5.2 Mitigation Effectiveness Monitoring

Clearing activities relevant to mammals monitoring were undertaken in the majority of construction segment N3 from February through March 2014, and in N2, south portion of N3 and N4 (primarily centerline clearing), prior to initiation of Year 1 (2014/15) of the mammals monitoring programs in January 2015. Clearing activities along the N3 and N4 ROW construction segments was completed during Year 2 (2015/16). In Year 3 (2016/17) tower erecting and line stringing was undertaken. In Year 4 (2017/18) construction activities were completed and operations phase began in the summer of 2018.

This report concentrates on analysis from the Construction phase of the Project for the various mammal VECs being monitored at local and/or landscape scales through each Project phase. An updated assessment of use on mitigation areas within P-Bog range was undertaken as data on the location of each vegetation leave area was available. From 2016 to 2018 caribou in the P-Bog range crossed the ROW at mitigated areas more frequently than non-mitigated areas. However, from 2018 to 2019 caribou did not choose to use the mitigation areas as often as was predicted and/or as observed in previous years. This current result could be a reflection of low sample size (only one year of data for operations phase) or could suggest that caribou may not as strongly prefer these mitigated areas now that construction is completed, and sensory disturbance is reduced. This pattern should continue to be evaluated as more data accumulates. However, as caribou used this mitigation areas during the Construction phase, they have been effective in ensuring that caribou continue to move across the landscape in the same ways as before Construction, particularly reducing disruption to local movement dynamics during the most disruptive part of the Project.

In the Wabowden range, vegetation mitigation was applied along the entire length of the ROW (within caribou range boundaries). Consequently, a statistical comparison of mitigated versus non-mitigated vegetation areas cannot be undertaken. However, given that caribou continue to cross the ROW and the results of the P-Bog range it would be assumed that caribou are benefitting from the mitigative effect of vegetation leave areas along the segment of the ROW.

No project-related effects have been detected during the Construction phase with respect to ungulate (i.e., woodland caribou, moose) population abundance or trend (Sections 5.1.2.2, 5.2 and 5.3), or altered annual or seasonal range use or changes in predator-prey dynamics (Section 5.6.2), suggesting that mitigations applied to the project such as project routing, vegetation management mitigations, and winter construction windows have aided in reducing potential impacts to these species. ZOI and crossing analysis have revealed that the Project is a semi-permeable barrier on the landscape; caribou typically avoid spending long periods of time within 1 to 2 km of the Project but will still cross the Project on occasion using the vegetation leave areas. Site fidelity analysis revealed that caribou continued to demonstrate fidelity at both population and local scales to important seasonal areas including calving and over wintering ranges. The one exception to this pattern was observed at the local scale in February and March during Construction phase in the P-Bog range where caribou did not displayed fidelity to previously used local sites in these months. This could be due to disturbance from Construction, however, it was limited to a very local scale for a period of 2 months. This pattern should continue to be assessed through the Operation phase.

Table 5-1-3: Average Annual and Seasonal Home Range Sizes for each Woodland Caribou Range during Operations Phase

Range	Annual Home range (km^2)*	Overwintering Areas (km^2)*	Calving Areas (km^2)*
Bog	340.3 ± 306.5 (n = 22)	77.6 ± 58.1 (n = 3)	17.8 ± 28.1 (n = 20)
Charron Lake	648.5 ± 500.3 (n = 24)**	203.1 ± 98.6 (n = 6)**	45.3 ± 59.7 (n = 19)**
Wabowden	367.2 ± 278 (n = 25)	119.9 ± 41.3 (n = 4)	7.4 ± 11.6 (n = 20)

Notes:
* Annual home range estimates based on 90% kernel estimates, overwintering and calving areas based on 70% kernel estimates
** Significantly different from all of the other ranges (P <0.05)

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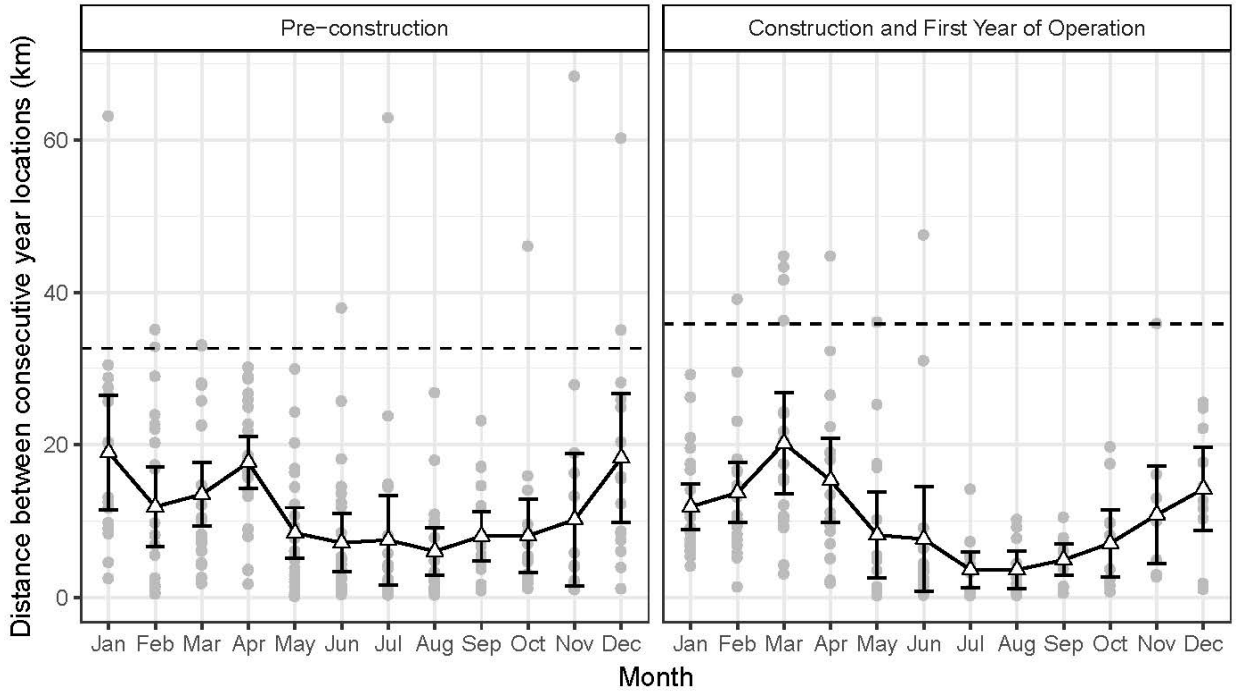

Figure 5-1-15: Population Scale Site Fidelity Dynamics Observed in the Wabowden Range during Pre-construction Phase (2010 to 2014), Construction phase (2014 to 2018) and First Year of Operation (2019)

The population scale includes the entire range boundaries as defined by all satellite collared cows in Wabowden range across all months; therefore fidelity (or lack thereof) at this scale is assessed for seasonal core areas within a larger range. As confidence intervals do not encompass the null expectation, strong fidelity to calving areas occurred during all Project phases. Weaker but significant fidelity to wintering areas also occurred. Patterns in site fidelity have not changed from Pre-construction through to the end of the Construction phase at this scale.

** The first year of Operations was pooled with the Construction phase for this report as only one year of data was available for the Operation phase. Site fidelity analysis requires at least two years per phase to undertake analysis. Results specific to the operations phase can be split out in the 2020 report.

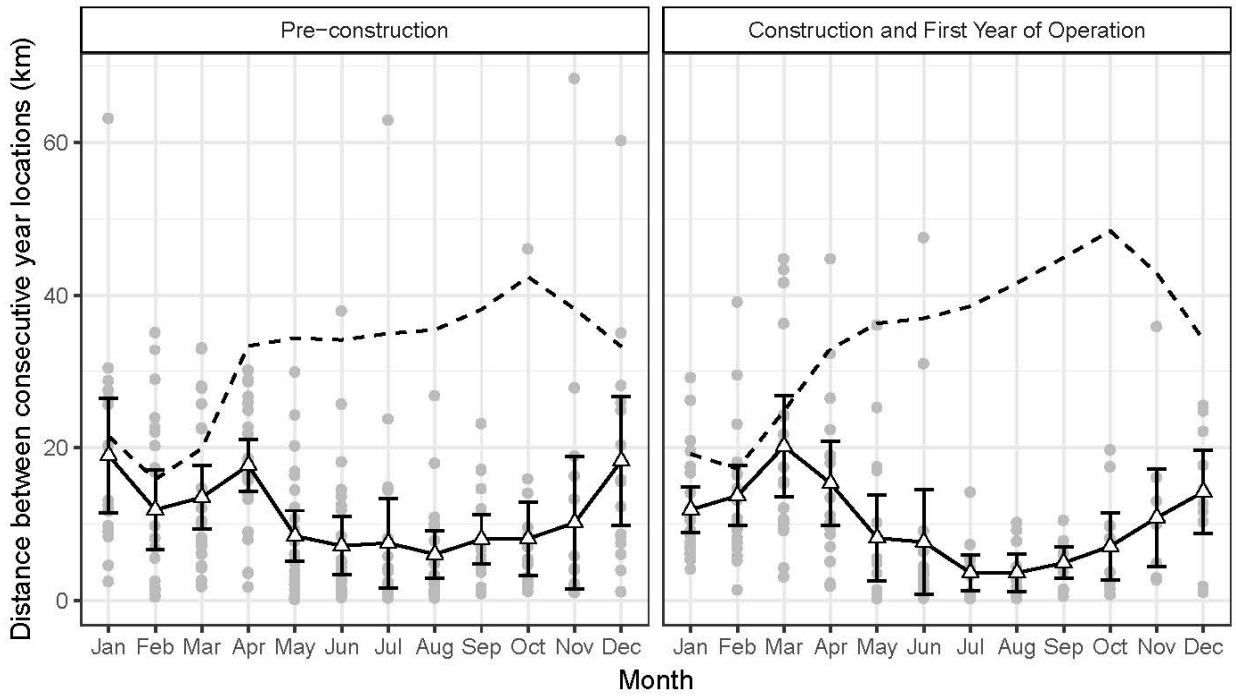

Figure 5-1-16: Seasonal Scale (Local) Site Fidelity Dynamics observed in the Wabowden Range during the Pre-construction phase (2010 to 2014), Construction phase (2014 to 2018) and the First Year of Operation (2018 to 2019)

The seasonal scale includes boundaries as defined by all satellite collared cows in Wabowden range within a given month; therefore fidelity (or lack thereof) at this scale, is assessed for local sites within seasonal core use areas for a given month. As confidence intervals do not encompass the null expectation during the calving period, strong site fidelity is occurring during all Project phases. As confidence intervals within the monthly ranges encompass the null expectation from January to February in the pre-construction phase, fidelity was absent during the winter. However, during the Construction phase and first year of operations (2014 – 2019) fidelity to these ranges was displayed. This suggests that construction activities and Project installation did not weaken fidelity to over wintering areas in this range.

** The first year of Operation was pooled with the Construction phase for this report as only one year of data is available for the Operation phase. Site fidelity analysis requires at least two years per phase to undertake analysis. Results specific to the operations phase can be split out in the 2020 report.

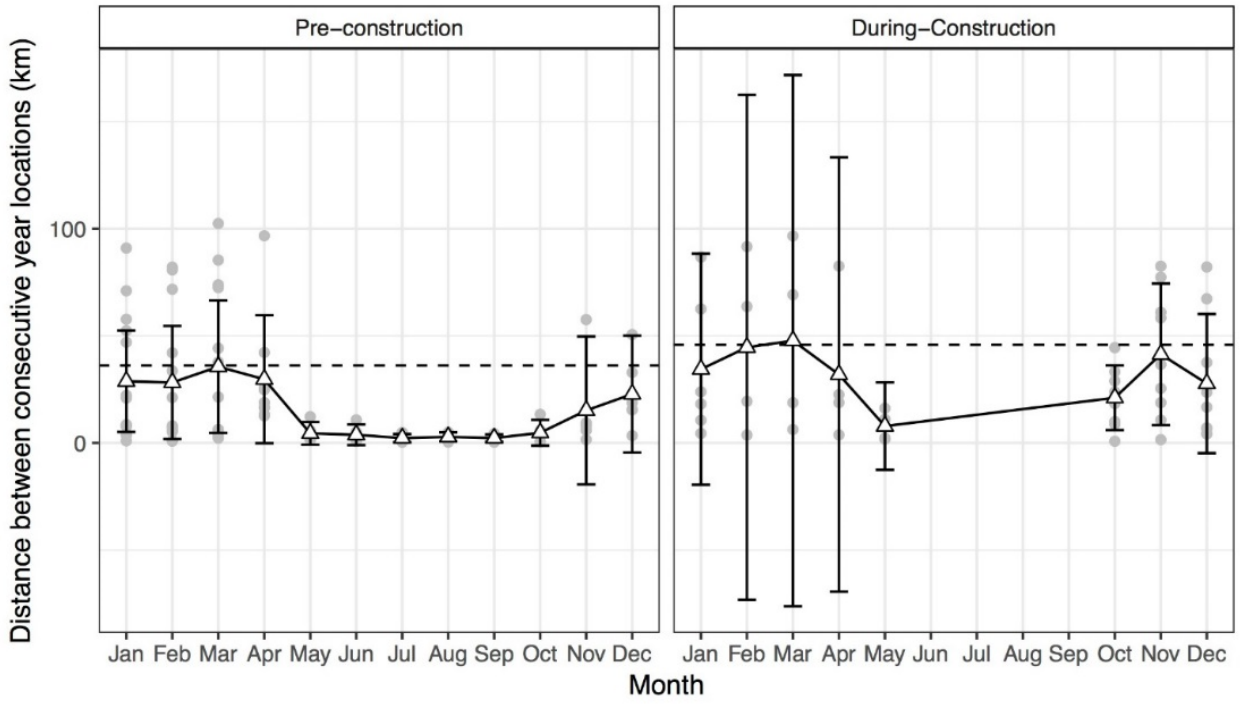

Figure 5-1-17: Population Scale Site Fidelity Dynamics observed in the N-Reed Range during the Pre-construction (2010 to 2014) and Construction (2014 to 2018) Project Phases

The population scale includes the entire range boundaries as defined by all satellite collared cows in the N-Reed range across all months; therefore fidelity (or lack thereof) at this scale is assessed for seasonal core areas within a larger range. As confidence intervals do not encompass the null expectation during the calving period strong site fidelity is occurring during all Project phases. As confidence intervals within the winter monthly ranges encompass the null November to April, fidelity is absent during both Project phases.

