Golder Associates

TECHNICAL MEMORANDUM

DATE April 27, 2017 **PROJECT No.** 1539221

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QuantumPlace Developments

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RE: RESPONSE TO FIERA'S THIRD PARTY REVIEW OF THE RESORT CENTRE ASP AMENDMENT ENVIRONMENTAL IMPACT STATEMENT

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) prepared an Environmental Impact Statement (EIS) for an amendment to the existing approved 2004 Resort Centre Area Structure Plan (ASP) on Three Sister's Mountain Village (TSMV) properties in Canmore (the Project), as proposed by QuantumPlace Developments Ltd. (QPD) on behalf of Three Sisters Mountain Village Properties Ltd (TSMVPL). The EIS identified potential environmental impacts, proposed mitigation, and assessed predicted impacts after mitigation based on an analysis of extensive local data about wildlife, human use and other environmental conditions in the area. Modelling was used as one of the many lines of evidence presented within the EIS to assess impacts and develop mitigation for wildlife.

Fiera Biological Consulting Ltd. (Fiera) was retained by the Town of Canmore (the Town) to review Golder's EIS as outlined in the Town of Canmore's Environmental Impact Statement Policy (2016). According to the EIS Policy Statement, Fiera's role was to identify and make recommendations on how to reduce, mitigate or avoid negative impacts of the proposal including raising concerns if the negative impacts cannot be satisfactorily reduced, mitigated or avoided.

Fiera's Third Party Review (TPR) provides some useful information, feedback, and requests for clarification which Golder has incorporated into this response. However, the TPR fails to address items requested in the scope of work provided to Fiera by the Town and advocates for standards and analyses that are not applicable to the EIS, as defined in the project specific terms of reference (ToR) provided to Golder by the Town. Further, the TPR misrepresents the content of Golder's EIS, and contains a number of serious errors, omissions, and irregularities.

Fiera's review focusses almost entirely on technical aspects of modelling and largely ignores the many other lines of evidence which support the analysis of project impacts, negative human-wildlife interactions, cumulative impacts, and the identification of appropriate mitigation. Fiera's errors and misinterpretations when evaluating models, along with significant omissions and irregularities contained within the TPR results in a document that presents an inaccurate and incomplete review of Golder's EIS.

After this introduction, Golder's response to Fiera's TPR is organized into 7 parts, as follows:

- **Section 2** explains how Golder conducted an assessment to meet the project-specific ToR and addresses Fiera's misrepresentation of the information, data, and approach used by Golder to conduct the EIS.
- **Section 3** identifies areas where Fiera has failed to understand or correctly interpret Golder's resource selection function (RSF) analysis and provide additional information to reinforce a correct interpretation.
- **Section 4** provides additional information requested by Fiera with respect to the interpretation of RSFs as a resistance layer when considering wildlife movement.
- **Section 5** addresses Fiera's criticisms of Golder's scenario analysis and explains why the approach Fiera suggests is required to meet the ToR is inappropriate in light of both current and previous approvals for the Resort Centre (e.g., existing Resort Centre ASP and DC1-98 unit density approvals).
- **Section 6** provides further clarification regarding mitigation, monitoring and adaptive management.
- **Section 7** presents a table in which additional errors, omissions and misrepresentations made by Fiera are listed along with Golder's associated responses and commentary.

2.0 HOW GOLDER CONDUCTED THE EIS

Golder conducted the EIS to meet the project-specific ToR issued by the Town. The ToR is included as Appendix A in Golder's EIS. A key component of Fiera's role, as stated in Section 1.3 of the TPR (pg. 3), was to determine whether the EIS was completed according to the project-specific ToR. Although the importance of the ToR in defining the scope of Golder's work was clearly identified by the Town, the TPR indicates that Golder must undertake work that exceeds the requirements of the ToR. In addition, Fiera argues that this work must be completed before they can fulfil the scope of work provided to them by the Town, which includes evaluating proposed mitigation, evaluating the significance of the residual impacts, and identifying additional mitigation. The current TPR fails to comment on the residual impact assessment provided by Golder, does not comprehensively evaluate Golder's proposed mitigation, and does not identify other mitigation that might be required to address predicted residual effects. This section, in conjunction with Sections 3-7, demonstrates why Fiera's assertion that Golder has not met the ToR is incorrect and explains how the EIS meets the requirements of the ToR in a manner that provided sufficient information for Fiera to complete their scope of work.

Fiera's perspective about how Golder evaluated the amendment to the Resort Centre ASP in the EIS is summed up in the Executive Summary of Fiera's TPR where they state, "*This review found that the Resort Centre EIS evaluated potential impacts by examining possible changes to existing conditions based on the output of Resource Selection Function (RSF) models which examine an animal's habitat selection, not their movements*." (Fiera 2017, pg. i, para. 2). This statement is incorrect and thoroughly misrepresents Golder's EIS. As summarized in the Executive Summary of the EIS, "*Quantitative data, including data from remote cameras, telemetry data from collared wildlife, empirical models of wildlife habitat selection including the influence of human use, and records of negative human wildlife interactions were combined with a review of literature, opinion of local wildlife experts, and information provided by the Town and Province to provide the foundation for the wildlife effects assessment*." (Golder 2017, pg. viii, para. 2).

A review of the EIS's table of contents demonstrates a much broader focus of analysis than simply RSF modelling, which incorporates all of the valued components identified in the ToR and includes a broad diversity of information. With respect to the wildlife assessment, for example, the description of existing conditions includes sections on human use, grizzly bears, wolves, cougars and elk. These sections include in depth discussions about habitat use, population dynamics, use of the existing corridors, and effects of human use on wildlife species. The description of existing conditions is based on RSF analyses, telemetry data, remote camera data, backtracking data, human-wildlife conflict data, a substantial literature review, and discussions with local experts. For each wildlife species, Golder uses the available evidence to evaluate whether the population in the Bow Valley is self-sustaining and ecologically effective. This approach is carried through the assessment of the Project effects as well as the cumulative effects assessment for each species, where again, the predicted status of population is summarized based on cumulative changes in the environment. The cumulative effects assessment included all reasonably foreseeable projects in the Regional Study Area (RSA).

Nowhere in Fiera's TPR is this in-depth examination of the existing conditions, predicted effects of the Project, or cumulative effects assessment acknowledged. Instead, Sections 3.0 through 5.0 of Fiera's TPR focus almost entirely on the RSF. Fiera's critique of the RSF modelling demonstrates a lack of understanding of basic RSF modelling principles. Much of this discussion regarding mathematical modelling (i.e., Section 3 and 4 of this response) may go beyond the understanding or interest of lay readers or decision makers.

Fiera's myopic focus on models may detract from, rather than improve, the ability of decision makers to evaluate the proposed project. Moreover, Fiera's arguments in support of conducting additional modeling are based on an incorrect reading of the literature. Fiera states that Neff's (2007) work on scenario planning and impact assessment near Jackson, Wyoming espouses "the careful use of scenario modeling as an effective method to engage stakeholders and inform complex decisions" (Fiera 2017, pg. 36). This interpretation is entirely incorrect. Neff (2007) never mentions models, but focuses instead on scenario planning and interaction among stakeholders, including assembling storylines to help stakeholders identify common goals and generate consensus in previously intractable disputes. In contradiction to Fiera's arguments, Neff (2007, pg. 225 to 226) concludes that "Traditionally, decision-makers in such situations have relied on science to reduce uncertainty with the assumption that more information will make decisions less contentious. Experience has shown, however, that simply doing more research rarely reduces contention in environmental disputes".

When making this argument, Neff (2007) cites Sarewitz (2004), who wrote a paper titled "How science makes environmental controversies worse". In the paper, Sarewitz (2004, pg. 386) states that "the growth of considerable bodies of scientific knowledge, created especially to resolve political dispute and enable effective decision making, has often been accompanied instead by growing political controversy and gridlock. Science typically lies at the center of the debate, where those who advocate some line of action are likely to claim a scientific justification for their position, while those opposing the action will either invoke scientific uncertainty or competing scientific results to support their opposition."

Not only is Fiera's claim that more data and more modelling are required to satisfy the ToR for the EIS incorrect, but Golder believes that completing additional modeling would not substantially change the outcome of the EIS, because the EIS analysis is based on a **many decades of local data, experience, and literature** beyond the RSF model results. Nor is additional quantitative scenario modeling expected to substantively improve Council's ability to make a decision about the proposed Project. As identified in the EIS, there is uncertainty about the potential effects of the Project, and Golder and Fiera agree that monitoring and adaptive management can be an effective means to manage this uncertainty (Section 6 of this document).

Fiera's strict focus on RSFs and wildlife movement in the TPR also fails to address several of the key findings of the EIS. For example, one of the most significant potential Project effects identified in the EIS is an increase in negative wildlife human interactions. In the case of grizzly bears, and without adequate mitigation, this potential effect would contribute to a serious risk to the Bow Valley population identified under existing conditions. Fiera's review fails to address this issue in a substantive way.

Similarly, Fiera's review does not adequately address Golder's assessment of cumulative effects. Fiera states that "the EIS does not provide predictions of any expected reductions in human use the fencing might achieve, or whether this reduction is expected to be meaningful or below an impact threshold from the perspective of reducing cumulative effects on wildlife use of the movement corridor" (Fiera 2017, pg. 35). This statement reflects a poor understanding of Golder's cumulative effects assessment and lack of understanding of some of the most important details of Golder's EIS. First, the EIS clearly states that no reduction in overall human use is anticipated in wildlife corridors adjacent to the Project. Instead, Golder states that human use on designated trials will increase substantially as a result of the Project and could more than double in adjacent wildlife corridors (Section 5.6.1, pg. 97) and human use in wildlife corridors, including illegal human use, is likely to more than double as a function of cumulative effects in the Bow Valley by 2037 **unless** something is done to change patterns in human behavior at the regional scale (Section 5.8.1, pg. 126). Second, the threshold beyond which cumulative effects might have an adverse effect on wildlife corridors is a key part of the assessment and in several cases, these thresholds may have been exceeded in the existing case and may be exceeded in the cumulative effects case, resulting in significant adverse cumulative effects should no mitigation be implemented.

