COUGAR CREEK
DEBRIS FLOOD RETENTION STRUCTURE

Project Update

SUBMITTED TO:
Alberta Environment and Parks
and Natural Resources Conservation Board

SUBMITTED BY:
Town of Canmore

February 2019

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APPENDIX

TABLE OF ABBREVIATIONS

AEP	Alberta Environment and Parks
CDA	Canadian Dam Association
CPL	Canadian Projects Limited
EIA	Environmental impact assessment
IDF	Inflow Design Flood
NRCB	Natural Resources Conservation Board
SIR	Supplemental information requests
TEK	Traditional Ecological Knowledge
TLU	Traditional Land Use

1 INTRODUCTION

The Town of Canmore submitted an environmental impact assessment (EIA) report and Natural Resources Conservation Board (NRCB) application summary for the Cougar Creek Debris Flood Retention Structure and Access Road in July 2016 (NRCB Application No. 1601). The EIA was deemed complete by Alberta Environment and Parks (AEP) in March 2018 and the NRCB concluded that the Project was in the public interest in November 2018 (Decision NR 2018-01). The NRCB concluded that the Project was in the public interest because the evidence establishes a justifiable need, the social and economic effects are positive and considerable, and that while most environmental effects are low to negligible those that are moderate are offset by the conditions and mitigations imposed by the NRCB's decision. The Town of Canmore will be submitting a *Water Act* application in early 2019 to AEP to obtain authorization to construct and operate the Project.

As described in Section 2, the Town of Canmore intends to incorporate design changes identified during a constructability and optimization review that was completed in December 2018. This Project Update provides a description of the design changes and a summary of implications on the findings of the EIA. Section 2 describes the rationale for each design change and discusses implications for EIA disciplines directly affected by the specific change. Section 3 summarizes the review of EIA findings for all disciplines. Section 4 outlines engagement actions undertaken by the Town of Canmore from December 2018 to February 2019 to inform stakeholders and seek feedback on the design changes.

2 DESIGN CHANGES

The Town of Canmore engaged Canadian Projects Limited (CPL) in 2018 to complete a constructability review for the Project. CPL also identified opportunities to address input provided by AEP Dam Safety and third party reviewers and to reduce Project construction and operating costs. The review resulted in proposed design changes aimed at reducing Project complexity and improving the long-term serviceability of the Structure. These changes shorten the construction schedule and reduce construction costs to ensure that the Project can be completed within budget. Proposed changes were presented to the AEP Dam Safety unit and third party reviewers in December 2018, prior to the Town of Canmore making any decisions regarding the incorporation of changes.

Based on input from Dam Safety and third party reviewers, the Town of Canmore intends to incorporate the design changes described below. An overview of these changes has been presented to NRCB staff; the AEP EIA manager, EIA coordinator and Water Act regional approvals technologist assigned to the Project; and Alberta Parks staff. Feedback from NRCB and AEP staff have been incorporated into this Project Update where possible.

The basic design, function, and location of the Structure has not changed; but some of the design elements, particularly the approach to spillway design and flow control, have been optimized. In this Project Update, Structure refers to the debris flood retention structure itself and the spillway is now a separate component. Together, the Structure, spillway and access road comprise the Project. It is important to note that the design changes described in this Project Update do not affect the following:

- the design intent of the Project is the same and the reduction of risk for residents and infrastructure downstream does not change
- the Structure is designed to the same Canadian Dam Association (CDA) *Dam Safety Guidelines* "very high consequence dam" classification
- the location of the Structure does not change
- the maximum outflow rate of the Structure has not changed
- the flow control inlet and outlet designs have not changed
- the inflow design flood (IDF), used to determine height and freeboard of the Structure, as well as to determine the size of the spillway and outlet works, has not changed
- the spillway capacity is the same
- the spillway crest elevation is the same, producing a very similar inundation area
- all the geotechnical investigation data and results are valid and additional site investigation information for the new spillway location has been collected
- mitigation identified in the EIA for construction activities (e.g., dust control, erosion control, blasting) do not change
- backcountry access to Cougar Creek canyon will be maintained over the Structure
- all of the conditions listed in the NRCB approval (Approval No NR 2018-01) as issued in November 2018 with the NRCB decision, along with any further conditions the NRCB may impose as a result of these design changes will be met

There are four changes from the design considered in the EIA and the NRCB decision:

1. **Flow Control:** The original design included a diversion tunnel and associated emergency bypass pipes through the east abutment. The revised design includes a large diameter steel conduit and associated emergency bypass pipes built into the embankment of the Structure at creek level on the west abutment (Section 2.1, low level outlet on Figure 4). There is no functional change between these two design options as they provide the same outflow rate, and the design of the inlet and outlet structures has been retained.

2. **Spillway:** The original design incorporated a concrete spillway on the downstream face of the Structure. The revised design includes a rock-cut spillway located on the east abutment. The rock-cut spillway provides excavated rock for Structure fill and eliminates the need to accommodate flood waters over the crest of the Structure, resulting in reduced design complexity, reduced construction costs and reduced Project related traffic. There is no functional change between these two design options as they both provide the same capacity and the spillway configurations are similar (Section 2.2).

3. **Sheet Pile Wall:** A sheet pile wall is being proposed to replace the concrete seal wall of the original design. A sheet pile wall is faster to erect and less expensive to construct (Section 2.3).

4. **Access Road:** Changing the spillway location allows for the access road to be mostly incorporated into the downstream face of the Structure, rather than on the west abutment as originally proposed (Section 2.4).

In addition to these four changes, the Town plans to source existing accumulated alluvium from the creek bed, upstream of the Structure, to be used as fill material for the embankment. The use of rock from the spillway excavation and material from the creek bed will reduce the required quantity of imported fill material, resulting in reduced construction costs and construction traffic through Town. Sourcing material from the creek bed will result in re-contouring of the creek bed but will not result in any permanently impounded water and will not impede human or wildlife movement in Cougar Creek. Removal of this material will reduce maintenance requirements at the Structure by allowing additional space for deposition of materials in the creek bed before they reach the Structure, minimizing the amount and frequency of clean-out required.

The original design had a Structure crest height of 29.85 m with 34 m sidewalls. Now that the centre of the Structure does not include the spillway, the entire crest of the Structure will be brought to the level of the original sidewall height. The spillway crest elevation remains unchanged and will accommodate the required wave run-up and freeboard for the IDF with the Structure height at 34 m. However, the footprint of the Structure does not materially change since the original design already included 34 m high sides and the slope of the downstream face of the Structure is now slightly steeper. The slope change is possible due to the removal of the spillway from the downstream face of the Structure.

The size of the Structure, as well as its rock-filled embankment, is similar to the original design. The Town of Canmore is currently working with its consulting team to confirm if the results of the dam breach analysis completed for the original design can be used for the updated design and, if required, to determine what additional work is required to validate the results.

