designed for flood protection measure as it is built off-stream.

Those reasonings are not convincing to all the final ToR items the EID deemed *not applicable for impact assessment or not discussed further*. The EID needs to address the possible changes to the downstream waterbodies due to the expansion project including reservoir drawdown, filling and completion, as well as the updated operation plan. Any conclusions need to be supported by data, reasonable assumptions (if any), and/or science-based analysis.

Although this project is not intended to irrigate more land base, the updated reservoir operation may also change the return flow loadings in terms of volume and timing. A predictive modelling or a quantitative analysis needs to be performed to estimate the change of the return flow loading.

a. Provide predictive analysis on the potential impact on water quality at the Bow River downstream of Bassano Dam due to water level and flow rate change.

b. Provide estimates on the change of the return flow loading.

106. Volume 2, Section 7.4.1.3, Page 9
Volume 2, Section 7.7, Page 32

EID states *Limnologists lowered a Van Dorn sampler to a depth between 0.5 and 1 m above the reservoir bottom to collect water samples*.

a. Explain why representative water samples were taken near the bottom of the water column, and the potential impacts on the analytical results on each water quality parameter.

107. Volume 2, Section 7.4.1.3, Page 10
Volume 2, Section 7.4.1.3, Table 7-3, Page 10
Volume 2, Section 7, Appendix E2, Table E2-2, Page 18 and 19

EID provides a list of parameters that were analyzed from grab samples taken during the water chemistry sampling events (events listed Table 7-3). The surface water quality results in Table E2-2, do not appear to include all the general chemistry, metals, nutrient and hydrocarbon parameters listed parameters analyzed as listed on Volume 2, Section 7.4.1.3, Page 10.

a. Include all analyzed parameters and results, including for parameters with no guidelines.

108. Volume 2, Section 7.4.2.4, Page 15
Volume 2, Section 7, Appendix E2, Table E2-1, Page 16 and 17

Fluoride is missing its Canadian Council of Ministers of the Environment (CCME) Protection of Freshwater Aquatic Life guideline in Table E2-1. EID identified fluoride as having exceedances in Section 7.4.2.4.

Table E2-1 appears to include only the most stringent guidelines for each column (e.g., the livestock water guideline for fluoride is 1 to 2 mg/L but only listed as 1 mg/L in Table E2-1).

a. Include all applicable guidelines in Table E2-1.

b. If Table E2-1 only includes the most stringent guidelines, modify the table caption to identify as such or provide the full range of the guideline.

109. Volume 2, Section 7.4.2.4, Page 15
Volume 2, Section 7, Appendix E1, Figure E1-10, Page 11
Volume 2, Section 7, Appendix E2, Table E2-1, Page 16

EID identifies pH (*in-situ*, winter 2022) as having exceeded guideline(s) in Section 7.4.2.4. The *in-situ* water quality data appears to only be presented in Figure E1-10. However, the figures are small and the measured pH values are very close to pH 9, which is the upper end of the Protection of Freshwater Aquatic Life guideline. It is difficult to assess the pH exceedance in winter 2022 relative to the other sampling events (where no exceedance was identified).

a. Provide raw values for all in-situ water quality measurements.

110. Volume 2, Section 7.4.2.4, Page 18
Volume 2, Section 7, Appendix E2, Table E2-2, Page 18
Volume 2, Section 8.4.2.3, Table 8-5, Page 15 and 16

Water quality sampling for baseline conditions were compared against the Environmental Quality Guidelines (EQG) for Alberta Surface Waters (2018) for the Protection of Freshwater Aquatic Life (PAL). Guideline exceedances for fluoride and total mercury are documented in Table E2-2 in Section 7 and Table 8-5 in Section 8. The fluoride parameter appears to be compared against the Guideline for Canadian Drinking Water Quality as no relevant PAL guideline exists in the EQG.

Although the Irrigation Districts Water Quality Data Tool does not provide total mercury data, there is existing total mercury data from Alberta Environment and Protected Areas in the Bow River at Cluny and Ronalane Long-Term River Network stations that can provide additional context for total mercury in the source water.

a. Verify the comparison of fluoride to the PAL guideline and explain the relevance of fluoride to aquatic life.

b. Confirm and explain the three order-of-magnitude increase in total mercury concentrations between Fall 2021 and Winter 2022.

c. Describe the monitoring program being considered to assess for changes to total mercury concentrations and mitigation options being considered to address elevated concentrations.

d. Compare and discuss the reservoir total mercury measurements to the Bow River at Cluny (AB05BM0590) and Bow River at Ronalane (AB05BN0010) total mercury measurements.

111. Volume 2, Section 7.4.2.4, Page 18
Volume 2, Section 7, Appendix E2, Table E2-2, Page 18 and 19

The EID states *Total suspended solids (TSS) concentrations are generally highest in the spring and summer caused by short term precipitation events and resultant effect on surface erosion and deposition. This effect is diminished significantly during winter.*

TSS presented by the EID in Table E2-2 includes a Spring 2021 value of <3.0 mg/L, and a Winter 2022 value of <3.0 mg/L. The statement from EID above appears to be general watershed chemistry and is not necessarily supported by the data presented by this specific Project.

a. Discuss the applicability of the above cited TSS statement to SLR given the reservoir sampling results.

112. Volume 2, Section 7.4.2.4, Page 18
Volume 2, Section 7, Appendix E

EID states *The dissolved concentrations for metals and trace elements in the reservoir were generally low indicating most are present in particulate form (i.e., suspended, not dissolved), and are not available to aquatic life*.

There are no dissolved metals data provided in Volume 2, Section 7, Appendix E.

a. Provide the dissolved metals data, at a minimum in raw form.

b. Include dissolved metal guidelines in Volume 2, Section 7, Appendix E2, Table E2-1, Pages 18-19.

113. Volume 2, Section 7, Appendix E2, Table E2-2, Page 18 and 19

EID states the measured total mercury for the Fall 2023 dugouts averaged <0.025 µg/L. The most stringent guideline for total mercury is 0.005 ug/L, which is lower than the detection limit for the Fall 2023 dugouts mercury sample. The reservoir samples in Spring 2021 and Fall 2021 were measured at lower detection limits. It is unclear what the mercury detection limit for the Fall 2023 reservoir sample is.

a. Explain why the detection limit increased to above most stringent guideline in Fall 2023, for mercury.

b. Discuss whether the reasons behind the increased detection limit in the Fall 2023 dugout samples could have influenced the Fall 2023 reservoir samples, which indicated a large increase in total mercury concentration relative to the Spring 2021 and Fall 2021 samples.

114. Volume 2, Section 7.4.2.4, Page 19

EID states *These data, spanning years 2006 through 2024 included between 2 and 8 measurements per year per location examined, and have been analysed by determining the maximum concentration of each assessed parameter by year. This allowed a conservative examination of how water quality changed over time and space*.