Finally, and not a minor point, Fiera states in the Executive Summary that "*As part of the application to amend this ASP, the developers completed an EIS, and Fiera Biological Consulting Ltd. was retained by the Town of Canmore to complete the required third-party scientific review on the EIS*.**"** (Fiera 2017, pg. i, para. 1). This is incorrect. The developers did not complete an EIS. The developers, QPD and TSMVPL, formulated the Resort Centre ASP Amendment application. QPD hired Golder to conduct an environmental assessment of that application, which Golder presents in the EIS. Golder conducted a thorough, transparent and independent review of the application to meet the requirements of the ToR. To say otherwise is false and inappropriately questions Golder's integrity. The statement suggests that the developer directed the outcome of the EIS, which is contrary to professional environmental assessment practice and the ethics of the professionals conducting the assessment. Fiera is aware of these standards as they are also members of the Alberta Society of Professional Biologists (P. Biol. Designation).

3.0 RESOURCE SELECTION FUNCTIONS

Fiera states that they have had trouble assessing and understanding the ecological context of the RSFs and question the validity of the models used in Golder's EIS. Specifically, Fiera identifies what they term "analytical anomalies" and questions whether appropriate land cover classes were used in conjunction with the radio telemetry data, which were collected between 1988 and 2009. The following sub-sections address each of Fiera's concerns and identify text from both the EIS and previous communications between Golder and Fiera about these topics that highlight Fiera's misunderstanding of the issues and demonstrate that the RSF models used by Golder are technically sound and were appropriately applied.

Analytical Anomalies

The "analytical anomalies" identified by Fiera arise from a comparison between the grizzly bear models presented in Golder 2013 and in the Resort Centre EIS. These models present different predicted probability of grizzly bear selection for the abandoned golf course. Golder provided a clear explanation of the reasons for these differences, first in the EIS and again in a follow up e-mail to Fiera.

Page 1 of Appendix B of the EIS states that "*because the unfinished golf course on the Resort Centre is not managed or used like other golf courses in Canmore, the designation was changed from one of "golf course* *greens, tees, and fairways" (Golder 2012) to "herbaceous grassland" for application of the models to all analyses undertaken for the Resort Centre ASP amendment and Smith Creek ASP. This change was made to more accurately reflect the ecological conditions and types of human use that occur on the abandoned golf course*. "

In a follow up e-mail provided to Fiera on 24 March 2017, Golder reiterated this statement: *"In the 2013 EIS, the grizzly bear model runs did not treat the abandoned golf course as anthropogenic grassland, even though by that time it had developed vegetation characteristics that were likely to be selected by grizzly bears. However, moving forward to 2017, we recognized that 'golf course' was not an appropriate designation for the abandoned golf course lands, and that they more correctly should be referred to as anthropogenic or non-native grasslands. This change in designation resulted in the area displaying as selected in the grizzly bear RSF output".*

Fiera have ignored or do not understand these explanations and spend substantial effort in their TPR using misdirected speculation to question the validity of the RSF models (Fiera 2017, pg. 17 to 21). Specifically, Fiera indicate that they were "*left with a somewhat confusing chronology of exactly how the most important land cover areas in this EIS were classified, let alone how other land cover types were classified for this analysis. In 2012/2013, the golf course lands appear to have been considered human-impacted areas that are highly avoided by grizzly bears, yet within three years hence these same areas are highly selected by grizzly bears.*" Fiera continues by showing the comparison of RSF output between Golder 2013 and the EIS on pg. 19 with the following text, "*Both are purported to be "existing case" yet they are the inverse of each other*." Fiera stated this in spite of Golder's clear explanation regarding how different land cover assignments for the unfinished golf course were used for prediction in Golder 2013 and in the EIS.

As indicated in Appendix B, grizzly bear models were estimated using data collected during 2000-2008. Data collected for four bears during 2000-2004 were associated with landscape conditions present in 2001, prior to development of the unfinished golf course on the Resort Centre. Data for one bear available after 2004 were associated with development in 2008. Most grizzly bear data used for model development were associated with a period when the abandoned golf course was not present on the landscape. The unfinished golf course was still under construction during 2008 and the grizzly bear data from 2008 were from a bear that primarily used the north side of the highway and did not interact with TSMVPL land. Nothing has changed with respect to the model that was developed from the available grizzly bear data. The only change was in the application of golf course vs. anthropogenic grassland (i.e., herbaceous) as the land cover class used for prediction on the unfinished golf course, and this has been clearly articulated in the EIS and to Fiera. Note that both the outputs for Golder 2013 and the EIS are predictions relative to the land cover with which bears interacted at the Resort Centre in the periods when the RSF was developed.

The grizzly bear RSF indicates strong avoidance of golf courses. As noted on pg. 19 of Appendix B: "*Strong avoidance of golf courses by grizzly bears may be related to ongoing aversive conditioning programs implemented by the Province in the Bow Valley, and not necessarily because golf courses represent inherently poor habitat for bears*". Appendix B goes on to point out that collared bears, which provided the telemetry data for the RSF models, were subject to aversive conditioning more often than other bears because they were easily tracked by their collars. Because the abandoned golf course is not operated as a golf course and the factors causing grizzly bear avoidance of golf course greens, tees, and fairways do not apply, Golder deliberately changed the land cover class for the EIS relative to the class used in Golder 2013. This adjustment also increased the amount of high quality habitat potentially affected by the Project, yielding a more precautionary estimate of the potential effects of the Project in terms of habitat loss.

In Figure 6 of the TPR, Fiera suggests that the abandoned golf course lands are not indicative of high quality herbaceous habitat. Again Fiera has ignored the relationships identified from grizzly bear telemetry data in the Bow Valley and have instead presented their subjective opinion about grizzly bear habitat selection based on visual interpretation of an aerial image of the site. As presented in Appendix B, herbaceous habitat and greenness were associated with habitat with a high probability of grizzly bear selection in the Bow Valley[1], a result that is common for RSF models of grizzly bear habitat (e.g., Stevens 2002), including those from papers published about grizzly bear habitat selection in the Bow Valley (Chetkiewicz and Boyce 2009). The abandoned golf course is both herbaceous and has high greenness values. Without the negative effects associated with the golf course variable, such habitats are strongly selected by grizzly bears in the Bow Valley (e.g., habitats surrounding Quarry Lake).

Fiera's assertion that the change in predicted grizzly bear habitat selection in the Resort Centre between Golder 2013 and the EIS indicates flaws in Golder's RSF is incorrect. The suggestion is also unwarranted given the clear dialogue between Golder and Fiera about this issue.

Age of Wildlife Telemetry Data versus Age of Habitat Data

Fiera and Golder agree that land cover data should represent conditions to which animals were exposed when telemetry data were collected. Page 12 of Appendix B of the EIS states the following:

Because wildlife telemetry data were obtained over long periods of time (i.e., 1988-2009, depending on species) it was important to account for landscape changes caused by human development during that period. Wildlife location data were therefore integrated with land cover layers depicting development prior to and after 2004, depending on the date associated with the telemetry location. Data were unavailable to make finer temporal divisions. This may not account well for wolf data collected in the late 1980s and early 1990s, but because most wolf locations occur west of Canmore where new development over the last two decades has been less pronounced, the introduced bias was expected to be minimal. All RSF surfaces used to predict probability of selection for the purpose of preparing environmental impact statements were estimated by applying models estimated from appropriate temporal information to more up-to-date development and land cover surfaces (e.g., 2016).

Despite this clear statement by Golder about how the RSF was developed to tie animal telemetry locations to land cover data that were representative of the landscape at the time the animal telemetry data were obtained, Fiera applied speculation and selective use of quotations from the EIS to assert that Golder's "*approach may have introduced error into the models that could potentially be significant*" (Fiera 2107, pg. 16).

Although Fiera is correct that the years used as snapshots were not clearly identified in the EIS (Fiera 2017, pg. 16), this does not warrant a conclusion that Golder's RSF models are significantly flawed. The pre-2004 snapshot was associated with data primarily obtained from 2001 and the post-2004 snapshot was associated with data primarily obtained from 2008. Not all data sources regarding disturbance and other landscape change were available at yearly intervals, which was the reason for describing the snapshots as pre-2004 and post-2004. The original vegetation classification from the Canadian Forest Service's Earth Observation for Sustainable Development of Forest data was from 2001 and was updated over time (Appendix B, pg. 10). As stated in the EIS, the pre-2004 and post-2004 land cover data align well with most of the data from each species group (Table 3.0-1). Substantial divergence was only present for wolves, and the potential biases associated with this were

[1] This point was also made in the email to Fiera on March 24th, 2017, which states: "*During model development, greenness and areas rich in herbaceous vegetation (i.e., the variable 'herb') were identified as important variables for explaining grizzly bear habitat selection, and grasslands tended to display as selected by grizzly bears in RSF model output.*"

acknowledged in the EIS and expected to be small because wolf locations were not obtained near places where land cover classes changed substantially as a result of development in the Bow Valley (Appendix B, pg. 12).

