Attachment 3

Response to CEAA's Request for Additional Information Issued May 16, 2017

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FISH AND HABITAT

1. REGIONAL STUDY AREA – DAISY CREEK

Reference: EIS Guidelines, Section 6.1.5 and 6.3.1; EIA Summary – E.6, Pg. E-47 & E-197, Consultant Report #3, page 70, Addendum to the Environmental Impact Statement – January 31, 2017

Preamble:

The Guidelines require Benga Mining to identify any potential serious harm to fish, including the calculations of any potential habitat loss (temporary or permanent) in terms of surface areas (e.g. spawning grounds, fry-rearing areas, feeding), and in relation to watershed availability and significance.

Benga Mining had been asked previously to include Daisy Creek in the aquatic assessment or provide a rationale as to why Daisy Creek was not included. The Regional Study Area presented in the January 31, 2017 Addendum - Aquatic Ecology Effects Assessment (Figure 1.1, p.3) does not include Daisy Creek, however no explanation is given as to the rationale behind this exclusion. The consultant report on hydrology includes Daisy Creek in the Regional Study Area (CR#3, Figure 4.3-1) and the report indicates base flow in Daisy Creek will be reduced, but impacts are not predicted to be significant. The reduced flow predicted in the hydrology consultant report does not appear to have been carried forward into an analysis and assessment of fish and fish habitat in the aquatic assessment.

Information Required:

- Include Daisy Creek in the aquatic assessment, within the Regional Study Area, and provide an assessment of predicted impacts to aquatic habitat.
- Describe proposed monitoring of predicted impacts to Daisy Creek
- Provide an explanation as to why Daisy Creek has not been considered in the Regional Study Area.

Response:

Many criteria were identified during the Project design to avoid or minimize impacts to the aquatic resources. Benga identified the need to stay out of the Daisy Creek watershed with all project development. It was not possible to avoid Blairmore and Gold creeks drainages, but it was possible to avoid Daisy Creek. All project related impacts would be confined to the Oldman River watershed. This is why the LSA and RSA focus on the Oldman River watershed.

During the initial assessment, it was noticed that a small portion of the project overlapped into the Daisy Creek watershed (0.036%). This was identified as a mapping error and shouldn't have been included in the assessment. Unfortunately, it was included in the modeling and the assessment. Potential impacts were negligible and were easily addressed.

Benga will not develop in the Daisy Creek watershed. As a result, there will be no impacts to the aquatic resources in the Daisy Creek watershed.

2. MAPPING FISH HABITAT

Reference: EIS Guidelines, Section 6.1.5; Consultant Report #6, Addendum to the Environmental Impact Statement – January 31, 2017

Preamble:

The Guidelines require Benga Mining to provide maps, at a suitable scale, indicating the surface area of potential or confirmed fish habitat for spawning, rearing, nursery, feeding, overwintering, migration routes, etc. The federal Fisheries Act defines fish habitat as: "…spawning grounds and any other areas, including nursery, rearing, food supply and migration areas, on which fish depend directly or indirectly to carry out their life process". Fish habitat information for Blairmore Creek is limited to two sampling points: BC01 in lower Blairmore, and BC02 in upper Blairmore. Habitats are not mapped for Blairmore Creek as they are for the Gold Creek watershed (Appendix A2).

Information Required:

a. Discuss how Benga Mining has arrived at an understanding of habitat potential for the entire watercourse of Blairmore Creek based on two survey points.
b. Provide a justification for the limited baseline information for fish habitat potential in Blairmore Creek and discuss any uncertainty with respect to effects determination and future monitoring of potential project effects. .

Response:

a. Benga Mining arrived at an understanding of habitat potential for Blairmore Creek based on extensive fish habitat surveys conducted throughout the mainstem and tributaries. Biophysical habitat inventory surveys of the mainstem were completed in 2014. In 2016, more detailed assessments of Blairmore Creek mainstem were completed and included: delineation and characterization of macrohabitat (reach scale), mesohabitat (hydraulic unit scale), microhabitat (site-specific scale, for instream flow assessment), water temperature, barriers to fish passage (*i.e.*, understanding of migration corridors), and fluvial geomorphology (*i.e.*, channel morphology). Fish surveys conducted between 2014 and 2016 aimed to describe habitat use in terms of spawning, rearing, overwintering, and migration habitat. Food supply was also assessed in 2014 and 2016 using a combination of benthic and drift invertebrate surveys. The technical reports where this information can be found is provided in Table 2-1.