The revised spillway configuration is similar to the original design (i.e., same IDF with similar chute slope, stilling basin and inlet design). The Town of Canmore is currently working with its consulting team to confirm that the results of the physical scale modelling can be used to inform the design the rock-cut spillway and, if required, to determine what additional work is required to validate the model results.

The Project will incorporate reclamation and landscaping elements similar to the original design. Reclamation in No-Man's Land will be conducted in accordance with AEP guidance and changes to the location and orientation of the flow control outlet and spillway will be considered in the reclamation plan.

With respect to the socio-economic assessment of the Project, the revised design results in reduced overall costs for construction and operation, improving the economic viability of the Project. The Structure will still allow backcountry access to Cougar Creek canyon; however, human access may be prohibited in a designated area around the rock-cut spillway. If the Town determines that an area of prohibited access is required for safety or to support wildlife habitat connectivity, the area would be delineated with signage and may be monitored by camera surveillance.

The design changes are described in more detail below, along with key implications for EIA findings associated with each design change. A comparison of the original and revised Project footprint is presented in Figure 1, renderings illustrating the changes are presented in Figures 2 and 3 and a revised plan view is presented in Figure 4.

2.1 Flow Control

The revised Structure design includes a 2.7 m diameter steel conduit and two 1 m diameter emergency bypass pipes, located at creek level on a rock-cut bench on the west abutment (low level outlet on Figure 4). The design of the inlet and outlet of the flow control system has not materially changed. As in the original design, flow control through the conduit is achieved by a throttle located within the inlet structure. The inlet and outlet of the flow control system, including the debris rake, have been extensively studied through numerical modelling and physical scale modelling. Studies included confirming that the orientation of the inlet does not affect hydraulics. The 2.7 m conduit is oversized to provide equipment and worker access for tunnel clean-out and maintenance.

Rationale **-** This design change reduces construction risks associated with geological and technical challenges typically associated with tunneling, therefore reducing construction costs. Moreover, the conduit construction requires less specialized equipment and workers, and requires only a limited amount of enclosed or confined space work. The conduit is constructed on a rock-cut bench, eliminating long-term risks of differential settlement or movement. Long-term maintenance requirements are reduced since steel conduits are easy to inspect with non-destructive testing equipment and their rehabilitation are also commonly done. The conduit will allow for the same Structure performance as the original design. Finally, the emergency bypass inlets are situated at the same elevation as the original design and the bypass will function in the same manner.

Review of EIA Findings – The inlet and outlet designs, as well as the maximum flow through the Structure, remain the same. The revised outlet orientation is better aligned with the existing creek channel and maintains a similar flow as the original design.

The revised flow control system is still designed to allow regular flow and sediments through the Structure during normal operations; therefore, the revised design does not alter the findings of the hydrogeology assessment.

The revised design does not change the volume or rate of water passing/withheld by the Structure, nor the volume or sizes of sediment passing/withheld by the Structure, during any of the design flood events. Therefore, the revised design does not change the hydrology assessment of impacts on peak flow, peak water level, geomorphology, river hydraulics, or surface water/groundwater interactions in the local and regional study areas.

The rock removed from the west abutment to construct the rock bench for the conduit will be re-used onsite as fill material for the Structure. Mitigation identified in the EIA specific to blasting activities has not changed.

No further environmental impact analysis is required as a result of the revised flow control design and the conclusions of the EIA remain unchanged. As required in the NRCB decision, the Town will conduct surface and groundwater quality and quantity monitoring through construction and operation.

2.2 Spillway

The original design incorporated a spillway on the downstream face of the Structure that will be replaced by a rock-cut spillway located on the east abutment (Figure 4). The rock-cut spillway is designed with the same performance requirements as the original spillway. The revised design uses the same IDF for design; has the same crest height; and has a similar chute gradient, stilling basin design and predicted inundation area.

Rationale - The rock-cut spillway reduces the technical complexity of the Project and reduces construction costs. Construction and design of a steep concrete spillway chute on a new embankment is more technically challenging. The rock-cut spillway solution greatly simplifies construction methods of both the embankment and the spillway, while providing the same function.

The original Structure design relied on significant volumes of rock and aggregate being trucked to the site from local quarries to construct the embankment. The construction of the rock-cut spillway on the east abutment will generate large quantities of high quality angular rock fill specifically well-suited for the embankment construction. This local source of material will reduce the need to truck materials in to the Project site. This offset in material sourcing will therefore significantly reduce rock fill and trucking costs. The reduced trucking will result in a significant benefit to residents affected by construction traffic. The long-term inspection of the rock-cut spillway is simpler and its maintenance requirements should be reduced compared to the concrete structure.

Implications for EIA Findings - The revised spillway is designed with the same parameters as the original spillway; therefore the findings of the hydrology and hydrogeology assessments do not change. As further discussed in Section 2.4, removing the spillway from the Structure allows for

the access road to be located primarily on the downstream face of the Structure rather than in the designated wildlife corridor to the west. The portions of the Structure that are not used by the access road will be vegetated.

The revised Project footprint is entirely located within the local study area used for the vegetation, soils and terrain assessments. The design changes described in this Project Update result in an increase in disturbance to vegetation and soils of less than 0.5 ha in the local study area. Additional footprint may be required to address wildlife egress from the rock-cut spillway. Areas of additional disturbance for wildlife egress structures will be located in the local study area and will be designed and located based on guidance from AEP. Upon review of the mitigation measures and assessment criteria presented in the EIA, the assessment of effects on vegetation, soils and terrain do not change as a result of the design changes described in this Project Update. Regulators expressed concerns about impacts to whitebark pine (*Pinus albicaulis*) resulting from the revised spillway location. The revised footprint remains within the boundaries of the local study area of the EIA where whitebark pine was not reported.

The rock-cut spillway is located between a wildlife corridor to the west and a habitat patch to the east and may affect wildlife movement. Preliminary data from cameras at and around the Structure location do show some movement but do not indicate that the site is a major point of cross-canyon movement. Due to the steep terrain at the Structure location, movement across Cougar Creek at that specific location is likely small, relative to shallower slopes further downstream. However, there is some uncertainty in the amount of movement up the steep slopes and additional mitigation is required to adequately address wildlife connectivity and mortality concerns. The revised spillway design will include egress points at the entrance and exit and along the length of the spillway to facilitate wildlife movement in and out of the spillway to reduce the possibility of animals being trapped. The Town of Canmore is working with AEP to ensure that mitigation to preserve habitat connectivity is adequate. With mitigation already identified in the EIA and additional mitigation to provide egress from the spillway, the environmental consequence ratings of the wildlife assessment do not change. Further information on the assessment of potential effects of these Project changes to wildlife habitat availability, habitat connectivity and mortality is presented in Section 3.