Table 3.0-1: Intersection between land cover data and telemetry data

Land cover year	Data Intersected During RSF Development
2001	■ Grizzly bear GPS data (2000-2004) ■ Wolf VHF data (1988-2003) ■ Cougar GPS data (2000-2004) ■ Elk VHF data (2000-2003)
2008	■ Elk GPS data (2009) ■ Grizzly bear GPS data (2008)

Land cover data used by Golder changed over time in places where rapid development occurred. In Figure 4 of the TPR, Fiera identifies changes between 1999 and 2013 in the Resort Centre. Fiera's statement that Golder may not have accounted for land cover change in this area ignores information provided by Golder to Fiera about how the landscape had changed in an e-mail dated 24 March 2017. Landscape change near the Resort Centre was incorporated into Golder's RSF development and into predictions made in 2016. This was done using high resolution imagery, as described in the EIS (Appendix B, pg. 10). Imagery used were from

Model Selection

Fiera indicates that Golder has failed to complete two steps associated with RSF model selection namely that there are not hypotheses to support the models and that there is no ecological interpretation of the top-ranked model. This assertion is simply false.

Wildlife modeling conducted for the Resort Centre EIS did not lack hypothesis development, nor did it lack ecological interpretation of the best ranked models. The methods used to undertake each of the 4 steps of model development and selection identified by Fiera are described and presented in Section 2.1 of Appendix B, and Table B-1 presents a description of each variable used in model development. The ecological interpretations of the best-ranked models used for prediction in the EIS are provided in Sections 2.2.1, 2.2.2, 2.2.3, and 2.2.4 of Appendix B. Additional ecological interpretation of the predictions made through application of the top models to existing and future conditions are provided for each species in the existing conditions, predicted project effects, and cumulative effects sections of the EIS. Given that this information was readily available in the EIS, the lack of understanding by Fiera is perplexing.

Fiera state the following to support their argument that the hypothesis development step has been missed:

"*Although the EIS provides a general literature review outlining different aspects of animal selection for bears, wolves, elk, and cougar, it does not tie these together into hypotheses explaining why each candidate model was chosen to be evaluated in this analysis. That is, we are left to interpret; greenness elev elev2 builtup_300 elevnonveg_600 south_slope_600 dens_trails_600 forest_edge_600 herb_600 golf_150 shrub_600 dens_roads_600 dist_builtup"* (Fiera 2017, pg. 22-23)

First, this clearly indicates that the hypothesis development step has not been missed and Fiera identifies some of the variables used in model development. Second, this is misleading because it suggests that there is nothing else in the EIS that provides an explanation of the variables listed in the models. However, Table B-1 of Appendix B does exactly that, providing definitions for each of the variables used in the modelling exercise.

What Golder has not included is a detailed description of each of the hypothesis presented for each species. Detailed descriptions are not normally incorporated into environmental assessments and are frequently excluded from scientific publications where RSFs are used for prediction (e.g., Chetkiewicz and Boyce 2009, Abrahms et al. 2016). What matters most for evaluating changes in probability of selection by wildlife in the context of the EIS is whether the model predicts responses well in terms of changes in wildlife behavior as a function of development. The ecological interpretation of top models is presented and the lack of a detailed ecological description and rational for each model in the candidate set (beyond the literature review already presented in Golder 2012) does not represent incompleteness in the EIS.

Notably, Fiera makes no mention of the model validation that Golder performed. All four RSF models validated extremely well, in that they provided a good fit to the data and exhibited excellent predictive capacity (Appendix B). If important variables had been missed, then it follows that the models would not validate well. Similarly, good model validation results contradict Fiera's assertion that there is potential for significant errors in the layers used to develop the RSF models. If the layers were flawed the RSF would validate poorly.

To reiterate, Fiera uses inappropriate speculation and selective reading of the EIS to make sweeping statements, such as "*We noted discrepancies in model output that implicated the validity of the land cover data used for this EIS, and thus by extension the RSF output* "(Fiera 2017, pg. i, para. 2) and that Golder's "*approach may have introduced error into the models that could potentially be significant*" Fiera 2107, pg. 16, para. 4). The evidence presented in this response clearly shows that Fiera's speculation is incorrect; Golder's RSF models are sound.

4.0 MOVEMENT ANALYSES

Fiera concludes that RSF modelling is not the correct analysis for the EIS because RSFs are '*movement-independent'* and that the only way to assess the effects of the project on the adjacent wildlife corridor is to conduct a quantitative connectivity analysis. This suggests that no other potential environmental effects (other than movement) are important and that no other data or analyses were used to make conclusions about the potential effects of the Project on the way wildlife may use the corridor (including for movement) as a result of the Project or cumulative effects. This is incorrect.

Because habitat use as well as movement are issues that are potentially affected by the Resort Centre ASP, Golder's approach was stated as follows in the EIS. "*The RSF models used in this EIS incorporate multiple behavioral states, which is appropriate for answering questions about how the Project could affect wildlife use in approved wildlife corridors. The models consider the breadth of behavioral states exhibited by grizzly bears, cougars, wolves, and elk in the Bow Valley, acknowledging that corridors in the Bow Valley may be used both for occasional dispersal by animals traveling to other destinations, for short inter-patch movement for resident animals, and as important habitat that contributes to population viability. Using probability of selection for all behavioral states combined also provides a better understanding of where animals are most likely to occur on the landscape and permits an improved understanding of potential habitat loss as a result of the Project and the potential for negative human-wildlife conflict.*" (Section 5.1.2 pg. 46).

The importance of wildlife corridors as habitats that are not strictly used for movement is identified by GPS data, camera data, and available literature. Wildlife corridors can be defined as areas of land designed to maintain connectivity between habitat patches. In this particular case, the designated Along Valley Corridor, which is adjacent to the south side of the proposed Resort Centre development is bounded by additional undeveloped land including Bow Valley Wildland Provincial Park along its entire southern boundary. Radio telemetry data collected by Alberta Environment and Parks show that areas on the south side of the corridor is are used as habitat that is connected to that found within the corridors (Figures 4.0-1 and 4.0-2). Least cost path analysis conducted for grizzly bears and cougars near Canmore indicates least-cost movement routes that occur upslope from currently designated wildlife corridors and away from development, indicating that substantial space is available for east-west movement through the Bow Valley for these species (Chetkiewicz and Boyce 2009).

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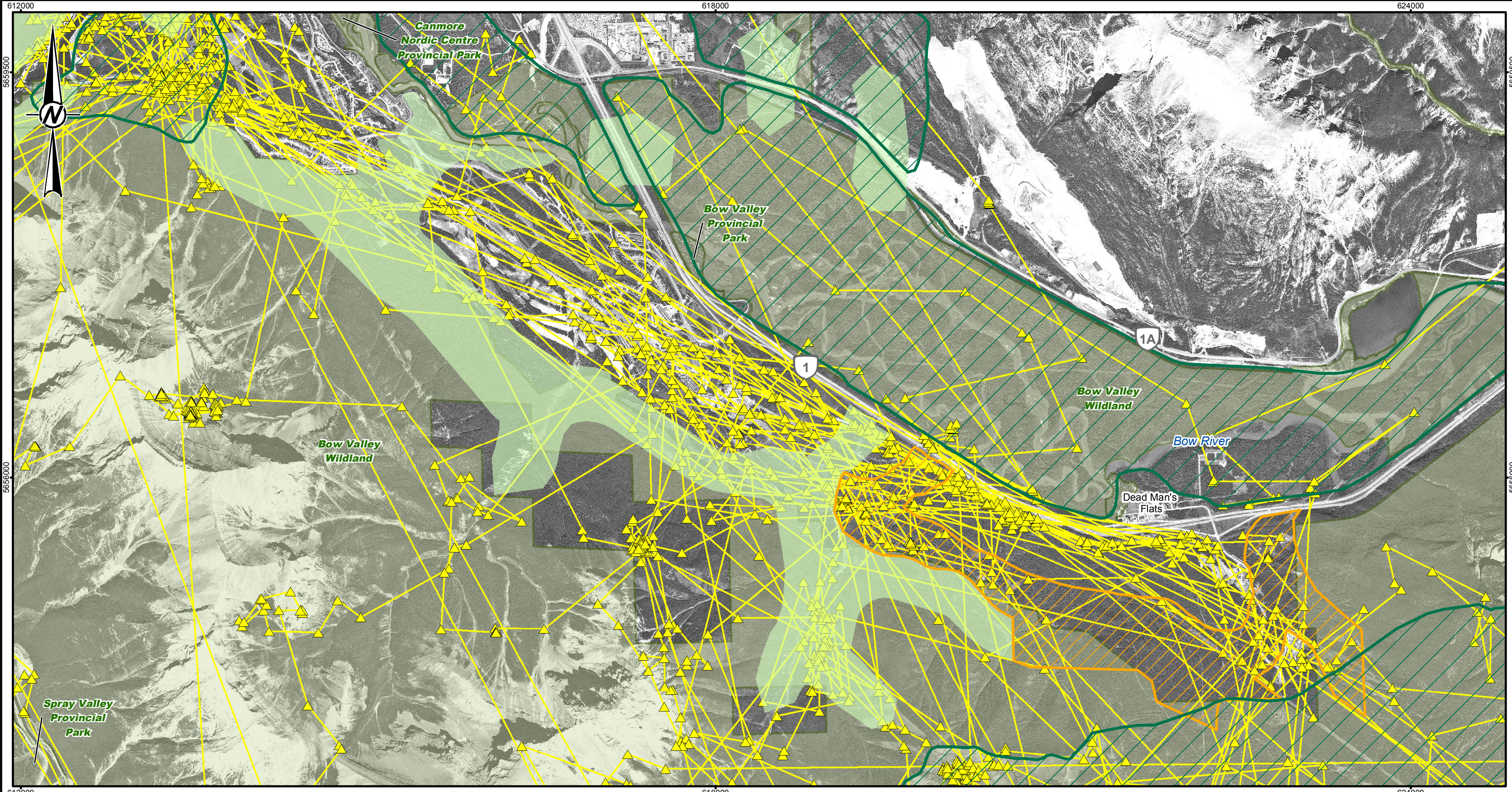