** Currently during the Construction phase from June – September there are no caribou who were collared during that period for consecutive years so data is not available. No additional data were available for 2018. This figure has not been updated for this report as there is not new data since the last report.

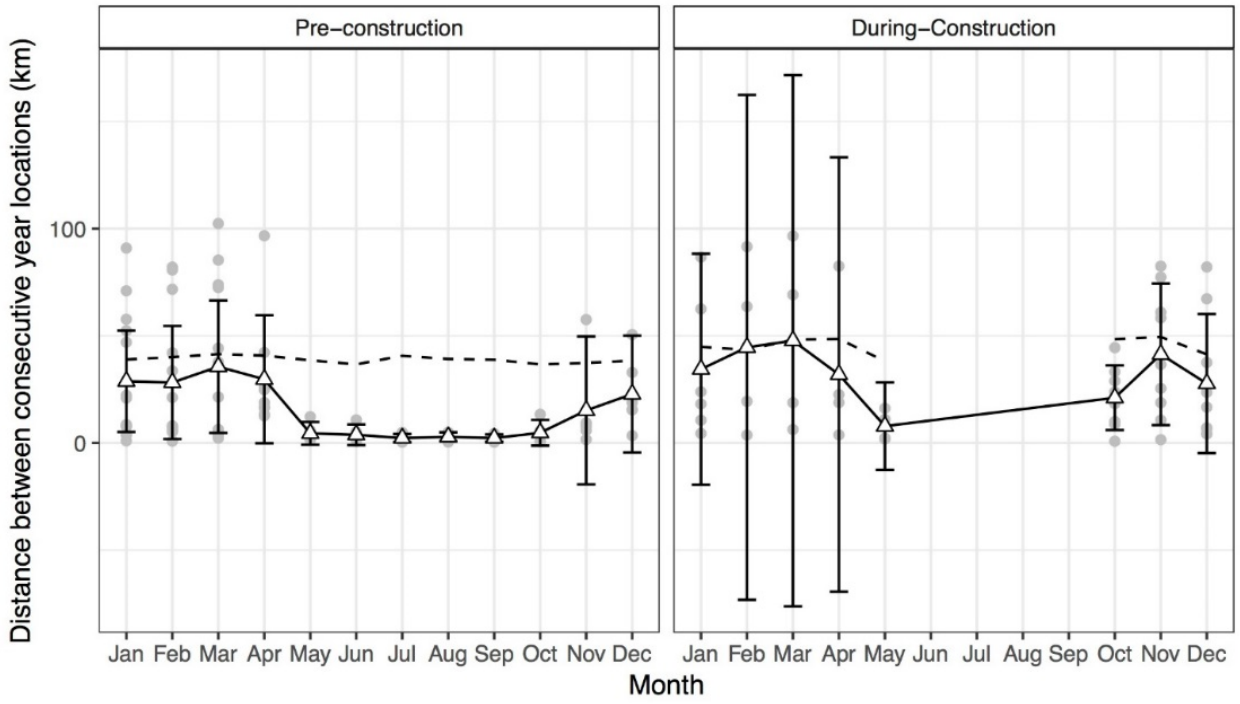

Figure 5-1-18: Seasonal Scale Site Fidelity Dynamics observed in the N-Reed Range during the Pre-construction and Construction Project Phases

The seasonal scale includes boundaries as defined by all satellite collared cows in the N-Reed range within a given month; therefore fidelity (or lack thereof) at this scale, is assessed for local sites within seasonal core use areas for a given month. Similar to the population scale, confidence intervals do not encompass the null expectation during the calving period, strong site fidelity is occurring during all Project phases. As confidence intervals within the winter monthly ranges encompass the null November to April, fidelity is absent during both Project phases.

** Currently during the Construction phase from June to September there are no caribou who were collared during that period for consecutive years so data is not available. No additional data were available for 2018. This figure has not been updated for this report as there is not new data since the last report.

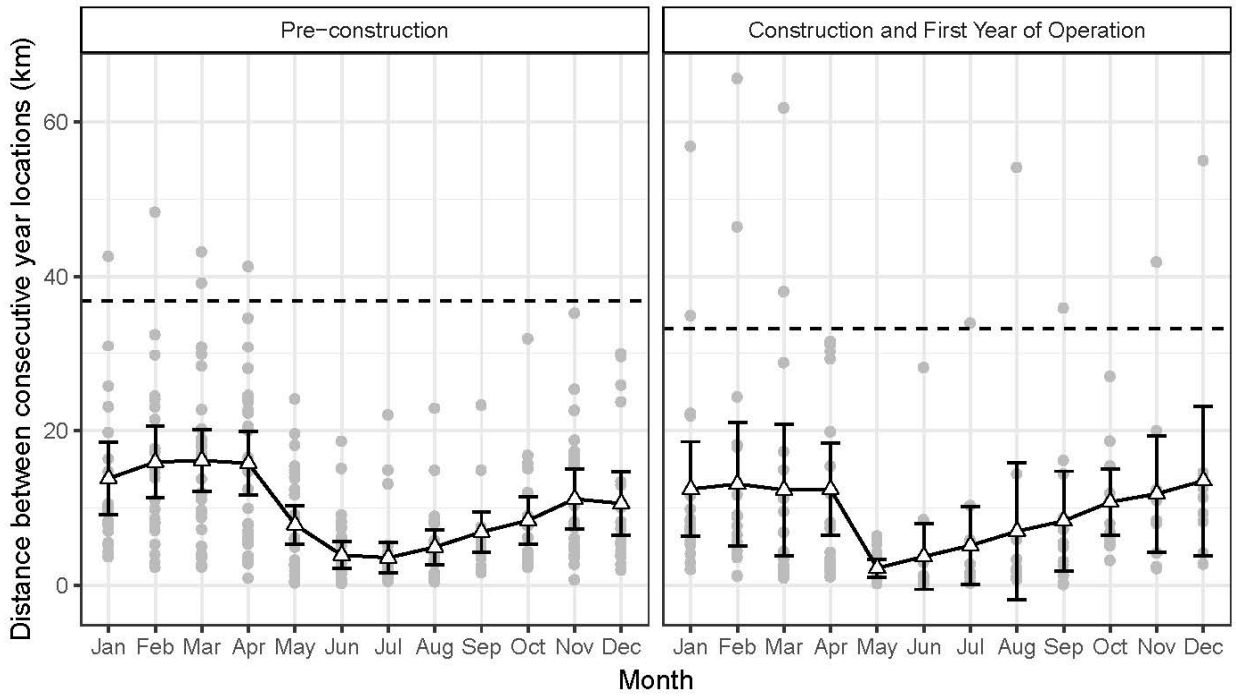

Figure 5-1-19: Population Scale Site Fidelity Dynamics observed in the P-Bog Range during the Pre-construction Phase, Construction phase and the First Year of Operation

The population scale includes the entire range boundaries as defined by all satellite collared cows in the P-Bog range across all months; therefore fidelity (or lack thereof) at this scale is assessed for seasonal core areas within a larger range. As confidence intervals encompass the null expectation, site fidelity is occurring throughout the year during the Pre-construction and Construction phase and first year of Operation. Patterns in site fidelity have not changed from Pre-construction through to the end of the monitoring period to date.

** The first year of Operation was pooled with the Construction phase for this report as only one year of data was available for the Operation phase. Site fidelity analysis requires at least two years per phase to undertake analysis. Results specific to the operations phase can be split out in the 2020 report.

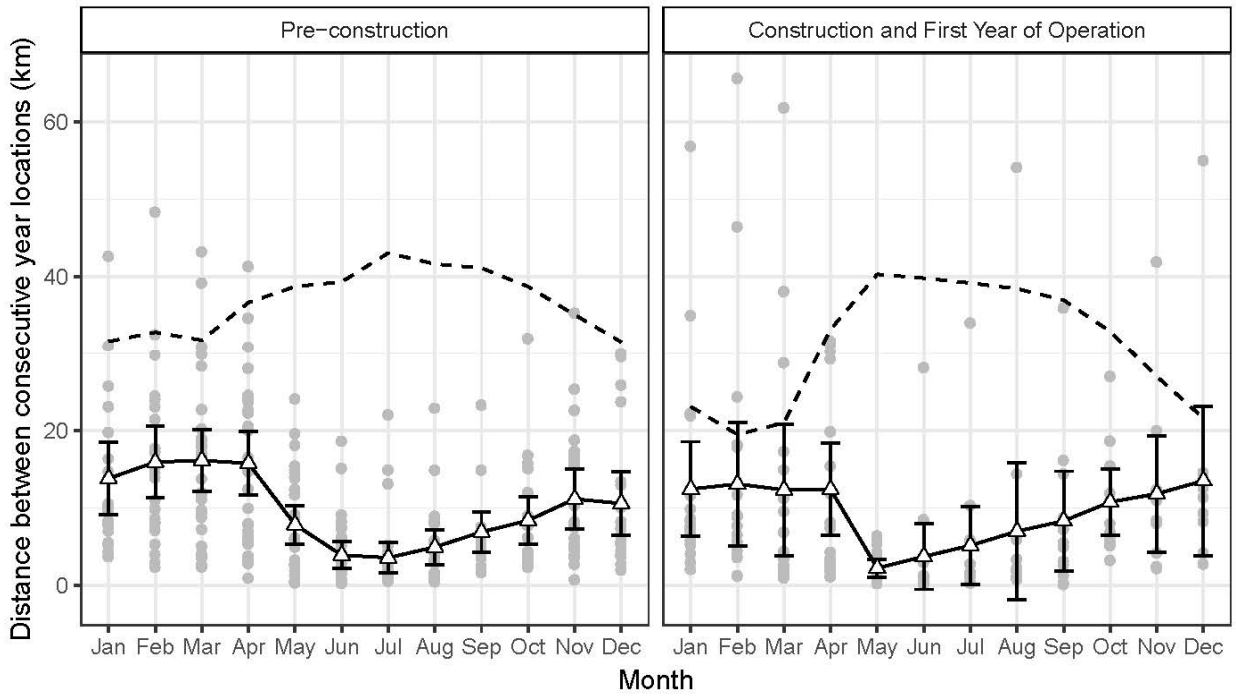

Figure 5-1-20: Seasonal Scale Site Fidelity Dynamics observed in the P-Bog Range during the Pre-construction Phase, Construction phase and the First Year of Operation

The seasonal scale includes boundaries as defined by all satellite collared cows in the P-Bog range within a given month; therefore fidelity (or lack thereof) at this scale, is assessed for local sites within seasonal core use areas for a given month. Similar to the population scale, as confidence intervals encompass the null expectation, site fidelity is occurring throughout the year during the pre-construction phase. As confidence intervals within the winter monthly ranges encompass the null February to March, fidelity is absent during these winter months during construction phase; however, fidelity to areas within calving ranges remains strong.

** The first year of Operation was pooled with the Construction phase for this report as only one year of data was available for the Operation phase. Site fidelity analysis requires at least two years per phase to undertake analysis. Results specific to the operations phase can be split out in the 2020 report.

