Tables for the EAC of the Valentine Gold Project EIS Review – Registration 2015

Table 1. Agency Comments (Evaluation) on the EIS

EIS Guideline within your mandate	Does the EIS answer the specific guideline requirement? Yes or No.	Is this section deficient, contain errors or require further mitigation?	If no, explain how the guideline **has NOT been** met by the EIS.? What else is needed?
3.0 Scope of project, factors to be considered and scope of factors 3.1 Scope of Project: Air emission sources including dust lift-off. Noise sources, expected noise levels and noise monitoring locations. Sources and frequency of vibrations including seismic loading (Victoria Dam and wildlife).	No. While the EIS mentions dust, noise & vibrations it does not adequately address them	Yes (Requires Further Mitigation)	The EIS does not address the impact of dust on caribou & its habitat (see comments in Annex A). The EIS does not address noise & stress response in caribou (see comments in Annex A). The EIS mentions vibrations, such as in Sections 11.5.1.1 (page 11.53) 12.5.1.1. (pages 12.58-.59), but it does not describe how the magnitude will be measured or mitigations planned.
4.2.1.2 Woodland Caribou (Habitat, Migratory Behaviour and Cumulative Effects)	No	Yes (Deficient)	Annex A provides specific comments related to Woodland Caribou throughout the EIS. The **Baseline Caribou Study (Appendix 2 of the EIS)** does not adequately: Represent the extent of use of the project area by caribou and relate it to the degree of risk posed by project components Integrate common findings between the three monitoring components (spring and fall camera surveys, population census) where these suggest accentuated risk to caribou. For

			example, common travel corridors used during both spring and fall migration represent increased risk due to their common use across seasons. Provide a comprehensive assessment of risk posed by the project as a whole to caribou migration and subsequently to caribou populations. For example, discuss implications for the Buchans caribou herd if they are unable to travel between calving and wintering grounds. Provide standardized analyses and summaries of data collected for all baseline studies Discuss the risks to caribou migration due to specific project components (pit, road, waste rock pile) based on caribou movement through the project area Propose effective mitigation measures for caribou, in particular migrating caribou, based on best practices and degree of obstruction posed by specific project components to migration during construction and operation. For example, the impact of the waste rock pile, directly in the path of a migratory corridor, is a major concern that is not evaluated or discussed. Several aspects of baseline information remain incomplete: o Camera monitoring stations are not set up throughout the project area, and include only a small number of cameras (12), some of which malfunctioned. o Therefore, caribou use of the project area, with specific reference to entrance and exit points of migrating caribou during spring and fall migration, and crossing of the main road, is incomplete. o A reliable baseline population estimate for Buchans caribou, the population most affected, is unavailable ▪ The method used to census the population was applied incorrectly and as a result there is no estimate to provide a baseline for future comparisons.

Contain original research to refine timing and duration of migrations, connectivity between seasonal habitats and migratory behavior.	Yes	No (acceptable)	Original analyses on migratory pathways are presented.
Outline mitigations that resolve the project's effects on migratory corridors	No	Yes (Deficient)	Table 11.13 does not contain mitigations that address specific projects components and their impact on caribou migration. Detailed comments are provided throughout the review. This is the primary deficiency of this EIS.
Contains original research on timing and duration of calving and post-calving periods.	Yes	No (Acceptable)	The proponent provides maps of calving and post-calving ranges based on telemetry data provided. While not original research, the requirement is met.

ANNEX A: COMMENTS ON WOODLAND CARIBOU

<u>Baseline Study Appendix 2: Woodland Caribou</u>

General comments

- The results of the three monitoring components are not integrated and discussed (spring camera surveys, fall camera surveys, and post-calving aerial surveys) even where there are common findings which emphasize use of particular corridors. Commonalities in use between seasons indicate accentuated risk under these circumstances. For example, in spite of differences in how caribou move through the proposed mine project area in fall versus spring migrations, there are also many similarities i.e. both fall and spring camera surveys show extensive use and movement through the proposed waste rock pile near the pit, a feature which will likely block movement due to its extent and size. The absence of a discussion that integrates findings such as these undermine the risk posed to caribou migration by specific project components.

- One of the key findings is that there is extensive use of the project area by caribou during migration, and this needs to be an essential element of assessment of potential impacts. The proposed rock pile is showing a lot of caribou use during migration and the project area is showing a lot of use as a whole based on the data. These are important findings and as such, it is important for the EIS to have a more focused discussion on potential impacts as well as a mitigation plan that addresses the high use of caribou within the project footprint during migration.