LEGEND

- GRIZZLY BEAR GPS COLLAR LOCATION
- PATH BETWEEN SEQUENTIAL LOCATIONS
- 2017 WILDLIFE CORRIDOR PROPOSAL
- APPROVED WILDLIFE CORRIDOR
- HABITAT PATCH
- PARK / PROTECTED AREA

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REFERENCES
1. IMAGERY OBTAINED FROM UMA ENGINEERING, 2003.
2. WILDLIFE CORRIDOR OBTAINED FROM ASRD, MARCH 2010.
3. UPDATED STEWART CREEK ACROSS VALLEY CORRIDOR DATA LAYER FROM QPD IN OCTOBER 2016.
4. PARKS AND PROTECTED AREAS OBTAINED FROM ALBERTA PARKS, GOVERNMENT OF ALBERTA.
DATUM: NAD 83 PROJECTION: UTM ZONE 11

CLIENT
TSMV C/O QUANTUMPLACE DEVELOPMENTS

PROJECT
RESORT CENTRE ASP AMENDMENT EIS – ADDENDUM

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-04-26
DESIGNED	TSMV
PREPARED	SG
REVIEWED	MJ
APPROVED	KK

TITLE
GRIZZLY BEAR GPS COLLAR LOCATIONS ON THE SOUTH SIDE OF THE BOW VALLEY NEAR CANMORE

PROJECT NO.	PHASE	REV.	FIGURE
1539221	9800	0	4.0-1

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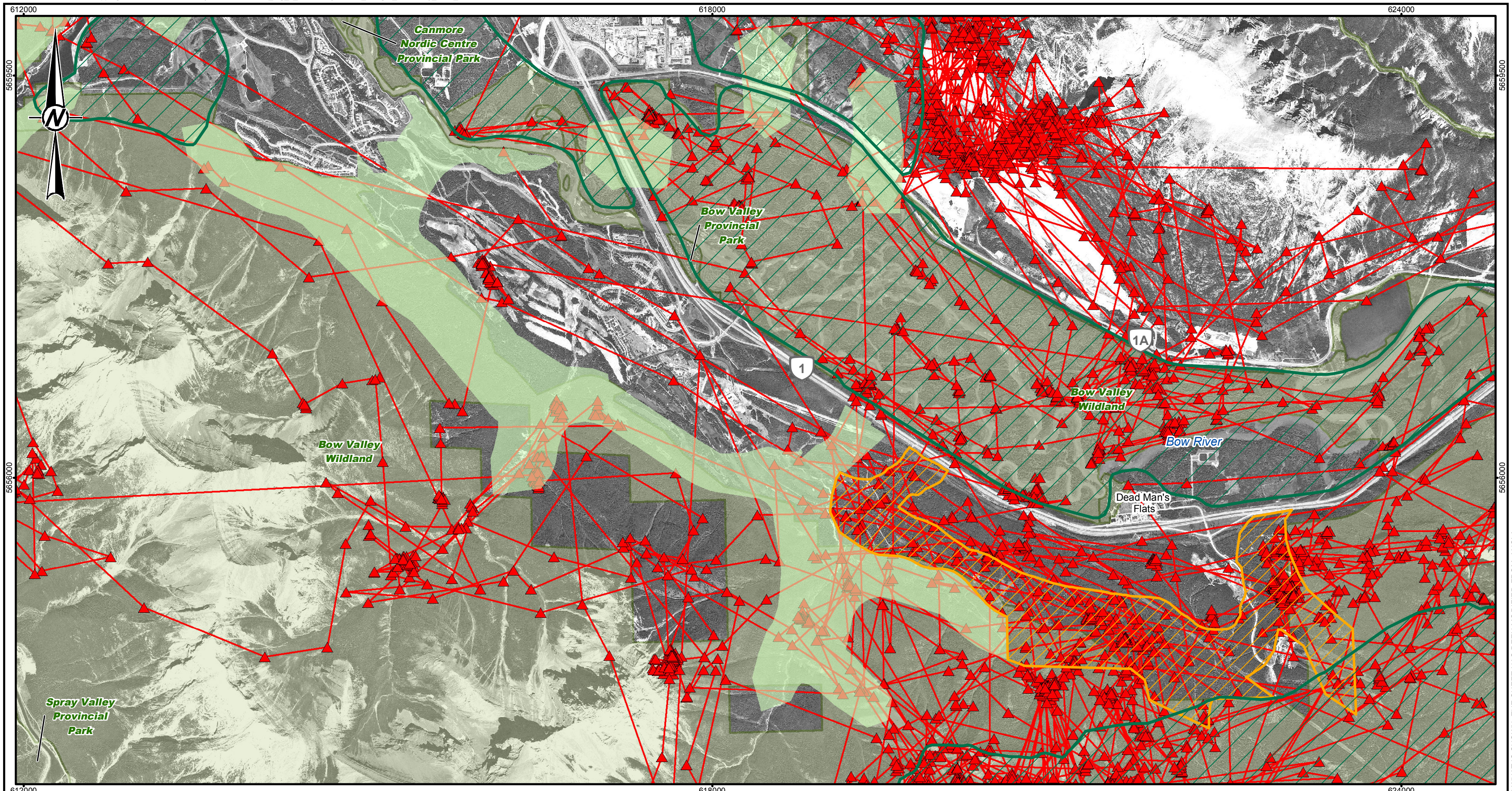

LEGEND

- COUGAR GPS COLLAR LOCATION
- PATH BETWEEN SEQUENTIAL LOCATIONS
- 2017 WILDLIFE CORRIDOR PROPOSAL
- APPROVED WILDLIFE CORRIDOR
- HABITAT PATCH
- PARK / PROTECTED AREA

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1:50,000 KILOMETRES

REFERENCES

1. IMAGERY OBTAINED FROM UMA ENGINEERING, 2003.
2. WILDLIFE CORRIDOR OBTAINED FROM ASRD, MARCH 2010.
3. UPDATED STEWART CREEK ACROSS VALLEY CORRIDOR DATA LAYER FROM QPD IN OCTOBER 2016.
4. PARKS AND PROTECTED AREAS OBTAINED FROM ALBERTA PARKS, GOVERNMENT OF ALBERTA.

DATUM: NAD 83 PROJECTION: UTM ZONE 11

CLIENT

TSMV C/O QUANTUMPLACE DEVELOPMENTS

PROJECT

RESORT CENTRE ASP AMENDMENT EIS – ADDENDUM

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-04-26
DESIGNED	TSMV
PREPARED	SG
REVIEWED	MJ
APPROVED	KK

TITLE

COUGAR GPS COLLAR LOCATIONS ON THE SOUTH SIDE OF THE BOW VALLEY NEAR CANMORE

PROJECT NO.	PHASE	REV.	FIGURE
1539221	9800	0	**4.0-2**

Despite the utility of the RSF for identifying changes in patterns of animal use of the landscape, Fiera indicate that a connectivity analysis based on movement data is required to meet the ToR. They contend that such analyses are more appropriate than the RSF used by Golder because: "*When properly designed and specified, a connectivity model can assess "baseline" connectivity for an existing corridor, aide in identifying new corridors, can determine the location of isolated habitat patches, and can identify where pinch-points may exist within previously designated corridors (i.e., areas where wildlife movement is constricted to a narrow corridor)* (Fiera 2017, pg. 7).

Importantly, identifying new corridors or adjusting the width of existing corridors to address pinch points is clearly beyond the scope of the EIS, for which the ToR clearly states that "*the scope of the EIS will not include the functionality of the wildlife corridors as this is under the authority of the Province under the direction of the NRCB Decision*". However, Fiera is correct that the proposed development "*will both directly and indirectly effect lands within the wildlife corridor, and in turn, these effects will likely influence the way that wildlife move through and utilize habitats within the wildlife corridor*" (Fiera 2017, pg. 12). Golder used the RSF output as one of a number of data sources to help evaluate potential changes in wildlife movement.

As pointed out on page 45 and 46 of the EIS, and several times by Fiera in the TPR, using the inverse of the probability of selection derived from point data RSFs to define amount of resistance to movement, as Golder's EIS did, will not always provide an accurate reflection of wildlife movement (see also Abrahms et al. 2016). Fiera correctly points out that the accuracy of Golder's RSFs as a reflection of animal movement has not been validated. To address this gap, such a validation is presented here.

The relationship between RSF values and steps between consecutive telemetry locations was analyzed to determine whether the RSF models might be used to understand changes in movement. This relationship may take one of three forms, as follows:

1) Probability of selection derived from the full suite of animal behavior (i.e., all point data) is positively correlated with movement steps – this relationship indicates that the RSF can be used to understand both movement and habitat selection (e.g., Chetkiewicz et al. 2006; Chetkiewicz and Boyce 2009; Fattebert et al. 2015).

2) Probability of selection derived from the full suite of animal behavior (i.e., all point data) is independent of the location of movement steps such that movement steps occur equally in all RSF classes – this relationship represents an RSF that would serve as a poor movement model.

3) Probability of selection derived from the full suite of animal behavior (i.e., all point data) is negatively correlated with movement steps – this form has been reported in the literature and indicates that the RSF provides a very poor reflection of movement potential, where selection patterns during movement are the opposite of selection patterns during other behavioral sates (e.g., Abrahms et al. 2016).

GPS telemetry data used to examine these relationships are available for elk, grizzly bears, and cougars. Wolf VHF telemetry data are not suitable for this kind of analysis[2]. The analysis was conducted for both grizzly bears and cougars. Elk in the Bow Valley are habituated to people, spend much of their time near and within development, and need to be aggressively chased in order to achieve displacement (Kloppers et al. 2005; Appendix B). Therefore, changes in elk movement in wildlife corridors due to the increased proximity of anthropogenic developments are not a concern, and similar analyses were not conducted for elk.