2.3 Sheet Pile Wall

The concrete seal wall has been replaced with a sheet pile wall that will be faster and easier to construct but will provide the same impervious function as the original design. Sheet piles will be erected on a concrete foundation to ensure a waterproof seal and then will be backfilled as the embankment is being constructed. The erected sheet pile wall is easy to inspect during construction to ensure high quality and its long-term performance. Exact configuration and details of the revised design will be submitted to Dam Safety for final review.

Rationale – This design change lowers construction costs and duration. Construction of a sheet pile wall does not require any special materials or construction methods and sheet piles are easily sourced.

Implications for EIA Findings – This change does not result in any functional or operational changes and does not result in a change to the Project footprint. Therefore, no further environmental impact analysis is required and the conclusions of the EIA remain unchanged.

2.4 Access Road

As discussed in Section 2.2, removing the spillway from the Structure allows for the majority of the access road to be located on the downstream face of the Structure rather than in the designated wildlife corridor to the west (Figure 1).

Rationale **-** Incorporating the access road on the Structure, rather than building an independent road on the abutment, reduces tree removal quantities and rock blasting required. Therefore, the road construction duration is shortened and costs are lowered.

Implications for EIA Findings **-** Locating the access road on the Structure reduces the road footprint within the designated wildlife corridor to the west of the Structure. High quality habitat loss within the corridor is therefore reduced compared to the original design. As recommended in the NRCB decision, the Town of Canmore will continue to support AEP efforts to understand the use of corridors and habitat patches, and to monitor the long-term effects of the Project and revegetation of No-Man's Land on wildlife distribution and movement. Eliminating road construction on the west abutment also reduces interference with established, high-use hiking trails.

3 REVIEW OF ENVIRONMENTAL IMPACT ASSESSMENT FINDINGS

The design changes described in Section 2 do not alter the basic design, function or location of the Structure. However, they do result in the following key changes that have implications for the environmental assessment:

- changes to the Project footprint resulting from the removal of the access road on the west abutment and addition of the rock-cut spillway on the east abutment
- reduction in construction duration and cost
- reduction in construction traffic
- changes to blasting requirements and timing

Design changes were reviewed for each EIA discipline to:

- identify any additional mitigation that may be required
- assess potential changes to the assessment findings based on the effects criteria as described in Section 5.2.7 of the EIA report and defined specifically for each discipline
- identify any additional monitoring that may be required

The results of this review are that, for all disciplines, the findings of the original EIA do not change. Table 1 summarizes this review by discipline, with additional detail provided for disciplines that are affected by the design changes.

The EIA indicators most directly affected by the design changes are wildlife habitat connectivity and wildlife mortality and the Town of Canmore is working with AEP to mitigate these effects. Specifically, the rock-cut spillway on the east abutment will include egress points at the entrance and exit and along the length of the spillway to facilitate wildlife movement in and out of the spillway. As noted in Section 2.2 and described in Table 1, with mitigation already identified in the EIA and additional mitigation to provide egress from the spillway, the environmental consequence ratings of the wildlife assessment do not change.

TABLE 1 Environmental Impact Assessment Update by Technical Discipline

TOR Component	EIA Sections	Confirmation of Assessment Findings
Project Description		
Conservation and Reclamation	Section 4.9: Conservation and Reclamation	The Structure will incorporate reclamation and landscaping elements similar to the original design. Reclamation in No-Man's Land will be conducted in accordance with AEP guidance and changes to the location and orientation of the flow control outlet and spillway will be considered in the reclamation plan.
Environmental Assessment		
Air Quality, Climate and Noise	Section 8.2: Human Environment, Air Quality and Climate Section 8.3 : Human Environment, Noise	The EIA findings were that the Project would have a low impact on air quality and that noise from the Project would be within a range reasonably expected during construction and maintenance activities. A significant decrease in construction traffic will reduce vehicle noise and emissions compared to what was considered in the EIA; therefore, no additional modelling was conducted for this Project Update and the findings of the EIA remain the same. Mitigation in the EIA for dust control, vehicle maintenance and blasting will be applied as required by the NRCB decision. A blasting schedule will be shared with local residents and posted on signs from trails leading to the Project area.
Hydrogeology	Section 6: Aquatic Environment	The EIA findings were that groundwater levels near the Structure would be locally altered in the immediate vicinity of the Structure footprint, but that downgradient water levels and groundwater flux would re-equilibrate to pre-development conditions shortly after construction as long as the flow control system operates as intended. Impacts to groundwater quality were not expected unless any upset conditions occur during Project construction (e.g. spills). The revised flow control system is still designed to allow regular flow and sediments through the Structure during normal operations; therefore the revised design does not alter the EIA findings that impacts to groundwater levels are low and groundwater quality are negligible.
Hydrology	Section 6: Aquatic Environment	The revised design does not change the volume or rate of water passing/withheld by the Structure, nor the volume or sizes of sediment passing/withheld by the Structure, during any of the design flood events. The revised outlet orientation is also better aligned with the existing creek channel. Thus, the revised design does not change the hydrology assessment of impacts on peak flow, peak water level, geomorphology, river hydraulics, or surface water/groundwater interactions in the local and regional study areas.

TOR Component	EIA Sections	Confirmation of Assessment Findings
Surface Water Quality	Section 6: Aquatic Environment	The revised design does not alter any water quality parameters. The findings of the surface water quality assessment do not change.
Aquatic Ecology	Section 6: Aquatic Environment	The revised design does not alter downstream sport fish habitat, sediment load, or woody debris contribution. The findings of the aquatic ecology assessment do not change.
Vegetation	Section 7: Terrestrial Environment	The revised design does not alter the conclusions of the vegetation assessment presented in the EIA. The small increase in disturbance to vegetation (upland ecosites/meadow) is less than 0.5 ha and, based on the mitigation measures and the assessment rationale presented in the EIA, the assessment of effects to vegetation in the local and regional study areas does not change. Additional footprint may be required to address wildlife egress from the rock-cut spillway. Areas of additional disturbance for wildlife egress structures will be located in the vegetation local study area and will be designed and located based on guidance from AEP. Whitebark pine (*Pinus albicaulis*) was not observed in the footprint or the local study area for the Project. The revised footprint remains within the boundaries of the local study area of the EIA where whitebark pine was not reported.
Wildlife	Section 7: Terrestrial Environment	**Review of Design Changes on Wildlife** – Each design change was reviewed for potential effects on wildlife indicators as follows: • **Flow Control and Sheet Pile Wall -** The revised flow control and sheet pile wall design are not anticipated to impact wildlife. These changes do not alter the conclusions of the EIA. • **Access Road -** The revised design reduces habitat loss on the west abutment relative to EIA predictions. The revised location of the access road on the downstream face of the Structure will still allow wildlife movement up the downstream face of the Structure and will therefore not decrease connectivity. This change does not alter the conclusions of the EIA. • **Spillway** - The revised spillway design will result in additional blasting, some habitat loss along the cliff and a steeper slope along the canyon wall where egress is not added. The additional blasting will be temporary and mitigation from the EIA will be applied to reduce impacts to wildlife. The resulting reduction in heavy truck traffic needed to haul rock is likely to offset the increased disturbance from the blasting. The spillway is located in an area that connects a wildlife corridor and a habitat patch; however, the spillway area currently has steep cliff walls not likely to be as important to wildlife movement as the shallower slopes downstream of the spillway. The spillway is being designed to address habitat connectivity concerns by including egress points at the entrance and exit and along the length of the spillway to facilitate wildlife movement in and out of the spillway.