Table 2-1 Summary of surveys used to characterize Blairmore Creek habitat potential for the Grassy Mountain Coal Project.

Report	Blairmore Creek Habitat Information
Fisheries and Aquatics Technical Baseline Report, CR #6, Appendix A1	▪ Biophysical habitat, macrohabitat, mesohabitat, barriers to fish passage (migration), water temperature, fish use (e.g., spawning, overwintering, rearing), and food supply (benthic and drift invertebrates)
Fluvial Geomorphology Assessment of Blairmore Creek and Gold Creek, CR #6, Appendix A2	▪ Land use changes, geomorphology (morphology, sediment transport)
Instream Flow Assessment, CR #6, Appendix A3	▪ Microhabitat, changes in water temperature

As summarized in Part a, baseline fish habitat information for Blairmore Creek is comprehensive. Fish habitat was surveyed throughout the majority of Blairmore Creek watershed (mainstem and tributaries), which falls within the aquatic local study area (LSA) defined for the Project. This baseline information was ultimately applied to the Aquatic Ecology Effects Assessment Addendum (CR#6). Future monitoring for potential project effects was proposed to capture any uncertainty associated with the assessment (CR#6, Section 6). Monitoring will target the following uncertainties:

- Efficacy of mitigation measures to protect fish and fish habitat during the construction phase of the project;
- Prediction of potential project effects on stream flows, water quality, sediment quality (i.e., calcite precipitation), and fish and fish habitat during operations, closure and early post-closure phases; and
- Baseline characterization of the LSA.

3. GEOMORPHOLOGICAL CHANGES

Reference: EIS Guidelines, Section 6.3.1; EIS Guidelines, Section 6.2.2; Consultant Report #6, Section 5.3.1.3, Pg. 42-48; EIA E.4.3.1, E.4.3.2, E.6.3 and E.6, Addendum to the Environmental Impact Statement – January 31, 2017

Preamble:

The Guidelines require that the assessment of the environmental effects of the Project on fish and fish habitat include the geomorphological changes and their effects on hydrodynamic conditions and fish habitats (e.g., modification of substrates, dynamic imbalance, silting of spawning beds). The assessment should also consider the modifications of hydrological and hydrometric conditions on fish habitat and on the fish species' life cycle activities (e.g. reproduction, fry-rearing, movements).

Due to discharge of effluent from the saturated zones into Blairmore Creek, the flows of these waterbodies are anticipated to change. Benga Mining has provided an assessment of potential physical impacts to aquatic environments and water quality as a result of increased discharges to Blairmore Creek and other surface waters however Benga Mining has not presented mitigation with respect to fish and fish habitat.

Information Required:

a. Describe how the potential effects on the aquatic environment (i.e. water quality, fish and fish habitat) due to increased discharges to Blairmore Creek and other surface waters will be mitigated.

Response:

a. In support of the Aquatic Ecology Effects Assessment Addendum, the following assessments were conducted to evaluate potential effects to the aquatic environment:

- Fisheries and Aquatics Technical Baseline Report (CR#6, Appendix A1), characterizing fish habitat and fish species' life cycle activities;
- Fluvial Geomorphology Assessment of Blairmore Creek and Gold Creek (CR#6, Appendix A2), characterizing baseline geomorphology and associated potential Project effects resulting from changes in hydrology;
- Instream Flow Assessment (CR#6, Appendix A3), assesing potential changes to hydrological conditions and the associated potential effects on fish habitat and fish species' life cycle activities; and
- Surface Water Quality Assessment Report (CR#5), characterizing surface water quality and associated potential Project effects to fish.

Based on these assessments it was determined the effects to the aquatic environment due to increased discharge to Blairmore Creek and other surface waters could potentially include five types of effects, as listed in Table 3-1.

Table 3-1 Potential effects to the aquatic environment due to increased discharge to Blairmore Creek.