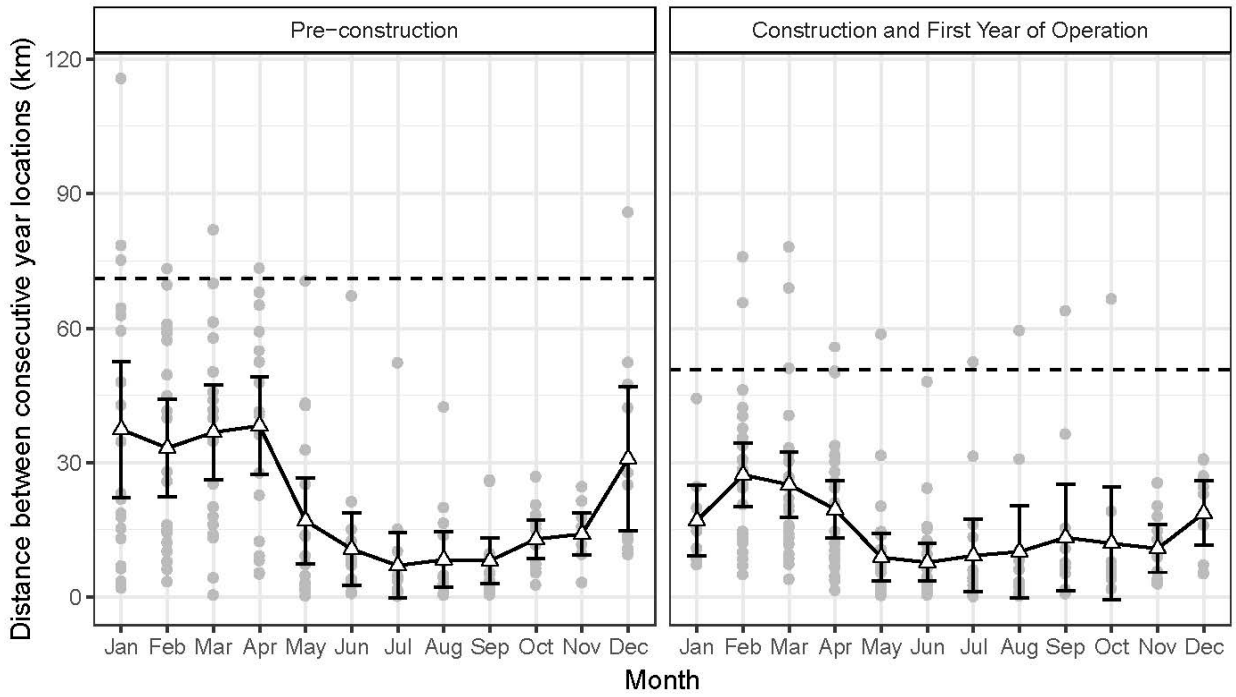

Figure 5-1-21: Population Scale Site Fidelity Dynamics observed in the Charron Lake Range during the Pre-construction Phase, Construction Phase and First Year of Operation

The population scale includes the entire range boundaries as defined by all satellite collared cows in the Charron Lake range across all months; therefore fidelity (or lack thereof) at this scale is assessed for seasonal core areas within a larger range. Population scale site fidelity dynamics observed in the Charron Lake range during the Pre-construction and Construction Project phases. As confidence intervals encompass the null expectation, site fidelity is occurring throughout the year during both Project phases (including the first year of Operation)

** The first year of Operation was pooled with the Construction phase for this report as only one year of data was available for the Operation phase. Site fidelity analysis requires at least two years per phase to undertake analysis. Results specific to the operations phase can be split out in the 2020 report.

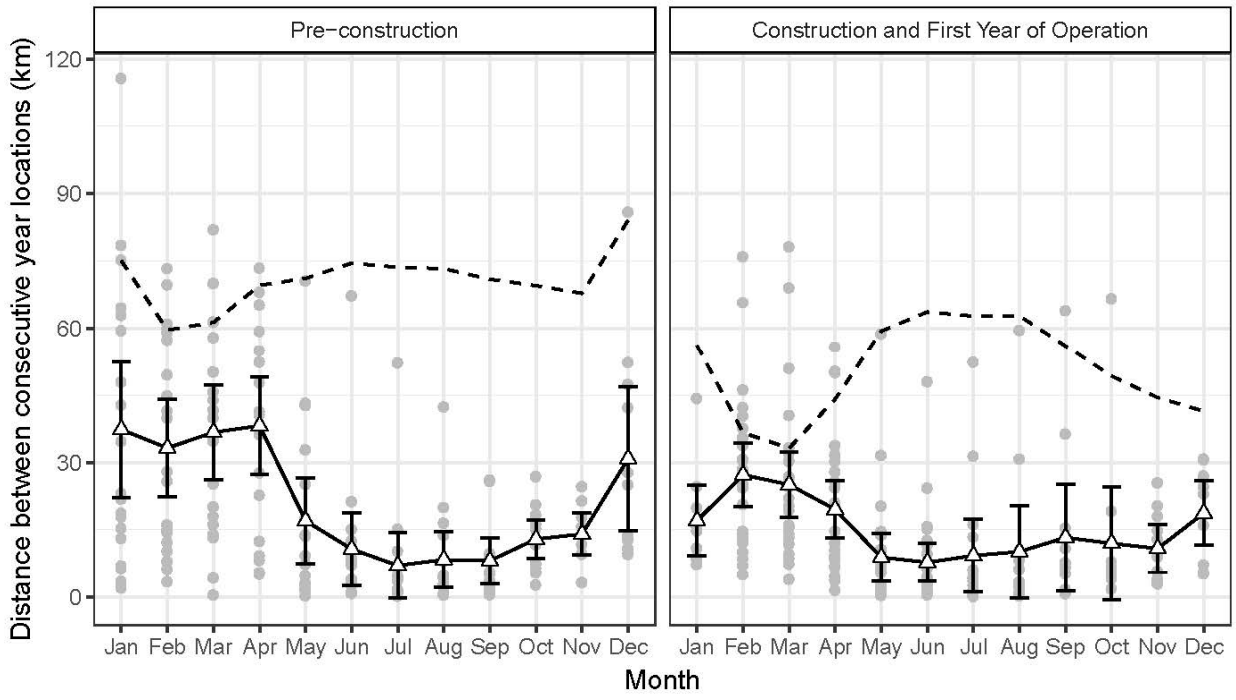

Figure 5-1-22: Seasonal Scale Site Fidelity Dynamics observed in the Charron Lake Range during the Pre-construction Phase, Construction Phase and First Year of Operation

The seasonal scale includes boundaries as defined by all satellite collared cows in the Charron Lake range within a given month; therefore fidelity (or lack thereof) at this scale, is assessed for local sites within seasonal core use areas for a given month. Seasonal scale site fidelity dynamics observed in the Charron Lake range during the Pre-construction and Construction Project phases. As confidence intervals encompass the null expectation, site fidelity is occurring throughout the year during the Pre-construction and Construction phases and first year of Operation.

** The first year of Operation was pooled with the Construction phase for this report as only one year of data was available for the Operation phase. Site fidelity analysis requires at least two years per phase to undertake analysis. Results specific to the operations phase can be split out in the 2020 report.

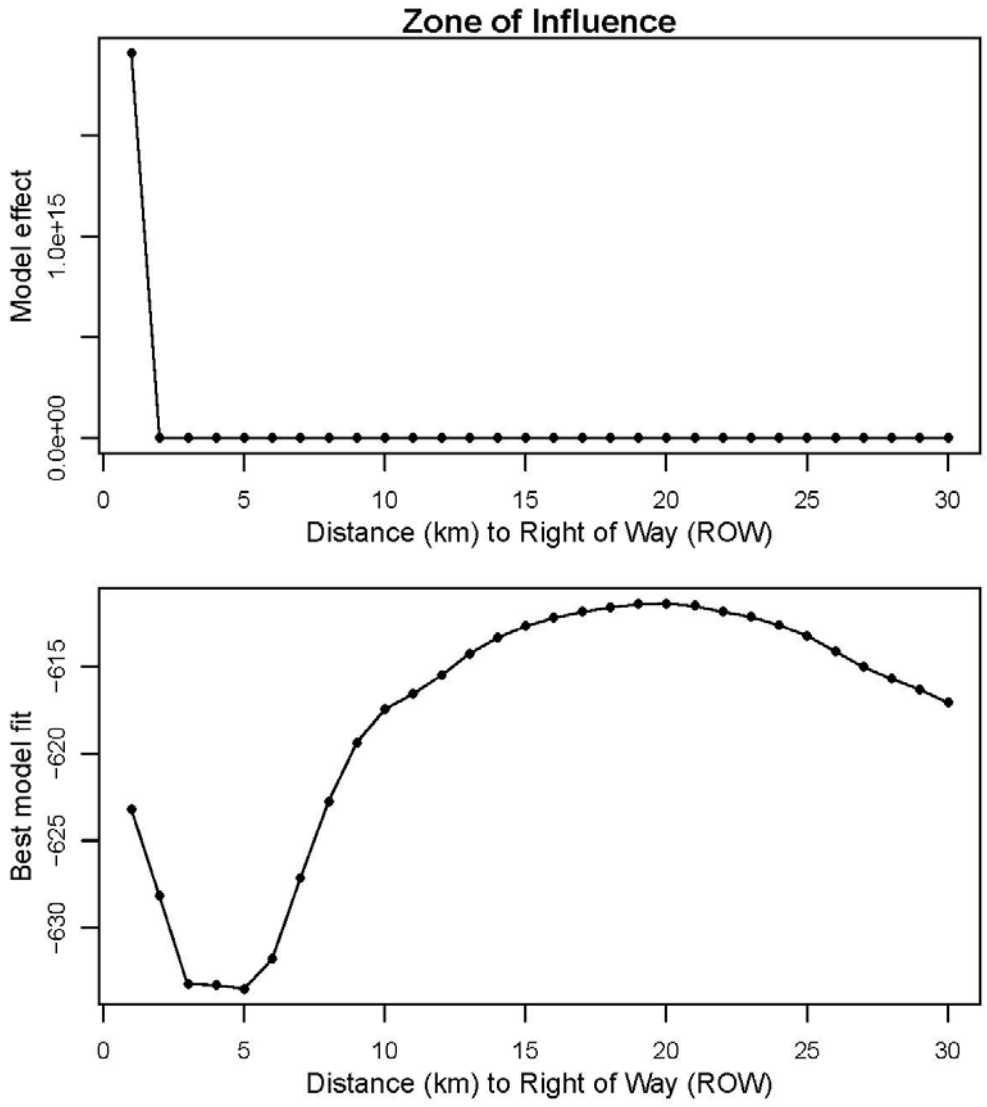

Figure 5-1-23a: Zone of Influence as Measured by Model Effect for Early Winter during the First Year of Operation in Wabowden Range

The ZOI generated using locations from early winter. In this range, caribou avoided the pre-existing linear corridor by 1 to 2 km and this avoidance pattern continued during the Construction phase (Wood 2018). The ROW was widened for most of this range and avoidance was already occurring on the landscape prior to the Project being installed. Currently, with one year of operations data the ZOI appears to continue to be 1 to 2 km during this period. This pattern should be considered preliminary and re-evaluated again after more years of Operation phase data have accumulated as the model fits may change.