TOR Component	EIA Sections	Confirmation of Assessment Findings
		Summary – The design changes do not alter the environmental consequence ratings for Project effects on wildlife. Specific details are provided below for the indicators assessed in the EIA: • **Wildlife Habitat Availability** - The revised design will alter habitat availability relative to the original EIA with an increase in footprint of 0.25 ha for a total of 7.34 ha. The increase in footprint and change in disturbance areas will result in a small increase in high quality habitat loss for deer (0.01 ha) and game trails (0.24 ha) relative to the EIA findings; as well as an increase in medium quality habitat loss for elk (0.12 ha) and deer (0.31 ha). High quality habitat loss will decrease for elk relative to the EIA footprint. The final ratings for habitat loss from the original EIA does not change and remains negligible as no effect on wildlife is anticipated to be discernable and no species are anticipated to lose substantial habitat. Loss of habitat availability tables for elk, deer and game trails are included in Appendix A. • **Wildlife Habitat Connectivity** - The revised spillway will alter habitat connectivity by creating a barrier to movement along the canyon that is approximately 300 m long. Current movement across Cougar Creek at that location is likely minimal due to the natural steep terrain; however, there is uncertainty in the amount of movement up the steep slopes. The magnitude for habitat connectivity, rated as low in the EIA, is increased to medium for the LSA as there may be a detectable change in movement greater than that observed in natural variation. There is potential for habitat connectivity to be impacted greater than levels seen in natural variability and have a measureable change on movement of regional wildlife populations; however, no measureable change on the size of regional wildlife populations is predicted. The environmental consequence rating defined in the EIA is determined by the predicted impacts of a Project on the size of a regional wildlife population. With consideration for increased uncertainty and magnitude within the LSA, mitigation measures identified in the EIA and proposed mitigation associated with spillway design, the environmental consequence rating for habitat connectivity remains low within the RSA and LSA because the size of the regional populations are not anticipated to change. • **Wildlife Mortality Risk** - The design change will potentially alter wildlife mortality by increasing the amount of blasting necessary to create the spillway and by potentially creating an increase in predation, or an increase in predation success at the spillway. Standard mitigation identified in the EIA will address mortality associated with blasting. The potential change in predation associated with the spillway is mitigated by preventing traps and dead ends in the design and through the addition of additional egress out of the spillway. The decrease in traffic, also associated with sourcing rock from the spillway, will reduce potential mortality along the access road. These minor changes to mortality risk and the associated mitigation measures do not present a material change in the assessment of mortality compared to the original design.

TOR Component	EIA Sections	Confirmation of Assessment Findings
		Therefore, the environmental consequence rating remains negligible for all mortality indicators and effects.
Terrain and Soils	Section 7: Terrestrial Environment	The revised design does not alter the conclusions of the terrain and soils impact assessments presented in the EIA. The increase in disturbance to soils is less than 0.5 ha within the local study area and, based on the mitigation measures and the assessment rationale presented in the EIA, the assessment of predicted effects on terrain and soils in the local study area does not change. Additional footprint may be required to address wildlife egress from the rock-cut spillway. Areas of additional disturbance for wildlife egress structures will be located in the terrain and soils local study area and will be designed and located based on guidance from AEP.
Biodiversity	Section 7: Terrestrial Environment	The revised spillway design does not change the environmental consequence rating of potential effects on terrain and soils, vegetation, or wildlife. Upon review of the effects criteria for biodiversity defined in the EIA, the mitigation outlined in the EIA and new mitigation identified in this Project Update, the findings of the biodiversity assessment do not change.
Land Use Management	Section 8.4: Human Environment, Land Use and Management	The design change does not alter the Project land use. The boundary of the disposition issued by AEP for the Project will include the final design footprint.
Historic Resources	Section 8.6: Human Environment, Historical Resources	The proposed footprint changes do not alter the recommendations of the Historical Resource Impact Assessment; however a revised clearance application will be submitted to provide the final footprint to Alberta Culture and Tourism prior to construction.
Traditional Land Use (TLU) and Traditional Ecological Knowledge (TEK)	Section 8.7: Human Environment, Traditional Knowledge and Land use	No specific TEK was provided by any of the First Nations consulted on the Project and none of the First Nations who conducted TLU site visits identified any specific cultural, historical, or TLU areas associated with the Project site. The proposed footprint changes do not alter the assessment of potential effects on TLU.

TOR Component	EIA Sections	Confirmation of Assessment Findings
Public Health and Safety	Section 9: Public Health and Safety	The design intent of the Structure is the same and the reduction of risk for residents and infrastructure downstream does not change. The Structure is designed to the same high standard of the CDA Guidelines for a “very high consequence dam” classification. The human health risk assessment found that over the life of the Project, air emissions from mobile equipment included in the air quality assessment are not considered to have a valid linkage to human health. Design changes result in reduced construction traffic and lower emissions than were included in the human health risk assessment; therefore the findings of the human health risk assessment remain valid.
Incidents and Malfunctions	Section 10: Incidents, Malfunctions and Retention Structure Safety	The design intent of the Structure is the same and the reduction of risk for residents and infrastructure downstream does not change. The Structure is designed to the same high standard of the CDA Guidelines for a “very high consequence dam” classification and the expected performance of the Structure does not change.
Socio-Economic Assessment	Section 8.5: Human Environment, Socio-Economics	The design changes reduce construction costs and increase the viability of the Project. Economic effects will be altered as less truck contracting will be required and less aggregate will be sourced from local quarries. Reduced traffic is expected to be less disruptive for local residents and recreational users. There will be a view shed change resulting from removal of the road on the west abutment and the addition of a spillway independent from the Structure on the east abutment. The Town of Canmore still intends to vegetate as much of the Structure as possible to improve visual appeal and is also investigating options for vegetating the rock-cut spillway.

4 PUBLIC AND STAKEHOLDER ENGAGEMENT

Design changes proposed by CPL as a result of the constructability review were presented to Dam Safety and third party reviewers in December 2018. With positive feedback from these reviewers, the Town of Canmore decided to incorporate the changes described in this Project Update. Since that decision was made, the Town of Canmore has engaged provincial and municipal government stakeholders and the public to inform them of the design changes. Table 2 includes a summary of regulatory and public engagement undertaken in December 2018 to February 2019.

