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Abbreviations

ABWRET-E	Alberta Wetland Rapid Evaluation Tool – Estimator
AEP	Alberta Environment and Parks
AER	Alberta Energy Regulator
CSA	Canadian Standards Association
ECO Plan	Environmental Construction Operations Plan
EIA	environmental impact assessment
EMS	environmental management system
ERBWMP	Elbow River Basin Water Management Plan
IR	information request
LAA	local assessment area
MOU	memorandum of understanding
NEB	National Energy Board
NRCB	Natural Resources Conservation Board
OM&S	Operation Maintenance and Surveillance Manual
PDA	Project development area
Project	Springbank Off-stream Reservoir

9 APPROVALS

9.1 *WATER ACT*

Question 529

Volume 4C, Table C-1, Page C.12
Volume 3A, Section 10.3.1, Table 10-11, Page 10.39
Volume 4D, Section 6.1, Page 6.1
Volume 4D, Section 6.2, Pages 6.1 and 6.2

Alberta Transportation states that *A site specific erosion and sediment control plan will be developed*. In addition, it provided *Soil Handling and Revegetation Mitigation Measures* that provided an overview of how sediment would be removed from drainage courses inside the reservoir as required.

Alberta Transportation also committed that *AEP will have an Operation, Maintenance and Surveillance Plan developed for the reservoir will be that would include sediment stabilization and debris (sic)*.

a. Identify if the *Site Specific Erosion and Sediment Control Plan* will be a stand alone document or incorporated into the *Operation, Maintenance and Surveillance Pla*n for the post construction operation by AEP.

Response 529

a. The Site-specific Erosion and Sediment Control Plan will be a stand-alone document as part of the Environmental Construction Operations Plan (ECO Plan) to be developed by the selected construction contractor using Alberta Transportation's ECO Plan framework.

   Relevant components of that Site-specific Erosion and Sediment Control Plan will be incorporated into the Operation, Maintenance and Surveillance Plan by AEP Operations.

Question 530

Volume 3A, Section 10.2.2.2, Table 10-4, Page 10.21
Volume 3A, Section 10.2.2.4, Table 10-9, Page 10.36
Volume 3A, Section 10.4.5, Table 10-13, Page 10.52
Volume 3B, Section 10.2.2.3, Table 10-8, Page 10.14
Volume 3B, Section 10.2.2.3, Table 10-11, Page 10.22
Volume 3B, Section 10.2.4, Table 10-12, Page 10.26

Alberta Transportation identifies that the LAA area covered by wetlands is 311.6 ha (3A Table 10-4). It then identifies that the wetlands in the LAA with a value cover of 123 ha prior to 30 ha being lost to construction (3A Table 10-13).

Alberta Transportation noted that the design flood would cover 70.3 ha of wetland in the reservoir (3B Table 10-8). It also notes that 29.8 ha out of 108.2 ha of wetlands would be covered by more than 3 cm of sediment in the reservoir (3B Table 10.11) and then it noted that wetlands in the PDA with a value totaling 15.3 ha would have 12 ha inundated (3B Table 10-12).

a. **The 108.2 ha of wetlands in the reservoir identified in Volume 3B, Table 10-11 did not appear to have a source and it is inconsistent with the 70.3 ha to be flooded as identified in Volume 3B, Table 10-8. Provide a breakdown of the wetland areas in the LAA, the reservoir, and the area of these wetlands that will be removed by construction and the wetlands that will be inundated by floodwater.**

b. **Provide details on the wetland assessment method used to arrive at *estimated* values for wetlands and identify where the valued wetlands are located.**

Response 530

a. Table IR530-1 lists wetland areas in the PDA and vegetation LAA. In addition, it shows the area of wetlands that will be removed by construction, reclaimed following construction (i.e., present in dry operations), and inundated by a flood. Tables 10-5, 10-6 and 10-8 of Volume 3B, Section 10 contained errors in the area of community types in the PDA. Table IR530-1 replaces Volume 3B, Section 10, Table 10-5, Table 10-6 and Table 10-8. The areas of inundation are largely unchanged.

Table IR530-1 Vegetation and Wetland Cover Types Removed by Construction, Present in Dry Operations and Inundated during Floods (in the Off-Stream Reservoir)

Cover Type	Land Unit	LAA Existing Condition Area (ha)	PDA Existing Condition Area (ha)	PDA Area Removed by Construction (ha)	PDA Area Dry Operations[1] (ha)	PDA Area Inundated[2] (ha)		
						1:10 Year Flood	1:100 Year Flood	Design Flood
Broadleaf forest	b2 Hairy wild rye Aw	0.2	0.0	0.0	0.0	0.0	0.0	0.0
	d1 Pine grass Aw	21.3	0.1	0.0	0.1	0.0	0.0	0.0
	e1 Snowberry-silverberry Aw-Pb	89.8	1.5	1.2	0.3	0.0	0.0	0.0
	f2 Red osier dogwood Pb-Aw	67.1	19.7	1.8	18.0	0.0	0.0	0.0
	g2 Horsetail Aw-Pb	73.4	0.0	0.0	0.0	0.0	0.0	0.0
Coniferous forest	b4 Hairy wild rye Sw	59.1	0.0	0.0	0.0	0.0	0.0	0.0
	d3 Pine grass-Sw	6.8	0.0	0.0	0.0	0.0	0.0	0.0
	g1 Horsetail Sw	179.3	17.3	11.0	6.3	0.0	0.0	0.0
Mixed forest	b3 Hairy wild rye Aw-Sw-Pl	109.9	14.1	8.9	5.2	0.0	0.0	0.0
	d2 Pine grass-Sw-Pl-Aw	2.5	0.0	0.0	0.0	0.0	0.0	0.0
	e2 Snowberry-silverberry Sw	81.9	24.4	2.8	21.6	0.0	0.0	0.0
	e4 Snowberry-silverberry Sw-Aw	16.1	9.0	6.5	2.5	0.0	0.0	0.0
	f1 Red osier dogwood Sw	85.7	19.5	16.6	2.9	0.0	0.0	0.0