Potential Effect	Pathway of Effects Classification	Relevant Section in Aquatic Ecology Effects Assessment Addendum (CR#6)
Changes in water temperature	Secondary	Section 4.2.2.1
Changes in westslope cutthroat trout food supply	Secondary	Section 4.2.2.2
Changes to sediment supply and transport mechanisms	Secondary	Section 4.2.2.3
Changes to water quality affecting the health of westslope cutthroat trout	Secondary	Section 4.2.2.4
Changes to hydrology in Gold and Blairmore creeks potentially affecting westslope cutthroat trout habitat	Primary	Section 4.2.4.1

As summarized in the "changes to sediment supply and transport mechanisms" pathway (Table 3-1), the likelihood and extent of physical habitat to be altered in terms of quantity and suitability is considered negligible in Blairmore Creek. The changes in flows in Blairmore Creek are not expected to alter the morphology of the stream channels due to the low shear stresses that result from these flows. There are no detectable residual effects to fish habitat expected due to modifications in fluvial geomorphic processes (*e.g.*, sediment mobility, bed load movement) and no direct mitigation is required. However, mitigation to minimize or avoid any potential adverse effects (Table 3-1) to the aquatic environment due to increased discharges to Blairmore Creek and other surface waters was identified, as described below:

- **Water Management Plan (WMP)**: The WMP, as summarized in CR#6, Section 4.2.2.3 and 4.2.4.1, includes four sedimentation/release ponds, four surge ponds, and numerous contact water ditches. Proposed mitigation measures include:
  - Water will be discharged back into Blairmore Creek at specific nodes to minimize impacts to flow, and in volumes proportional to the size of the catchment areas at each node;
  - Sedimentation ponds will be used to settle total suspended solids (TSS) from surface runoff and pit water (that was not in contact with any mine waste) prior to release to Blairmore Creek. If the quality does not meet provincial, federal or Project specific release criteria it will be directed towards the appropriate saturation zone, as needed;
  - The surge ponds will collect and store water that comes in contact with waste material as part of the selenium mitigation plan. This water will either be pumped to the raw water pond for use in the coal wash plant or directed to saturated zones; and
  - Discharge from the saturated zones will be controlled based on the rate of accumulation of water in the saturated zone and the stream flow conditions in Blairmore Creek.

- **Surface Water Management and Active Treatment**: As summarized in CR#6, Table 4.2, mitigation targeting water quality effects due to increased discharge to Blairmore Creek will:
  - Maintain appropriate riparian reserves and management zones from watercourses, where feasible;
  - Be consistent with regulatory standards, including erosion and sediment control industry standards;
  - Monitor discharges and ambient variables in receiving environments to ensure that water quality is within tolerances for westslope cutthroat trout;
  - Discharge water to watercourses in a manner that does not cause erosion or other damage to adjacent areas; and
  - Mitigate (if necessary) potential increases or reductions in surface water flows in Blairmore creeks that could affect the natural flow regime by managing the timing, discharge volume and location of water to mimic the natural flow regime and maintain flow increases or reductions within acceptable limits.

The Aquatic Effects Monitoring Program (AEMP) (CR#6, Section 6), is proposed to test the predictions regarding potential Project effects on stream flows, water quality, sediment quality, and fish and fish habitat during operations, closure, and early-post closure phases. As site conditions and monitoring dictate, and as new technology emerges, adaptive management will be implemented to adjust site practices and the monitoring program as needed. If the monitoring and follow-up program identify unexpected adverse effects to the aquatic environment, the effects assessment will be reevaluated and revised, addressing any needed development and implementation of new mitigation and management practices.

4. WESTSLOPE CUTTHROAT TROUT

Reference: EIS Guidelines, Section 6.3.3; EIA, E.9.3.6, Addendum to the Environmental Impact Statement – January 31, 2017, Alberta Westslope Cutthroat Trout Recovery Plan 2012-2017.

http://aep.alberta.ca/fish-wildlife/species-at-risk/species-at-risk-publications-web-resources/fish/documents/SAR-WestslopeCutthroatTrout-RecoveryPlan-A-Mar2013.pdf

Preamble:

Benga Mining has provided information on the effects of the Project on Westslope Cutthroat Trout, including mitigation and offsets. The analysis provided in the Aquatic Effects Assessment and the preliminary Habitat Offsetting Plan do not include a discussion of how population and distribution objectives set out in the Alberta Westslope Cutthroat Trout Recovery Plan 2012-2017 will be met in light of the proposed measures to offset the predicted residual effects to aquatic habitats over the lifespan of the Project.

The recovery approaches and strategies presented in the Recovery Plan should be used to address the identified threats and guide appropriate research and management activities for their Project, in order to meet the recovery goals and objectives for the species. Each specific strategy is designed to assess, mitigate, or eliminate specific threats to the species; to address information deficiencies that might otherwise inhibit species recovery; or to contribute to the species' recovery in general.