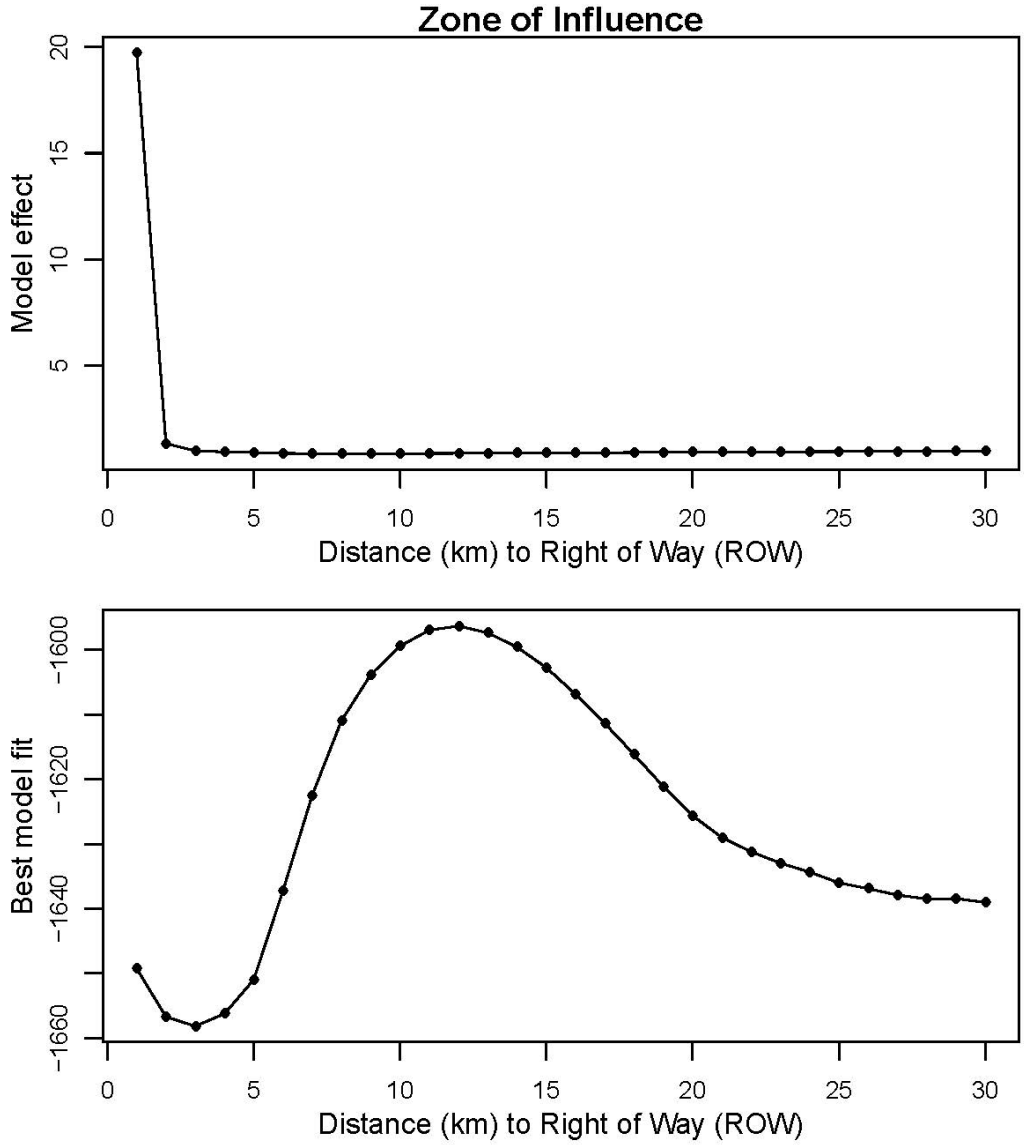

Figure 5-1-23b: Zone of Influence as Measured by Model Effect for Late Winter during the First Year of Operation in Wabowden Range

The ZOI generated using locations from late winter. In this range, caribou avoided the pre-existing linear corridor by 1 to 2 km and this avoidance pattern continued during the Construction phase (Wood 2018). The ROW was widened for most of this range and avoidance was already occurring on the landscape prior to the Project being installed. Currently, with one year of operations data the ZOI appears to continue to be 1 to 2 km during this period. This pattern should be considered preliminary and re-evaluated again after more years of Operation phase data have accumulated as the model fits may change.

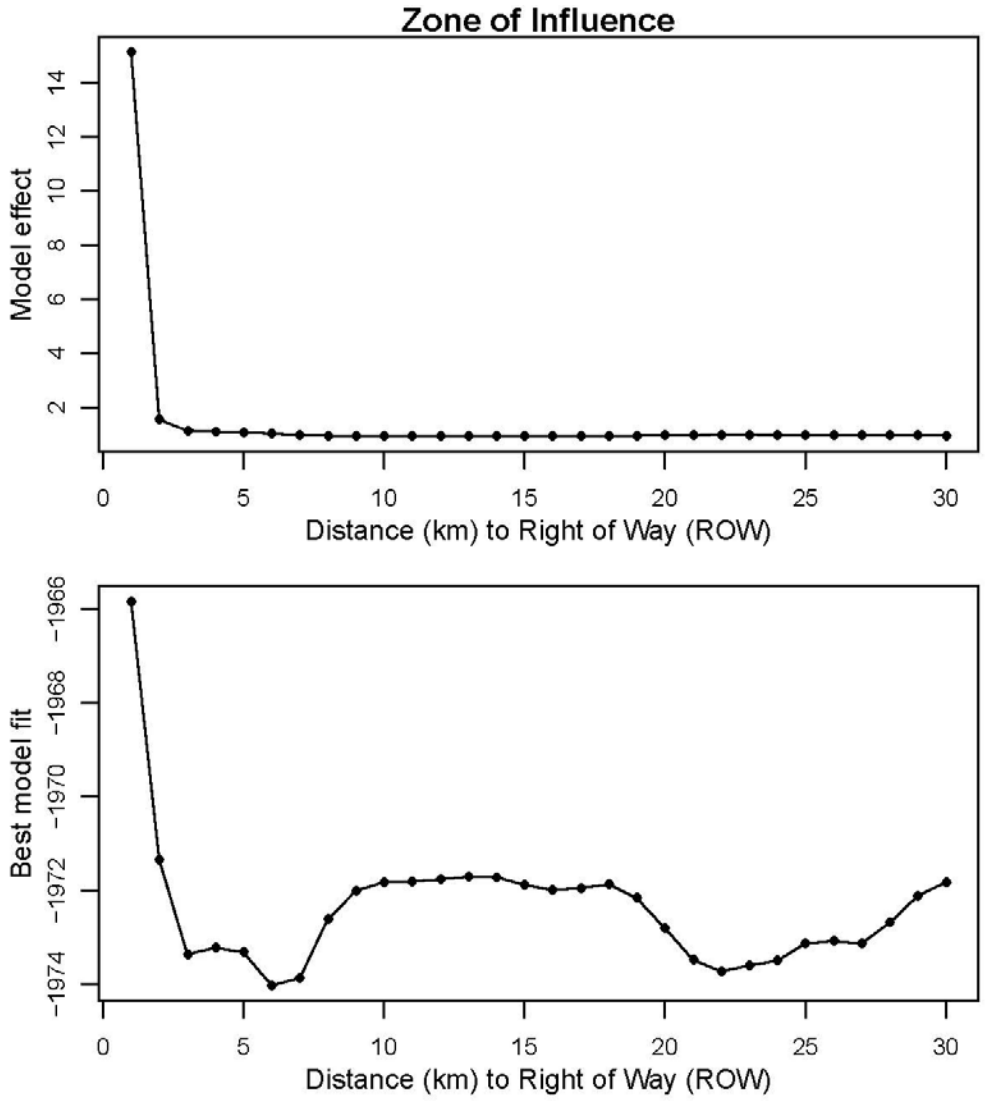

Figure 5-1-23c: Zone of Influence as Measured by Model Effect for Spring during the First Year of Operation in Wabowden Range

The ZOI generated using locations from spring. In this range, caribou avoided the pre-existing linear corridor by 1 to 2 km and this avoidance pattern continued during the Construction phase (Wood 2018). The ROW was widened for most of this range and avoidance was already occurring on the landscape prior to the Project being installed. Currently, with one year of operations data the ZOI appears to continue to be 1 to 2 km during this period. This pattern should be considered preliminary and re-evaluated again after more years of Operation phase data have accumulated as the model fits may change.

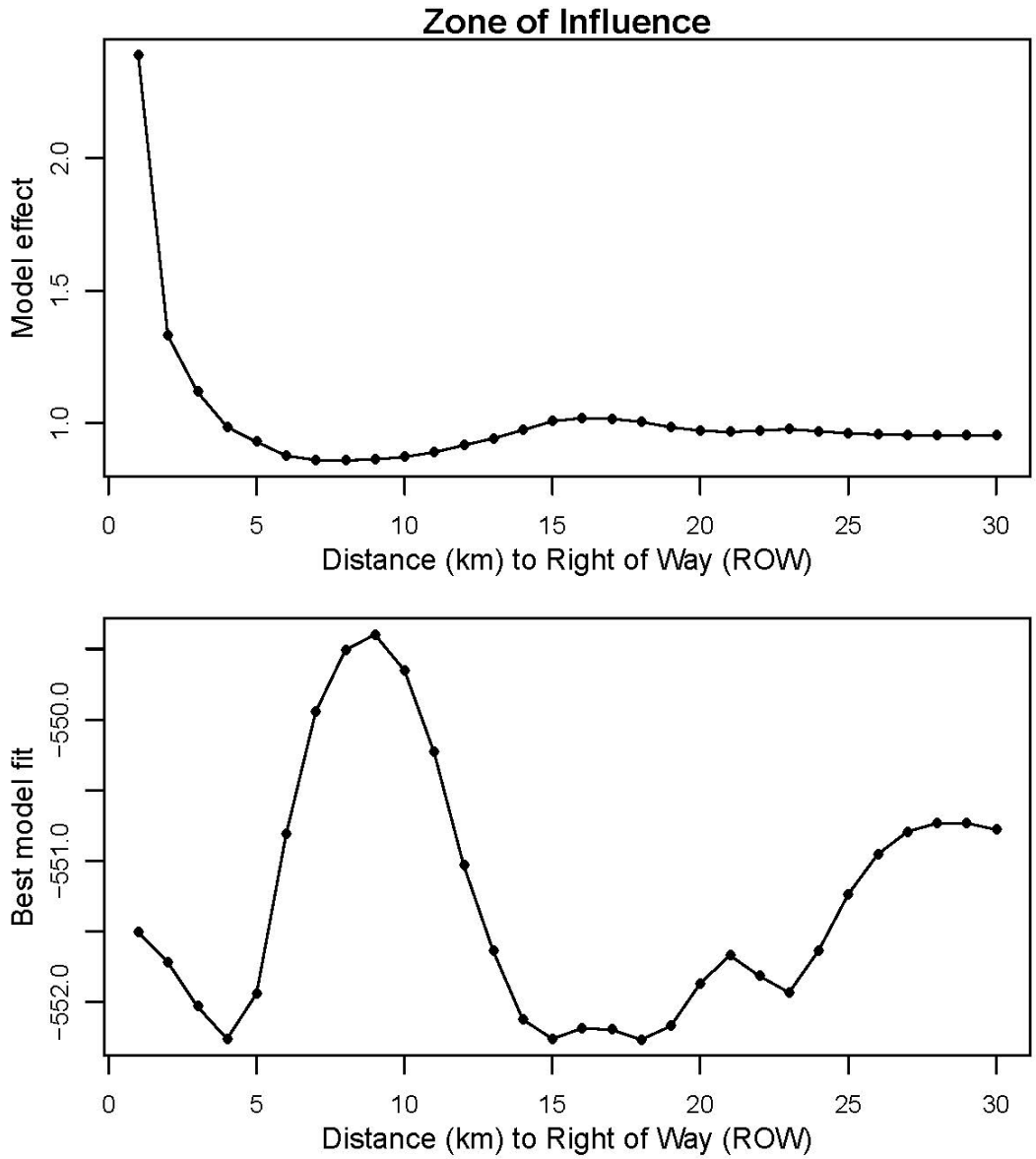

Figure 5-1-23d: Zone of Influence as Measured by Model Effect for Summer during the First Year of Operation in Wabowden Range

The ZOI generated using locations from summer. In this range, caribou avoided the pre-existing linear corridor by 1 to 2 km and this avoidance pattern continued during the Construction phase (Wood 2018). The ROW was widened for most of this range and avoidance was already occurring on the landscape prior to the Project being installed. Currently, with one year of operations data the ZOI appears to continue to be around 5 km during this period. This pattern should be considered as preliminary results and re-evaluated again after more years of Operation phase data has accumulated as the model fits may change.