Table IR530-1 Vegetation and Wetland Cover Types Removed by Construction, Present in Dry Operations and Inundated during Floods (in the Off-Stream Reservoir)

Cover Type	Land Unit	LAA Existing Condition Area (ha)	PDA Existing Condition Area (ha)	PDA Area Removed by Construction (ha)	PDA Area Dry Operations[1] (ha)	PDA Area Inundated[2] (ha)		
						1:10 Year Flood	1:100 Year Flood	Design Flood
Shrubland	e3 Shrubland - mesic/rich	99.0	33.7	18.6	16.4	0.9	0.0	0.0
	f3 Shrubland - subhygric/rich	309.5	163.2	66.7	96.5	0.6	0.0	0.0
Grassland	b5 Grassland – submesic/medium	37.9	21.3	14.9	25.3	1.6	5.4	6.4
	c1 Rough fescue	381.8	187.6	74.8	178.7	0.0	12.2	78.0
	d0 Grassland - mesic/medium [c]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	e0 Grassland - mesic/medium [c]	0.0	0.0	0.0	21.8	2.1	10.3	20.5
	f4 Grassland - subhygric/rich	5.4	4.1	0.0	69.0	2.2	57.5	122.9
	g0 Grassland - hygric/rich [c]	0.0	0.0	0.0	8.7	0.0	0.0	6.4
	Upland Subtotal	**1,626.7**	**515.5**	**223.8**	**473.3**	**7.4**	**85.4**	**234.2**
Open Water	Open Water	283.5	102.4	30.6	98.8	9.4	52.8	61.2
	Open Water Subtotal	**283.5**	**102.4**	**30.6**	**98.8**	**9.4**	**52.8**	**61.2**

Table IR530-1 Vegetation and Wetland Cover Types Removed by Construction, Present in Dry Operations and Inundated during Floods (in the Off-Stream Reservoir)

Cover Type	Land Unit	LAA Existing Condition Area (ha)	PDA Existing Condition Area (ha)	PDA Area Removed by Construction (ha)	PDA Area Dry Operations[1] (ha)	PDA Area Inundated[2] (ha)		
						1:10 Year Flood	1:100 Year Flood	Design Flood
Ephemeral Waterbody	Ephemeral waterbody	5.0	0.7	0.3	0.7	0.0	0.3	0.4
Graminoid Marsh	Temporary graminoid marsh	92.9	32.4	10.5	27.2	1.1	11.3	23.7
	Seasonal graminoid marsh	102.7	47.1	8.8	42.9	0.0	18.3	32.8
	Semi-permanent graminoid marsh	34.7	18.1	8.7	13.7	0.0	12.2	13.3
Shallow Open Water	Saline shallow open water with submersed and/or floating aquatic vegetation	0.9	0.0	0.0	0.0	0.0	0.0	0.2
Shallow Open Water	Shallow open water with submersed and/or floating aquatic vegetation	7.2	0.2	0.0	0.2	0.0	0.0	0.2
Shrubby Swamp	Seasonal shrubby swamp	5.3	1.4	0.3	1.1	0.0	0.0	1.1
Wooded Mixedwood Swamp	Seasonal wooded mixedwood swamp	20.3	0.0	0.0	0.0	0.0	0.0	0.0

Table IR530-1 Vegetation and Wetland Cover Types Removed by Construction, Present in Dry Operations and Inundated during Floods (in the Off-Stream Reservoir)

Cover Type	Land Unit	LAA Existing Condition Area (ha)	PDA Existing Condition Area (ha)	PDA Area Removed by Construction (ha)	PDA Area Dry Operations[1] (ha)	PDA Area Inundated[2] (ha)		
						1:10 Year Flood	1:100 Year Flood	Design Flood
Graminoid Fen	Moderate-rich graminoid fen	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Shrubby Fen	Moderate-rich shrubby fen	42.6	23.1	0.8	22.3	0.0	0.0	0.0
Wetland Subtotal		**311.6**	**123.0**	**29.4**	**108.2**	**1.1**	**42.1**	**71.7**
Agricultural	Annual Crop	547.2	136.6	124.8	11.8	0.0	0.0	0.0
	Dugout	2.0	0.5	0.1	0.4	0.0	0.4	0.4
	Hayland	469.5	82.8	75.7	7.1	0.0	0.0	0.0
	Tame Pasture	1,325.2	411.5	199.0	553.5	2.7	277.9	373.2
Disturbed Land	Disturbed Land	294.6	65.4	50.4	184.5	1.0	21.8	75.5
Anthropogenic Subtotal		**2,638.5**	**696.8**	**450.0**	**757.3**	**3.7**	**300.1**	**373.6**
Total Area[3]		**4,860.0**	**1,437.7**	**733.9**	**1437.7**	**21.6**	**480.4**	**816.2**

NOTES:

[1] Area at dry operations includes areas restored following construction.