Information Required:

Provide a detailed discussion focusing on:

a. How specific approaches and strategies contained in the Alberta Westslope Cutthroat Trout Recovery Plan 2012-2017 will be employed to address identified threats that may occur as a result of, or in combination with, project effects.

Response:

a. The Aquatic Ecology Effects Assessment Addendum (CR#6), Section 4.0 considered a number of potential threats to westslope cutthroat trout that may result from interactions with the project. Overall, nine specific approaches and strategies contained in the Alberta Westslope Cutthroat Trout Recovery Plan 2012-2017 were considered when scoping and collecting fisheries and aquatics baseline data to address information deficiencies and/or will be employed to address threats that may occur as a result of, or in combination with, project effects (Table 4-1).

Table 4-1 Approaches and strategies from the Alberta Westslope Cutthroat Trout Recovery Plan 2012-2017 that were and/or will be applied to identify potential threats from the Project.

Alberta Westslope Cutthroat Trout Recovery Plan 2012-2017 Approaches and Strategies	How these apply to the Grassy Mountain Coal Project
R1. Elucidate life-history requirements and characteristics: Conduct studies to understand the life history, ecology, current distribution within native range, population dynamics and population structure (*e.g.*, number of mature fish) of westslope cutthroat trout.	▪ Baseline studies of fish and fish habitat in the local study area (LSA) focused on elucidating the life-history requirements and characteristics of westslope cutthroat trout including habitat quality, habitat use, fish and fish habitat distribution, population dynamics and population structure (CR#6, Appendix A1).
R2. Elucidate habitat requirements: Conduct studies to determine biophysical attributes of habitat required seasonally by each life stage of the westslope cutthroat trout, with a specific focus on identifying habitat attributes and geographic locations that constitute critical habitat for the species. This will include habitat characteristics (*e.g.*, barriers, temperature) that limit the intrusion of non-native species.	▪ Characterization and mapping of fish and fish habitat baseline conditions included evaluation of biophysical, spawning, rearing, overwintering and migratory (*i.e.*, barriers) habitats in Blairmore and Gold watersheds, as well as macrohabitat delineation, mesohabitat mapping and a microhabitat (instream flow) assessment (CR#6, Appendix A1 and A3). ▪ Evaluated migration barriers and distribution of non-native species (*i.e.*, rainbow trout, brook trout; CR#6, Appendix A1) ▪ Temperature trends were identified and correlated with westslope cutthroat trout prevalence (CR#6, Appendix A1, Section 4.1.5.2)
R3. Improve knowledge of population genetics: Complete surveys and genetic analyses to characterize genetic status of westslope cutthroat trout populations throughout native range. This should include consideration of the degree of population subdivision among pure populations.	▪ During the baseline characterization, fish identified as westslope cutthroat trout or suspected westslope cutthroat trout x rainbow trout hybrids were selected for genetic sampling (as per the requirements of the Fisheries and Research Licence and *Species at Risk Act* permit) in support of the Recovery Plan (CR#6, Appendix A1, Section 3.1.2). ▪ Genetic samples were preserved appropriately as directed by Alberta Environment and Parks (AEP) and shipped to AEP for analysis and archiving.
R4. Develop population models: Conduct studies to establish reliable population models, including population viability estimates, as well as appropriate surrogate measures relying on relative abundance, presence/absence and population structure data.	▪ Populations were estimated in Gold and Blairmore creeks as part of the baseline characterization using a combination of relative abundance and a mark recapture program (CR#6, Appendix A1, Section 3.1.5 and 4.1.5).

Table 4-1 Approaches and strategies from the Alberta Westslope Cutthroat Trout Recovery Plan 2012-2017 that were and/or will be applied to identify potential threats from the Project.