Using the maximum concentration can mask additional information. For example, Year A and Year B may both have a maximum value that exceeds guidelines, but there may be five other values below the maximum that is also above the guideline in Year A, and no additional values that is exceeding guidelines in Year B. Applying guidelines is also more difficult when it comes to parameters with toxicity modifying factors, such as ammonia where the guideline is dependent on pH and water temperature; there may be a maximum value that does not exceed the calculated guideline for that sample, but another value that does exceed its respective calculated guideline. Using the maximum value also considers extreme values, but not central tendency when assessing change.

EID also states that *Note that these do not identify the surface water quality through the year, only that occasionally exceedances occur in the incoming water*.

To understand the baseline, it is important to consider seasonal variation in when exceedances are occurring. For example, are these exceedances all happening in the spring (possibly driven by flow), or are the exceedances occurring throughout the year.

a. Compare the individual samples for guideline exceedances.

b. Discuss any seasonality and temporal trends for guideline exceedances.

115. Volume 2, Section 7.4.2.4, Page 19

EID states *Note that some guidelines use a narrative approach or determining if a concertation has been exceeded. In absence of starting values for these comparisons, estimated narrative values were estimated by comparison to the median of the maximum values among years to identify possible exceedances for the following parameters:*

- *Temperature: estimated as the median plus 5°C;*
- *TSS: estimated as the median plus 25 mg/L or plus 10% if the median was >250 mg/L;*
- *Total Nitrogen: Median multiplied by 2 in mg/L; and*
- *Total Phosphorus: Median multiplied by 2 in mg/L.*

a. Provide justification and relevant references for the establishment of these estimated narrative values.

b. Provide information as to what dataset was used for calculation of the medians and +/- 10% values. This should include, at a minimum, details regarding the years of data used, site(s), and sample size.

116. Volume 2, Section 7.4.2.4, Page 19 and 20

EID states *TSS and sulphate are more common near the return flow sites*.

It is unclear whether this is in reference to the number of guideline exceedances. If so, the inflow site (E-P1) had exceedances in 3 of 16 years, while return flow site E-R2 only had TSS exceed in 1 of 16 years and return flow site E-R2A had exceedances for TSS for 5 of 14 years. This suggests that based on the limited information, there are more TSS exceedances for only the return flow site that receives more field run-off not for return flow sites in general.

a. Clarify the metrics by which TSS was determined to be more common near the return flow sites.

117. Volume 2, Section 7.4.2.4, Page 19 and 20
Volume 2, Section 7.5, Page 23

EID states *As water is already exceeding guidelines at baseline, it is unlikely that stored water from a larger reservoir will result in any new exceedances*.

This statement does not take into account which parameters are exceeding guidelines as well as the frequency. Information provided in this section already points to a different set of exceedances in E-S2 (downstream of SLR) compared to E-P1 (incoming water); thallium, Chlorpyrifos, Mirex and MCPA were only exceeding at E-S2 and not E-P1. Conversely, E-P1 had exceedances in cadmium, cobalt, zinc and Dicamba that were not seen at E-S2.

a. Expand on and discuss this statement in the Impact Assessment section, for all parts of the Project (during site preparation, construction, operation, maintenance, decommissioning, and reclamation).

118. Volume 2, Section 7.4.2.5, Page 21

EID states:

- *Under the sediment quality guidelines for the PAL, arsenic levels exceed the "Interim Sediment Quality Guideline" but are still below the "Probable Effects Level".*
- *Conductivity falls within the "Possibly Safe" range for the Guideline for the Protection of Agricultural Water Uses.*
- *Nickel exceeds the "Lowest Effects Level" guideline for the PAL.*

a. Discuss the implication and impacts of these statements in regards to potential project impacts on surface water quality.

b. Justify the appropriateness of using water quality guidelines for sodium absorption ratio (SAR) and electrical conductivity (EC) to evaluate sediment quality.

119. Volume 2, Section 7.4.2.5, Page 21

EID states *The FTOR requires discussion of other metals that may be susceptible to methylation and could become water quality issues if they can enter the aquatic food chain. Other elements of interest include lead, arsenic, cadmium, and selenium. These were not selected as applicable to the Project since they do not occur above guidelines for PAL or for use in agriculture*.

However, this was followed by another statement from EID: *Under the sediment quality guidelines for the PAL, arsenic levels exceed the "Interim Sediment Quality Guideline" but are still below the "Probable Effects Level".*

These two statements appear to contradict each other as sediment arsenic levels are above a guideline for PAL, even if interim.

a. Clarify the justification for excluding metals methylation other than mercury from discussion.

120. Volume 2, Section 7.4.2.5, Table 7-10, Page 22

Table 7-10 uses the irrigation water quality guideline for SAR and EC from the Environmental Quality Guidelines for Alberta Surface Waters, for conductivity in saturated paste. This guideline is intended for water, not saturated paste. It is important to also note that, even when correctly applied to a water sample, both SAR and EC need to be considered together for this guideline to determine the safety of water for irrigation because it is both salinity and sodicity and their interactions that affect soil structure. If routine analysis (including major ions) is not available, EC may be used as a flag for investigating further, but it is only a flag and it is important to evaluate SAR and sodium levels to provide the correct context.

a. Justify the appropriateness for using this guideline for sediment conductivity.

121. Volume 2, Section 7.5.2, Page 23

EID states that *The South Saskatchewan Water Quality Management Plan will be respected and aquatic resources in the rivers downstream will not be compromised by diversion driven by the EID operations; the status quo will persist*.

a. Clarify how the South Saskatchewan Region Surface Water Quality Management Framework will be respected to avoid compromising downstream waters.

122. Volume 2, Section 7.5.2, Page 23

EID states that the reservoir will store *extra water in periods of high flow*.

a. Define the threshold of high flow with corresponding water levels.

123. Volume 2, Section 7.5.3.1, Page 27

EID states *The EID does not plan to take additional water from the Bow River to fill the reservoir*. This is in reference to the unused water that the EID has been allocated.

a. Discuss the additional water requirement from the Bow River that will be used to fill the reservoir relative to the water taken for typical reservoir operations under current circumstances.

124. Volume 2, Section 7.5.3.2, Page 28

The EID states *Phosphorus and nitrogen loading from surface runoff is not considered to pose a risk to water chemistry – residency time is short and input dilute relative to other basins with off stream storage*.

a. Clarify what other basins with off stream storage are being used in this comparison.

125. Volume 2, Section 7.5.3.2, Pages 28 and 29

EID states that *residency time is short*, and that *[SLR] is drawn down partially to fully (to meet irrigation demand and maintenance, respectively, depending on the year)*. EID also states that *the new reservoir area and depth will allow particulates to settle and dissolved components longer time to precipitate and sink to the bottom*. Short residency time and rapid drawdown was noted to contribute to the preferred water quality.

a. Explain the impact of the Project on residency time and subsequent effects on water quality.

b. Explain if the Reservoir will operate fully off the canal system (e.g., bypassed), and if so, how will that impact the residency time and water quality.