[2] Inundated area of land unit present at dry operations.

[3] Totals may differ from sum of individual values due to rounding.

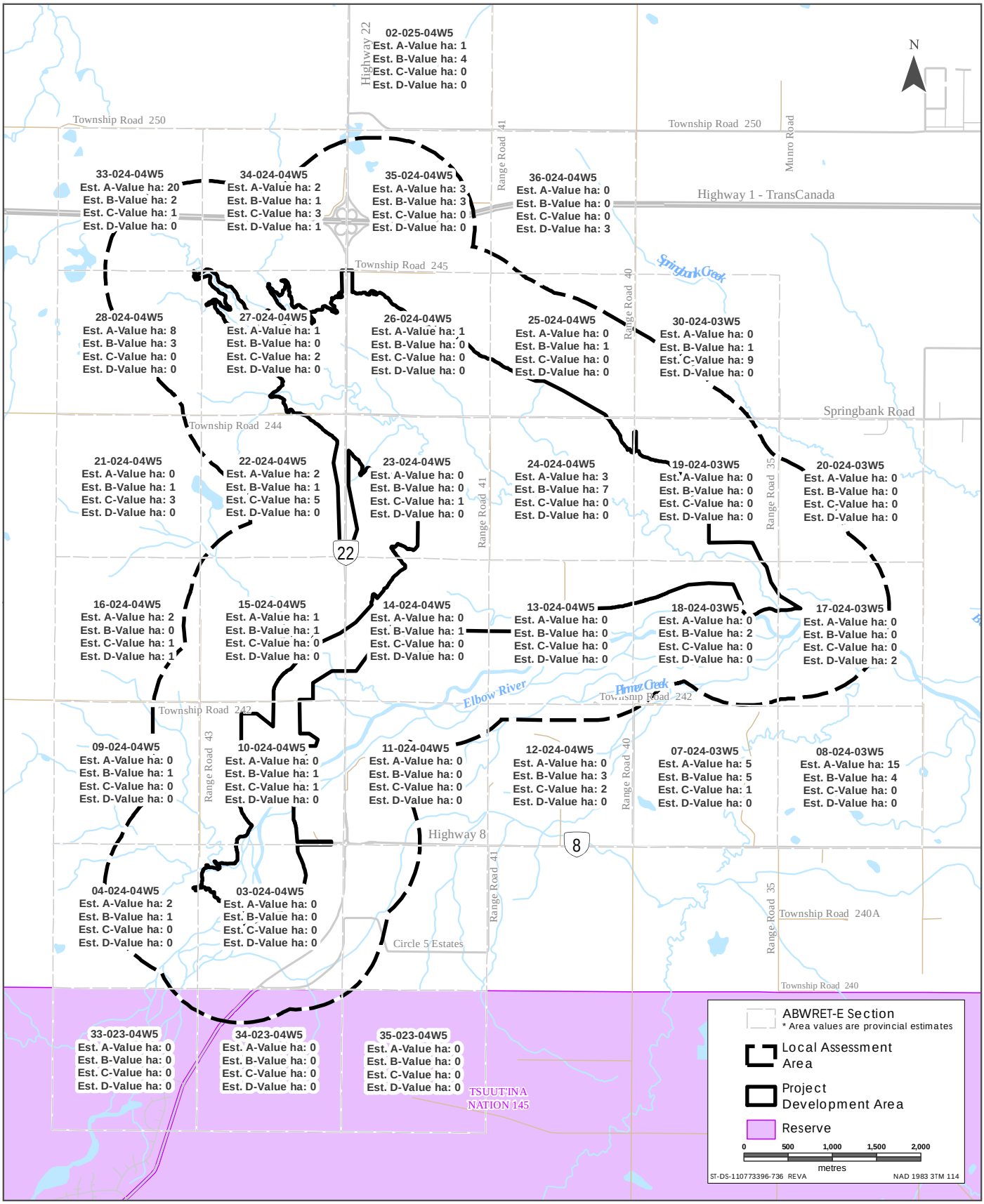
b. The existing wetland area of 123 ha in the vegetation LAA identified in Volume 3A, Section 10.4.5, Table 10-13 was calculated using the Alberta Wetland Rapid Evaluation Tool – Estimator (ABWRET-E) (GoA 2015). That table provides an estimate of the area of wetlands by value class (A (highest) value, B value, C value and D (lowest) value) for wetlands captured within the Alberta Merged Wetland Inventory by Alberta Township System Version 4.1 for sections intersected by the vegetation LAA. The wetland areas shown in Volume 3B, Section 10.2.4, Table 10-12 (i.e., 15.3 ha) are calculated using the ABWRET-E Alberta Merged Wetland Inventory data, except for sections intersected by the PDA.

   The estimated wetland values are summarized from GOA (2015). Wetland areas identified with this approach are not spatially explicit and are not directly comparable to wetland areas determined from Project mapping.

   Figure IR530-1 shows the area of wetland value classes by section in the vegetation LAA.

REFERENCES

GoA (Government of Alberta). 2015. Alberta Wetland Rapid Evaluation Tool – Estimate of Relative Wetland Value by Section. Alberta Environment and Parks. Edmonton, Alberta.



Sources: Base Data - Government of Alberta, Government of Canada, Thematic Data - Stantec Ltd.