Alberta Westslope Cutthroat Trout Recovery Plan 2012-2017 Approaches and Strategies	How these apply to the Grassy Mountain Coal Project
R6. Identify and understand limiting factors: Conduct studies to better understand the potential threats associated with human activities including water regulation, connectivity/fragmentation, land-use practices, resource extraction, species introductions, climate change, angling and cumulative effects.	▪ Completed an Instream Flow Assessment of Gold and Blairmore creeks to assess the potential threats of flow changes to various life history stages of westslope cutthroat trout (CR#6, Appendix A3). ▪ Conducted baseline field program characterizing existing westslope cutthroat trout habitat designed to identify limiting factors that could further adversely affect productivity, taking into account existing pressures and potential project effects (CR#6, Appendix A1).
MR1. Limit the spread of non-native species. Where non-native species are negatively influencing remaining populations of westslope cutthroat trout, targeted removal or suppression of non-natives should occur where feasible. This strategy should also include evaluating the use of migratory barriers to protect the pure westslope cutthroat trout from invasion by non-native species.	▪ Evaluated barriers to fish passage and distribution of non-natives species (i.e., rainbow trout, brook trout) in the LSA during the fish and fish habitat surveys characterizing baseline conditions (CR#6, Appendix A1).
MR2. Apply mitigation measures for threats: Evaluate current practices and associated threats to westslope cutthroat trout at both site and landscape/watershed scales, with a view to refining or developing mitigation measures as well as consideration of management and/or regulation changes. Avoidance of negative impacts is the first, best (and sometimes only) option for mitigating impacts on westslope cutthroat trout.	▪ Avoidance: design of the Project footprint to avoid watercourses where possible, minimize disturbance, use existing watercourse crossings where possible (CR#6, Section 4.3.1). ▪ New watercourse crossings will follow the *Water Act*, Code of Practice for Watercourse Crossings as per A27 of Recovery Plan (CR#6, Section 4.3.1). ▪ Aquatic Resources Management Plan, Aquatic Effects Monitoring Program, compliance and effectiveness monitoring for Fisheries Act Authorization include evaluation of mitigation and adaptive management approach to address any changes required due to mitigation not functioning as intended or changes in the management and/or regulation framework (CR#6, Section 6.1.1).

Table 4-1 Approaches and strategies from the Alberta Westslope Cutthroat Trout Recovery Plan 2012-2017 that were and/or will be applied to identify potential threats from the Project.

Alberta Westslope Cutthroat Trout Recovery Plan 2012-2017 Approaches and Strategies	How these apply to the Grassy Mountain Coal Project
MR5. Recover populations within historical range: Based on the results of the feasibility studies, recover populations of diverse life-history strategies within historical range. This would include both re-establishing populations of diverse life-history strategies, as well as increasing current population levels, distribution and connectivity.	▪ The Preliminary Habitat Offsetting Plan identified several options designed to increase current population levels and improve connectivity (CR#6, Appendix A4). ▪ Offsetting options are to be developed in detail based on acceptance of residual serious harm predicted for the Project through consultation with regulators and stakeholders.
MR7. Data conservation and management: To provide continuity and the ability for future reference, all samples and information (historical, current and future) must be appropriately preserved and/or archived within known repositories.	▪ Genetic samples were preserved appropriately as directed by AEP and shipped to AEP for analysis and archiving (CR#6, Appendix A1, Section 3.1.2).

b. How the population and distribution objectives contained in the Recovery Strategy will be achieved, taking into consideration the proposed measures to offset the predicted residual effects to aquatic habitats over the lifespan of the Project.

Response:

b. In the Recovery Strategy (DFO 2014), the population and distribution objectives are stated as:

> *"Protect and maintain the existing ≥ 0.99 pure populations (currently believed to be approximately 51) at self-sustaining levels, and re-establish additional pure populations to self-sustaining levels, within the species' original distribution in Alberta."*

Currently the proposed measures to offset are in the early stages of development, as the Aquatic Effects Assessment Addendum describing the residual effects is under review by regulators. Upon agreement of the proposed residual effects, the Preliminary Habitat Offsetting Plan (provided in CR#6, Appendix A4) will be further developed in consultation with regulators and stakeholders. Five potential offsetting options have been described, all with the overall goal of creating a net increase in productivity of pure populations of westslope cutthroat trout. The Preliminary Habitat Offsetting Plan was developed with a primary focus on the Alberta Westslope Cutthroat Trout Recovery

Team's (2013) Management and Regulation approach to protect the westslope cutthroat trout and its habitat through implementation of the following strategy:

> *"**MR5. Recover populations within historical range**: Based on the results of the feasibility studies, recover populations of diverse life-history strategies within historical range. This would include both re-establishing populations of diverse life-history strategies, as well as increasing current population levels, distribution and connectivity."*

In addition to implementing actions under the MR5 strategy, data collection and scientific research have and will continue to contribute to the knowledge gaps and research needs identified in the Recovery Plan.