126. Volume 2, Section 7.6, Page 32

EID states *The Project is not expected to affect water quality within the Bow and Red Deer rivers. Water quality parameters will be monitored by the EID through filling and operations phases, including monitoring at several existing monitoring sites up to 4 times per year to trace the chemistry of water from near Bassano dam, through reservoirs and back to the Bow or Red Deer rivers.*

Mercury was identified by the EID as a parameter of concern throughout Volume 2, Section 7, with recognition of existing guideline exceedances as well as a need for future monitoring (also in light of potential mercury methylation). This is thus understood to be a water quality parameter that may be affected by the Project.

a. Address the potential water quality impacts downstream in regards to mercury.

127. Volume 2, Section 7.6, Page 32
Volume 2, Section 7.7, Page 33
Volume 2, Section 7, Appendix E2, Table E2-2, Page 18 and 19
Volume 2, Section 7, Appendix E2, Table E2-5, Page 23-24

EID states monitoring for surface water quality is recommended for *the expanded reservoir in midsummer to early fall, one year after the reservoir is filled and operating* for the following samples and timing:

- *Water: full parameter set for PAL and Agricultural Use – three sites, 1 year after filling*
- *Water: In-situ parameters – three sites, 1 year after filling*
- *Water inorganic mercury – two sites, 1 year after filling*
- *Sediment inorganic and methylmercury – two sites, 1 year after filling*

This section suggests a single sample per site within the reservoir, for three sites (expansion outlet, existing SLR basin, expansion SLR basin) one year after filling. This may not capture potential changes in water quality through the different phases of the Project.

EID also states that *Water quality parameters will be monitored by the EID through filling and operations phases, including monitoring at several existing monitoring sites up to 4 times per year.*

a. Clarify what monitoring will be done by EID during the filling and operations phases, including sampled parameters, sampling locations and sampling frequency.

b. Justify the appropriateness of the proposed monitoring (Volume 2, Section 7.7) for monitoring the impacts of the Project throughout all phases, including but not limited to mercury methylation.

c. Compare and discuss how the E-S2 monitoring site is representative in monitoring water quality in the SLR during all phases of the Project.

5.5 Aquatics

128. Volume 2, Section 8.4.1.2, Page 7 and 8

Sampling was conducted in SLR to describe the fish species assemblage and relative abundance. Catch rates for the methods that were used to sample fish in SLR are not standardized to population size which limits utility for estimating abundance. Similar methods can be easily adjusted to provide useful estimates of abundance and target a broader range of fish species to improve description of fish community.

a. Additional sampling of SLR fish populations, especially the Northern Pike population, following procedures developed to index population size and status in Alberta lakes and reservoirs is required.

129. Volume 2, Section 8.4.2.3, Page 12-14

Water quality sampling for baseline conditions documented exceedance of CCME guidelines for fluoride and mercury.

a. If baseline concentration of fluoride and mercury are at or above guideline values, explain if these parameters should be considered sensitive to changes in water management related to the project.

b. Explain the potential consequences of high flouride concentration on fish and other aquatic organisms.

c. Explain the potential consequences of high mercury concentration on fish and other aquatic organisms.

130. Volume 2, Section 8.4.2.6, Page 21-24
Volume 2, Section 8.5.3.7, Page 36

EID states *Prussian Carp (colloquially referred to as Goldfish), an invasive fish, have been introduced in most watersheds across Alberta. They are present in SLR but not abundant based on the inventory (Table 8-8). They have proliferated throughout major population centers when released into stormwater ponds or waterways. Prussian Carp are now a threat to many aquatic ecosystems in Alberta.*

a. Based on experience with Prussian Carp what are the possible outcomes of reservoir expansion for Prussian Carp, and does the expansion of SLR alter possible outcomes?

b. Explain if the presence of Prussian Carp threatens to reduce the potential benefit of a larger reservoir?

131. Volume 2, Section 8.4.2.6, Table 8-7, Page 23

Table 8-7 contains technical errors and omissions. Provide a corrected table including:

a. The Bow River fish assemblage includes 33 fish species – five introduced species and 28 native species.

b. Bow River fish species in the table should also include Bull Trout, Fathead Minnows, Flathead Chub, Goldeye, Lake Trout, Mooneye, Mountain Sucker (now Plains Sucker), River Shiner, Westslope Cutthroat Trout, and Spoonhead Sculpin.

c. Remove Bull Trout from Lake Newell fish assemblage; though Bull Trout may have been documented, they are not considered a resident fish in Lake Newell.

132. Volume 2, Section 8.4.2.7, Page 25 and 26

EID states *Spawning habitat suitable for Lake Whitefish ("firm", coarse, or hard packed substrate) is absent in SLR. No juveniles were caught during the inventories (see Appendix F1, Figure F1-8).*

EID states *Total habitat for Burbot was limited to boulder (riprap) areas on the dam walls.*

EID states *Habitat is suitable for White Sucker feeding and rearing throughout SLR. The reservoir does not contain spawning habitat for this species (unembedded coarse substrate and flow).*

Riprap boulder substrate is known to provide spawning habitat for broadcast spawners in other southern Alberta reservoirs.

a. Explain why coarse, hard substrate is not considered suitable to provide spawning habitat for Lake Whitefish in SLR?

b. Provide justification for the statement that habitat for burbot was limited to areas on the dam walls, explain why riprap boulder substrate is not considered to provide spawning habitat for Burbot in SLR?

c. Provide justification for the statement that the reservoir does not contain spawning habitat for the White Sucker, explain why riprap boulder substrate is not considered to provide spawning habitat for White Suckers in SLR?

133. Volume 2, Section 8.5.3.1, Page 29 and 30

Changes to reservoir physical habitat (Full Supply Level (FSL), depth, total surface area, littoral area, pelagic area) are described, but changes to area with different benthic substrates and changes to area with emergent and submergent vegetation are not fully described.

a. Provide details on how much emergent and submergent vegetation area is anticipated to occur in the expanded reservoir? Describe how much these areas will change from the current reservoir?

b. Provide details on how much coarse substrate is anticipated in the expanded reservoir and where the coarse substrate is located? Describe how much these areas will change from the current reservoir?

134. Volume 2, Section 8.5.3.1, Page 29 and 30
Volume 2, Section 8.5.3.2, Page 30 and 31

Section 8.5.3.2 is titled *Altered Timing of Habitat Availability*, but there is no description or prediction of changes in habitat due to altered timing. In the previous Section 8.5.3.1 it is suggested that littoral habitat will increase due to expansion of the reservoir, but operation is generally described as being similar.

a. Explain if modeling has been completed to describe predicted annual operation and changes in operational timing of the expanded reservoir.

b. Describe the fish habitat area fluctuation based on predicted reservoir operation.