Distribution of ABWRET-E Wetland Values in the LAA Using the Alberta Merged Inventory (Version 4.1)

Question 531

Volume 3B, Section 10.2.2, Table 10-4, Page 10.4
Volume 3B, Section 10.2.2.3, Page 10.12
Volume 3B, Section 10.2.2.3, Page 10.23
Volume 3B, Section 10.2.4, Page 10.26

Alberta Transportation made the following statements:

- **For 3-10 cm of sediment deposition;** ***Most species comprising upland and wetland plant communities at existing conditions are retained in addition to recruitment of new species (Van der Valk and Bliss 1971; Van der Valk et al. 1983; Limon and Peco 2016). Small changes to existing species diversity and abundance are expected.***
- ***Plants species that comprise wetland plant communities have inherent adaptation to seasonal or periodic flooding (Cronk and Fennessy 2001). Thus, wetland plant communities would be more tolerant to prolonged flooding***
- **For 3-10 cm of sediment deposition;** ***Sediment of this depth has been shown to negatively affect vegetation productivity; however, high rates of mortality have not been observed (Van der Valk and Bliss 1971; Van der Valk et al. 1983; Limon and Peco 2016).***
- ***The inundation duration from the design flood is 62 days and deposition of sediment greater than 3 cm would likely alter wetland plant composition and abundance. It has been observed that sediment deposition of 3 cm to 4 cm is enough to affect productivity of wetland plant species in Alberta (Van der Valk and Bliss 1971). Deposition of sediment is likely to alter wetland topography, resulting in changes to surface flow and alteration of wetland basin shape and depth.***

a. These statements provide contradictory information. Provide a detailed explanation of the effect of the design flood regarding sediment deposits on wetlands. Provide an update so that the contradictory information is corrected and the new information is added.

b. Provide an assessment of the cumulative effect of multiple floods on all wetlands identified within the PDA with an estimate of the number of 1:100 and greater floods that would result in the wetlands being impaired by sediment depth. Include an assessment of the depth of sediment that would result in the wetlands becoming upland sites.

c. Identify what mitigation (restoration or replacement) is proposed for each of the wetlands identified in the PDA that will be affected by sediment deposition due to flooding.

Response 531

a. The statements in the question do not provide contradictory information; however, they have been clarified below to more clearly describe the effects of sediment deposition on wetland communities.

   As stated in Volume 3B, Section 10.2.2, Table 10-4, sediment deposition of less than 3 cm is not predicted to affect wetland plant communities. With sediment deposition of 3 cm to 10 cm, small changes to species diversity and abundance are expected (this responds to the first item in the question and the fourth item in the question), however most species are retained (this responds to the first item in the question).

   While effects to vegetation productivity are expected with 3 cm to 10 cm of sediment deposition (this responds to the third item in the question and the fourth item in the question), widespread mortality is not expected (this responds to the third item in the question). As a result, wetland communities are expected to persist with 3 cm to 10 cm of sediment deposition.

   Wetland plant communities are more tolerant of prolonged flooding than upland plant communities (this responds to the second item in the question).

   With greater than 10 cm of sediment deposition, most of the species at existing conditions are lost in the herbaceous and short shrub layers and are replaced by new species, and wetland communities are expected to transition into upland communities.

   While the deposition of sediment is likely to alter wetland topography, resulting in changes to surface water flow and alteration of wetland basin morphology, these changes do not necessarily result in the outright loss of wetland communities. Changes in surface flow and topography could also result in the creation of wetland communities either by changing shape and depth of existing wetlands, or inundation of new areas because of changes caused by sedimentation.

   An assessment of the effects of sediment deposition described above resulting from the design flood is provided in Volume 3B, Section 10.2.2.3 and Section 10.2.4. Section 10.2.2.3, which discusses change in area of wetland communities within the PDA as a result of sediment deposition. Section 10.2.4 describes effects on wetland functions as a result of sediment deposition.

b-c. As described in Volume 3A, Section 10.6, *Water Act* approval would be obtained for disturbances to wetlands before construction, and permanent disturbance to wetlands would be replaced in accordance with the *Alberta Wetland Policy*. As a conservative approach, Alberta Transportation will obtain *Water Act* approval for disturbance to all wetlands within the design flood footprint in the off-stream reservoir as if they were lost. Since it is assumed that all wetlands will be lost and mitigated according to the *Alberta Wetland Policy,* it is not necessary to assess multiple floods to determine when wetland communities would become uplands sites.

Question 532

Volume 1, Section 3.4.1, Page 3.33

Alberta Transportation states *The low-level outlet would remain open to carry the flow of the unnamed creek over which the dam was built*. This permits natural flow from the unnamed creek basin to flow unimpeded during spring runoff and other local rainfall events. The Elbow River Basin Water Management Plan (ERBWMP) has an objective to *Manage water source areas to improve water quality in the Elbow River* and Appendix B of the ERBWMP provides water quality objectives.

a. Provide an assessment of the possible methodology and benefits to water quality and hydrology of operating the outlet during non-flood periods to provide storm water retention behind the dam with a post-storm controlled release to meet water quality objectives.

b. Identify how AEP, as the reservoir operator, can work with watershed authorities on managing water quality between flood events and identify if that information can be placed in the *Operation, Maintenance And Surveillance Plan* to be provided to AEP.

If the information can be placed in the *Operation, Maintenance and Surveillance Plan* can Alberta Transportation commit to having that information added?

Response 532

a. The Project was designed to meet the single objective of flood mitigation in Elbow River. As such, additional operational objectives were not designed into the Project including storm water management. Nonetheless, the following provides a discussion regarding such management.