References

Alberta Westslope Cutthroat Trout Recovery Team. 2013. Alberta Westslope Cutthroat Trout Recovery Plan 2012-2017. Alberta Environment and Sustainable Resource Development, Alberta Species at Risk Recovery Plan No. 28. Edmonton, AB. 77pp.

[DFO] Fisheries and Oceans Canada. 2014. Recovery Strategy for the Alberta populations of Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi*) in Canada [Final]. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa. iv + 28 pp + Appendices.

[Matrix] Matrix Solution Inc. 2012. Determination of water monitoring standards for oil and gas operators. Prepared for: Canadian Association of Petroleum Producers Shale Gas Water Technical Committee.

MIGRATORY BIRDS AND SPECIES AT RISK

5. LITTLE BROWN MYOTIS

Reference: EIS Guidelines, Section 6.1.7 & Section, 6.3.3; EIS Guidelines, Section 6.4; Consultant Report #9, Section 2.3.4 & Section 7; Canadian Environmental Assessment Agency's Request for Additional Information (SIR #38 - March 21, 2016 Letter – Revised Questions April 26, 2016 – Document 34 on the Agency's Website); Addendum to the Environmental Impact Statement – January 31, 2017

http://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_LittleBrownMyotisNorthernMyotisTricoloredBat_e_proposed.pdf

Preamble:

The Guidelines require Benga Mining to include a description of the abundance and distribution of species at risk including habitat requirements, key habitat areas, identified critical habitat and/or recovery habitat, and the general life history of species at risk that will occur in the Project area or be affected by the Project.

The Little Brown Myotis was emergency listed in 2014 under Species At Risk Act as Endangered because their survival is imminently threatened by a deadly and highly contagious disease, white-nose syndrome. Hibernacula are used by Little Brown Myotis to survive when ambient temperatures decline and insects are unavailable and typically include caves, abandoned mines, hand-dug wells, cellars, or tunnels where light and noise levels are low. The Recovery Strategy for Little Brown Myotis (2015) identifies all hibernacula (found and not found) as critical habitat as they are necessary for the survival and recovery of the species. The loss of a hibernaculum could have regional population effects on Little Brown Myotis.

Benga Mining's desktop assessment, indicates that there are no suitable karst formations, that old mine access has been sealed, and the elevation of the Project site is too high for hibernacula, however no hibernacula or swarming surveys were done to confirm this assessment. Although hibernacula for Little Brown Myotis are uncommon and hard to find, this endangered bat species has been observed in the area during the mist-netting surveys and terrain, and conditions may in fact be suitable for hibernacula. ,

Information Required:

a. Provide the number and locations of bat hibernacula (through the use of surveys) in the Project Development Area (footprint plus disturbance buffer), and provide information on whether little brown bats are using these hibernacula.

Response:

a. Benga has developed a field program to identify potential areas within the Project's proposed mine permit boundary, that may provide suitable areas for little brown myotis hibernacula. A copy of the field program is attached as Appendix 5A.

The field program was initiated in July 2017 and completed in September 2017. The analysis of the acoustic recording data is underway and a final data analysis is expected to be completed in December 2017. A response to IR #5 will be issued in January 2017.

b. Using information obtained through the above mentioned surveys (in a) hibernacula surveys (in (a) above), estimate the number of little brown bats that will be affected for each hibernacula disturbed/destroyed due to the Project.

Response:

See response to 5a.

c. If hibernacula are found in (a), through the use of surveys, identify hibernacula near, but unaffected by, the Project to which Project-impacted little brown bats could relocate.

Response:

See response to 5a.

d. Based on the information obtained through a-c above, identify mitigation measures to reduce impacts on the potential destruction of little brown bat hibernacula.

Response:

See response to 5a.

Appendix 5A

Bat Hibernacula Program – Swarming Survey Workplan

1.0 INTRODUCTION

As part of the Grassy Mountain Coal Project (the Project), Benga Mining Ltd (Benga) is initiating a wildlife field program to identify potential areas within the Project's proposed mine permit boundary, that may provide suitable areas for little brown myotis hibernacula. This program was initiated in part during a phone conversation between ECCC, Benga, and MEMS on April 27, 2017, during which it was agreed that Benga would conduct a preliminary survey to determine and verify potential locations of little brown myotis hibernacula, and from that develop a swarming survey workplan for ECCC's review.