[2] Wolf and elk VHF data are also not suitable for developing other kinds of movement models because of the long time interval between points (commonly days).

Straight line movement steps of ≥500 m, ≥1,000 m and ≥5,000 m between consecutive cougar and grizzly bear GPS collar relocation points were intersected with the RSF output for each species for the period when the GPS data were collected. The RSF outputs were categorized and interpreted according to the 5 classes described on page 44 of the EIS (i.e., selected, used as available, somewhat avoided, strongly avoided, rarely used). The linear distance of each RSF category passed through by each step was obtained.

In the case of grizzly bears, a strong positive relationship was identified between probability of selection class and the proportion of grizzly bear steps overlapping with each class (Figure 4.0-3). This relationship indicates that the RSF is a good reflection of grizzly bear movement and that the selected class is especially important for movement (i.e., resistance is very low relative to other classes). Although the relationship flattens somewhat at steps ≥5,000 m, it remains consistently positive (Figure 4.0-3).

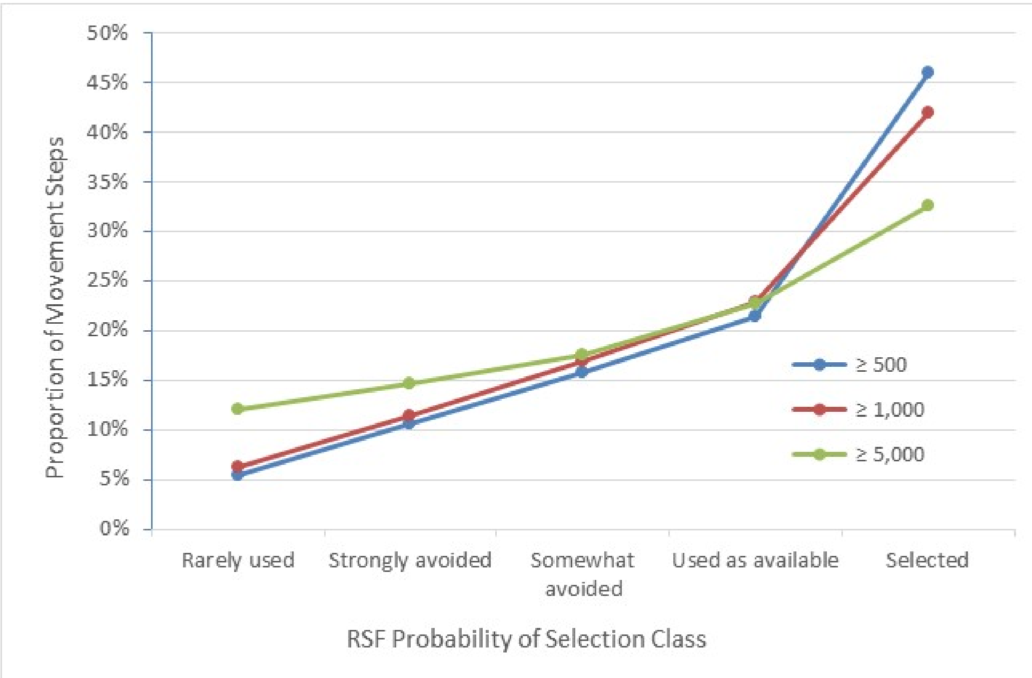

Figure 4.0-3: Interaction between grizzly bear movement steps and probability of selection class from the grizzly bear RSF

Analysis of the available cougar GPS telemetry collar data also shows that there is a positive relationship between habitat selected during all behavioural states and habitat selected during movement. The relationship between proportion of movement paths ≥500 m, ≥1,000 m that intersect habitat classes with an increasing relative probability of cougar habitat selection is generally positive. However, this relationship breaks down in the top 2 habitat classes (i.e., used as available and selected; Figure 4.0-4). Both habitat classes are important for movement, but cannot be interpreted precisely in the manner predicted in the RSF. Instead, both used as available and selected habitats should be interpreted as maintaining equally low resistance for cougar movements. Unlike grizzly bears, patterns of movement behavior did not change with cougar step length. No steps of ≥5,000 m were recorded for cougars.

The analysis presented here for cougars and grizzly bears provides strong support for a conclusion that increasing probability of selection can also be interpreted as reducing resistance and increasing the likelihood of movement through a given area on the landscape, although the top 2 habitat classes cannot be distinguished in the case of cougars. The RSF modelling conducted for the EIS can therefore be used to demonstrate potential impacts from the Project to wildlife movement through wildlife corridors. This analysis addresses Fiera's recommendation that existing telemetry data be used to assess confidence in model predictions to reduce uncertainty.

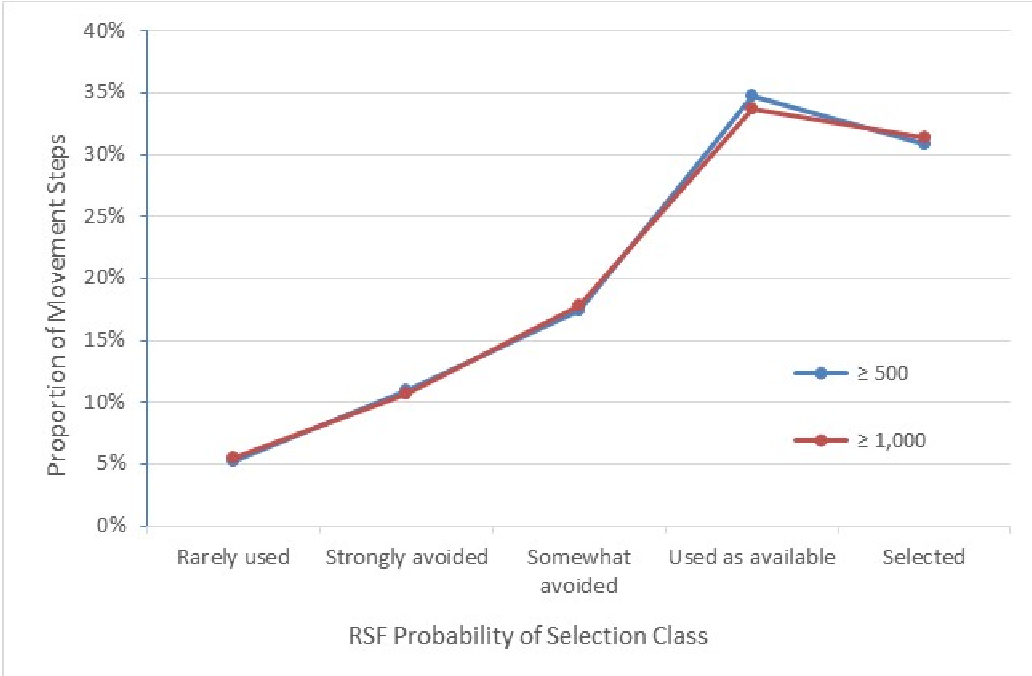

Figure 4.0-4: Interaction between cougar movement steps and probability of selection class from the cougar RSF

5.0 SCENARIOS ANALYSIS

Although Fiera applauds the use of scenario modelling in the Resort Centre EIS, they go on to state that the scenario analysis did not consider combinations of unit densities and associated populations (Fiera 2017, Section 2.3, pg. 23), analyses that Fiera believes are required. Golder clearly stated why the scenario analysis was conducted in this manner in the EIS (Golder 2017, Section 2.1, pg. 13 para. 2), and Fiera acknowledged the text referring to this issue in their review. However, Fiera maintained that varying the number of units and therefore people in the development should be a part of the scenario analysis (Fiera 2017, Section 2.3 pg. 23). Fiera argues that a range of values in human use, from low to high, should be explored to understand the potential impact that an increase in human-use might have on habitat selection and wildlife movement in the adjacent corridor. As a result, Fiera claims that the EIS remains deficient in achieving the alternative analyses outlined in the EIS TOR.

This claim is false. The NRCB Decision approved the development in 1992. In 1998, the Town of Canmore and TSMVPL entered into an agreement that further outlined the provision of the NRCB development approval within the Settlement Agreement. The Town agreed to these provisions and set these provisions within a Bylaw, DC 1-98. The Town role, in this case, is making a decision regarding the configuration and other aspects of an already approved development. The number of units proposed is not part of their decision. The densities and Gross Developable Area are pre-determined within the NRCB Decision and reinforced within Bylaw DC 1-98.

The range of units listed in the Resort Centre Amendment ASP and EIS are provided because TSMVPL has the option of transferring density between the Resort Centre Amendment and Smith Creek ASPs. The ASP and accompanying EIS was modelled based on the maximum the ASP allows. Therefore, in the EIS, Golder assessed the worst case scenario (i.e., full build out of the ASP) in order to ensure that if full build out occurred, the implications of such a build out were understood. The EIS cannot recommend mitigation that involve a reduction in the number of units within the ASP. Therefore examining variations in the number of units and people in the context of the scenario analysis is not within the scope of the EIS. To reiterate, the EIS provides analysis of the worst case scenario at maximum buildout and meets the requirement of the ToR that development scenarios be evaluated.

6.0 MITIGATION, MONITORING AND ADAPTIVE MANAGEMENT

Fiera states, "The EIS has proposed mitigation techniques that are appropriate in the context of a residential development in the Bow Valley" (Fiera 2017, Section 3.2, pg. 37). However, they go on to state that, "the mitigation plan notably lacks a realistic implementation strategy. As such, it is not that we think the proposed mitigations are inappropriate, as much as we are concerned they are not strongly linked to logistical realities, baseline conditions, or an understanding of pragmatic effectiveness." (Fiera 2017, Section 3.2, pg. 37).

Golder agrees with Fiera that attractant management, fencing, signage, public education, defined access points to designated trails in the wildlife corridors, enforcement within wildlife corridors, and a trail system and dog parks within the Project Boundary constitute appropriate mitigation for the Project. The proposed suite of mitigation is expected to prevent wildlife from entering the development areas, while simultaneously limiting inappropriate and illegal human activities within the wildlife corridor.