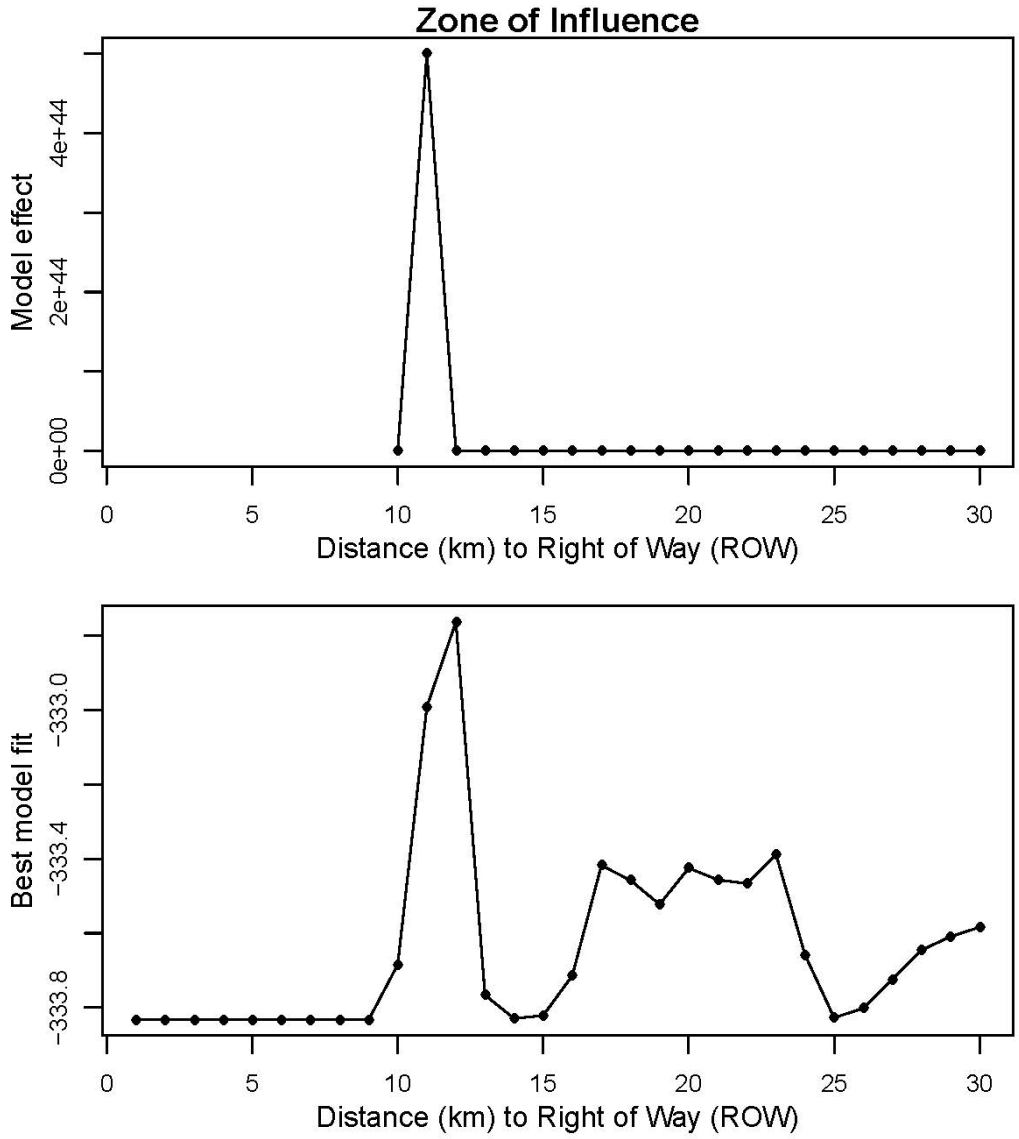

Figure 5-1-23e: Zone of Influence as Measured by Model Effect for Fall during the First Year of Operation in Wabowden Range

The ZOI generated using locations from fall. In this range, caribou avoided the pre-existing linear corridor by 1 to 2 km and this avoidance pattern continued during the Construction phase (Wood 2018). The ROW was widened for most of this range and avoidance was already occurring on the landscape prior to the Project being installed. Currently, with one year of Operation data the ZOI appears to continue to be around 10 km during this period. This pattern should be considered preliminary and re-evaluated again after more years of Operation phases data have accumulated as the model fits may change.

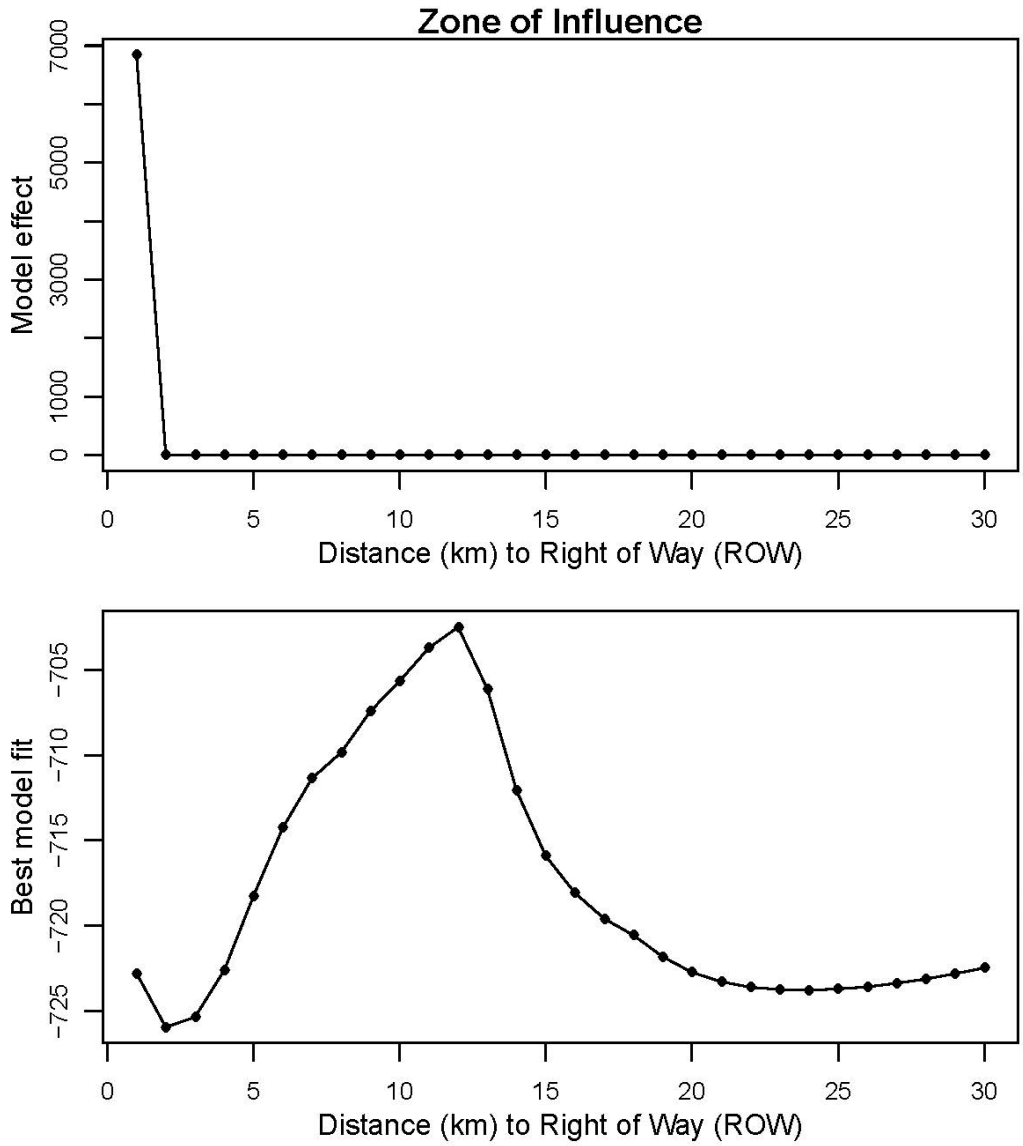

Figure 5-1-24a: Zone of Influence as Measured by Model Effect for Early Winter during the First Year of Operation in P-Bog Range

The ZOI generated using locations from early winter in P-Bog range. Caribou avoided the corridor by 1 to 2 km during the Construction phase and this pattern appears to be continuing into the first year of Operation. This pattern should be considered preliminary and re-evaluated again after more years of Operation phase data have accumulated as the model fits may change.

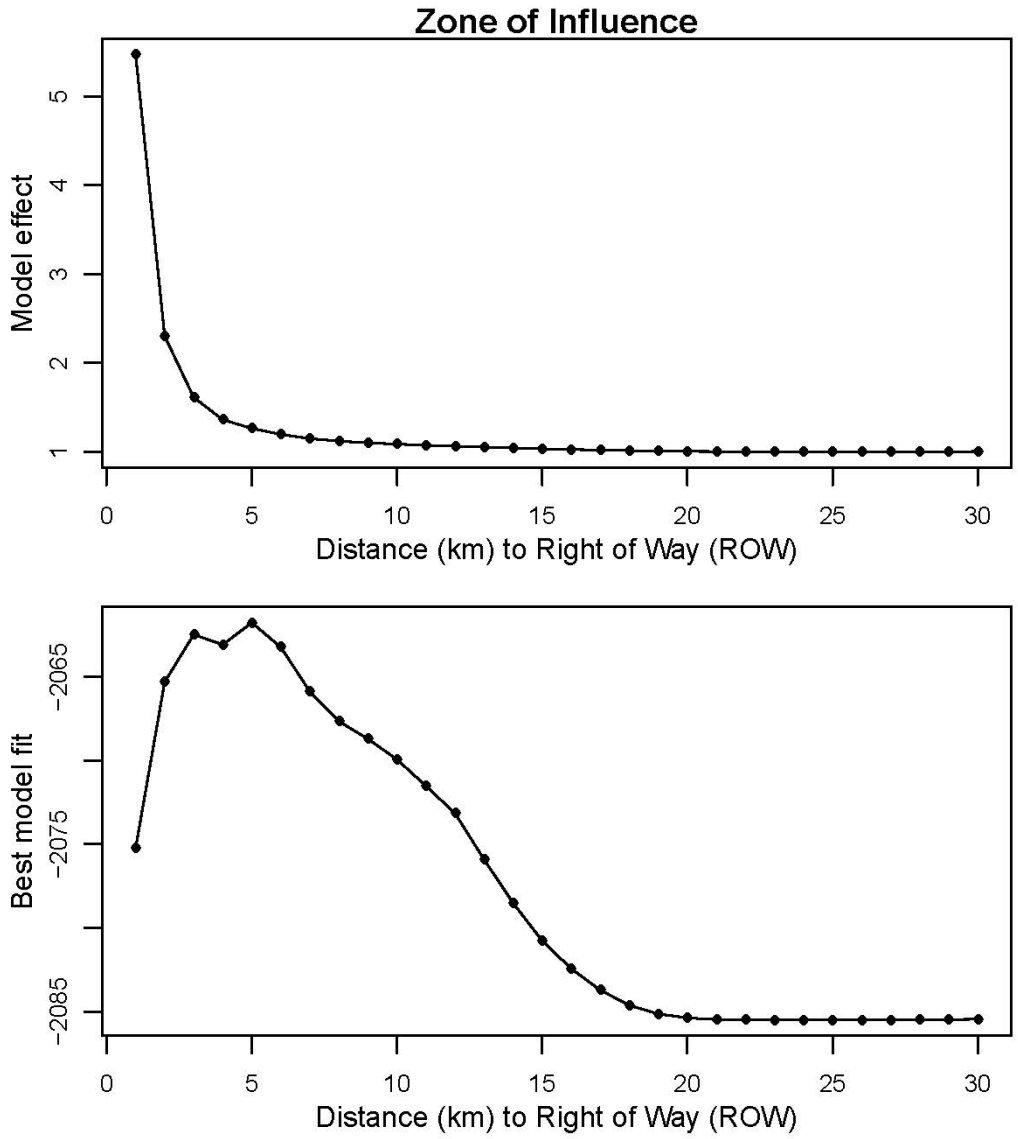

Figure 5-1-24b: Zone of Influence as Measured by Model Effect for Late Winter during the First Year of Operation in P-Bog Range

The ZOI generated using locations from late winter in P-Bog range. Caribou avoided the corridor by 1 to 2 km during the Construction phase and this pattern appears to be continuing into the first year of Operation. This pattern should be considered preliminary and re-evaluated again after more years of Operation phase data have accumulated as the model fits may change.

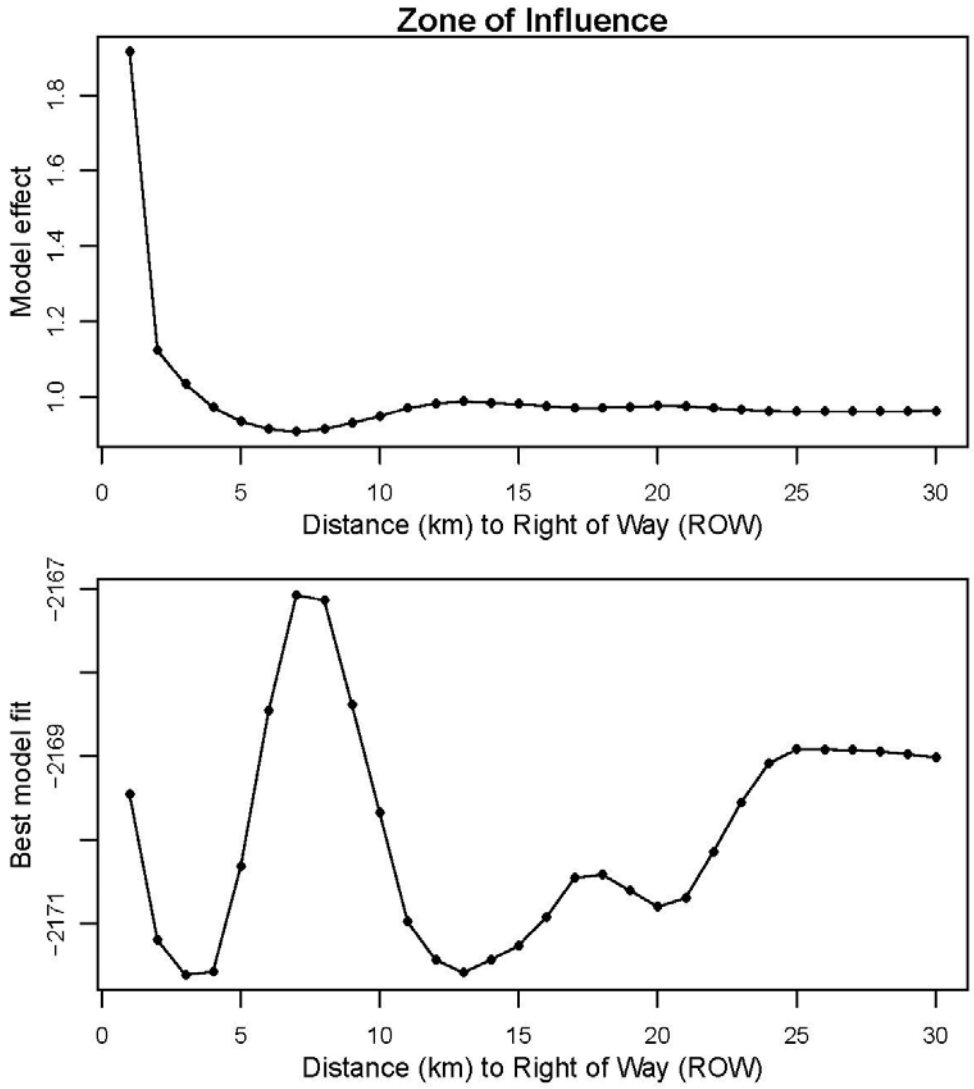

Figure 5-1-24c: Zone of Influence as Measured by Model Effect for Spring during the First Year of Operation in P-Bog Range

The ZOI generated using locations from spring in P-Bog range. Caribou avoided the corridor by 1 to 2 km during the Construction phase and this pattern appears to be continuing into the first year of Operation. This pattern should be considered preliminary and re-evaluated again after more years of Operation phase data have accumulated as the model fits may change.