135. Volume 2, Section 8.5.3.3, Page 31

Substantial changes in fish species richness and abundance are not anticipated except for Lake Whitefish and Burbot, which may benefit from an increase in pelagic habitat (both species) and an increase in rocky shoreline (Burbot).

a. Predicted benefit of additional coarse substrate should be supported with quantification of coarse substrate in the expanded reservoir. Provide quantification of coarse substrate in the expanded reservoir.

b. Impacts may be minimal if future operation resembles current operation. Describe the future operation with specific median and quartile ranges of reservoir water levels, if possible.

136. Volume 2, Section 8.5.3.4, Pages 31 and 32

Development and operation of reservoirs in Alberta is promoted on the basis of providing multiple benefits to offset the costs incurred in the source waterbodies.

a. The creation and maintenance of a reservoir fishery is considered a secondary benefit, and assessment suggests an expanded reservoir may improve the recreational fishery, but there is no baseline from which to monitor change. Additional data collection is required.

b. Increased recreational use may cause changes to public access and require maintenance on roads and water management infrastructure. Explain how the increased public access will be managed.

137. Volume 2, Section 8.5.3.5, Page 32

Mercury contamination of fish is identified as a potential environmental impact of the SLR Expansion Project. Insufficient sampling is identified as a limitation to assessing the impact of the project.

a. Provide additional samples to address the sampling deficiency.

138. Volume 2, Section 8.5.3.6, Pages 32 and 33

It is well understood that fish are entrained at unprotected water diversions to irrigation canal systems in southern Alberta. Trout Unlimited has not estimated fish entrainment in canals associated with the SLR. Trout Unlimited quantifies fish recovered from specific sites within canals and released back to source waterbodies. Post et al (2006) and Korman (2025) estimate entrainment at the Carseland Diversion from the Bow River.

a. Explain how EID proposes to mitigate entrainment of fish in the canals associated with SLR?

139. Volume 2, Section 8.5.3.7, Page 36

EID has an Aquatic Invasive Species Prevention Program.

a. How will increased vulnerability to introduction of invasive species by recreational users be managed?

140. Volume 2, Table 8-13, Page 38

Table 8-13 identifies a *Residual Impact Rating for Bioaccumulation of Methyl Mercury in top predators as Low Negative*. Methyl mercury contamination of fish may already warrant consumption advice, and reservoir inundation in southern Alberta typically results in elevation of mercury contamination for several years.

a. Provide justification and evidence for the *Low Negative* rating. Explain if the rating is anticipated because of the implementation of mitigation measures.

6 Terrestrial

6.1 Land Use and Land Management

141. Volume 2, Section 13.6.3, Page 13
Volume 2, Appendix K1, Figure K1-4, Page 5

Figure K1-4 identifies Crown lands, however it is unclear if the bed and shore waterbodies and watercourses within the Project Area are Crown Lands.

a. Provide a map showing Crown owned bed and shore waterbodies and watercourses within the affected area.

b. Describe how EID will obtain approvals for impacting and/or occupying crown owned water bodies and watercourses.

6.2 Conservation and Reclamation

142. Volume 0, Section i-iv, 2.9 [1] (e) and (j), Page 22
Volume 1, Section 10

The final ToR Section 2.9 [1] states *Provide a conceptual conservation and reclamation plan for all phases of the Project. Describe and map as applicable:*

e) current land use and capability and proposed post-development land use and capability;
j) existing and final reclaimed site drainage plans.

It is unclear where the proposed post-development land use and capability, and the existing and final reclaimed site drainage plans maps are located in the EIA.

a. Provide the section of the EIA where these maps are located.

b. If they are not in the EIA, provide the applicable maps.

143. Volume 1, Section 10.3.2, Page 3 and 4

EID also states: *Progressive reclamation is not applicable to this type of project that will be fully built and remain operational indefinitely.*

a. Provide justification for why reclamation cannot occur during the construction phase.

6.3 Vegetation and Wetlands

144. Volume 0, Section i-iv, Section 3.7.2 (11), Page 38
Volume 2, Section 10.5.3, Page 40 and 41
Volume 2, Section 2.7.3, Table 2-4, Page 13

The EID states in Section 10.5.3 *the same water volume will be provided to downstream irrigable lands as at baseline. Thus, there will be no new conversion of native grassland to native pasture or cultivate lands associated with the Project.*

In Table 2-4, the Eastern Irrigation District states under *Future Activities and Disturbances: Increased Irrigation Land (Reasonably Foreseeable)* and *Increased Cropland Conversion of Pasture / Grazing Lands*. These statements seem to contradict each other.

The concordance table also states that ToR 3.7.2 (11) is answered in Volume 2, Section 10.5.3, however it is not clear where the regional significance is discussed.

The ToR 3.7.2 (11) states *Discuss the regional significance of the indirect effects of the conversion of native grassland pasture to tame pasture or cultivated lands with an increase in water availability.*

a. Clarify whether the Project has the potential to result in increased conversion of native grassland to cultivated cropland.

b. Answer ToR 3.7.2 (11).

145. Volume 2, Section 10, Page iii

The EID states that *the cumulative effect of the Project along with past and future projects in the TRSA is expected to be a loss of… 482.3 ha of wetlands within the TRSA.*

a. Clarify what future projects within the Terrestrial Regional Study Area (TRSA) will contribute to further wetland loss, beyond wetland loss due to the proposed reservoir expansion.

146. Volume 2, Section 10, Page iii
Volume 2, Section 10.7, Page 44

The EID states in the Executive Summary that *The resources which showed residual effects from Project activities after all mitigations include … Plant Species of Conservation Concern. These showed a medium negative impact and were selected for cumulative effects assessments*. But in Section 10.7 EID states that *those resources that are not assessed in the CEA due to low negative, neutral, or positive residual impacts include:*

- *Plant Species of Conservation Concern.*

a. Clarify which statement is correct and provide an updated statement.

147. Volume 2, Section 10.2.2, Page 11
Volume 2, Section 10.3.1, Table 10-6, Page 19
Volume 2, Section 10, Appendix H4, Page 25

The EID states that *Each sample site was classified to reference communities from the Dry Mixedgrass Range Plant Community Guide, or in some cases, to the Mixedgrass Plant Community Guide.*

The EID lists *MGA30* as a plant community class observed within the TLSA. MGA30 is a plant community found in a different geographical location and at higher elevations than the study area. The plant species listed in Appendix H4 in the *Field Vegetation Inventory* column and *Vegetation of Class* column for the *Best Fit Community Class* of *MGA30* do not match up.

a. Provide justification for this plant community class decision based on the field vegetation inventory information presented.

b. Provide clarification of methodology used for classification of plant composition data into community types.

148. Volume 2, Section 10.3.1, Page 25

EID states that three noxious weeds plus two prohibited noxious weeds were observed.

a. Provide a map of the occurrence and distribution of Prohibited Noxious and Noxious weeds, and of other non-native plant species.