Treaty 7 First Nations were informed on January 10, 2019 that changes had been made to the design and that they would receive this Project Update when it was complete.

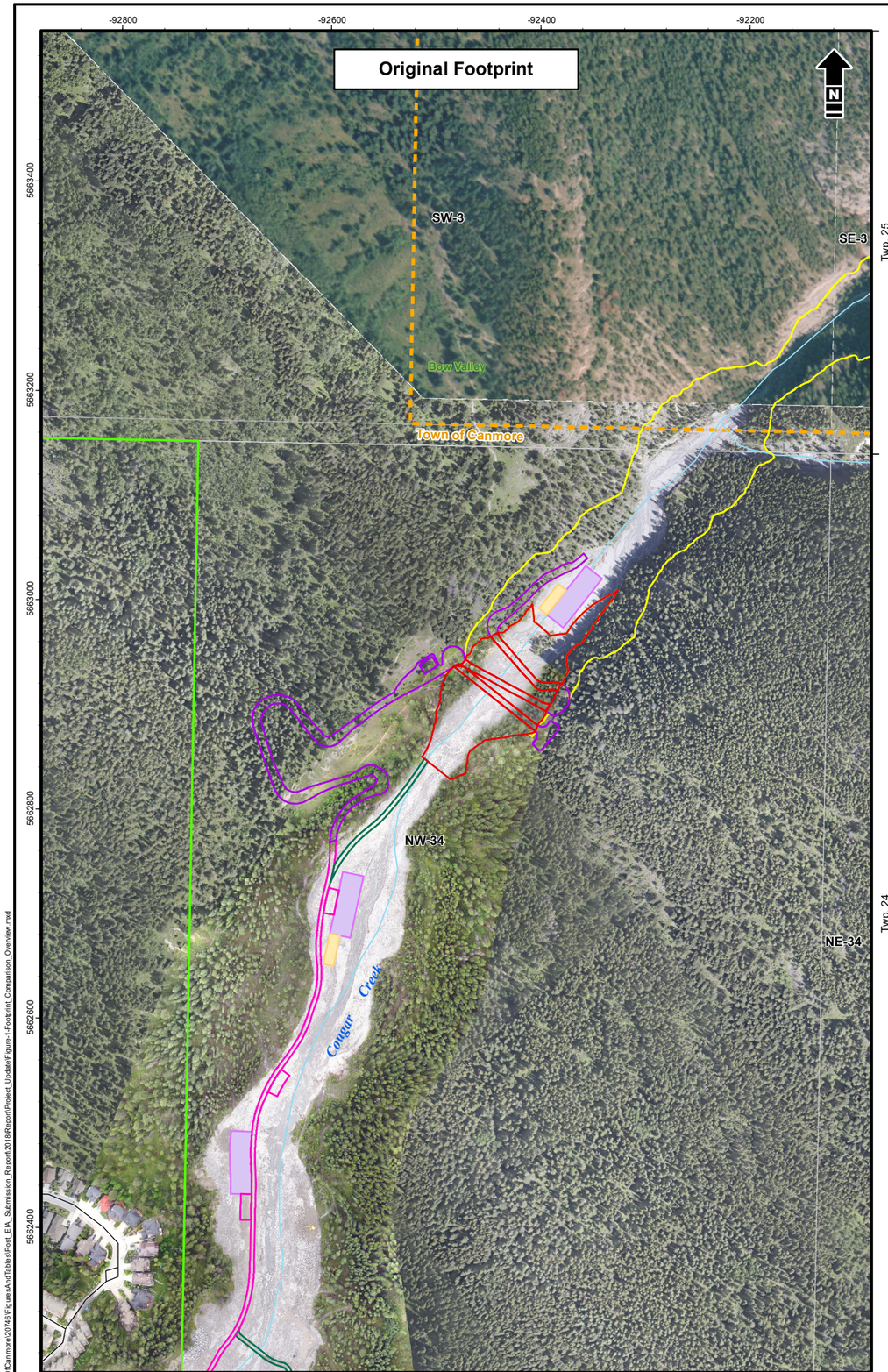
TABLE 2 Stakeholder Engagement Summary

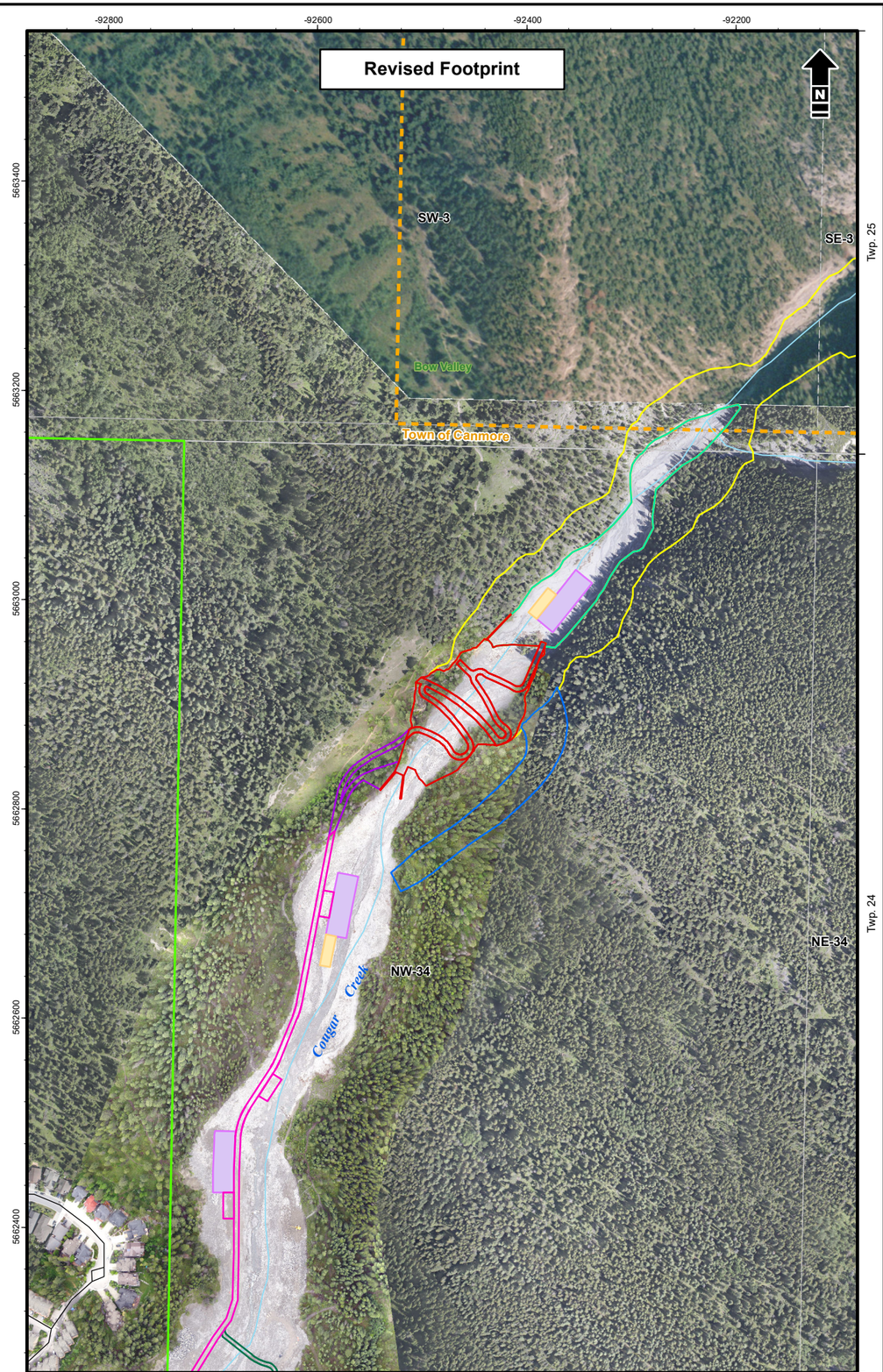
Date	Type of Engagement	Stakeholder	Notes/Comments/Feedback	Town of Canmore Response
December 11, 2018	Technical Project Update	Town's expert reviewer	Alternative approaches are appealing due to reduced complexity and cost. However, the design life of the Structure must remain the same (or longer) and long-term inspection and maintenance requirements have to be well thought out and planned while the design is being completed.	The Town of Canmore agrees that the life of the Structure must remain the same (or longer) and that consideration of maintenance requirements is a key part of Project design. The design team will maintain these principals through the final design. The Operations, Maintenance and Surveillance (OMS) manual will be updated to take into consideration the design changes. Inspection and maintenance of the Structure and the spillway will be a key focus of the OMS update.
December 11, 2018	Technical Project Update	AEP Dam Safety	Geotechnical information regarding the spillway design needs to be sufficient before proceeding to detailed design. Design life of the Structure needs to be the same. Numerical simulation versus physical scale modelling validation is required. Grouting requirements are similar to previous design.	Supplemental geotechnical information has been acquired by the design team during supplemental field days focused on the spillway area. The spillway design has already been modified to ensure that the bedding planes and rock faults are best used. The consulting engineering team has confirmed that the results of the physical scale modelling studies along with the considerable existing engineering body of knowledge on spillway design can be used to inform the design of the rock-cut spillway and that no additional work is required to validate model results. The Town of Canmore will continue to work with Dam Safety to provide all of the information necessary for their review.
December 14, 2018	Technical Project Update	Dam Safety third party reviewer	Concerns raised about the footprint area changes regarding the EIA and NRCB process. Construction methodology of the seal wall discussed to ensure lowest risk. Discussion regarding the validity of the physical scale modelling results – validation is required.	Design changes were reviewed for each EIA discipline and the results of this review are contained within this Project Update. The Town of Canmore is working with the NRCB and AEP to provide the information that they need to complete their review of the design changes. The seal wall design is being refined with the feedback provided. Validation of the physical scale modelling with Northwest Hydraulic Consultants is underway. Updates will be provided to Dam Safety reviewers once completed.

Date	Type of Engagement	Stakeholder	Notes/Comments/Feedback	Town of Canmore Response
January 9, 2019	Project Update	AEP and NRCB	Concerns were raised about: 1. Permanent water impoundment due to a proposed rock trap. 2. Magnitude of proposed changes and the requirement to review the revised Project design. 3. Access to Cougar Creek canyon for recreation. 4. Wildlife connectivity related to the new spillway location and design.	Town of Canmore response: 1. The rock trap has been replaced by an area in the creek bed where fill material can be sourced which does not permanently impound water (see description in Section 2.0). 