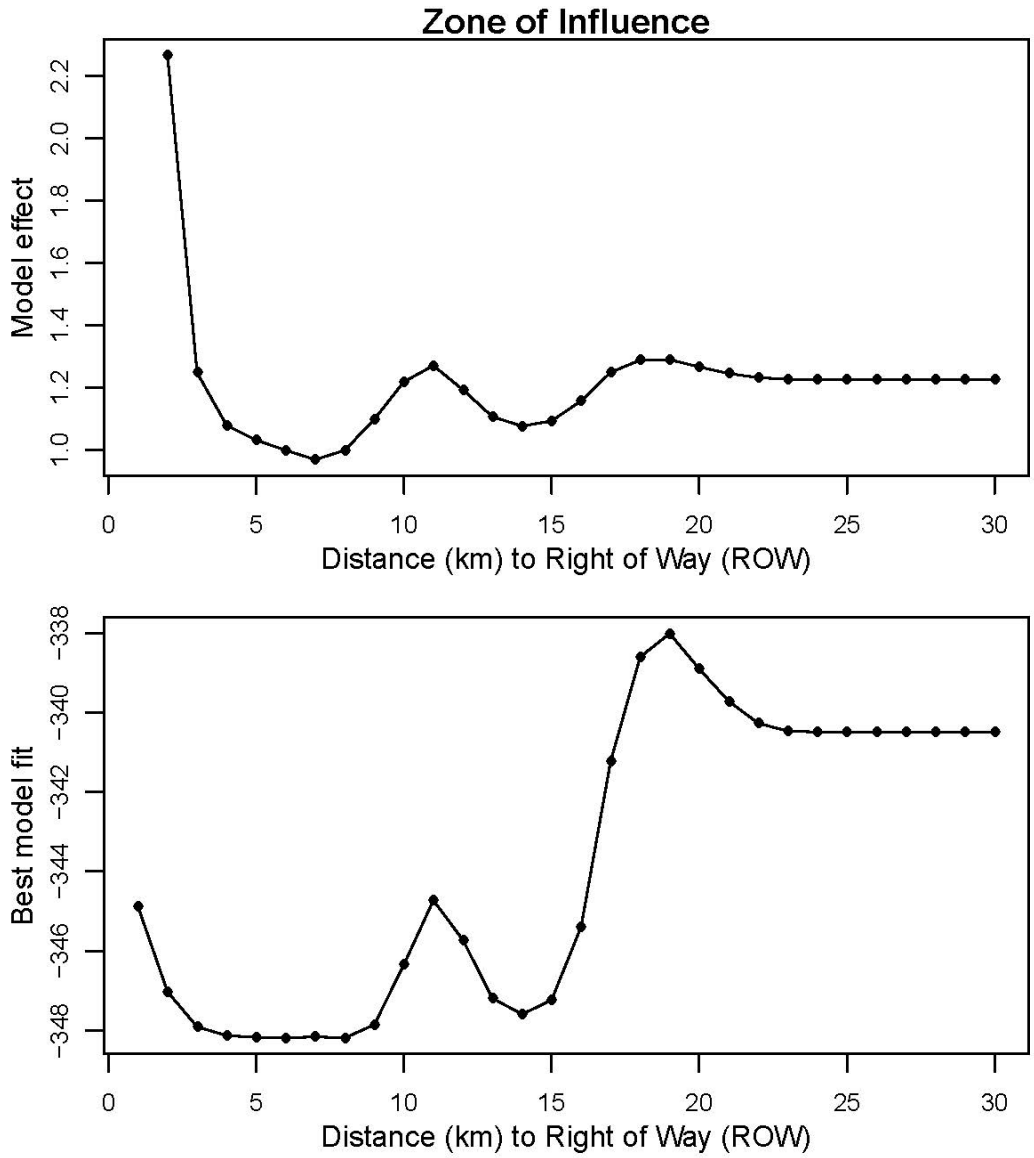

Figure 5-1-24d: Zone of Influence as Measured by Model Effect for Summer during the First Year of Operation in P-Bog Range

The ZOI generated using locations from summer in P-Bog range. Caribou avoided the corridor by 1 to 2 km during the Construction phase and this pattern appears to be continuing into the first year of Operation. This pattern should be considered preliminary and re-evaluated again after more years of Operation phase data have accumulated as the model fits may change.

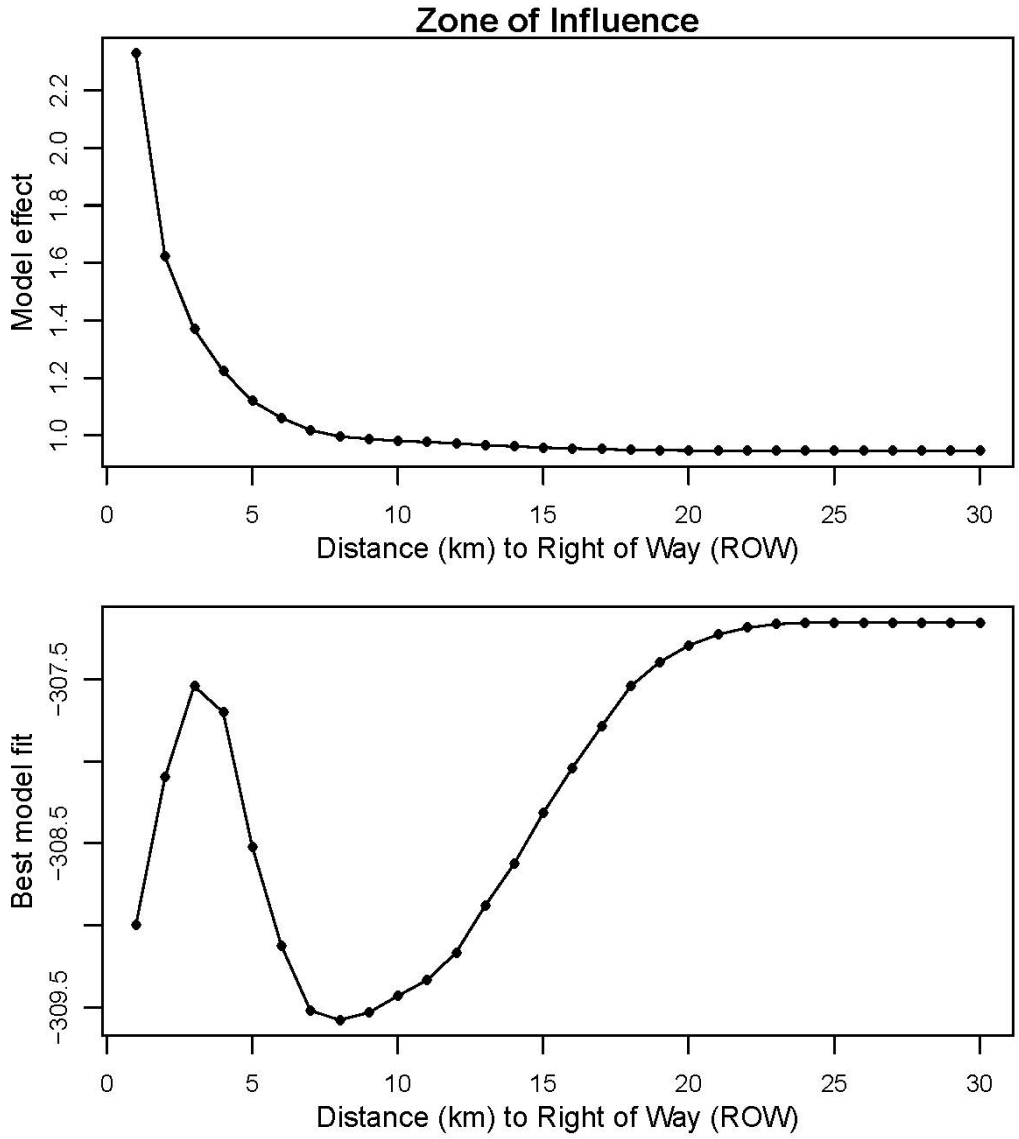

Figure 5-1-24e: Zone of Influence as Measured by Model Effect for Fall during the First Year of Operation in P-Bog Range

The ZOI generated using locations from fall in P-Bog range. Caribou avoided the corridor by 1 to 2 km during the Construction phase and this pattern appears to be continuing into the first year of Operation. This pattern should be considered preliminary and re-evaluated again after more years of Operation phase data have accumulated as the model fits may change.

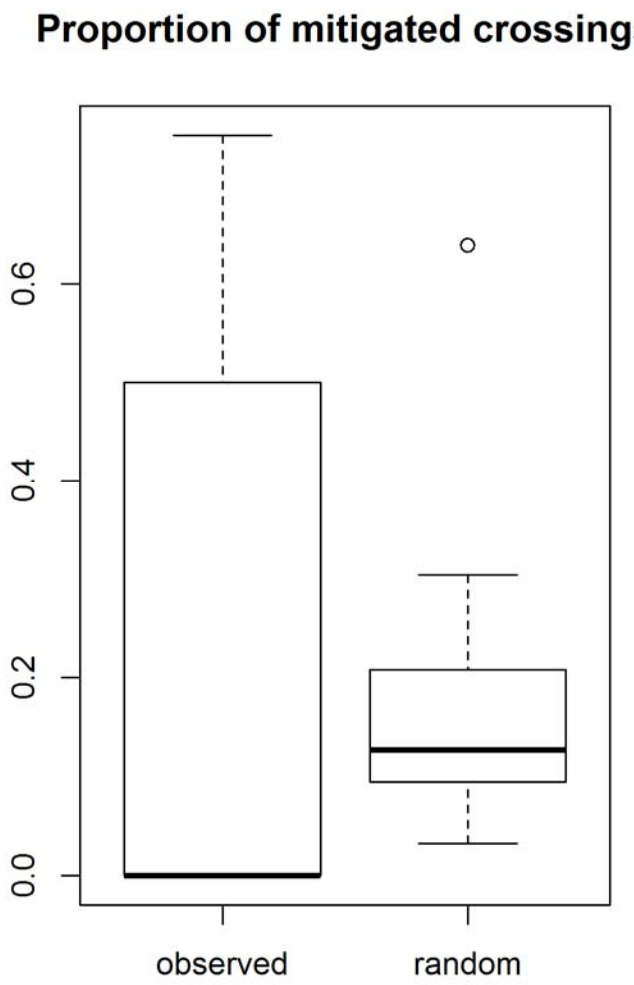

Figure 5-1-25: The Proportion of Crossings at the Mitigated Areas in the P-Bog Range in 2019

In 2019, caribou did not cross the Project ROW in areas with vegetation mitigation applied significantly more frequently than random (df = 17, P = 0.3). This pattern should be considered preliminary as only one year of data have accumulated. During the Construction phase caribou were using these areas significantly more frequently than random areas. This current result for the first year of Operation is either reflecting lower sample size as only one year of data for the Operation phase has accumulated or suggests that caribou may not rely on these mitigation areas as heavily once Construction ceased, as sensory disturbance levels were lower. This pattern should continue to be evaluated as more years of data accumulate. Caribou with a minimum of 2 crossings were included in this figure.