As clearly stated in the EIS, the response of people to signage and education, the effectiveness of enforcement, and the overall change in human use of the corridor is uncertain and this uncertainty will be addressed with monitoring to verify assessment predictions and the effectiveness of proposed mitigation (Golder 2017, Section 5.7, pg. 122). In addition, the precise details of development are lacking at the ASP stage because the ASP represents a development concept. This is acknowledged in the ToR, which states that "*the scope of the EIS will generally be limited to the level of detail provided within an Area Structure Plan*" (Town of Canmore 2016, pg. 4). Additional details relevant to developing a final implementation strategy are not available until the land use and subdivision planning stages.

To meet the ToR for the EIS, Golder has provided recommendations on the types of mitigation that should be implemented, along with a description of how they should be implemented in in terms of timelines and development phases. Viable options for adaptive management are also included (Golder 2017, Section 5.7, pg. 125). Golder agrees that a more detailed implementation plan and framework for an adaptive management and monitoring program will be required, including details about the implementation of education and enforcement components of the recommended mitigation, but these are not within the scope of this EIS, as defined by the ToR.

Golder has presented a framework for monitoring and adaptive management. As stated in the EIS (Golder 2017 Executive Summary, pg. xiv)), "*A monitoring program developed and directed by a stakeholder committee comprised of a Government of Alberta representative (e.g., an AEP biologist), a representative of the Town, and a representative of TSMV is recommended to provide the information necessary to inform adaptive management. The committee may seek advice from external experts, as required."*

In the Uncertainty and Monitoring section of the EIS, additional details are provided (Golder 2017, Section 5.7, pg. 124). *"The committee and experts consulted by the committee should consider the following when developing the monitoring program:*

- *A before after control impact (BACI) design may be appropriate to more clearly isolate the effects of the Project.*

- *Remote cameras may be the appropriate data collection tool to monitor use of wildlife corridors by people, off-leash dogs, and large mammals. The reasons for using remote cameras are a) substantial remote camera data are available for TSMV between 2009 and 2016, and b) data collected by the Town and the Province for the Human Use Management Review is currently being collected using remote cameras to monitor human and wildlife use of wildlife corridors and habitat patches in the RSA. Integration with the Human Use Management Review study should be considered.*
- *Fixed camera locations should be considered to facilitate detecting trends in use over time. The potential need to collect additional baseline data from fixed locations should be evaluated.*
- *Statistical power should be considered when defining sampling effort.*
- *AEP currently collects information about negative human wildlife interactions. The adequacy of this information to test predictions of this EIS should be considered, and additional data collection approaches identified, if required. "*

As previously stated, Golder agrees with Fiera that the mitigations presented in the EIS are appropriate and agrees that detailed monitoring and adaptive management programs are required as part of the development. However, the details of monitoring and adaptive management are more appropriately fully developed through a collaborative process undertaken by the parties that will be required to implement the monitoring and adaptive management plan (e.g., the developer, the Town, and the Province).

7.0 OTHER ERRORS, OMISSIONS, AND IRREGULARITIES

Additional comments not dealt with in the preceding text are provided in tabular format below (Table 7.0-2).

Table 7.0-2: Additional Errors, Omissions and Irregularities in Fiera's Third Party Review

Item #	Fiera Statement	Description of the Error, Omission, or Irregularity
1	Fiera Biological had no direct input into, or final say on, any content submitted by Golder or QPD (Section 1.1, pg. 2)	This statement is partially inaccurate. Fiera representatives met with Golder representatives and Town representatives on 21 March 2017 for an entire day to discuss the draft EIS and the EIS analysis. As part of this discussion it was agreed to include scenario modelling in the EIS based on input from Fiera. Section 1.2 of Fiera's TPR describes the meeting and they state, "A central focus of this meeting included a discussion about how the EIS could be revised …." However, Fiera is correct that they did not have final say on the EIS content.
2	'Further, the fact that telemetry data exist that could be used both to develop and validate a connectivity model would greatly enhance the reliability of the model, as compared to one that was created using best professional judgement alone.' (Section 2.1, pg. 12)	This statement is highly misleading. The RSFs were not created using best professional judgement. They were created using telemetry data. In addition, the analysis of the relationship between RSF model outputs and wildlife movements undertaken as part of this assessment support the idea that increases in probability of selection can be interpreted as reducing resistance and increasing the likelihood of wildlife movement.
3	Interestingly, in support of using their RSF output as some form of a connectivity layer, the EIS cites Abrahms et al. (2016); *…whereas the highest quality habitat facilitates movement (i.e., low resistance) (Chetkiewicz and Boyce 2009; Abrahms et al. 2016). Therefore, increases in probability of selection can also be interpreted as reducing resistance and increasing the likelihood of movement through a given area on the landscape. (EIS, Pg. 45)*	These statements reflect a poor reading of the EIS. Abrahms et al. 2016 developed resistance surfaces for which an increase in probability of resource selection was interpreted as a reduction in resistance to movement, as indicated on page 45 of the EIS. They derived these surfaces from multiple behavioral states and found that some variables differed substantially during movement relative to other behavioral states, occasionally with opposite selection patterns during movement, as indicated on page 45 of the EIS. The results of their study indicate that using GPS points collected during movement will result

Table 7.0-2: Additional Errors, Omissions and Irregularities in Fiera's Third Party Review

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	However, a closer look at Abrahms et al. (2016) reveals the inverse, in that RSF models likely misrepresent habitat connectivity or predicted movement on a landscape; *"Our review indicates that most connectivity studies conflate resource selection with connectivity requirements, which may result in misleading estimates of landscape resistance, and lack validation of proposed connectivity models with movement data. Our case study shows that including only directed movement behaviour when measuring resource selection reveals markedly different, and more accurate, connectivity estimates than a model measuring resource selection independent of behavioural state. Resource selection analyses that fail to consider an animal's behavioural state may be insufficient in targeting movement pathways and corridors for protection. This failure may result in misidentification of wildlife corridors and misallocation of limited conservation resources."* *Section 2.1 pg. 12.*	in models that are more useful for defining the location of corridors for protection, as indicated on page 46 of the EIS. The interpretation presented in the EIS is consistent with what Fiera present in their TPR. Moreover, Fiera seems to indicate that RSF models derived from point data encompassing multiple behavioral states cannot be used to develop movement models. This is incorrect. As concluded by Abrahms et al. (2016 pg. 9): "*resource selection within an animal's home range may be a suitable proxy for movement preference during dispersal for some species (Fattebert et al. 2015), though researchers and conservation practitioners should be aware this is not always the case and failure to recognize this distinction may have important consequences for preserving landscape connectivity*." Not only has Golder acknowledged the potential problems with using point data from multiple behavioral states as proxy of movement in the EIS (pg. 45 and 46), but this response to Fiera's TPR provides analyses that indicate that the grizzly bear and cougar RSFs do represent good proxies for movement in the Bow Valley.
4	Without more clarity on land cover data, it becomes very difficult to interpret any of the model output in this EIS, and particularly so where there are possible discrepancies. We found this for the scenario modeling. For Scenario 1 shown in Figure 3 of the EIS, we noted an abrupt change in habitat quality from red to green along the southern boundary of the Resort Centre polygon, which we cannot rationalize given the methods that were provided in the EIS, and the discrepancies noted above. (Section 2.2 pg. 20)	The result identified for grizzly bears in Scenario 1 of EIS Figure 3 is not a modelling discrepancy. The relationship between grizzly bears and development that explains this outcome is provided in several locations in the EIS, including Appendix B, Section 5.2.3, 5.6.2, and 5.8.2. In brief, grizzly bears avoid places with low greenness and high density development (red in Scenario 1), but the effect of development has a small zone of influence for this species, explaining the rapid transition from red to green in Scenario 1. Fiera's inability to rationalize these model outputs reflects a poor understanding of how RSFs models work – abrupt changes in probability of selection between different habitat classes are common in many RSF outputs.
5	Moreover, for the instances where human use is addressed, it is integrated using what appear to be static disturbance coefficients that were selected using best professional judgement (BPJ). While best professional judgement is often used in absence of empirical data, we note that there are somewhat extensive human-use data available for the area of interest, and to our knowledge, these data were not used to inform the selection of the disturbance coefficient, or to generate a realistic range of possible disturbances based on actual human-use data. Further, when BPJ is used to select variables for modeling, it is good practice to select a range of values rather than a single value, to examine the phenomenon of interest, as it is generally acknowledged that values selected using BPJ can be less accurate than values selected using empirical data. (Section 2.3 pg. 25)	This statement is incorrect. Available human use data were used to inform both existing and predicted levels of human disturbance and use in the vicinity of the Project and throughout the RSA (EIS, Sections 5.2.2, 5.6.1 and 5.8.1). As clearly identified in Appendix B, the substantial human use data that are available in the Bow Valley do not overlap with the telemetry data. On page 31 of Appendix B, Golder notes that: "*Because data about the intensity of human use on trails were not available concurrent with the telemetry data collected for the grizzly bears, cougars, wolves and elk in the Bow Valley, intensity of use could not be included as a candidate variable in the RSF models*." Given that Fiera clearly recognizes the importance of linking telemetry data to temporally appropriate data (e.g., land cover classes), their suggestion that these data could be used to inform the disturbance coefficient in a quantitative manner is both incorrect and surprising.