2. The Town of Canmore prepared this Project Update for submission to AEP and NRCB providing descriptions of the design changes, including rationale, and implications on the EIA findings. 3. The Town of Canmore has confirmed that recreational backcountry access will be provided over the Structure. 4. The Town of Canmore agrees that additional mitigation is required to address concerns related to wildlife habitat connectivity and mortality and has committed to work with Alberta Parks to find solutions that are satisfactory. A workshop between the Town of Canmore and Parks staff was held on January 30 to discuss mitigation related to wildlife connectivity and a follow-up site visit with the Town of Canmore's engineering consultant was held on February 14. As described in this Project Update, the Town has committed to including egress along the spillway to address habitat connectivity and to ensure that there are no traps or dead ends in the design.
January 11, 2019	Project Update	Alberta Parks	Concerns were raised about: 1. The presence of rare plants in the new spillway footprint, specifically Pinus albicaulis (whitebark pine). 2. Wildlife habitat connectivity related to the new spillway location and the steep walls of the new spillway design. Meeting included discussion of potential mitigation.	Town of Canmore response: 1. The spillway footprint was part of the terrestrial LSA. There are no whitebark pine in the LSA. 2. The Town of Canmore agrees that additional mitigation is required to address concerns related to wildlife connectivity and mortality and has committed to work with Alberta Parks to find solutions that are satisfactory. A workshop between the Town of Canmore and Parks staff was held on January 30 to discuss mitigation related to wildlife connectivity. As described in this Project Update, the Town has committed to including egress along the spillway to address habitat connectivity and to ensure that there are no traps or dead ends in the design.

Date	Type of Engagement	Stakeholder	Notes/Comments/Feedback	Town of Canmore Response
January 22, 2019	Project Update at Committee of the Whole	Town of Canmore's Council	The update was provided to Council through a formal presentation. A briefing was also provided ahead of Council presentation through the agenda package. Council is fully aware of the alternatives proposed, as well as all positive and negative impacts of the changes. Concerns were raised about: 1. The effect of design changes on EIA review and NRCB decision 2. Timing of the ongoing review process and possible construction start 3. Which companies are involved in the technical reviews of the updates - Alpinfra or BGC perhaps?	The Project team will continue to keep Council informed on Project developments. Project ream response: 1. A Project Update meeting, including a presentation describing the design changes, was held with AEP and NRCB in early January 2019. The required review process was unclear at the time and is still to be determined. This Project Update was prepared for AEP and NRCB review and includes a description of the design changes and an assessment of implications on the findings of the EIA. 2. The NRCB review of this Project Update and the AEP Water Act review will occur concurrently. The NRCB review of this information is not expected to materially impact the overall Project schedule. The design changes also result in a reduced construction schedule, allowing for additional regulatory review time within the existing Project schedule. 3. Dr. Morgenstern, our independent expert reviewer, was the first to provide comment and feedback on the updates. AEP Dam Safety and their third party reviewers also provided technical feedback. Finally, CPL is in discussion with Alpinfra/CHT to ensure that they continue to be involved in the Project.