The low-level outlet is designed as a flow-through system for water from the reservoir. Closing the outlet during non-flood periods would impound stormwater runoff into the off-stream reservoir. Retention of stormwater to meet water quality objectives is typically only done in urbanized landscapes where runoff rates increase for a given storm because there are more impermeable areas and storm systems deliver water to watercourses faster than in the pre-

development condition. The objective of such operations is typically to store the faster, excess runoff and release it at rates similar to those that were present prior to development.

These considerations do not apply to the Project; the Project does not increase the amount of impermeable area. Runoff will not be greater in peak or volume, nor will it arrive at the Elbow River faster than in existing conditions. There will not be a benefit to water quality from withholding stormwater by closing the low-level outlet during non-flood periods.

b. AEP Operations will manage the water quality in the reservoir. Without modification to the low-level outlet's operation for non-flood stormwater retention, the Project has a net-positive impact on all the Appendix B Water Quality Objectives and Indicators. The Project removes existing agricultural and ranching operations from a portion of the basin thus supporting the objectives of the Elbow River Basin Water Management Plan (ERBWMP).

   If a storm were to occur that would initiate flood conditions and if the reservoir retain that stormwater prior to partial diversion of river flood flows, then this may affect AEP Operations' ability to maximize flood diversion capacity and post-flood release rates. This would negatively affect how the Project is used for flood mitigation. Therefore, the off-stream reservoir will not be used as a stormwater retention pond.

Question 533

Volume 1, Section 3.2.8.1, Figure 3.12, Page 3.21
Volume 1, Section 3.2.8.1, Page 3.28
Volume 3D, Section 1.4.6, Pages 1.15 and 1.16
Volume 3D, Section 1.5.6, Pages 1.25 and 1.26

Alberta Transportation is proposing that pipelines carrying gas and oil through the Project are to be relocated. In addition, an abandoned pipeline (Plains Midstream Canada ULC) is identified as being within the proposed reservoir.

a. Clarification is required with regard to the relocation and abandonment of pipelines. Describe and provide a sketch of pipelines that will be:

   i. abandoned in place;

   ii. removed; and

   iii. new construction (relocations).

b. If pipelines are to be left within the reservoir explain the mechanisms for weighting pipe when the pipeline is already buried.

c. There is a potential for an abandoned pipeline to leach contaminants from coatings and from products left in the pipeline. Provide details on how each pipeline will be cleaned and abandoned with reference to requirements in CSA Z662 as well as giving consideration to removal of the pipeline.

d. If abandoned pipelines are not removed they may act as water conduits under the reservoir and dam which would be a potential hazard to the reservoir operation. What mitigation measures will be used to prevent a water conduit effect from happening on abandoned pipelines?