149. Volume 2, Section 10.3.3, Page 26 and 27

The EID states that *traditional use plant species occur within the TLSA… and that plant species known to have been use by Indigenous Peoples can be readily found throughout the DMG subregion*.

a. Clarify the potential of each ecosite phase or ecological range site within the Terrestrial Local Study Area (TLSA) to support plant species of cultural significance. Explain if certain ecological range sites identified within the TLSA have the potential to support more plant species of cultural significance than others?

150. Volume 2, Section 10.5.2, Table 10-18, Page 38
Volume 2, Section 10.7.3, Table 10-24, Page 46
Volume 2, Section 10.7.4, Page 46

The EID states that the *3% relative contribution to native prairie loss* resulting from the Project is a *low-level impact*. Table 10-18 identifies Magnitude Ratings of Low (<5%) and Medium (5 – 25%). Table 10-24 states that the *Snake Lake Reservoir is Negligible (2% loss)* and *Future Projects and Activities are Low (5% loss)*. Based on Table 10-18, Snake Lake Reservoir should be considered Low and Future Projects and Activities should be considered Medium.

a. Provide justification for the categorizations in Table 10-24 or provide corrected ratings.

151. Volume 2, Section 10.6, Table 10-21, Page 41 and 42

The EID states in Table 10-21 that there will be residual effects including *indirect impacts to adjacent wetlands due to alteration of local hydrology*.

a. Provide a description and map with a corresponding list of adjacent wetlands anticipated to be indirectly impacted, including the wetland classification and water permanence (desktop assessment is sufficient) and the anticipated impacted and any mitigation measures to be implemented.

152. Volume 2, Section 10, Table 10-22, Page 43.
Volume 2, Section 10.8, Page 46
The EID states the *direct loss of wetland area from land clearing and reservoir filling as well as indirect impacts to adjacent wetlands due to alteration of local hydrology* will be short term in duration. As per Section 10.8 (page 46) the proposed wetland loss is to be permanent.

a. Clarify how permanent wetland loss is anticipated to be short term in duration.

153. Volume 2, Section 10.7.1, Page 44
The EID states *An increase in disturbed/non-native plant communities will arise and that diversity will be low until the natural seral progression of grassland occurs*.

a. Discuss the implications of potential vegetation changes for other environmental resources such as terrestrial and aquatic habitat diversity and quantity, water quality and quantity, and erosion potential.

154. Volume 2, Section 10.7.2, Page 45
The EID states that *of the original 11.8 million hectares of native prairie in the DMG natural subregion, 43% remains today (Adams, et al., 2013b).*

a. Provide justification for the use of this statistic as a representation of the state of the Dry Mixedgrass (DMG) subregion today given that the source cited was written 12 years ago.

b. Provide an updated statistic if available.

c. If no updated statistic can be found, provide an updated statement reflecting the age of the statistic presented.

6.4 Wildlife

155. Volume 0, Section i-iv, Section 3.8.2 1(g), Page 38
Volume 2, Section 10.5.3, Page 40 and 41
Volume 2, Section 11.8, Page 95 and 96
EID states *The increased availability of water from the reservoir expansion is meant to provide resiliency to the current irrigation needs within the EID. The expansion is necessary in response to climate change and increasing drought frequency. The same water volume will be provided to downstream irrigable lands as at baseline. Thus, there will be no new conversion of native grassland to native pasture or cultivate lands associated with the Project.*

However, in a NOTICE TO ALL IRRIGATORS Proposed Increase in the Irrigation Expansion, if the project is approved EID proposes 5,000 acres can be added on unsupported areas today, to be supported by Snake Lake Reservoir (Section 6.0, Page 10).
https://www.eid.ca/documents/publications/Proposed_Increase_in_the_Irrigation_Expansion_Limit_Web.pdf.

There are discrepancies between this Notice and what is stated in the EIA.

ToR Section 3.8.2 1(g) states:*Describe and assess the potential impacts of the Project to wildlife, wildlife habitats, and biodiversity considering:*
g) the potential and expected effects on wildlife, wildlife habitats and biodiversity from the loss of habitat due to the conversion of native prairie to irrigated cultivation;

a. Clarify if there will be 5,000 acres of expansion and provide the location of the expansion. Clarify if these areas are already converted.

b. Answer ToR Question 3.8.2 1(g) as it relates the potential conversion of new acres.

156. Volume 1, Section 2.13.4, Table 2.5, Page 27 and 28

Identified locations for aggregate sources are both located in native grassland habitat, including one site adjacent to the Bow River Valley.

a. Explain if the Snake Lake Expansion Project will necessitate expansion of the footprint of these excavations? If yes, quantify the projected expansion footprint and discuss the impacts on native prairie and associated habitat loss.

157. Volume 2, Section 11.5.2.1, Page 71-73

The assertion of habitat improvement for Leopard frog is based on a Habitat Suitability Index (HSI model). This model did not consider the presence of predatory fish. In 2010, a reintroduction to Snake Lake was attempted with the translocation of egg masses. Within 2 years frogs were no longer detected at the site (GOA report in prep). Typically, frogs do not do well in reservoirs and require shallow oxygenated water free from predators. The reservoir will undoubtedly have northern pike and walleye occurring within it. These species are both known predators of leopard frogs and would likely greatly reduce the suitability or habitat or successful reproduction of this species.

a. Explain what specific habitat features in the planned reservoir construction would meet the needs of leopard frogs and would support the assertion that their habitat will increase.

158. Volume 2, Section 11.6.4.1, Page 89
Volume 2, Section 11.7.1.3, Page 94

EID states *The Project will result in a loss of 703 ha of grassland and pasture habitat, which is a relative Project contribution of 0.8% to the cumulative effect. This is a low relative contribution, however, considering the severity of grassland habitat loss across the prairies, even small losses should be avoided, when possible, and mitigated when not.*

Mitigation is mentioned as a concept that should occur in Volume 2, Section 11.6.4.1. Section 11.7.1.3 makes claims about the potential to better manage existing grassland habitat but includes no commitments. EID also states *Enforcing BMPs around rangeland management and restricting cattle from particularly sensitive habitat, at least temporarily (e.g., during nesting season) may have a substantial positive effect for wildlife in the region, potentially offsetting Project losses of grassland habitat.*

Conservation offsets are enabled in the South Saskatchewan Regional Plan (SSRP) and other government policy.

A key component of the SSRP includes conservation offsets to reduce the impacts of development. The plan states:

- Encourage local authorities or qualified organizations to explore the applicability and use of voluntary stewardship and conservation tools on private lands including conservation easements, conservation offset programs and transfer of development credit schemes;
- Explore innovative funding mechanisms to support stewardship and conservation on private lands; and
- Promote private land voluntary conservation actions on native grasslands that support sustainable grazing activities, biodiversity, lands identified as environmentally sensitive areas and/or on wetlands for protection, restoration and development.

a. Provide confirmation on and further details of the conservation offset plans for the Project.