Table 7.0-2: Additional Errors, Omissions and Irregularities in Fiera's Third Party Review

Item #	Fiera Statement	Description of the Error, Omission, or Irregularity
6	'…given the human-use data available for the area, are there thresholds that are already being exceeded given existing development permissions, let alone those under review? This issue remains to be addressed, and we argue that this is an important cumulative effect that should be examined in the context of this ASP amendment.' (Section 2.3, pg. 25)	Golder agrees with Fiera that it is important to examine the cumulative effects of the Project; however their conclusion that cumulative effects and thresholds have not been evaluated in the context of the ASP amendment is false. Extensive discussion and analysis of cumulative effects was provided in the EIS for each valued environmental component considered. The EIS considered cumulative effects for three assessment cases within a 23,878 ha regional study area (RSA) located between the east boundary of Banff National Park and Exshaw. The Existing Conditions Case considered the cumulative effects of previous and existing developments, setting the stage for evaluating Project effects. The Project Effects Case considered the predicted contribution of the Project, after incorporating mitigation, to the effects identified under existing conditions. The Cumulative Effects Case added the combined effects of the Project and other reasonably foreseeable developments in the Bow Valley, such as the Smith Creek ASP, Dead Man's Flats ASP, Silvertip Resort Expansion, and industrial expansion at Baymag and Lafarge plants to the effects identified under existing conditions. (Executive Summary pg. vii). Whether or not these cumulative effects exceed important thresholds was examined for each valued environmental component in each assessment case. An analysis of human use impacts on wildlife populations and habitats was required by the TOR and was central to evaluating the effects of the Project and cumulative effects to wildlife. (Executive Summary pg. viii). Section 4.5 pages 39 through 40 describes the Cumulative effects analysis. Section 5.8.1, page 126, specifically addresses the cumulative effects of human use. Section 5.8.2 pages 126 through 131 specifically addresses the cumulative effects in regards to grizzly bear. Section 5.8.3 pages 131 through 135 address cumulative effects in regards to cougars. Section 5.8.4 pages 136 through 140 address cumulative effects in regards to wolves. Section 5.8.5 pages 140 through 144 address cumulative effects in regards to elk.
7	'First, disturbance coefficients have only been applied to primary trails and not to undesignated trails that human-use data clearly indicate are already being used. The rationale for exclusively limiting disturbance to primary trails while excluding any proximity to development is unclear.' (Section 2.3, pg. 25)	Page 31 of Appendix B does lay out the rational for assigning disturbance coefficients to trails, as follows: "*One factor that could both reduce access of animals to high quality habitats and increase landscape resistance for movement is human use on trails. Trail density was considered during model selection and appeared in the top RSF models for grizzly bears (positively associated with trail density), cougars (negatively associated with trail density), and wolves (negatively associated with trail density). Trails were not retained in the top model for elk.* *Human use of recreational trails in the Bow Valley has increased substantially since the RSFs were estimated, and is predicted to increase further as a result of the Project and other reasonably foreseeable developments and activities in the RSA. Animals may respond differently to trails with more or less human use, and human use may therefore influence probability of selection (Ladle et al. 2016). Because data about the intensity of human use on trails were not available concurrent with the telemetry data collected for the grizzly bears, cougars, wolves and elk in the Bow Valley, intensity*

Table 7.0-2: Additional Errors, Omissions and Irregularities in Fiera's Third Party Review

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		of use could not be included as a candidate variable in the RSF models. *During initial consultation about the Resort Centre ASP amendment EIS, Fiera recommended undertaking spatially explicit analyses to investigate the potential ramifications of changes in human use of recreational trails for wildlife. Because data were not available to parameterize the zone of influence or strength of the response of wildlife to increased human use of trails in the Bow Valley, spatially explicit scenarios were created using assumptions about potential derived from and inferences from available data about how animals respond to human disturbance in the Bow Valley*. Variation in human use associated with different intensities of development was accounted for directly in the RSF models, because data about this variation were present at the time models were developed and were incorporated into the models. Consequently, there is no need to "double dip" in terms of adding additional adverse effects associated with zones of influence from development. This is inherent in the models.
8	'Placing a 5% reduction only to primary trails and not undesignated trails implies that the effectiveness in mitigating the use of non-designated trails will be 100% even with a concurrent doubling of human population in the adjacent development. We question this assumption, and this again reflects the apparent disconnect between mitigation and monitoring, because if mitigation is already being anticipated as 100% effective, then neither monitoring nor adaptive management are required.' (Section 2.3, pg. 25)	This statement is incorrect. The efficacy of mitigation is clearly associated with some uncertainty, and this uncertainty is inherent in the EIS predictions, as discussed in Section 5.7. Uncertainty includes issues regarding human use in the wildlife corridor, and indicated by the following quote: "*Human behaviour is challenging to predict and predictions about future human use of wildlife corridors depend on current and future citizens of Canmore responding positively to education, signs, fencing and enforcement*" (Golder 2017, Section 5.7 pg. 123). Identification of uncertainty was followed in the EIS by clear identification about the need to monitor when there is greater uncertainty regarding the outcomes of mitigation, particularly if the potential consequences for wildlife could be significant. "*Where consequences associated with uncertainty are potentially high for wildlife, as they are in the case of new developments in the Bow Valley, monitoring and adaptive management should be applied (MSES 2013, Foley et al. 2015). Consequently, a monitoring program is recommended in conjunction with a phased approach to developing the Project to facilitate adaptive management*." (Golder 2017,Section 5.7 pg.123). Fiera's comment regarding the "disconnect between mitigation and monitoring" does not accurately reflect the content of the EIS.
9	'Second, disturbance coefficients are not applied to the development footprint itself, even though human use would de facto come from adjacent development.' (Section 2.3, pg. 27)	This statement indicates that it would be appropriate to apply a disturbance coefficient to the development footprint in the same way that it was appropriate to apply a disturbance coefficient to trails. Disturbance coefficients do not need to be applied to developed areas, because the zones of influence associated with different development types in the Bow Valley are inherent in the RSF models and these models validate well. On the other hand, zones of influence associated with the amount of trail use by people were not inherent in the RSF model (only trail density was included) and therefore a disturbance coefficient was applied to trails. The responses of each species to different types of development are discussed throughout the EIS. Please see the response to item 8 for more information.

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10	'And third, we are equally unclear why a doubling in human population density only results in a 5% RSF reduction via the disturbance coefficient. For example, in Appendix B, Table B-14, for grizzly bears, if a designated trail is within a habitat patch, the patch's quality is reduced 15%; then as the human population is simulated to double, this quality is only reduced an additional 5%. But it is unclear how a full development (the paragraph above notwithstanding) and doubling of adjacent human density can only result in a 5% reduction of habitat quality. Given the FID narrative provided in Section 3 of Appendix B, we would have expected some more transparent explanation linking development with human use and the FID of various wildlife species (e.g., Figure 7 herein).' (Section 2.3, pg. 27)	The rational for disturbance coefficients is described in Section 3 of Appendix B in separate sections for grizzly bears, cougars, and wolves. These sections are preceded by a statement that "Evidence and rationale used to select the FID and disturbance coefficient information presented in Table B-14 is described in the following sections". These explanations clearly link FID estimates to human use for each species. In the case of grizzly bears, for example: "*A review of the literature undertaken by Fortin et al. (2016) found that brown bears fled at distances from 100 m to 400 m when directly approached by hikers, but bears that were not approached directly tolerated distances <100 m. Grizzly bears in the Bow Valley are selecting areas where human use is high, and in general people will not be directly approaching grizzly bears; therefore, a FID of <100 m may be appropriate. However, to be precautionary, a FID of 100 m was selected (Table B-14). Disturbance coefficients applied for grizzly bears were relatively weak because grizzly bears in the Bow Valley do not exhibit strong responses to high levels of human use*. Fiera provides no indication about why these explanations are not "transparent".
11	'The Resort Centre has the potential to directly and indirectly impact patterns of wildlife movement in the adjacent wildlife corridor, and this remains unexplored.' (Section 2.3, pg. 30)	This statement reflects Fiera's singular focus on connectivity modelling to examine wildlife movement as a requirement to assess the effects of the Project on the adjacent corridor. Golder approach was to use the RSF to examine both movement and habitat use because, as discussed in Section 4 of this document, the land in the corridor as well as undeveloped land south of the corridor is used both for movement and as habitat, and habitat loss within the Project footprint is an important potential adverse effect. The analysis presented in Section 4 for cougars and grizzly bears provides strong support for a conclusion that increasing probability of selection can also be interpreted as reducing resistance and increasing the likelihood of movement through a given area on the landscape. Therefore the RSFs address both movement and habitat. Use of the corridors and movement through them was discussed in the EIS for grizzly bears, cougars, wolves and elk under existing conditions, as a result of the predicted effects of the Project, and as a part of the cumulative effects assessment (Golder 2017, Sections 5.2, 5.6 and 5.8).
12	'Similarly, a viewshed analysis as requested in the TOR was not completed as part of this EIS, and this has become standard practice especially in areas with high tourism and scenic value. The Bow Corridor is world renowned for its mountain scenery, so a best-practices approach would be to examine the impact of the Resort Center amendment on visual resources.' (Section 2.4, pg. 32)	The requirement to complete an assessment of visual resources as specified in the ToR was completed for the project (EIS, Section 6.6, pg. 176-178). The ToR does not specify the type of analysis that is required.
13	Regarding mitigations to reduce human use in the wildlife corridor '…*but does not examine their potential effectiveness in mitigating impacts to wildlife movement in the adjacent wildlife corridor, and what might be expected if these mitigations fail.'* (Section 3.1, pg. 35)	Uncertainty regarding potential effectiveness of mitigation was recognized in the EIS (Section 5.7, pg. 123), and an adaptive management framework to deal with this uncertainty was outlined. In addition, the consequences of being wrong about the potential effects of the Project or the efficacy of the mitigation was clearly stated. "*The consequences of being wrong about the potential effects of the Project or the efficacy of mitigation could be substantial for wildlife in the Bow Valley. If the Project were to proceed without the proposed mitigation, or if proposed mitigation is less*