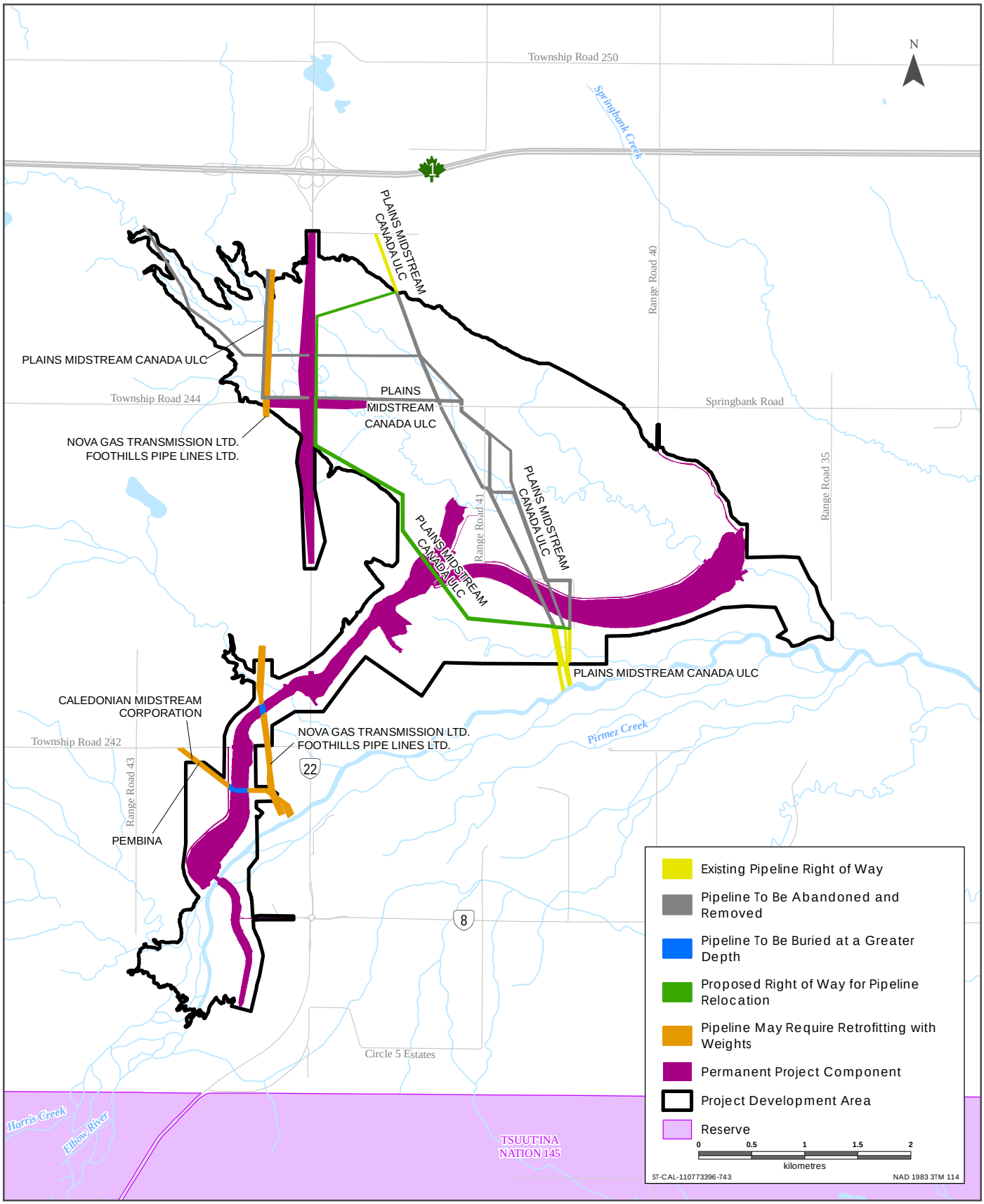
Response 533

a. Figure IR533-1 identifies the pipeline modifications within the PDA.

Engineering for the abandonment, removal or retrofit of these pipelines is the responsibility of the pipeline owners, who are compensated by Alberta Transportation for this work as described in Alberta Transportation (2011). Work will be completed under the regulatory requirements and design standards and codes for pipelines regulated by the Alberta Energy Regulator (AER) and the National Energy Board (NEB) (where applicable). As outlined in Volume 1, Section 3.2.8.1, activities associated with the relocation or retrofit will be executed entirely by pipeline operators. Alberta Transportation has provided the owners with specific requirements of their design to accommodate the Project. Those requirements are described below.

Plains Midstream Canada operates three pipelines (a crude oil pipeline, a low-vapour pressure product pipeline and an abandoned pipeline) that cross the PDA at the deepest part of the off-stream reservoir and pass under the off-stream dam. The pipelines located within the PDA will be abandoned and removed. The two active pipelines will be relocated from their current rights-of-way within the PDA in a loop to the west alongside the east side of Highway 22, and out of the deeper portions of the off-stream reservoir (Figure IR533-1). Pipe weighting may be required in some areas where these pipelines are under water within the portion of the off-stream reservoir flooded at full supply level; weighting requirements are subject to engineering design by the owner.

TransCanada Pipelines Ltd. operates two natural gas pipelines under the entities of Foothills Pipelines Ltd. and NOVA Gas Transmission Ltd. Both pipelines will remain operational and stay in their current rights-of-way (Figure IR533-1). The pipelines in the upper reaches of the off-stream reservoir will likely be retrofitted by weighting while the sections of the pipelines (located in the south portion of the PDA) that cross the diversion channel will be trenched or horizontally directionally drilled to a depth that buries them below the diversion channel by a minimum of 3 m.



Sources: Base Data - ESRI, Natural Earth. Thematic Data - ERBC, GeoLOGIC (2015)

Pipeline Modifications within the PDA

Stantec

Caledonian Midstream Corporation and Pembina operate side-by-side high vapour pressure product pipelines and both pipelines will stay in their current rights-of-way (Figure IR533-1). They will be modified in the same way as the TransCanada pipelines: trenched or horizontally directionally drilled to a depth that buries them to a depth of no less than 3 m where they cross under the diversion channel.

b. For pipelines that are left operating and have potential to be in flooded areas during operations, the mechanism for weighting pipe will be determined by the owners and their engineers. Common methods include concrete weights or bags, or shotcrete. As outlined in Volume 1, Section 3.2.1, activities associated with the relocation or retrofit will be executed entirely by the pipeline operators.

c. Abandoned pipelines will be removed in accordance with requirements of CSA Z662 and other regulatory requirements for the decommissioning and removal of pipelines. Pipelines will be abandoned and removed by third party pipeline operators during the construction required for the Project.

d. As stated in the response to a. and c., abandoned pipelines will be removed and there is, therefore, no potential for abandoned pipelines to act as water conduits.

REFERENCES

Alberta Transportation. 2011. Engineering Consulting Guidelines for Highway, Bridge, and Water Projects. Volume 1 – Design and Tender, 2011. Available at: http://www.transportation.alberta.ca/Content/docType29/Production/ECG%20Vol%201%20-%202011.pdf

Approvals
May 2019

9.2 OTHER

Question 534

Volume 3A, Section 3.2.1.3, Page 3.20

Alberta Transportation states *Light monitoring was conducted during the night of January 6 and 7, 2017 (ground was snow covered) at four sites (Figure 3-2) either adjacent to or with unobstructed views of the PDA*:

Testing over two nights and only during the 2017 year is a very small time frame and not representative enough to determine the effects of light especially considering the fact that construction will take place 24 hours a day, and will continue throughout the year until construction is finished. This means that during construction light trespass will occur over all seasons and a variety of climatic conditions.

a. Justify and explain why light testing was not conducted throughout the year under a variety of different circumstances such as seasonal conditions (winter, summer, spring, fall) and climatic conditions (rain, snow, etc.).

Response 534

a. Measuring incident light and sky glow should occur during periods of low moon light and clear skies because these are conditions when the sky is at its darkest. The light measurements on January 6 and 7 (2017) occurred during clear skies and the moon was not in the sky. Accordingly, the light measurements taken are considered appropriate and adequate for the Project.

   For estimating Project lighting effects, existing conditions when the sky is darkest are compared to estimated lighting during Project activities.