7 Health

159. Volume 2, Section 4.5.1.1, Tables 4-17, 4-18, and 4-19
Volume 2, Section 16.4.1.1, Page 12

The Air Quality Assessment identified three contaminants of potential concern (COPCs) (NO2, SO2, and PM2.5) which were then carried into the human health risk assessment (HHRA). Diesel particulate matter (DPM) was not included as a COPC, although numerous diesel consuming engines were identified for the Project emissions construction case (Tables 4-17 through 4-19). Further, metals and polycyclic aromatic hydrocarbons (PAHs), also known contaminants of diesel exhaust, were not included as COPCs.

Alberta Health (2019) guidance for HHRA indicates that the HHRA must identify and include a list of all contaminants and substances associated with a project and specifically requires that DPM be considered as a COPC *when mobile source emissions associated with the project include diesel combustion*. Further, Alberta Health (2019) guidance indicates that *it is expected that the predicted deposition values from the air modelling will be used in the human health multi-media exposure model.*

a. Provide justification and supporting evidence for exclusion of other COPCs associated with diesel emissions (including DPM, metals and PAHs) for human receptors, or provide an assessment of exposures and associated risks.

b. Provide an assessment of deposition of the COPCs and an associated multimedia assessment or provide scientific rationale for exclusion of the multimedia exposure pathway.

Alberta Health, Government of Alberta. August 2019. Guidance on Human Health Risk Assessment for Environmental Impact Assessment in Alberta, Version 2.0 ISBN: 978-1-4601-4359-9, https://open.alberta.ca/publications/9781460143599

160. Volume 2, Section 3.5, Table 1-2, Page 24
Volume 2, Section 8.8, Page 39
Volume 2, Section 16.4.1.1 and 16.4.1.3, Page 13
Volume 2, Section 16.4.3, Page 15

Volume 2, Section 16.5.2, Page 23-34
Volume 2, Section 16.5.2.4, Page 28

The HHRA identifies mercury as a COPC for the ingestion pathway, and the consumption of fish as an operable exposure pathway. EID states that *No standard models to predict and qualitatively assess methylmercury in fish were considered applicable to the Project* and therefore the HHRA addresses the pathway discussion qualitatively.

Volume 2, Section 3.5 indicates a *neutral* residual impact rating for health effects of ingesting fish from the project; however, risks associated with fish consumption are not defined in the HHRA and baseline samples indicate concentrations of methylmercury in the muscle are within the "avoid consuming fish" for women of reproductive age and within "consumption limit" for other consumers.

Given the baseline concentrations and as EID indicates that it is possible that methylmercury concentrations will increase, it appears that there is the potential for adverse health effects. Further, while monitoring is recommended, exposures could occur prior to monitoring/implementing advisories. The HHRA Toxicity Assessment does not provide a discussion of potential health effects associated with methylmercury exposures via fish consumption. Further, while Indigenous Peoples are identified receptors of concern, the HHRA does not provide consideration of the potential for higher fish consumption rates for this receptor group.

EID stated that *sampling of methylmercury in fish is recommended. The Alberta Government has an existing government fish sampling program under Alberta Health in collaboration with Alberta EPA (Alberta Irrigation Districts Association, 2024; GOA, 2024b); it is recommended that Snake Lake Reservoir be added to this program*.

a. Provide further discussion of potential health risks associated with methylmercury exposure through consumption of sportfish to demonstrate acceptable health risks, including to Indigenous Peoples.

b. Describe the monitoring and mitigation plan being considered to mitigate risk of exposures associated with methylmercury if the Project is ineligible for the Government of Alberta monitoring program.

161. Volume 2, Section 16.4.1 Page 12-14

Alberta Health (2019) guidance for HHRA states *The conceptual model is an output of the problem formulation stage of a risk assessment, providing a schematic description of contaminant sources, release mechanisms, fate and transport processes, as well as exposure routes and vulnerable receptors*. Further, Health Canada (2024) indicates that the conceptual site model is a *key output of the problem formulation stage of a risk assessment*.

The Problem Formulation includes the identification of COPCs, receptors and relevant exposure pathways, but does not present a conceptual site model.

a. Provide a conceptual site model summarizing the Problem Formulation of the HHRA.

Alberta Health, Government of Alberta. August 2019. Guidance on Human Health Risk Assessment for Environmental Impact Assessment in Alberta, Version 2.0 ISBN: 978-1-4601-4359-9, https://open.alberta.ca/publications/9781460143599..

Health Canada. March 2024. Federal Contaminated Site Risk Assessment in Canada: Guidance on Human Health Preliminary Quantitative Risk Assessment. Version 4.0. ISBN: 978-0-660-68497-0, H129-114-2023-eng.pdf.

162. Volume 2, Section 16.4.3, Table 16-3, Page 15
Volume 2, Section 16.4.3 and 16.4.4, Page 15, 16 and 22

Table 16-3 provides Alberta Ambient Air Quality Objectives (AAAQO) that were used as Toxicity Reference Value (TRVs) (except for PM2.5). Toxicological profiles for the COPCs that provide the toxicological endpoints for the TRVs, a review of the available TRVs and rationale for the TRVs selected, have not been included in the HHRA as required by Alberta Health (2019).

The AAAQO used as TRVs for Sulfur Dioxide (SO2) and NO2 do not appear to be human health based. In addition, the assessment of human health effects from SO2 exposure should be conducted based on short-term exposure (10-minute) (WHO 2022; WHO 2021; Health Canada 2016). Finally, while the annual Canadian Ambient Air Quality Standard for PM2.5 is listed in Table 16-3, no assessment of chronic exposures and risks has been conducted for PM2.5.

EID indicates that because Alberta does not have an annual AAAQO for PM2.5, that an assessment of the potential risks to human health was not completed. The potential risk associated with chronic PM2.5 exposures has been described by several agencies and requires further consideration.

a. For each COPC provide rationale for the TRVs selected and estimates of risk using health-based TRVs.
b. Provide adequate scientific rationale for the exclusion of 10-minute SO2 exposures or provide an assessment of this exposure pathway.
c. Identify an appropriate chronic TRV for PM2.5 along with an assessment of annual exposure or provide adequate scientific rationale for exclusion of this exposure scenario.

Alberta Health, Government of Alberta. August 2019. Guidance on Human Health Risk Assessment for Environmental Impact Assessment in Alberta, Version 2.0 ISBN: 978-1-4601-4359-9, https://open.alberta.ca/publications/9781460143599.

Health Canada. February 2016. Human Health Risk Assessment for Sulphur Dioxide: Executive Summary. Available at: https://www.canada.ca/en/health-canada/services/publications/healthy-living/human-health-risk-assessment-sulphur-dioxide-executive-summary.html.

WHO. 2021. Particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide. Executive Summary: Available at: https://iris.who.int/bitstream/handle/10665/345334/9789240034433-eng.pdf.

WHO. October 2022. Health Effects of Short-Term Exposure to SO2. Available at: Factsheet on WHO AQG - Health Effects of Short-Term Exposure to SO2.