2.0 PRELIMINARY SURVEYS

Benga conducted a preliminary desktop and field survey to:

1. compile available information on habitat requirements for little brown myotis hibernacula, as relevant to the Project;
2. based on available information, identify and ground verify key locations within or adjacent to the Project's Mine Permit Boundary (MPB) that may provide suitable hibernation conditions for little brown myotis; and,
3. based on the preliminary survey, develop a work plan to further determine whether the identified areas may be used by little brown myotis for hibernacula purposes (by conducting swarming surveys and acoustic monitoring).

2.1 REQUIREMENTS FOR HIBERNACULA

Publicly available resources were reviewed to establish benchmarks for characteristics required for little brown myotis hibernacula in southwestern Alberta. Locations with the following characteristics are the most suitable for little brown myotis hibernacula in the region of the Project:

1. Stable temperature within the range of 2°C to 10°C and relative humidity of >80% during the winter hibernation period (OMNR 1984, Environment Canada 2015);
2. Sheltered from extreme weather (OMNR 1984); and
3. Minimal/no human presence and protected from predators (WDNR 2013).

The MPB occurs on often-steep mountainous terrain with large areas previously disturbed by mining, and without known karstic formations. The types of locations that would best provide the abovementioned hibernacula requirements include (OMNR 1984, Johnson *et al.* 2006, WDNR 2013, Environment Canada 2015, ACA 2016, Brigham 2017 (pers.comm.):

1. abandoned underground mine infrastructure (*e.g.*, shafts, tunnels);
2. caves on rock faces; and
3. deep cracks or crevices on rock faces.

The presence of hibernacula at 6,200 feet asl (Cadomin Cave opening) and up to 8,000 feet asl (in nearby Montana, MNHP 2013) indicate that there are unlikely to be elevation limitations to hibernacula on Grassy Mountain (~6,700 feet asl at its current peak).

2.2 IDENTIFICATION OF POTENTIAL HIBERNACULA LOCATIONS

Locations in or adjacent to the MPB that may provide suitable conditions for little brown myotis hibernacula were initially determined using aerial imagery and knowledge of the landscape, geological features, and abandoned mine infrastructure. These locations included sites with abandoned underground mine infrastructure and areas with rock faces with crags and outcroppings that may include deep cracks and crevices.

The locations identified during the desktop survey were visited by a qualified wildlife/bat biologist to discern the likelihood of each to be a potential little brown myotis hibernaculum.

As confirmation of the actual potential for a site to be a hibernaculum is not possible to determine during spring/summer seasons, relative potential (relative to other areas surveyed) was determined. Within the 18 areas surveyed, a total of 43 sites were assessed.

3.0 SWARMING SURVEY WORKPLAN

Bats, including little brown myotis, may swarm prior to or during the fall migration period at locations at or near hibernacula. For this reason, Environment Canada (2015) has indicated that swarms may be an indicator of locations where hibernacula occur. Swarming surveys will be conducted for the ground-verified sites rated as having high (n=8 sites) or high-moderate (n=3 sites) relative potential for providing suitable conditions for hibernating little brown myotis (Table 5A-1 and Photos 5A-1 to 5A-12); BC2 is not included in the workplan because it will not be affected by the Project. These 11 sites are in six areas (extending from north to south, R5a, R4, R1, M3, M2, and M1).

Swarming surveys will consist of:

1. acoustic monitoring, with analysis focussing on identifying the presence of multiple little brown myotis present at the same time, rather than identifying individual bats of all species passing through the acoustic monitoring zone;
2. visual observations for swarming activity; and,
3. mist netting to identify species present in the area.

The swarming survey methods for each site are summarized in Table 5A-2. Wherever vehicle access is possible to allow for nighttime safety and quick egress, the full suite of three surveys will be conducted at sites rated as having high relative potential for providing suitable hibernaculum conditions (*i.e.*, M1, M3, R4-2). At high relative potential sites where access is possible only by foot (*i.e.*, along steep rocky ridges; R5a-3), only acoustic monitoring will be conducted, as nighttime work would not be safe. Acoustic monitoring will only be conducted for

high relative potential sites outside the MPB (*i.e.*, M2-1, M2-2 and -3, and M2-4) and for high-moderate relative potential sites in the MPB (*i.e.*, R1-3, R1-7, R5a-5).