   Ambient light measurements taken during each season is typically not required. Incident light levels are not sensitive to seasonal variation, and sky glow typically varies by less than 0.1 mag/arcsec^2 (depending on the season). Sky glow is usually dominated by other factors, including anthropogenic light, celestial objects (e.g., the moon) and meteorological conditions (e.g., cloud cover).

Question 535

Volume 3A, Section 3.4.1.2, Page 3.40
Volume 3A, Section 3.5.2, Page 3.132

Alberta Transportation states *Lighting can become obtrusive if the light criteria in Table 3-4 and Table 3-5 are not met. The effects of Project lighting on nearby residential locations is assessed by comparing the predicted light changes to the these light criteria.*

Alberta Transportation also states *a significant environmental effect on lighting is defined as an increase in Project related light emissions that are greater than the CIE guidelines (Section 3.1.5.1) for light trespass and glare in a rural environment (E2) and the resulting conditions related to sky glow would be altered toward those of an urban environment.*

At no point are the impacts from light on wildlife addressed. Within the EIA changes in wildlife movement, mortality risk, biodiversity, etc. are all discussed.

a. **Why did Alberta Transportation not look at the impacts to wildlife from light especially when construction is to take place 24 hours a day? List the species in the area that could be affected from light trespass at night. Be sure to include species that may be drawn to the PDA at night as a result of the light and those that may move further away from the PDA to avoid the light.**

b. **How does the light impact the species movement and mortality risk (if species are drawn to the light would this increase the number of vehicle collisions as they would be drawn to the PDA)? Explain.**

c. **If any species are to avoid the light during nighttime conditions where is it expected that these species will move to?**

d. **If any of the species from (c) move to another area is there a chance that predator prey relationships might change? Explain and provide the rationale behind the conclusion.**

e. **Can the mitigation measures discussed for light trespass in a rural area be applied wildlife? If there are different mitigation measures that apply for light trespass on wildlife discuss the different mitigation measures and if these mitigation measures will be adopted. If they will not be adopted why not?**

Response 535

a. The impacts of sensory disturbance, including lights, on wildlife during construction are considered in Volume 3A, Section 11.4.2, page 11.40 and page 11.42; and Section 11.4.7, page 11.73, page 11.79, and page 11.80. Nocturnal species such as rails (e.g., sora), amphibians (e.g., boreal chorus frog, wood frog), some small mammals (e.g., rodents, American badger) and diurnal prey species (e.g., songbirds, deer) are more likely to avoid light (Beier 2006; Yorzinski et al. 2015).

   Species that may be drawn to light include nocturnal migrating birds (e.g., songbirds, shorebirds) (La Sorte et al. 2017) as well as bats, which may be indirectly drawn to light where insect prey may congregate (Stone et al. 2015; Cravens et al. 2018). The effects of light on wildlife due to the Project will be reduced during dry operations.

b. Smaller nocturnal species can be affected by light by either reducing their movement to avoid predators in lit areas or increasing predation risk (i.e., mortality risk) by foraging in or near lit areas (Beier 2006; Longcore and Rich 2016). Due to increased predation risk, diurnal prey species can also be affected by increasing their nocturnal vigilance while sleeping (Beier 2006; Yorzinski et al. 2015). Deer have shown some avoidance behaviours to light in wildlife underpasses (Bliss-Ketchum et al. 2016), thereby affecting their movement; however, other studies have shown no effect of light on deer (Reed et al. 1975). Similarly, some large carnivores (e.g., cougar) will avoid light, changing their local movement (Beier 2006). Lights can change the movement of nocturnally migrating birds by attracting them and causing them to become disoriented (Beier 2006; La Sorte et al. 2017).

   Some bat species are drawn to light because of the abundance of insect prey available under the lights; this can cause unnatural changes in foraging behaviour and, thereby, changes in bat movement in the area (Beier 2006; Stone et al. 2015; Cravens et al. 2018). Manoeuvrable and efficient fliers (e.g., aerial hawkers), such as little brown myotis (Naughton 2012), are more likely to be attracted to lighted areas than erratic, flutter fliers which would have increased predation risk near lights (Lacoeuilhe et al. 2014; Mathews et al. 2015). Because some of the mobile lighting units will be located at major roadway intersections (see the response to c), there is potential for increased mortality risk for foraging bats through vehicle collisions (Stone et al. 2015).

c. Mobile light units are expected to be used in the PDA and at major roadway intersections (see Volume 3A, Section 3, Figure 3-6), as required for safety during construction (e.g., areas will not require night work at the same time). Areas with lighting will be associated with human disturbance during construction activities; therefore, wildlife species are likely to avoid these areas even if lights were not used. The use of light is unlikely to create additional sensory disturbance. Given that some of the mobile light units will be placed in already disturbed areas (e.g., major roadway intersections) and are concentrated in certain parts of the PDA (as opposed to spread throughout the PDA), there will be substantial areas of the

PDA with little to no sensory disturbance including light trespass. As such, wildlife species are expected to either remain in areas where there is no light trespass or move to other suitable habitats within the PDA or wildlife LAA.

d. Artificial lighting can affect certain predator-prey relationships for species that avoid light (Longcore and Rich 2016). Although predator and prey species, such as cougar and deer, might avoid lights in some parts of the PDA, predator or prey abundance is not expected to measurably change as a result of the Project.

e. Yes, mitigation measures discussed for light trespass in Volume 3A, Section 3.4.4.2 and Volume 3A, Section 11.4.2.2 can be applied to wildlife, specifically:

- Lights will be positioned so that the luminaires can be pointed downward with no more than a 10º tilt from the horizontal, so that only the working area is illuminated.
- As much as is possible, lighting will be located such that unavoidable light spill off the working area is not directed toward receptors outside the PDA. Mitigation where lights are focused away from surrounding habitat and towards the work site should reduce the residual effects of light trespass on wildlife.
- Lighting will be located so that the lights are not directed toward oncoming traffic on nearby roads on or off-site because of the nuisance and safety hazard this may present. This can reduce the likelihood of an animal-vehicle collision because wildlife is then more visible to vehicular traffic.
- Lights will be designed to avoid excessive use of the mobile flood lighting units and reduce potential effects by turning off lighting when they are not required.