163. Volume 2, Section 16, Appendix N

Alberta Health (2019) guidance for HHRA notes that *substantial expertise and professional judgement is required to conduct an HHRA*.

a. Provide a signatory page to the HHRA identifying the authors and their professional designation(s).

Alberta Health, Government of Alberta. August 2019. Guidance on Human Health Risk Assessment for Environmental Impact Assessment in Alberta, Version 2.0 ISBN: 978-1-4601-4359-9, https://open.alberta.ca/publications/9781460143599

164. Volume 2, Section 16, Appendix N

The conclusions of the HHRA are dependent on the predicted air and water quality impact assessment results. Through the SIR process, additional assessment may be required for the air and surface water quality portions of the application thus generating new predicted concentration data.

a. In the event that new or additional concentration data is generated for selected COPC, compare the results to health-based TRVs and discuss the potential health impact or provide justification for not completing these steps.

8 Dam Safety

165. Volume 1, Section 6.2, Page 4

EID states *All geotechnical design tasks have been reviewed and approved by senior geotechnical engineers. Seepage design has been reviewed by an independent expert. The geotechnical design is also expected to be reviewed by an independent expert review board.*

a. Describe what other aspects of the project (e.g., hydrotechnical, structural) have been reviewed or will be reviewed by independent experts? Provide a list of the independent experts involved or planned to be involved and/or the members of the review board.

166. Volume 1, Section 6.2.3, Table 6-1, Page 9

Laboratory tests, such as pinhole dispersion, double hydrometer and SAR tests determined that the borrow material to be used for clay core, as well as for the shells, is moderately to highly dispersive, and not suitable or recommended to be used as dam fill.

a. Provide a description for how EID will mitigate or rectify the issue.

167. Volume 1, Section 6.2.6, Page 17

EID states *The geotechnical design developed contingency plans to address observed unexpected conditions or events. The contingency measures are well defined, feasible, and can be implemented in a time frame that avoids undesirable consequences*.

a. If the contingency plans are found in the EIA, provide the Section. If not, how will the contingency plans be submitted to Agriculture and Irrigation for review.

168. Volume 1, Section 6.3.1, Page 18

EID states *To date, an extensive analysis to estimate the PMF of Project has not been performed*.

a. Provide an explanation for why there has not been an analysis to estimate the probable maximum flood (PMF) of the Project. When does EID plan to complete a probable maximum precipitation (PMP) and PMF analysis? How will this analysis be submitted to Agriculture and Irrigation for review? If EID does not plan to complete the analysis, provide the rationale for this decision.

169. Volume 1, Section 6.3.3, Page 18

EID states *Inflow from the East Branch Canal is not included, as the inlet to the reservoir can be closed if overtopping is a concern*.

a. Explain if the risk of a potential gate malfunction has been considered in this scenario. If not, explain the risk associated with gate malfunction and how it will be mitigated during future stages of the Project.

170. Volume 1, Section 6.6, Page 23-31

EID defines the proposed dam as a zoned earth fill dam. However, the clay till and clay shale that are specified for use in the core and shells are both relatively impervious and more or less similar in engineering properties as they relate to clay content, Atterberg limits, and hydraulic conductivities.

a. Discuss the engineering design approach for a "zoned earth fill dam" when using material of similar properties in both the core and shell.

b. Discuss monitoring and mitigation options that will be considered in the final design to reduce the risks posed by using material of similar engineering properties in both the shell and the core.

9 Errata

171. Volume 0, Section i-iv, 3.4.1, Page 28
Volume 2, Section 7.4.2.4, Page 15-20

Volume 2, Section 7.4.2.4, Pages 15-20 also have information that support ToR Section 3.4.1 and should be referenced in the Concordance Table.

a. Provide all sections where this information is discussed.

172. Volume 0, Section i-iv, 3.4.1 [2], Page 28
Volume 2, Section 7.5.3.2, Page 29

Volume 2, Section 7.5.3.2, Page 29 has information that support the final ToR Section 3.4.1[2] and should be referenced in the Concordance table.

a. Provide all sections where this information is discussed.

173. Volume 0, Section i-iv, 3.4.2 [2](a), Page 29
Volume 0, Section i-iv, 3.4.2 [2](b)(i), Page 29
Volume 0, Section i-iv, 3.4.2 [2](b)(iii), Page 29
Volume 0, Section i-iv, 3.4.2 [3], Page 30

Volume 2, Section 7.5.3.1, Pages 24-27
Volume 2, Section 7.5.3.2, Pages 27-29
The Concordance Table lists the location in the EIA as *Volume 2, Section 7.5.3.1* in response to the term 3.4.2 [2](a), (b)(i), (b)(iii), and 3.4.2 [3] in the final ToR.

Volume 2, Section 7.5.3.1. references *Potential Hydrological Changes* while Volume 2, Section 7.5.3.2. references *Change in Reservoir Water Chemistry*. Section 7.5.3.2. is more relevant to Surface Water Quality and should be included in the Concordance Table.

a. Provide all sections where this information is discussed.

174. Volume 0, Section i-iv, 3.4.2 [4] (a), Page 30
Volume 2, Section 7.4.2.5, Page 20-21
Volume 2, Section 7.4.2.5 speaks to the final ToR Section 3.4.2 [4](a) whereas the Section 7.4.2.4 listed in the Concordance Table does not.

a. Update the sections where this information is discussed.

175. Volume 0, Section i-iv, 3.4.2 [7] (a) and (c), Page 30
Volume 2, Section 7.5.2, Page 23-24
Volume 2, Section 7.5.2 is also a relevant reference for final ToR 3.4.2[7](a) to 3.4.2 [7](c).

a. Provide all sections where this information is discussed.

176. Volume 0, Section i-iv, 3.4.2 [10], Page 31
The latter part of the final ToR Section 3.4.2.10 appears to be missing.

Describe the potential and implications for organic carbon and nutrient management in the Project, based on the proposed operating regime, to:
a) impact treatment of water and downstream (natural or man-made) bodies of water for drinking water purposes (e.g., disinfection by-products); and
b) impact productivity of aquatic vegetation (e.g., macrophyte, algae).

a. Update the concordance table to include the correct final ToR for Section 3.4.2.10 (a) and (b).

177. Volume 0, Section i-iv, 3.7.2 [1], Page 37
The concordance table incorrectly identifies the location of the area of vegetation communities as being found in Tables 10-20 and 10-21. The location of areas of vegetation communities is in Tables 10-19 and 10-20.

a. Provide the correct EIA tables for final ToR Section 3.7.2 [1].

178. Volume 0, Section i-iv, 5 [4], Page 45
The concordance table identified Section 5 Number 4 as being discussed in Aquatic: Volume 2 Section 8.4.2.6, however that seems incorrect as that Section is titled *Fish Populations*. The correct Section appears to be 8.4.2.5.

a. Provide confirmation of the correct section.