- The remote camera monitoring that took place in Fall 2019 and Spring 2020 cannot be considered a survey as the cameras are not set up into an array based on principles of experimental design, and include only a small number of cameras (12), some of which malfunctioned. Further, cameras were not placed throughout the extent of the project area, or even along wildlife trails identified within this region.

    - For example, figure 3-2 pg. 6 (Attachment 2B 'Spring'2020 Camera Survey', section 3.1), indicates that a number of wildlife trails that traverse the project area have no cameras placed on them, as does Figure 3-1 pg. 5.

- As a result of cameras not being distributed throughout the project extent, gaps in knowledge of caribou use of the region persist, even though extensive use of the project site by caribou is clear i.e. ~ 700 caribou were photographed during spring migration, for cameras deployed between 60-80 days, and focal, intensive use of some areas is apparent (e.g. one camera alone detected > 440 caribou Attachment 2B, Table 4.1). Consequently, knowledge of caribou use of the region is incomplete, which constrains assessment of potential impacts. For example:

    - Attachment 2A, Section 5.0 (pg. 12) indicates that they were unable to determine where caribou exit the proposed project area during fall migration given a lack of cameras deployed in probable areas.
    - Similarly, during spring migration the available information does not allow for a determination of how caribou approach the mine site and how many might be crossing the main road (Attachment 2B, section 5, pg 15). Given that road crossings have been identified as an impediment for Buchans caribou during a prior EA in the region (report was made available to the proponent) this significant limitation will preclude assessment of changes in road crossings before, during and after construction due to the lack of baseline information.

- While the cameras provide information on caribou presence and timing of caribou movements, group sizes and composition, the overall results from the camera trapping are poorly summarized, are not standardized, and limited data analyses took place. For example:

    - No standardized observations are included (e.g. # detections per camera monitoring days). Since the number of operational cameras varied by day it is unclear whether

figure 4-3 Attachment 2B (page 11) and figure 4-2 Attachment 2A simply sum all observation per camera or are standardized by the monitoring effort (trapping days).
    - Other data summaries that could have been included given the data collected are the (standardized) number of caribou detected per calendar day for each migration period, and summaries for the mean, median and range of detections per day for each season.
    - No process to determine the number of discrete caribou observations was included. Since multiple images taken over a short time frame can overestimate the number of individuals, this is an oversight.

- Improper application of the 'distance sampling' technique in the post-calving survey to generate an estimate of population size for the Buchans caribou herd makes this estimate wholly unreliable. Consequently, current baseline information on Buchans caribou herd population size is incomplete and future comparisons to changes in abundance during and after construction cannot be made using this survey estimate.

Specific comments:

<u>Fall 2019 remote camera survey</u>:
Note all references to figures and tables pertain to 'Attachment 2A'

- Significant use of the proposed waste rock pile location during fall migration is documented e.g. section 5.0—"during fall migration caribou moved through proposed waste rock pile location near marathon pit as they travelled south"; Cameras depicted in Figure 4-1 in the proposed waste rock pile shows high numbers of caribou observations. Nonetheless, the discussion includes no reference to the fact this waste rock pile could therefore block a significant migration corridor, and what the potential impacts of such an obstruction would be for caribou returning to their wintering grounds under this circumstance.

<u>Spring 2020 remote camera survey:</u>

Note all references to figures and tables pertain to 'Attachment 2B'

- A small number of camera deployments over a constrained spatial extent relative to the project area, limit the ability to describe baseline caribou activity and movements. For example, the single camera placed at the main road, an area that will have increased traffic and which caribou are likely to avoid under those circumstances, failed. Therefore, comparisons to future changes in use or avoidance of the road during spring migration cannot be made.

- Figure 3-1 (page 5) shows generalized wildlife trails throughout the proposed mine site, including straight through waste rock pile and across the main road. However, the discussion includes no reference to the potential ramifications of this to caribou attempting to travel north through the mine site to their calving grounds. For example, the size, extent, height and location of the waste rock pile is likely to pose a significant, possibly insurmountable, obstacle. The possible impacts of this are not discussed and no mitigations are proposed.