Table 7.0-2: Additional Errors, Omissions and Irregularities in Fiera's Third Party Review

Item #	Fiera Statement	Description of the Error, Omission, or Irregularity
		effective than predicted, the Project has the potential to contribute to a high environmental consequence for wildlife." (Golder 2017 pg. 123) and "…*if fencing and associated mitigation proves ineffective for achieving human behavior that follows existing regulations in wildlife corridors, the currently high levels of undesignated trail and off-leash dog use in wildlife corridors adjacent to the Project could increase dramatically as a result of the Project, similar to the effect predicted if the 2004 Resort Centre ASP proceeded as currently approved. This increase could contribute to the serious risk to wolf movement already present in the RSA under existing conditions."* (Golder 2017 pg. 123).
14	And so the fencing examples provided in the EIS become only partially relevant, because we still require an examination of the potential management issues that will inevitably precipitate *outside* the fence on adjacent lands. This concern interestingly can be illustrated in the examples provided in the EIS, namely the fence preventing elk (and other wildlife) from entering Jackson, Wyoming from the adjacent National Elk Refuge in the United States. This is an interesting digression to explore, because although the specific issues in Jackson WY are different, the big-picture context is notably similar to Canmore. (Section 3.1, pg. 35)	The Jackson WY example is highly relevant and demonstrates how fencing and associated mitigations of enforcement, controlled access points, and education, can achieve reduced conflict in an environmentally sensitive area adjacent to a Town. The result of the combined mitigation is an effective absence of human-wildlife conflict within the Elk Refuge itself. Additionally, the fence results in reduced human-wildlife conflict in urban areas within Jackson, and fencing is a critical component of that absence. As noted in Section 5.5.4 of the EIS "*Alyson Courtemanch, a wildlife biologist with the Wyoming Department of Game and Fish living in Jackson, stated that 'without the fence we could have thousands of elk on the highway or in downtown Jackson during the winter creating enormous human safety (and elk safety) issues*". Because of a lack of a fence, effective enforcement, controlled access points into wildlife corridors, and education, Canmore experiences substantial management challenges associated with human-wildlife conflict in wildlife corridors and habitat patches adjacent to the Town. These are the areas that are *outside* the fence in Jackson.
15	It is more than noteworthy that those involved with environmental assessment work in Jackson WY espouse the careful use of scenario modeling as an effective method to engage stakeholders and inform complex decisions. In fact, when we move away from the "fences work well to keep animals out" and rather use Jackson as an example of how the whole management-planning EIS structure, and not just the wildlife fence, could be improved then relevant lessons are revealed that are highly applicable to the Bow Valley. We have attempted to recommend some of these in this review within the context of scenario modeling. (Section 3.1, pg. 36)	When referring to "those involved with the environmental assessment work in Jackson WY", Fiera is referring to a paper by Neff (2007). Importantly, Neff (2007 does not mention the word modelling even once. Instead, Neff (2007) discusses scenario *planning*, which is a process of stakeholder engagement that is fundamentally different from scenario *modelling*. Importantly, scenario planning is not relevant to the evaluation of Golder's EIS because it is out of scope. Scenario planning, as described by Neff (2007) uses a combination of stakeholder perspectives and science to create multiple stories about the future against which broader wildlife management programs might be evaluated in a group setting with an aim of consensus building. This kind of work is not part of the ToR that directed Golder's assessment.
16	'The modeling scenarios examining human-use assume that education and enforcement will be 100% effective in preventing recreation on non-designated trails,' (Section 3.1, pg. 36) '..how effective education and enforcement would be post-development. Can trail closures actually be effective? And, what happens if enforcement fails?' (Section 3.1, pg. 36)	Examples of trail closures and good trail planning that have previously been implemented to successfully reduce undesignated trail use in Canmore was discussed in (Section 5.6.1, pg. 96). Evidence from the Benchlands study and the HUMR report suggests that with education and signage, people will respect the changes to trail use in the wildlife corridors. Uncertainty inherent in the EIS predictions are discussed in Section 5.7 Uncertainty and Monitoring, including issues regarding human use in the wildlife corridor. See Item #9 and #14 above.

Table 7.0-2: Additional Errors, Omissions and Irregularities in Fiera's Third Party Review

Item #	Fiera Statement	Description of the Error, Omission, or Irregularity
17	there was notable emphasis in the EIS placed upon camera monitoring of human use throughout the Bow Valley, but no exploration of the possible thresholds of human use that might trigger a negative shift in wildlife movement patterns away from baseline conditions. As a result, we recommended an examination of both direct habitat loss from developing the unfinished golf course, and an examination of indirect effects associated with these developments (e.g., light, odours, human use), as this examination would be a strong metric linking observed levels of human recreation to some proposed mitigation strategies to be included in this EIS. Ultimately we received only a partial examination of these issues, and one that we felt was disconnected from planned development, and thus, from monitoring and how monitoring was to inform adaptive management. (Section 3.2 pg. 37)	This statement is incorrect. The EIS contains both an evaluation of direct habitat loss and indirect effects associated with human use and sensory disturbance. The RSF models contain variables that account for both sensory disturbance and human use (Appendix B). Every model run therefore accounts for these variables. In addition, potential changes associated with the intensity of human use were incorporated into all models presented for existing conditions, potential effects of the Project, and cumulative effects, except models run for elk, which are not strongly affected by human use on trails (Appendix B, Section 3.0 and EIS, Section 5.1.2).
18	'In the case of Resort Centre, there appears little overarching consensus or direction regarding the primary criteria against which to evaluate development; some argue wildlife movement and habitat connectivity are important, while others argue that direct habitat loss and proximal habitat selection are important. This needs to be resolved before adaptive management can proceed.' (Section 3.3, pg. 38)	Golder agrees with Fiera that wildlife movement and habitat connectivity are important criteria. Golder also agrees that direct habitat loss and proximal habitat selection are important. All are important and need to be assessed as part of a holistic approach and analysis of the impacts of development. Golder does not agree with Fiera that an analysis of one criteria excludes an analysis of the other. Adaptive management can proceed without eliminating analysis of important ecological drivers. The EIS assessed habitat connectivity, movement, habitat loss and habitat selection. Section 2.2 Analysis; Section 4.0 Assessment Methods; Section 5.0 Wildlife; Section 5.2 Existing Conditions; Section 5.3 Environmental Risks Section 5.6 Predicted Project Effects; Section 5.8 Cumulative Effects
19	Regarding impact mitigation, fencing the development is suggested but is only discussed as it relates to keeping wildlife out of neighbourhoods, not in meaningfully keeping people from impacting adjacent wildlife corridors; the latter being arguably of equal or more concern. And, additional mitigations of "education and enforcement" are assumed to be 100% effective which we consider unrealistic, and there is no contingency offered if mitigation is less than 100% effective, nor are the potential impacts of this shortfall examined within a decision-informing context. (Section 4.1, pg. 40)	Fencing is not suggested in the EIS, it is required to achieve the residual impacts described in the EIS (Section 5.7). Fencing is also required to encompass the project development area including recreational spaces, not just neighbourhoods (rationale provided in EIS, Section 2.3). The importance of managing human use in the wildlife corridors and associated mitigations are discussed in the EIS in Sections 5.2.2 (Existing Conditions), 5.3.3 (Risks), 5.5.3 and 5.5.4 (Mitigations), 5.6.1 (Predicted Project Effects) and 5.8.1 (Cumulative Effects). The EIS identifies repeatedly that the impact of people in the corridor is a substantial concern and is affecting wildlife corridor use and will affect corridor use in the future (Section 5.8.4). The Jackson Wyoming wildlife fence is one example of a number of fencing examples and references provided to demonstrate the effectiveness of fencing as one tool to assist in the management of wildlife/human conflict. Golder agrees that it is unlikely that there will be a 100% effective strategy in regards to mitigation of management issues. However, given the commitment of the residences of Canmore to live with wildlife and adaptive management outlined in Section 5.7 pages 122 - 125, Golder predicts mitigations will be effective. Uncertainty and monitoring within a decision making framework are discussed throughout the EIS, in particular Section 4.4 pages 38-39, and Section 5.7 (pg. 122 to 125; wildlife) deal specifically with this issue.

Table 7.0-2: Additional Errors, Omissions and Irregularities in Fiera's Third Party Review

Item #	Fiera Statement	Description of the Error, Omission, or Irregularity
20	'…more work is required to examine fence placement particularly in the context of wildlife connectivity. Further, the EIS presents no compelling evidence that the fence and education and/or enforcement will be 100% effective in mitigating management issues in the adjacent lands.' (Section 4.2, pg. 41)	The boundaries of the wildlife corridors have been fixed and legislated. It is logical to place the fence along the boundary. Bringing the fence further into the development will reduce the area available for important mitigations which Fiera has agreed are applicable. Fiera states, "The EIS has proposed mitigation techniques that are appropriate in the context of a residential development in the Bow Valley" (Fiera 2017, Section 3.2, pg. 37). Golder agrees with Fiera that fencing, signage, public education, defined access points to designated trails in the wildlife corridors, enforcement within wildlife corridors, and a trail system, recreation areas and dog parks within the Project Boundary are appropriate mitigations for the Project. Moving the fence into the development may effectively remove mitigations such as dog parks, bike paths and recreation areas inside the fence that Fiera agrees are appropriate mitigations. Golder presents evidence and examples that fencing, enforcement and education can be successful. Section 5.5.4 pages 89 through 95. Golder agrees that it is unlikely that there will be a 100% effective strategy in regards to mitigation of management issues. However, given the commitment of the residences of Canmore to live with wildlife and adaptive management outlined in Section 5.7 pages 122 through 125, Golder predicts mitigations will be effective.

CLOSURE

We trust the above meets your present requirements. If you have any questions or require additional details, please contact the undersigned.

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