179. Volume 1, Section 10.6.2, Table 10-3, Page 8

Table 10-3 is referenced on Page 8 in Section 10.6.2. However, the table does not have a heading.

a. Provide the table with the correct heading.

180. Volume 1, Section 12.4, Page 10

The link to the provincial website listed under Government of Alberta (GOA). *(2024a)* in the references is not redirecting to the referenced document.

a. Provide the correct link.

181. Volume 2, Section 6.4.2.3, Page 31

EID refers to a clip from Google Earth showing the presence of springs in the study area. The attached clip from google earth shows evidence of their presence.

a. Provide this Google image as it was not found in the EIA.

182. Volume 2, Section 7, Appendix E2, Table E2-1, Page 17

The Protection of Freshwater Aquatic Life (PAL) guideline for pH is incorrectly reported in Table E2-1. EID states the PAL guideline for pH as *6 to 9* in Table E2-1, but the guideline is 6.5-9.0.

The PAL guideline for total mercury is incorrectly reported in Table E2-1. The EID states the PAL guideline for total mercury as *0.005 mg/L*, but the guideline is 0.005 µg/L, which is equivalent to 0.000005 mg/L.

a. Provide the correct Environmental Quality Guidelines for Alberta Surface Waters PAL guideline for pH in Table E2-1.

b. Provide the correct Environmental Quality Guidelines for Alberta Surface Waters PAL guideline for total mercury in Table E2-1.

183. Volume 2, Section 7, Appendix E2, Table E2-2, Page 18 and 19

As all values presented in Table E2-2 are averages, this should be clearly stated in the table caption, not just in the footnotes.

a. Provide an updated heading to Table E2-2 that specifies that the data is based on an average reading of multiple sites.

184. Volume 2, Section 10.9, Page 48

The Eastern Irrigation District states *under the Alberta Water Act, loss of wetlands require compensation.*

This statement is misleading as compensation is one option under replacement in the Wetland Policy.

a. Provide an updated statement as the Wetland Policy requires replacement of wetlands in which compensation is an option of the replacement requirements.

185. Volume 2, Section 10, Executive Summary, Page iii

The Eastern Irrigation District states *the values assigned to wetlands are used to assess replacement cost or offset areas for permitting wetland disturbance through a Water Act approval process.*

This statement in the EIA is incorrect. While the relative value of a wetland can be attributed to a replacement ratio, it is more importantly meant to reflect the relative importance of a wetland on the landscape, and to inform wetland management decisions.

a. Provide an updated statement which accurately reflects the Wetland Policy.

186. Volume 2, Section 10.3.1, Page 19

EID states that *The standard classification system for plant communities in the grasslands of Alberta are Natural Subregion-based guides, with each community including a code for the subregion (e.g., DMG for Dry Mixedgrass), letter (A, B, or C identifying grass, forb or shrub dominated).* The B code is used to denote tame/modified plant communities, not forb dominated communities as stated.

a. Provide a correct description as it relates to the *B* code.

187. Volume 2, Section 10.3.4, Page 31

The Eastern Irrigation District states *The Project area occurs in a RWVAU with high historical losses and is assigned the value of 1; for example, a wetland initially assessed as a D gets increased to a C, a C to B and a B to an A.*

The statement in the EIA is incorrect. Relative Wetland Value Assessment Units (RWVAUs) with high historical losses are assigned an abundance modifier of +1, which may increase the value category assigned to a wetland, however that is not always the case.

a. Provide an updated statement which accurately reflects the Wetland Policy.

188. Volume 2, Section 12.5.2.1, Table 12-6, Page 11

In Table 12-6, the Δ (%) of temperature between 1971-1990 and 1991-2020 should be (4.8 – 4.2) / 4.2 * 100 = 14.3%.

a. Provide a corrected table.

189. Volume 2, Section 12.5.4.3, Page 26

EID states *With respect to precipitation, ECCC has developed IDF data related to various climate scenarios to determine how conditions may change in the future.*

a. Provide the link or citation to the dataset used.

190. Volume 2, Section 13, Page i
Volume 2, Section 13.4, Page 5
Volume 2, Section 13.8.3, Table 13-11, Page 27

In three instances, EID identifies Alberta Arts, Culture and Status of Women's correspondence Historical Resources Act (HRA) #4825-21-0010-003 (January 24, 2025) as being a Historical Resources Act Approval. It should be clarified that the document is a Historical Resources Act Approval with Conditions. The condition of the approval is a requirement for targeted palaeontological monitoring during project construction.

a. Update the EIA to indicate that EID has been issued Historical Resources Act Approval with Conditions by Alberta Arts, Culture and Status of Women under HRA #4825-21-001-003.

191. Volume 2, Section 13, Page vi

The abbreviation PHRIA is defined as being a Paleontological Historical Resources Impact Assessment. The definition should be identified as a Palaeontological Historic Resources Impact Assessment.

a. Provide a statement with the correct spelling.

192. Volume 2, Section 14, Page ii

The government agency of Alberta Arts, Culture and Status of Women is referred to as the Heritage Resource Management Branch. This is incorrect.

a. Correctly identify the agency as the Historic Resources Management Branch.

193. Volume 2, Section 14.4.2, Page 8

EID indicates that site EdPb-17 *...is an HRV 0 artifact with scattered materials*.

a. Provide an updated statement as the site is an artifact scatter site with an Historic Resource Value (HRV) 0 rating.

194. Volume 2, Section 14.6.1, Page 13

EID indicates that Alberta Arts, Culture and Status of Women issued a Stage 1 mitigative excavation requirement for sites EdPb-28 and EdPb-39 following the completion of the archaeological Historic Resources Impact Assessment for the project area.

a. Provide an updated statement to reflect that the Alberta Arts, Culture and Status of Women correspondence requiring Stage 1 mitigative excavation was issued under file no. HRA #4825-21-001-002 on May 13, 2022.

195. Volume 2, Section 14.7.1, Page 26

EID indicates that the Historic Resources Application Amendment for additional temporary workspace and storage locations was submitted to Alberta Arts, Culture and Status of Women (ACSW) on April 15, 2024. This is incorrect.

a. Provide an updated statement to reflect that the Historic Resources Application Amendment was submitted to ACSW on March 14, 2025.

196. Volume 2, Section 15.6, Page 7

EID states *Descriptions of Baseline and Project Case TU access can be found in Land Use and Management (see Volume 2, Sections 13.5.7 and 13.6.10).* There is no Section 13.5.7 or 13.6.10 in Volume 2, Section 13.

a. Provide the correct references

197. Volume 2, Section 17.5.3.1 and 17.5.3.2, Page 27
Volume 2, Section 17.5.3.1 and 17.5.3.2, Page 31 and 32

There are two duplicated sections in Volume 2 that are labelled Section 17.5.3.1 and 17.5.3.2. The Sections on Page 27 should be labelled Section 17.4.5.1 and 17.4.5.2.

a. Provide the corrected section numbers and titles.