<u>2020 Post-calving Aerial Survey:</u>
Note all references to figures and tables pertain to 'Attachment 2-C'

- Distance sampling to estimate population size is a valid technique to estimate population size, particularly where animals are aggregated and where they can be readily observed, as is the case for post-calving regions of the Buchans caribou range. Unfortunately, the technique was improperly applied in this survey (see General comments), and the resulting population estimate is unreliable.

- Section 3.1.1 (first paragraph, page 4) – "The data was quality reviewed to remove locations that were either low quality or faulty e.g. ' Fix status >=2' . This is an ambiguous statement, as it would apply only to ARGOS location data (not GPS, for which precision is measured using DOP values). Further, since precision of ARGOS data improves with higher fix status (e.g. a value of 3

is better than 2) this statement implies that the most precise locations were in fact filtered out prior to mapping the calving range. Therefore, more detail on how data was selected based on precision for all data types used is required.

- Since individual calving ranges for animals are not defined, why were locations for animals with < 50 locations eliminated, since these are pooled to define the calving range? Also, the number of locations and individuals removed from the analysis as a result of this decision need to be indicated.
- It is unclear whether the 95% kernels were generated for individuals or for pooled animals within the population, given the above statement.

- On page 4 – section 3.1.1, the statement "point telemetry locations from May and June were also used to inform the survey area" is confusing since the calving period is defined as occurring throughout May and June and these locations would have been used by default.

- The statement "Transects were established within the survey area in an east-west orientation at 3 km intervals, consistent with WD protocol" is misleading given that the Wildlife Division has used distance sampling on only one other occasion (Middle Ridge 2012, report provided), in which case transect lines were spaced more tightly (e.g. closer together) and were based on expected caribou densities throughout the survey extent.

- Section 3.1.2. one reference was checked for accurate reporting of ZOI in this paragraph—and it was incorrect: caribou ZOI in Boulanger et al is 14 km, not 11 km.

Survey methods (Section 3.2).

- See also 'General comments'. The protocol for distance sampling was improperly applied. A key assumption of distance sampling is that the horizontal distance from the survey line perpendicular to each group of detected animals is measured. A recommended approach to accomplish this is to measure the sighting angle (using a rangefinder) from the aircraft to the centre of each group of animals. Then, a trigometric calculation of horizontal distance incorporating the accurate height of the aircraft is applied. If using waypoints to estimate altitude, the elevation height of land needs to be subtracted from aircraft height to precisely measure aircraft altitude. The survey as conducted did not precisely measure the distance to caribou and did not accurately measure aircraft altitude. It also excluded over half of all caribou observations (e.g. if they were observed further than 500m away), even though caribou were readily observed at distances well beyond 500m. Therefore, the estimate of population size is invalid.

- Why was perpendicular distance not directly measured with a range finder? This is a required input.

- Why was the assumption made that animals would not be sighted further than 500m away? This is a key error, as the creation of a detection function which models animals sighted by distance is a vital component of distance sampling and must be derived from the survey data, and should not be assumed *a priori*.

- Was survey altitude subtracted from a DEM? The use of altitude measured from the helicopter without taking into account the topography of the ground results is an incorrect estimate of altitude, a required input into the calculation of survey results.

- Why were observation > 500 metres not included? The recommended practice is to truncate detection distances at the tail end of a histogram where detection probability is < 0.15 (Buckland 2001: 103). The decision not to directly measure distances is affecting the calculation of results here, and may have led to the unnecessary exclusion of data (how many animals were sighted beyond 500m?). For a prior survey of NF caribou (Middle Ridge), the detection function showed animals were sighted up to 1000m, and the authors of this study reported that caribou detection between 400-500m was still 75%.

- Table 4.1 (page 12) How many of the 307 groups (and associated individuals) were included in the analysis? How many fell outside the 500m distance or were seen while in transit?

- It would be good to see statistics on the number of groups seen per line, and the size of those groups as a component of the presentation of results. This would help to assess caribou densities throughout the survey extent.

- Was group size used as a covariate or was consideration given to using size-biased regressions, as smaller groups are less likely to be detected at greater distance?

Results and Discussion (Section 4.0)

- This section identifies that more than <u>half of all observations</u> made of animals were excluded because they were observed further than 500m away. This explains why the reported number of animals seen on transect so closely match the population estimate (1700 vs 1704 caribou). The survey population estimate infers that all animals that were present in the survey region were detected, an implausible occurrence. In fact, because distances to animals further than 500m away were not measured, the detection function could not be properly estimated. As a result, the population estimate is unreliable (it is an underestimate) and this should be elaborated on as part of the discussion regarding the discrepancy between this estimate and the one from 2019. It also means that baseline information on population size for 2020 is not available, and will constrain assessment of future impacts.