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Figure 5-1-26: Movement Trajectories of Caribou in the Construction Phase using Mitigated Areas to Cross the Project ROW in 2016 and 2017

This figure demonstrates that most collared caribou were crossing the landscape in areas where mitigation was applied in 2016 and 2017. Some caribou such as BOG1303.1 and BOG 1404.1 do not use the mitigated areas, but the remainder of the collared caribou do appear to prefer these narrower portions of the ROW when they decide to cross. Red lines are the mitigation portions of the ROW and black lines are the non-mitigated areas portions of the ROW. These figures are generated from crossings from 2016 to 2017.

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Figure 5-1-27: Movement Trajectories of Caribou in the Construction Phase using Mitigated Areas to Cross the Project ROW in 2017 and 2018

This figure demonstrates that most caribou were crossing the landscape in areas where mitigation was applied. Some caribou such as BOG1303.1 do not use the mitigated areas (and this was the case in the previous year), but the remainder of the collared caribou do appear to prefer these narrower portions of the ROW when they decide to cross. BOG1303.1 did not use the mitigated areas in 2017 indicating that individuals may have set locations they use each year. Red lines are the mitigation portions of the ROW and black lines are the non-mitigated areas portions of the ROW. These figures are generated from crossings in 2018.

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Figure 5-1-28: Movement Trajectories of Caribou in the First Year of Operation relative to Mitigated Areas in 2018 and 2019

This figure demonstrates that from 2018 to 2019, collared caribou were not necessarily crossing the landscape in areas where mitigation was applied. Red lines are the mitigation portions of the ROW and black lines are the non-mitigated areas portions of the ROW.

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Figure 5-1-29: Movement Trajectories of Caribou in the First Year of Operations relative to Mitigated Areas in 2018 to 2019

This figure demonstrates that from 2018 to 2019, collared caribou were not necessarily crossing the landscape in areas where mitigation was applied. Red lines are the mitigation portions of the ROW and black lines are the non-mitigated areas portions of the ROW.

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Figure 5-1-30: Movement Trajectories of Caribou in the First Year of Operation relative to Mitigated Areas in 2018 - 2019

This figure demonstrates that from 2018 to 2019, collared caribou were not necessarily crossing the landscape in areas where mitigation was applied. Red lines are the mitigation portions of the ROW and black lines are the non-mitigated areas portions of the ROW.

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6.0 Adaptive Management

Adaptive management is a core approach to implementation of the Bipole III Environmental Protection Plan (EPP) responsive to ongoing evaluation of predicted versus actual effects accessed through various long-term monitoring activities. Modifications to project activities are informed by assessment of mitigation effectiveness and/or detection of significant effects (after mitigation implementation) through each project phase and are based on analysis of the monitoring program results.

The passive adaptive management approach is intended to identify where there may be data gaps and how to improve project mitigations (if warranted) and/or the monitoring program over time. This report is intended to provide such recommendations, as well as information for review by the regulatory authorities for informed input based on the monitoring program results.

6.1 Commitments Table

The Bipole III Transmission Project predicted effects and commitments relevant to mammals monitoring are summarized in Table 6-1-1, and were derived from the Bipole III Transmission Project EIS, EPP (MB Hydro 2013), Biophysical Monitoring Plan (MB Hydro 2015), revised Biophysical Monitoring Plan (MB Hydro 2018), CEC Review / Report (CEC 2013), mitigation plans (MB Hydro 2014), associated technical reports, and EA License conditions. This table is also provided in Part A Mammals Technical Report.

6.2 Monitoring Recommendations

Recommendations for Year 5 (2018/19) mammals monitoring based on results of analyses of mammal monitoring data sets from previous years are identified in Table 6-2-1. There are no recommendations to alter existing project mitigations to implement in Year 5.

Recent advances utilizing genetic capture-mark-recapture estimators for woodland caribou should include a spatial component applied to the existing datasets and future data sets to improve precision of abundance estimates. ZOI, crossing and site fidelity analysis should be updated for the operations phases once more years of data have accumulated to assess more supported results.

Table 6-1-1: Mammals Monitoring Commitments Registry – Bipole III Transmission Project

Mammal VEC	Location	Commitment	Method Used to Meet Commitment	Project Phase / Duration	Status
General	Project	Prevent/minimize adverse environmental impacts and enhance positive impacts; continually improve EMS; meet/surpass regulatory, contractual and voluntary requirements; consider interests and utilize knowledge of affected stakeholders.	MB Hydro Environmental Management Policy - improve environmental performance through annual review of environmental objectives/targets; document/report activities and environmental performance.	All project phases	Implemented, Ongoing
		Provide framework for delivery, management and monitoring of environmental protection measures that satisfy corporate policies and commitments, regulatory requirements, environmental protection guidelines and BMPs and stakeholder input.	Environmental Protection Program.	All project phases	Implemented, Ongoing
		Environmental monitoring - Monitor the project in accordance with pre-defined plans within passive adaptive management framework, including verification of accuracy of EIS predictions, effectiveness of mitigation measures and compliance with project approval terms and conditions.	Biophysical Monitoring Plan (BMP) and Annual Monitoring Report.	All project phases	BMP finalized July 2018 Annual Monitoring Reports completed for Year 1 (2014/15), Year 2 (2015/16), Year 3 (2016/17) and is ongoing
Environmentally Sensitive Sites (ESS)	Bear / Wolf / Wolverine Dens; Ungulate Mineral Licks	Implement site specific environmental protection measures of any ESS potentially affected by Project construction.	Mitigated known sites during planned routing to avoid disturbance.	Construction	Completed
			Stakeholder consultation and ATK process to identify known sites.	Pre-construction and Construction	Completed
			Pre-construction surveys (MB Hydro Environmental Monitors and Environmental Consultants) to detect potential ESS conflicts.	Pre-construction	Completed
			Planned winter construction and minimized footprint to avoid sensitive denning periods (timing and buffer restrictions). Site-specific mitigation of any detected sites during construction.	Construction	Completed

Mammal VEC	Location	Commitment	Method Used to Meet Commitment	Project Phase / Duration	Status
Mammal VECs	Project (N1 – N4)	Avoid wildlife disturbance during sensitive periods (denning, calving) and/or sites (dens, mineral licks) using timing windows and disturbance buffers.	Monitor disturbance during construction and operational phases for effects on mammal VECs and ESSs at appropriate spatial scale for duration of the monitoring period as outlined in the Biophysical Monitoring Plan and associated annual work plans.	Construction, Operation	Construction Phase completed Implemented, Operation Phase ongoing
	Project	Mitigate mammal VEC-vehicle collisions during construction phase using speed limits and access controls.	MB Hydro Environmental Monitors - Monitor occurrence to determine if reduced speed limits or access control required.	Construction,	Completed
		Mitigate habituation of wildlife to humans.	No feeding of wildlife by project personnel, proper food storage and waste disposal to avoid attracting wildlife.	Construction	Completed
	Project (N1 - N4)	Monitor mammal VEC populations.	Monitor effects of project on mammal VECs within the project zone of influence for project-related change in population size and/or range occupancy.	All project phases per BMP	Implemented, Ongoing
Ungulate VECs	Project	Prevent effects of potential increased disease/parasite transmission within and among ungulate species within project zone of influence.	Monitor disease/parasite (i.e., *P. tenuis*) occurrence prevalence for ungulate populations in the project area, including ingress of white-tailed deer along project ROW.	All project phases per BMP	Sampling conducted February 2017; next sampling recommended for Feb 2022 (5 years post-construction)
Boreal Woodland Caribou	Caribou ranges intersected by the project (P-Bog, N-Reed, Wabowden)	Mitigate sensory disturbance during calving and rearing in calving areas during construction.	Winter construction to avoid sensitive calving / rearing period.	Construction	Completed
		Access management during construction phase – to mitigate sensory disturbance and functional habitat loss during construction.	Monitor human use of ROW on core summer and winter areas. Mitigate via access control methods (gates, slash-rollback, ditching, trenching, tree-planting, and accelerated revegetation) to limit recreational ATV/UTV/snowmobile use of the ROW in core winter areas and known/potential calving areas).	Construction	Completed

Mammal VEC	Location	Commitment	Method Used to Meet Commitment	Project Phase / Duration	Status
Boreal Woodland Caribou (cont'd)	Caribou ranges intersected by the project (P-Bog, N-Reed, Wabowden) (cont'd)	Mitigate sensory disturbance, functional habitat loss, and temporary range fragmentation during construction.	Locate ancillary access and staging areas to avoid core use areas and accelerate natural habitat recovery (tree planting) to establish natural low-growing vegetation (security cover) to encourage movement across the ROW	Construction	Completed
		Maintain landscape function to facilitate caribou movement within core winter range.	Develop natural vegetation corridors at strategic locations on the ROW by maintaining naturally low tree cover (Black Spruce and Larch Tamarack) in core winter range affected by the project.	Construction, Operation	Implemented, success evaluated and presented in the annual mammals monitoring reports
		Long-term monitoring of populations (recruitment, mortality, disturbance effects, range fragmentation, occurrence and distribution).	Satellite telemetry study (occupancy, mortality investigation)	Construction, Operation (4 years post-construction)	Implemented, Ongoing – Collar deployments occurred in Feb 2019
			Aerial surveys (recruitment, occurrence and distribution), non-invasive genetic sampling (population estimation).	Construction, Operation (≤25 years or until sufficient knowledge acquired)	Implemented, Ongoing
		Monitor project related changes in predation risk and/or altered predator-prey dynamics. Mitigate project-related predation risk from wolves and black bear.	Monitor predator (wolf, black bear) occurrence in caribou ranges to determine changes in predator use of the ROW and increased predation (winter aerial surveys, IR camera traps, winter track transects, telemetry collar mortality investigations). Mitigate during construction using minimal disturbance techniques to maintain natural low vegetation cover, winter construction to limit disturbance and accelerate vegetation regeneration, and snow trail compaction to discourage movement efficiency and line of sight.	Construction, Operation (≥2 years post-construction pursuant to sufficient knowledge acquired)	Construction Phase completed Operation Phase ongoing (first year completed)
			Conduct late winter annual inspection of project infrastructure to avoid creating packed snow trails to facilitate predator use.	Operation	Ongoing

Mammal VEC	Location	Commitment	Method Used to Meet Commitment	Project Phase / Duration	Status
Boreal Woodland Caribou (cont'd)	Caribou ranges intersected by the project (P-Bog, N-Reed, Wabowden) (cont'd)	Hunting Mortality – minimize and mitigate.	Prohibit hunting and firearm use by project personnel during construction.	Construction	Completed
			Access control in winter core areas (in collaboration with MB Gov) during construction and operation.	Construction, Operation	Implemented, Ongoing
Forest-tundra / Barren-ground Caribou	Cape Churchill, Pen Islands and Beverley-Qamanirjuaq Populations	Mitigate sensory disturbance/functional habitat loss.	Access control (cooperatively developed with MB Gov). Monitor proximity of populations during construction phase using existing telemetry collars (Cape Churchill and Pen Islands populations), local knowledge (all populations) and/or aerial surveys to assess numbers, concentrations and proximity to construction.	Construction	Completed
		Hunter harvest – avoid excessive project related harvest during significant migration events.	MB Hydro work cooperatively with MB Gov to develop an Access Management Plan, hunting closures, hunter education. MB Hydro to prohibit hunting and use of firearms by project personnel in work camps to minimize caribou mortality.	Construction	Completed
Moose	ROW (N1-N4) including site access roads Keewatinoow Converter Station Sensitive moose ranges (Tom Lamb WMA / GHA8, Moose Meadows / portion of GHA14 and Pine River / GHA14A/19A)	Mitigate sensory disturbance during calving and rearing in calving areas during construction.	Winter construction to avoid sensitive calving period and sensitive areas/habitats.	Construction	Completed
		Access management during construction phase – to mitigate sensory disturbance and functional habitat loss during construction.	Monitor human use of ROW on core summer and winter areas. Mitigate via access control methods (gates, slash-rollback, ditching, trenching, tree-planting and/or accelerated revegetation) to limit recreational ATV/UTV/snowmobile use of the ROW in sensitive moose ranges. Decommission temporary construction access upon completion.	Construction	Completed
		Pre-construction surveys to locate sensitive sites (i.e., mineral licks).	Concurrent with aerial wildlife surveys, baseline studies, ATK consultation and MB Hydro Environmental Monitor duties.	Pre-construction	Completed