Date	Type of Engagement	Stakeholder	Notes/Comments/Feedback	Town of Canmore Response
January 22, 2019	Project Update/Open House	Cougar Creek residents and public Open house advertised on Canmore.ca, on the Mountain Creek Hazard Mitigation website, on the Town of Canmore Facebook page, in the Outlook newspaper for two weeks and in local radio station ads. An email was also sent to the mailing list of Cougar Creek residents to inform them of the Council update and open house. A further email was sent on January 23, 2019, to provide supplemental information for those who have missed Council and the open house.	• 221 people attended • Approximately 50 people were involved in direct discussion regarding the Cougar Creek Project. • Common themes/questions/comments/feedback (not directly related to the Project Update): o When will construction start and when will project be completed (almost everyone)? o Where are we at with the approval process (10 people)? o What is the budget and what are the funding sources (5 people)? o How does the Structure function and how will it protect the community and infrastructure (20 people)? • Common themes/questions/comments/feedback (directly related to the Project Update): o How will the changes affect our views (5 people)? o What are the advantages of the rock-cut spillway compared to the previous design (20 people)? o Will the spillway be accessible to the public (5 people)? o How will wildlife move around/in & out/across the spillway (5 people)? o Will we still be able to access the canyon upstream of the Structure (15 people)? o Will the trails surrounding the Structure still be accessible – such as the Lady McDonald Trail (10 people)? o How will wildlife move up and down the canyon? What about people (5 people)? • After all questions answered, everyone felt that the changes are warranted - the benefits of the changes (cost reduction, construction duration reduction & reduction of truck traffic) outweigh the negative impacts of the changes (blasting, change of view shed, wildlife connectivity). • A few residents have emailed back to thank the Town for the work being done on the Cougar Creek Project. Comments included appreciation for ongoing Project updates and good communication, and recognition of the Project team for their ongoing work to progress the Project.	The Town of Canmore Project Manager was in attendance at the Open House and was available throughout the evening to provide immediate responses to any questions from residents. No specific post-event follow-up is required. The Project team will continue to keep local stakeholders informed on Project developments.





- Town of Canmore Municipal Boundary
- Wildland Provincial Park
- Watercourse
- Road

Footprint

- Debris Flood Retention Structure
- Access Road
- Inundation Area
- Embankment Fill Material Source
- Spillway

Construction Footprint Areas

- Stockpile
- Laydown

Site Access

- Construction
- Operations and Construction

Reference: Data obtained from AltaLIS © Government of Alberta used under license. GDM transportation infrastructure data provided by IHS © 2015 used under license. Imagery (2009, 2013 and 2014) obtained from client used under license.

1:5,000

150 0 150
Metres

NAD 1983 3TM 114

Town of CANMORE

Cougar Creek Debris Flood Retention Structure

Footprint Comparison - Overview

Date: 15 Feb 2019		Project: 20746-514	
Technical: I. Trimble	Reviewer: R. Sturgess	Drawn: M. Wilkinson	

Figure 1

I:\Town\OfCanmore\20746\Figures\And\Tables\Post_EIA_Submission_Report\2019Report\Project_Update\Figure-1-Footprint_Comparison_Overview.mxd