- Population estimates calculated using distance functions correct for imperfect detection by incorporating variability in detection probability. Estimates are reported as an estimate of absolute density with confidence intervals that reflect variability in detection based on a number of covariates. Because distances to caribou were only measured at distances < 500m (and even in this case, imprecisely, by using bins of distance classes rather than exact measures), the detection function was not fully estimated over the distance in which caribou were observed from the aircraft and the resulting population estimate assumes that nearly all caribou that were present were observed. The population estimate must be considered unreliable.

<u>Environmental Impact Statement</u>

<u>Chapter 11: 11.2.1.3</u>

Page 11.11

Error: Argos collars provide a position every 4 days not every hour. The argos system collected positions for 6 hours every 4 days and most often a class 3 position was selected via filtering.

<u>Chapter 11 11.2.2.3</u>

Page 11.38

In July and Aug 2018, 3 adult caribou were killed by black bears on the Buchans Caribou Management Unit indicating that adults are also taken in addition to calves.

<u>Chapter 11 11.2.2</u>

Page 11.39

It states that “coyotes consume mostly moose” - add <u>carrion to this statement.</u>

<u>Chapter 11.3.3</u>

Table 11.11 section ‘Change in mortality risk’ does not include potential changes to calf mortality as a measurable parameter. Calf mortality is possible if females are unable to migrate successfully to calving grounds and calves are born elsewhere. Changes in calf mortality have the potential to significantly alter population size and trend.

Table 11.11 section 'Change in movement' does not include an impermeable migration corridor as a measurable impact. By summarizing loss only as a proportion of total migratory pathways it underestimates losses that may occur if the main corridor becomes impermeable to travel.

Chapter 11.3.5.2

Pg. 11.48 To assume an avoidance zone of only 500m during construction and operation of the mine is extremely conservative (small) and inconsistent with published literature, including studies cited in the caribou component study. This affects the discussion and assessment of risk surrounding potential habitat loss.

Chapter 11.3.5.4

Page 11.49 Why is additional hunting by project workers considered a component of mortality risk if hunting and fishing will be prohibited by project workers (Table 11.13)?

This whole section requires further discussion with respect to the information presented in the text. Given the high volume of caribou which pass directly through the project area twice a year, the level of risk posed needs to be comprehensively presented. See also comment for Chapter 11.3.3—discuss risk posed to caribou calves if migration to calving grounds can't be completed and caribou are born elsewhere.

Chapter 11.4

page 11.50 The text indicates that the waste rock pile was moved and reconfigured—yet the component study and the section on caribou migration indicate that it is still directly in the path of migrating caribou. Please provide further detail on how this mitigative measure will improve caribou movements through the project area.

Noise emissions—please provide detail on how these will be monitored, and how their effects on caribou avoidance will be determined and mitigated. Place anticipated noise emissions into context relative to avoidance shown by caribou in other mining operations.

Given extensive use of the project area by caribou, particularly during spring and fall migration, and the fact that an essential migratory pathway travels directly through the project site, it is concerning to see no targeted mitigations which address permeability of this migratory pathway, including potential shutdowns or relocations of project elements which block this pathway, during this time period. Addendum: I see these are referenced in the text pg 11.65, but should be incorporated into this table.

Chapter 11.5.1.2

Pg. 11.58 Given the proximity of calving and post-calving regions for Grey River caribou (Figure 11-9), discuss potential implications if Grey River caribou avoid calving in these regions at levels beyond the 500m zone of influence estimated in this report.

Pg. 11.61 It would be useful to provide statistics on the amount of indirect habitat loss if avoidance exceeds 500m, e.g. is closer to levels reported in the broader literature. Perhaps different scenarios—low, medium and high levels of avoidance could be presented and discussed in 11.5.1.3.

Page 11.65 while the project area may affect 3.8% of the total migratory corridor, given that the corridor passes directly through the project area, and is obstructed by a major project feature (waste rock pile), the potential risk posed if the corridor is not passable is not fully assessed or discussed.