Mammal VEC	Location	Commitment	Method Used to Meet Commitment	Project Phase / Duration	Status
Moose (cont'd)	ROW (N1-N4) including site access roads Keewatinoow Converter Station Sensitive moose ranges (Tom Lamb WMA / GHA8, Moose Meadows / portion of GHA14 and Pine River / GHA14A/19A) (cont'd)	Hunting Mortality – minimize project-related contribution to hunting mortality Vehicle collision mortality	Prohibit hunting and firearm use by project personnel during construction.	Construction, Operation (5 years post-construction pursuant to sufficient knowledge acquired)	Construction Phase completed
			Monitor project access by hunters using remote IR cameras at major access points and along the ROW.		Operation Phase ongoing
			Access control (in collaboration with MB Gov).	Construction, Operation	Implemented, Ongoing
		Predation Risk: - Monitor project related changes in predation risk and/or altered predator-prey dynamics. - Mitigate project-related predation risk from wolves and black bear.	Monitor predator (wolf, black bear) occurrence in caribou ranges to determine changes in predator use of the ROW and increased predation (winter aerial surveys, IR camera traps, winter track transects, telemetry collar mortality investigations).	Construction, Operation	Implemented, Ongoing during Operation Phase
			Mitigate during construction using minimal disturbance techniques to maintain natural low vegetation cover, winter construction to limit disturbance and accelerate vegetation regeneration, and snow trail compaction to discourage movement efficiency and line of sight.		Construction Phase completed
			Conduct late winter annual inspection of project infrastructure to avoid creating packed snow trails to facilitate predator use.	Operation	Implemented
	Sensitive Moose Ranges	Habitat loss and fragmentation – avoid / minimize.	Apply minimal disturbance techniques via winter clearing, selective cutting, avoidance of unrequired shear-blading, removal of danger trees (>17 m tall) to reduce line of sight, impair predator and hunter use of ROW as a travel corridor, and facilitate wildlife movement across the ROW.	Construction	Completed

Mammal VEC	Location	Commitment	Method Used to Meet Commitment	Project Phase / Duration	Status
Moose (cont'd)	Sensitive Moose Ranges (cont'd)	Long-term monitoring of populations (recruitment, mortality, disturbance effects, range fragmentation, occurrence and distribution).	Monitor sensitive moose ranges using a combination of, aerial surveys (recruitment, population structure, abundance, occurrence and distribution), remote IR camera studies and/or winter ground transects.	Construction, Operation (≤25 years or until sufficient knowledge acquired)	Implemented, Ongoing
Elk	C1, N4	Mitigate construction–related disturbance effects.	Monitor elk-vehicle collisions, excessive harvest and disease risk (related to potential encroachment of white-tailed deer spread of *P. tenuis*).	Construction	Completed
White-tailed Deer	C1, N4, N3, N2	Monitor white-tailed deer distributions and prevalence of brainworm *(P. tenuis)* along the Bipole III transmission line.	Pellet collection for *P. tenuis* detection / prevalence. White-tailed deer ingress along ROW via annual species distribution/recruitment surveys in woodland caribou ranges, winter ground transect surveys, trail camera traps, multi-species aerial survey and deer distribution survey of *P. tenuis* surveillance blocks.	Construction, Operation (4 years post-construction)	Implemented, Ongoing
Gray Wolf	C1, N4, N3, N2, N1	Monitor project-related changes in predator-prey dynamics (wolf use of the ROW).	Expand / enhance studies on wolf populations / distribution and predation of boreal caribou within the Project Study Area. Accomplished using occurrence/distribution surveys concurrent with caribou and moose aerial surveys, telemetry collar mortality investigations, as well as remote IR camera trap studies and winter ground transect survey conducted along the ROW.	Construction, Operation	Implemented, Ongoing

Mammal VEC	Location	Commitment	Method Used to Meet Commitment	Project Phase / Duration	Status
Black Bear	Project	Monitor incidents of human-bear encounters during construction, or from attractants (feeding, lack of proper food storage or waste disposal).	Document incidents and report annually; identify corrective actions.	Construction	Completed
		Monitor project-related changes in predator-prey dynamics (black bear use of the ROW).	Conduct studies on black bear population, distribution and predation on boreal caribou in affected caribou ranges within the Project study area; accomplished via trail camera traps, and caribou telemetry collar mortality signal investigation.	Construction, Operation	Implemented, Ongoing
Furbearers	42 Registered Traplines	Monitor change in trapping harvest resulting from increased access or sensory disturbance from the Project.	Monitor annual furbearer harvest statistics obtained from MB Gov for each trapline. Initiate community trapline monitoring program.	Construction, Operation (3 years post-construction)	Construction Phase completed Operation Phase ongoing
	Beaver	Minimize sensory disturbance.	Mitigate local effects of sensory disturbance by use of riparian buffers at ROW crossings during clearing and maintenance activities. MB Hydro environmental monitors to monitor ROW at water crossings (within 200 m buffer of ROW) for beaver presence.	Construction	Completed
	American Marten	Minimize sensory disturbance.	Clear ROW during winter months to lessen disturbance of female marten and their young. Access control (restrict recreational and public access during construction), including routing to minimize loss of forest cover in marten habitat.	Construction	Completed

Mammal VEC	Location	Commitment	Method Used to Meet Commitment	Project Phase / Duration	Status
Furbearers (cont'd)	American Marten (cont'd)	Minimize project-related harvest mortality.	Monitor trapper harvest.	Construction, Operation (3 years post-construction)	Construction Phase completed
					Operation Phase initiated
	Wolverine	Avoid disturbance of denning sites during construction phase.	Mitigate by clearing in wolverine range (>53°N Lat.) during winter when dens not active Mitigate any denning sites (if found).	Construction	Completed
		Minimize project-related harvest mortality.	Monitor trapper harvest.	Construction, Operation (3 years post-construction)	Construction Phase completed
					Operation Phase initiated

Table 6-2-1: Bipole III Transmission Project - Mammals Monitoring Program Recommendations

Wildlife VEC	Recommendation	Project Monitoring Commitment
Boreal Woodland Caribou	Continue **Capture-Mark-Recapture (CMR) Sampling** using Non-invasive Genetic Survey (NGS) methods. • Extend sampling frequency to 4-year intervals for populations that are stable or increasing; next survey is recommended to occur in Monitoring Year 9 (2022/23). • Sampling frequency should remain at 2-year intervals for population(s) for any population assessed to be in decline.	Monitor periodically up to 25 years or until suitable knowledge is acquired
	Continue annual winter **Woodland Caribou Recruitment Surveys** (aided by telemetry relocations) and concurrently conduct **Ungulate-Wolf Winter Distribution Surveys** in all four monitored woodland caribou study areas to monitor for changes in mortality risk, population demography (i.e., calf recruitment, population structure), white-tailed deer ingress (P-Bog Range), and altered predator-prey dynamics. • Final survey of recruitment and distribution is anticipated to occur in Monitoring Year 8 (2021/22). • Continue predator-prey dynamics monitoring annually for 4 years post-construction (Monitoring Year 8; 2021-22) to facilitate relative comparison to the 4 years of the Construction Phase.	Monitor recruitment annually for 3-4 years post-construction Monitor predator-prey dynamics for a minimum of 2 years post construction
	Continue **Woodland Caribou Telemetry Study** - Continue to acquire boreal woodland caribou telemetry locations in each monitored caribou study area to evaluate behavioural responses to the Project, the effectiveness of mitigates areas (vegetation leave areas), and to monitor adult female boreal woodland caribou survival rates and mortality sources through telemetry collar mortality investigations. • No additional collar deployments are anticipated to be required after February 2019.	Monitor habitat effects continuously for 3-4 years post-construction
Forest-tundra and Barren-ground Caribou	Discontinue monitoring – The Project is in operation phase; the monitoring commitment during construction phase was complied with and is no longer required.	Monitor annually during construction
Moose	Continue to acquire moose **population survey data** from MB Gov, MB Hydro, and Riding Mountain National Park to track trends (population state and vital rates) of sensitive moose populations (i.e., Tom Lamb/GHA8, Moose Meadows, Pine River/GHA14A/19A) intersected by the ROW relative to adjacent reference populations and relative to past population performance.	Monitor up to 25 years or until sufficient knowledge is acquired
	Continue to collect **moose occurrence / range occupancy data** via **Ungulate-Wolf Distribution Survey** and **Multi-species Distribution Survey** to inform the predator-prey dynamics analysis, and to monitor for project-related changes in predation risk relative to the ROW. • Final year of Ungulate-Wolf Distribution surveys in woodland caribou survey areas and Multi-species Distribution Survey is anticipated to occur in Monitoring Year 8 (2021/22).	Monitor range occupancy up to 25 years post construction or until suitable knowledge is acquired. Monitor predator-prey dynamics and vital rates up to 4 years post-construction, or until suitable knowledge is acquired
	Continue to monitor functional habitat availability (effects of ROW on moose occurrence) from various survey data sets (**Multi-species Arial Survey**, **Ungulate-Wolf Distribution Survey**, **Remote Camera Trap Study**, **Winter Ground Track Transect Survey**, **MB Gov Moose Surveys of GHAs** intersected by the project).	Monitor annually up to 3 years post-construction

Wildlife VEC	Recommendation	Project Monitoring Commitment
Moose (cont'd)	Discontinue monitoring for presence of **mineral licks** potentially affected by the ROW construction. No mineral licks were detected via systematic surveys or incidental detection during project construction or from local knowledge with respect to potential effects from the project.	Assess for conflicts pre-construction and during construction
Deer and Elk	Continue to collect white-tailed deer and elk occurrence data via various methods (**Ungulate-Wolf Distribution Surveys** in woodland caribou ranges, the **Multi-species Distribution Survey** of the Bipole III ROW, opportunistic surveys in *P. tenuis* surveillance blocks, **Winter Ground Track Transect Survey**, and **Remote Trail Camera Study**) to monitor for potential ingress of white-tailed deer into woodland caribou ranges and potential mortality-risk to elk from hunter harvest as a consequence of project-related access.	Monitor distribution during construction and for 4 years post-construction
	***P. tenuis* monitoring** to assess potential of change prevalence of spiney-tailed larvae shed by deer proximate to the ROW (N2 and N3 construction segments). • Repeat the community ground-based deer pellet collection in Monitoring Year 8 (2021/22) in both *P. tenuis* surveillance areas.	Assess during construction and repeat 2-5 years post-construction
Wolf and Black Bear	Continue to collect wolf winter occurrence data via the annual **Ungulate-Wolf Distribution Survey** to monitor for landscape scale changes in predation-risk to woodland caribou and moose. • Final survey is anticipated to occur in Monitoring Year 8 (2021/22).	Monitor predator-prey dynamics during construction and up to 4 years post-construction
	Continue use of the Remote Camera Trap Study and Winter Ground Track Transect Survey to monitor for local scale changes in use of the ROW by wolf and black bear. • Final sampling effort is anticipated to occur in Monitoring Year 8 (2021/22).	Monitor predator-prey dynamics during construction and up to 4 years post-construction
Furbearers	Continue **Winter Ground Track Transect** survey on camera transects only (n = 40 transects in N1-N4 construction segments). • Final sampling effort is anticipated to occur in Monitoring Year 8 (2021/22).	Monitor barrier effects of the ROW up to 3 years post-construction
	Continue sampling via **Remote Camera Trap Study** to collect occurrence data at local scale annually. • Remove cameras situated at 1.5 km from ROW in Monitoring Year 8 (2021/22); retain cameras situated near the ROW to continue monitoring human access along the ROW.	Monitor barrier effects of the ROW up to 3 years post-construction
	Continue collecting **Wolf and Wolverine** occurrence data for wide ranging/rare fur-bearers concurrent with the Woodland Caribou Recruitment Survey, Winter Ground Track Survey, Remote Trail Camera Study, and Multi-Species Aerial Survey, to inform evaluation of Project effects at local and landscape scales.	Monitor predator-prey dynamics during construction and up to 4 years post-construction
	Discontinue - Wolverine, Black Bear, Wolf ESS detection – Discontinue passive monitoring to detect dens and rendezvous sites; project is in operation phase.	Mitigate any ESS detected during Construction
	Continue to obtain **Fur Harvest Statistics** from MB Gov annually to monitor for changes in furbearer harvest amounts and harvest rates in traplines interacting with the ROW.	Monitor changes in in trapping mortality up to 3 years post-construction
Human Access	Continue human access monitoring using the Remote Trail Cameras along the ROW and at major project access points to monitor seasonal use of the ROW by local resource users. • Remove all cameras in Monitoring Year 8 (2021/22).	Monitor during construction and up to 5 years post-construction

7.0 Closing

This report has been prepared for the exclusive use of Manitoba Hydro. The information provided herein should not be used for any other purpose, or by any other parties, without review and advice from a qualified professional biologist and/or permission of the proponent. The findings of this report were prepared in accordance with generally accepted professional scientific principles and practice. No other warranty, expressed or implied, is given. The findings of this report are based on data acquired from specific survey designs specifically applied in the Bipole III Transmission Project Mammals Monitoring Program, information provided by the proponent, information provided by the Government of Manitoba, and from publically available information sources.

Sincerely,
Wood Environment & Infrastructure Solutions
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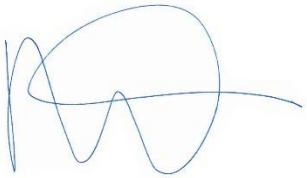
Prepared by:



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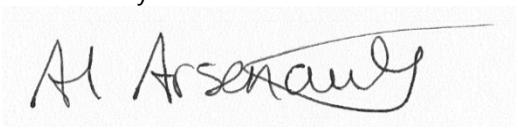

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