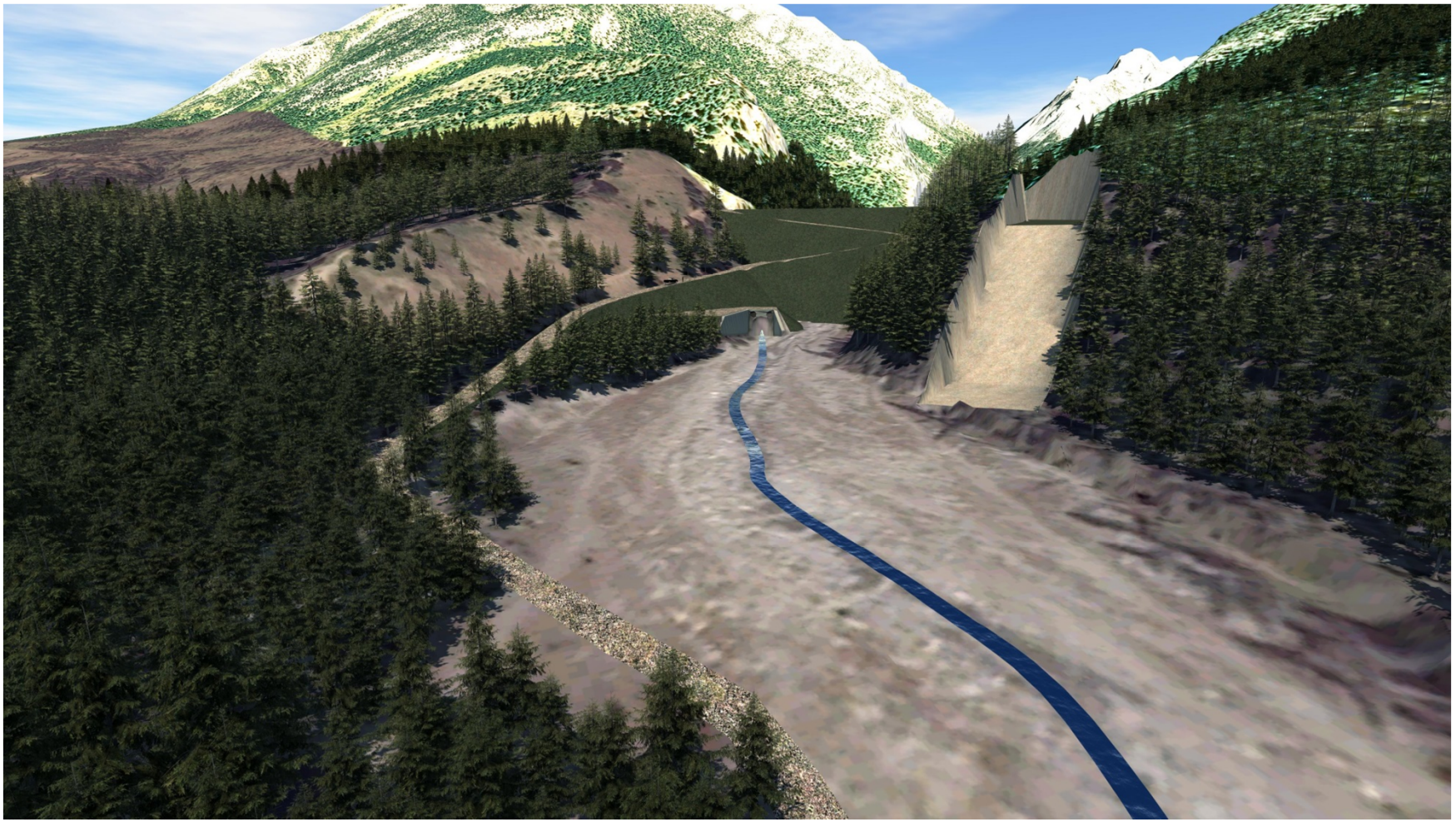
Town of CANMORE

Cougar Creek Debris Flood Retention Structure

Original Design Rendering

Date: February 2019	Project: 20746-514
Technical: TA	Reviewer: Town of Canmore

Figure 2



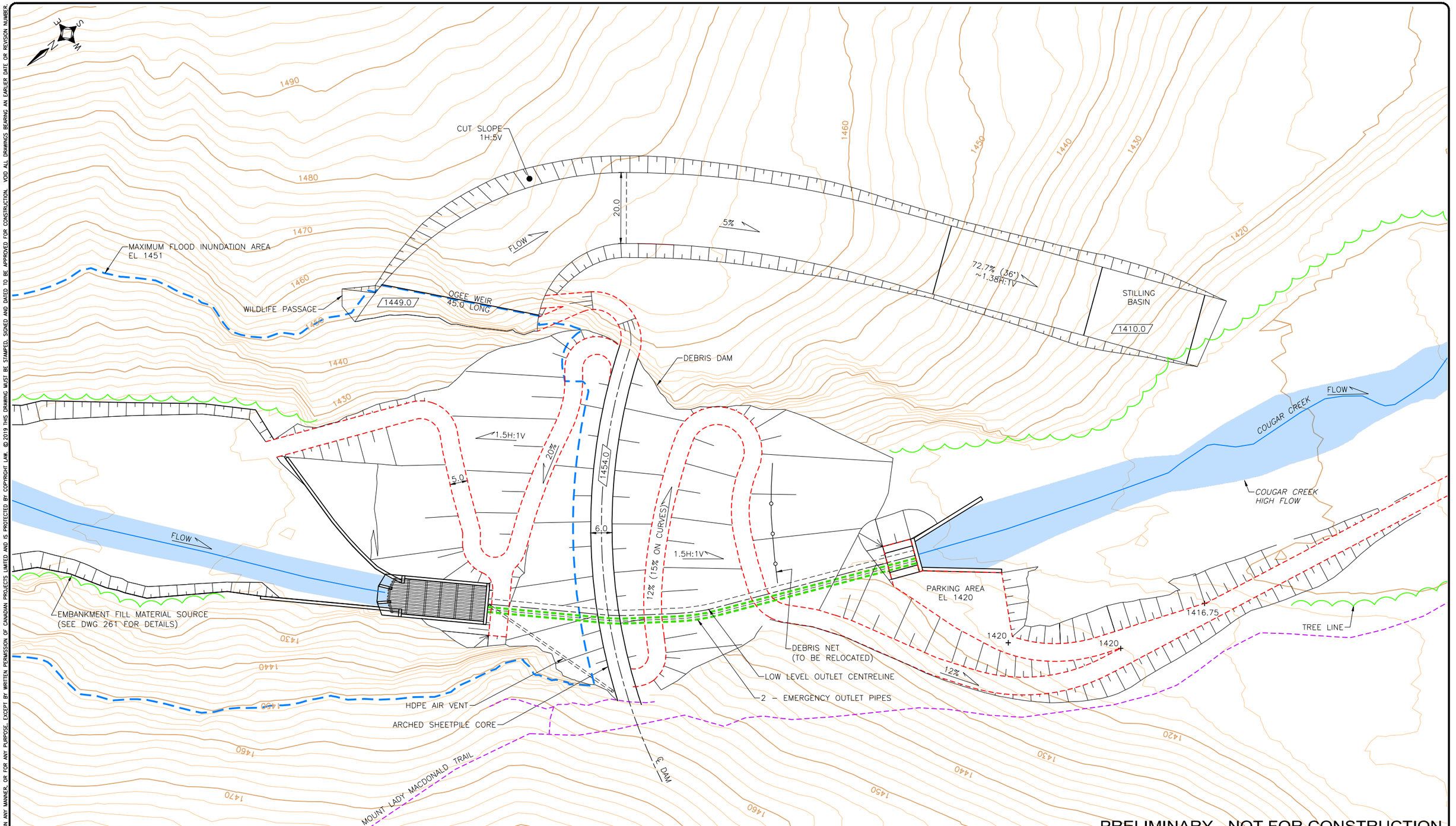
Town of CANMORE

Cougar Creek Debris Flood Retention Structure

Revised Design Rendering

Date: February 2019	Project: 20746-514
Technical: TA	Reviewer: Town of Canmore

Figure 3



PRELIMINARY - NOT FOR CONSTRUCTION

NOTES

1. ALL DIMENSIONS ARE IN ELEVATIONS IN METRES, UNLESS NOTED OTHERWISE.
2. 2m INTERVAL CONTOURS CREATED BY CPL FROM DEM DATA PROVIDED BY THE TOWN OF CANMORE MAY 2018.
3. HORIZONTAL DATUM: NAD83, ALBERTA 3TM, 114°.
4. VERTICAL DATUM: CGVD28.

LEGEND

- - - - - HIKING TRAILS

SCALE 1:1 000

0 10 20 30 40 50

METRES

REV	Y	M	D	REVISION DESCRIPTION	DES	CHK	DRN	CHK
A	19	02	12	NEW DRAWING	AB	CJW	AB	CPB

Canadian Projects Limited
A TETRA TECH COMPANY

Town of CANMORE

TOWN OF CANMORE

COUGAR CREEK PROJECT
- GENERAL
REVISED STRUCTURE
AND SPILLWAY PLAN

PROJECT NUMBER	1093-001
CADD NUMBER	4.3.047
DRAWING NUMBER	4

APPENDIX A
Loss of Habitat Availability

TABLE A-1 Loss of Habitat Availability for Elk in the Local Study Area

	Habitat Area (ha)				
	Very Low	**Low**	**Medium**	**High**	**Total**
Original Footprint	5.97	0.91	0.17	0.04	7.09
Revised Footprint	6.17	0.88	0.29	0	7.34
Difference in habitat loss	-0.20	0.03	-0.12	0.04	-0.25

TABLE A-2 Loss of Habitat Availability for Deer in the Local Study Area

	Habitat Area (ha)				
	Very Low	**Low**	**Medium**	**High**	**Total**
Original Footprint	4.58	2.09	0.39	0.03	7.09
Revised Footprint[1]	4.58	2.02	0.70	0.04	7.34
Difference in habitat loss	0.00	0.07	-0.31	-0.01	-0.25

TABLE A-3 Loss of Habitat Availability for Game Trails in the Local Study Area

	Habitat Area (ha)				
	Very Low	**Low**	**Medium**	**High**	**Total**
Original Footprint	0.78	2.3	2.77	1.24	7.09
Revised Footprint[1]	0.78	2.34	2.74	1.482	7.34
Difference in habitat loss	0.00	-0.04	0.03	-0.24	-0.25