Pg. 11.66. While there is some uncertainty in the degree of residual impacts on caribou, if migration is blocked or unable to occur the impact on the Buchans caribou population, which regularly uses a narrow migratory corridor that passes directly though the mine site, could be pronounced. This potentially highly detrimental impact needs to be more fully discussed as a component of risk faced by this population by this development.

Chapter 11.5.3.3

Page 11.72 Given the exposure to enhanced mortality (from vehicle collisions and from becoming tapped in the pit), when combined with the level of use shown by caribou throughout the project area, the assessment of risk as 'low' during construction and operation of the mine, is difficult to support.

Table 11.17 The number of adverse impacts and their frequency, duration, and irreversibility, do not support the assessment of low to moderate risk assigned for 'Mortality'. This is exacerbated since their evaluation of mortality also did not include potential calf mortality if caribou cannot reach the calving ground. Since mortality will directly affect population abundance and trends, their ranking suggests there is little risk to the Buchans population; this assessment is not supported by the available information.

Chapter 11.6

Page 11.74 The statement 'caribou may be able to circumvent project features in the migration path, and possibly the Project entirely' is not supported by the analyses of caribou, movements or the information presented in the Caribou component study. The statement is conjectural and should be removed.

Summary_of_EIS

A key component of the EIS guidelines was to outline mitigations that resolve the project's effects on caribou migratory corridors. The analysis of migration patterns of Buchan's caribou through the project area presented in this document (Section 11.2.2.1 page 11.31, also figures 11-12, and 11-13) indicate that there was 'only one distinct population level path identified'. Similarly, the caribou component study indicates heavy use of the project area by migrating caribou during spring and fall (See Annex A). Residual impacts for Buchans caribou are considered to be of a 'high' magnitude. However, the EIS does not present detailed or effective mitigations related to key project components.

Significant gaps in knowledge with respect to caribou use of the project area, and baseline information on population size for Buchans caribou, remain and will hinder assessment of future impacts.

The potential impacts on the Buchans caribou population if caribou are unable to migrate to their calving grounds are not considered, even though calf mortality may be substantial in this case.

The assessment of (indirect) habitat loss is based on a very conservative level of anticipated avoidance (500 m) and will likely underestimate impacts on caribou during construction and operation phases of the development.

It would be valuable to include any literature about stress responses in caribou. It is anticipated that a key migration route becoming impassable may elicit a stress response, as will disturbance from noise and activity.

The EIS does not include discussion of cumulative impacts from disturbance, habitat loss, mortality, potential changes in migration stemming from project development on the Buchans caribou herd.

The EIS only indirectly addresses the effects of noise, lights and dust on caribou. Prior environmental assessments pertaining to the influence of mining on caribou and the scientific literature both suggest that air quality (dust) and disturbance from noise and light are significant contributors to the impacts of mining on caribou and their habitat. Specifically, mining operations produce dust which results in dustfall, dust on leaves, dust on lichen, and dust on vegetation, especially within 1 km of mining operations (Chen et al 2017). In addition, it increases airborne fine particulate matter ($PM_{2.5}$). Collectively dust from mining operations alters soil pH and affects vegetation within the zone of dustfall (enhanced soil alkalinity reduces the availability of lichen and forage plants such as ericaceous shrubs). Monitoring of these items is informative for understanding the quantifying the impacts of mining on caribou and their habitat. All aspects of human activity (noise and light) are key disturbance stimuli for caribou and should be considered cumulatively. Noise disturbance has been shown to affect caribou by causing physiological stress, increased movement, less rumination, displacement (which may lead to predation) and enhanced energetic costs. In addition alarm reactions have been directly observed in caribou during activities such as blasting, dumping and bulldozing. A recent study evaluating caribou response to high and low activity periods for a surface mining operation (normal operation versus holiday shut-downs of several weeks duration) suggested that caribou reduced use within 1.5 km of the mine, but ameliorated this response during low activity periods (Eftestol et al 2019). This suggests that moderating mining activity during critical periods (e.g. migration) may be an important tool for mitigation of the mine's effects, and should be measured and quantified.

The monitoring and mitigation plan developed for noise, light and particulates should include airborne fine particulate matter (PM2.5). Dust from mining operations alters soil pH and affects vegetation

within the zone of dustfall (enhanced soil alkalinity reduces the availability of lichen and forage plants such as ericaceous shrubs). Monitoring of these items is informative for understanding and quantifying the impacts of mining on caribou and their habitat.