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Question 536

Volume 3A, Section 3.4.4.2, Page 3.55 and 3.56

Alberta Transportation states *To limit potential effects from the use of the mobile lighting on light trespass, glare, and sky glow, the following mitigation measures would be employed:*

Lights will be positioned so that the luminaires can be pointed downward with no more than a 10° tilt from the horizontal, so that only the working area is illuminated.

Adherence to lighting design guidelines, such as CIE, IDA, IES, and the lighting requirements for workspaces as enforced by Labour Canada.

Alberta Transportation goes on to list 4 other mitigation measures in addition to the two listed above.

a. How will Alberta Transportation ensure that all the mitigation measures listed are being followed and adhered to? Will any checks be in place? Will any policy or procedures be created for workers on site to ensure that before starting work or throughout the work day/night that all the mitigation measures are be followed and checked? If no check, policies, or procedures are to be in place justify and explain why this is not required.

Response 536

a. Monitoring of construction-related mitigations, such as light, will be part of the *Environmental Construction Operations Plan (ECO Plan) Framework* (Volume 4, Supporting Documentation, Document 10). The ECO Plan will be developed and implemented by the contractor and in accordance with Alberta Transportation. The ECO Plan has provisions to ensure compliance with applicable guidelines, regulatory requirements and proponent commitments. As part of the ECO Plan, the contractor will develop monitoring and inspection procedures that satisfy the contract terms and conditions set by Alberta Transportation. As such, when the plan is finalized, following selection of the contractor, the plan will be used to address implementation and monitoring of mitigation measures, including lighting.

Question 537

Volume 1, Section 1.1.1.1, Page 1.3
Volume 4, Supporting Documentation, Section 5: Alberta Transportation EMS Manual
Volume 3C, Section 2.1, Page 2.1
Volume 4C, Page C.2
Volume 4C, Table C-2, Page C.28 and C.39

Alberta Transportation is to have an Adaptive Management approach for the life of the project. However, Alberta Transportation states *As the operator of the Project, Alberta Environment and Parks will be provided an operation, maintenance and surveillance plan developed by Alberta Transportation for the operation of the Project. Alberta Environment and Parks (AEP), will be responsible for the mitigation measures required for the flood and post-flood phases of the Project, summarized in Table C-2.*

a. The description of the Adaptive Management approach appears to be how Alberta Transportation adapts its operations as a result of its EMS. How does adaptive management occur with the *Operation, Maintenance And Surveillance Plan* Alberta Environment and Parks is to receive for the Project?

b. Final follow-up programs are proposed to be developed following approvals. How will these be passed on to AEP?

c. Section C-2 is for *Flood and Post-Flood Phase of the Project*. Parts of the table identify that the *Environmental Construction Operations Plan* (ECO Plan) will be used for such things as fire and spills. Describe how the ECO Plan is going to be part of the *Operation, Maintenance And Surveillance Plan* or edit Table C-2 to identify how AEP will manage those aspects of the operation.

Response 537

a. AEP Operations operates dams, canals, and diversion structures. Once a project is substantially complete (an inspection process in which AEP takes part), AEP takes over the operation of the project. The key tool in this is the development of the operation maintenance and surveillance (OM&S) manual which is compiled by Alberta Transportation's consultant engineers. The OM&S manual is project-specific and describes the structure components and monitoring instrumentation based on standard best practices and licence requirements. This process has been done successfully by Alberta Transportation and AEP on large dams and complex water structure projects in Alberta. "Extreme", "Very High" and "High" consequence dams are required to update emergency preparedness plans (EPPs) and OM&S manuals annually and submit the updates to the Dam Safety regulator.

   The AEP Operations Infrastructure Branch (OIB) is responsible for the issue of all revisions or addenda to the registered holders of the OS&M manual. The Manager may identify or request specific changes or updates to the OM&S manual based on observations recorded during the annual inspections or due to specific engineering studies conducted to address dam safety deficiencies.

b. There is a memorandum of understanding (MOU) between Alberta Transportation and AEP for works and projects that Alberta Transportation undertakes and constructs on behalf of AEP. As part of the MOU, Alberta Transportation will be responsible for the commitments, monitoring and follow-up program associated with the construction of the Project. This typically lasts for two to five years following the completion of construction. The conditions attached to the Project approval will become the responsibility of AEP after the Project becomes operational.

c. Reference to Alberta Transportation's *Environmental Construction Operation Plan (ECO Plan) Framework* in Table C-2 is not correct because the ECO Plan is only relevant to the contractor during construction of the Project; it does not relate to dry operations, flood operations, or post flood operations. AEP has Emergency Preparedness and Response Plans that will be applicable to Project operations.

Approvals
May 2019