Acoustic monitoring is anticipated to provide the most conclusive evidence of swarming activity because it will be ongoing for nine weeks at each location. Not including netting/visual observations at all locations is not anticipated to negatively effect the overall results of the swarming survey.

The duration of July 31 to September 30 is based on the anticipated migration and swarming season of little brown myotis (and other bats) through and within the MPB. Surveys will be conducted in each location until September 30 unless evidence of swarming is identified prior to then. If swarming is identified at a location, surveys will not continue at that location unless species could not be identified to little brown myotis.

Table 5A-1 Summary of Ground Verification Survey Results

Site	Relative Hibernaculum Potential	Characteristics
Mine Sites		
M1	High	Old mine infrastructure with 20-cm pipe (unobstructed opening is about 12 cm) entering/exiting mine portal at ground level. Unknown depth.
M2-1	High	Abandoned, rotting wooden mine structure with a tunnel (5 cm x 20 cm; unknown depth) at the back, with potential to lead to mine shaft.
M2-2	High	30 cm x 30 cm shaft going downwards at 45°. Close to the opening for the old mine; may lead to a mineshaft. Cool air flowing out.
M2-3	High	A very deep diagonal crack (20 cm x 120 cm) in the rock about 3 metres above M2-2. Moss growing deep inside; unknown depth.
M2-4	High	8 cm x 12 cm opening in the rock near an abandoned, closed-up mine shaft; unknown depth.
M3	High	180 cm x 180 cm opening to an abandoned mine; very steep shaft goes down as far as can be seen. Unknown depth.
Mountain Ridge Sites		
R1-3	High-Moderate	8 cm x 30 cm diagonal crack behind a tree near ground level; unknown depth
R1-7	High-Moderate	Deep crack (8 cm x 15 cm) of unknown depth.
R4-2	High	Diagonal crack with 20 cm x 20 cm tunnel inside. Unknown depth.
R5a-3	High	Small cave 50 cm x 25 cm. At the back of the cave there is a 10 cm x 25 cm vertical crack of unknown depth. There is a vertical crack above this cave that cannot be accessed.

Table 5A-1 Summary of Ground Verification Survey Results		
Site	**Relative Hibernaculum Potential**	**Characteristics**
R5a-5	High-Moderate	Horizontal crack (20 cm high) of unknown depth.
Sandstone Cliffs along Blairmore Creek		
BC2	High-Moderate	15 cm x 15 cm tunnel going horizontal into the rock then turns left out of view, unknown depth.

Photo 5A-1: Site M1

Photo 5A-2: Site M1

Photo 5A-3: Site M2-1 (wooden structure)

Photo 5A-4: Site M2-1 (close-up of tunnel inside wooden structure)

Photo 5A-5: Sites M2-2 (yellow) and M2-3 (red)

Photo 5A-6: Site M2-4

Photo 5A-7: Site M3

Photo 5A-8: Site R1-3

Photo 5A-9: Site R1-7

Photo 5A-10: Site R4-2

Photo 5A-11: Site R5a-3 (small cave – yellow; crack – red)

Photo 5A-12: Site R5a-5

Table 5A-2 Swarming Survey Methods and Dates

Site	Methods	Dates
M1	Acoustic monitoring	July 31 – September 30, 2017
	Swarm visual observation	Every second week in August and September, 2017, starting first week of August. N=4 surveys.
	Mist netting	Every second week in August and September, 2017, starting first week of August. N=4 surveys.
M2-1	Acoustic monitoring	July 31 – September 30, 2017
M2-2 and M2-3	Acoustic monitoring (treated as one site due to proximity)	July 31 – September 30, 2017
M2-4	Acoustic monitoring	July 31 – September 30, 2017
M3	Acoustic monitoring	July 31 – September 30, 2017
	Swarm visual observation	Every second week in August and September, 2017, starting first week of August. N=4 surveys.
	Mist netting	Every second week in August and September, 2017, starting first week of August. N=4 surveys.
R1-3	Acoustic monitoring	July 31 – September 30, 2017
R1-7	Acoustic monitoring	July 31 – September 30, 2017
R4-2	Acoustic monitoring	July 31 – September 30, 2017
	Swarm visual observation	Every second week in August and September, 2017, starting first week of August. N=4 surveys.
	Mist netting	Every second week in August and September, 2017, starting first week of August. N=4 surveys.
R5a-3	Acoustic monitoring	July 31 – September 30, 2017
R5a-5	Acoustic monitoring	July 31 – September 30, 2017

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