



Keeyask Infrastructure Project

Terrestrial and Aquatic Monitoring Plan

Mammals Monitoring

Annual Report 2012-2013



KEYYASK INFRASTRUCTURE PROJECT

TERRESTRIAL AND AQUATIC MONITORING PLAN

Mammals Monitoring: Annual Report 2012 - 2013

Report for

MANITOBA CONSERVATION AND WATER STEWARDSHIP

Prepared on Behalf of the
Keeyask Hydropower Limited Partnership

By

Wildlife Resource Consulting Services MB Inc.

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EXECUTIVE SUMMARY

The Keeyask Hydropower Limited Partnership is constructing the Keeyask Infrastructure Project (the Project or KIP). The Project is located approximately 40 km southwest of Gillam, extending between Provincial Road (PR) 280 and Gull Rapids on the Nelson River. The Project includes a start-up camp and associated infrastructure, a 25 km all-weather access road and the first phase of a main camp.

As part of the KIP licensing conditions (Environment Act Licence No. 2952R), the Keeyask Hydropower Limited Partnership is conducting terrestrial effects monitoring during the KIP construction. Mammals monitoring for the KIP is required during construction activities and, in particular, for summer resident caribou present in the area. This annual report covers the period beginning at the start of construction, January 2012, through to March 31, 2013. In 2012, spring, summer and fall sign surveys for caribou, moose and other mammals were conducted. Black bear den surveys were also carried out in 2011 prior to Project clearing activities and are also included in this report.

The caribou monitoring component includes both the Local and Regional Study Areas. Caribou calving complexes and islands within these areas were selected using existing habitat data, and were first field sampled in 2011. Selected sites were resampled in 2012 and four complexes were added to the sampling program. Samples were distributed in Project Effects, Control and Road Control areas throughout 50 peatland complexes containing 342 habitat islands. Once selected, sign tracking transects with thread lines of varying lengths were used to detect caribou and moose occurrences in three seasonal sites visits. A total of 48 trail cameras were deployed on heavy use game trails and/or located near the edges of potential caribou calving islands for a five-month period. Trail camera results were used to corroborate the results from the tracking studies. Other types of monitoring transects consisting of 11 paired 5-km transects that were established adjacent to the future KIP road. These lines were used further to investigate the relationship between moose, black bear, gray wolf and caribou. All transects were sampled in April, July and September 2012.

Mammals Monitoring

In total, sign from 15 species were recorded during surveys completed in the spring, summer and fall of 2012. Mammal species signs included American marten, beaver, black bear, caribou, ermine, fisher, gray wolf, lynx, mink, moose, red fox, red squirrel, river otter, snowshoe hare, and wolverine. Moose and caribou sign were observed with the most frequency as the surveys were specifically designed to detect large mammal activity. With the exception of black bear and gray wolf, occurrences of other species are considered largely incidental.

Mammal sign surveys indicated that caribou use of complexes and islands was substantially less in 2012 compared to 2011 levels. Based on sampled levels of caribou sign on complexes and habitat islands in 2012, adult caribou activity levels were much lower than for calves. It could not be determined at this time whether this decline was due exclusively to Project effects because reduced caribou activity levels were also observed on Control and Road Control transects. Stochastic events such as regional trends or seasonal use patterns require further consideration and analysis in the Regional Study Area. Overall, while caribou activity is reduced compared to 2011 levels, caribou calving and rearing in peatland complexes and habitat islands in the Local and Regional Study Areas is still occurring.

Based on 2012 sampling activities, incidences of caribou calving do not appear to be limited through the proximity of complexes and islands to anthropogenic linear features in the Regional Study Area. A preliminary comparison of distance classes based on the proximity of sampled complexes and islands to the KIP road indicated no substantial variation in the number of complexes and islands with caribou sign based on their distance from the road. Complexes and islands in close proximity to the KIP road have roughly equivalent levels of adult and calf caribou compared to similar habitats sampled at further distances. This suggests that avoidance of the KIP road may not be occurring. Similarly, the sampling of complexes and islands within proximity to Provincial Road 280, also did not demonstrate substantially lower levels of caribou activity based on the proximity of sampled complexes and islands to this linear feature. Both these results appear to contradict the 2011 preliminary findings, and the general consensus in the literature describing the tendency of caribou to avoid linear features.

Reduced levels of caribou activity in indicated during 2012 sampling of complexes may be the result of a number of factors, including stochastic events which are indicative of temporal and

Mammals Monitoring

spatial factors which contribute to variation in caribou habitat use patterns in the Regional Study Area. However, factors such as the change in the timing of sampling events could have influenced the results. Other influencing factors contributing to lower levels of caribou activity could be higher occurrences of black bear and gray wolf compared to 2011. Further analysis and monitoring will be required to improve the assessment of caribou habitat use dynamics in the Local and Regional Study Areas.

Black bear den surveys were completed in October and November 2012 along the KIP road, borrow areas, the start-up camp and the main camp site. No dens were detected. No gray wolf dens were detected in May 2012.

ACKNOWLEDGEMENTS

Chief(s) and Council(s) of the Tataskweyak Cree First Nation (TCN), Fox Lake Cree Nation (FLCN), War Lake First Nation (WLFN) and York Factory First Nation (YFFN) are gratefully acknowledged for their support of this program. We would also like to thank Victor Spence and Clayton Flett of TCN for arranging logistic support.

We would like to thank Manitoba Hydro, in particular Sherrie Mason, for providing her guidance and for the opportunity and resources to conduct this study.

Also thanked are North/South Consultants Inc., who are gratefully acknowledged for providing guidance, logistical support, and other resources that made this study feasible. Special thanks are also extended to ECOSTEM Ltd., including Dr. James Ehnes, who are gratefully acknowledged for providing technical and other support throughout the study.

STUDY TEAM

The study team consisted of personnel from Wildlife Resource Consulting Services MB Inc., as well as field assistants from the KCNs. WRCS personnel who have worked on this field project include Joseph Guay, Scott Patrick, Scott MacKenzie, Morgan Scharf, Peter Hettinga, Nic LaPorte and Timothy Kroeker.

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TABLE OF CONTENTS

	Page
1.0 INTRODUCTION	1
2.0 METHODS	3
2.1 CARIBOU MONITORING	5
2.1.1 Mammal Sign Surveys	5
2.1.2 Trail Camera Monitoring	7
2.2 MOOSE AND OTHER TERRESTRIAL MAMMALS MONITORING	13
2.3 TERRESTRIAL MAMMAL DEN MONITORING	15
3.0 RESULTS	21
3.1 CARIBOU MONITORING	21
3.1.1 Mammal Sign Surveys	21
3.1.2 Trail Camera Monitoring	24
3.2 MOOSE AND OTHER TERRESTRIAL MAMMALS MONITORING	27
3.3 TERRESTRIAL MAMMAL DEN SURVEYS	28
4.0 DISCUSSION	29
5.0 CONCLUSION	33
6.0 RECOMMENDATIONS	35
7.0 REFERENCES	36

LIST OF TABLES

	Page
Table 1: Total sign observations per species, and sign composition on caribou calving island transects in 2011 and 2012.	39
Table 2: Distribution of tracking transects and number of caribou sign observations across three monitoring types in 2011 and 2012.	40
Table 3: Number of adult and juvenile sign on virtual complexes and virtual islands for caribou calving island monitoring 2011 and 2012.....	41
Table 4: Total numbers of caribou, moose, black bear and gray wolf sign on caribou calving island transects in 2011 and 2012.	42
Table 5: Distribution of moose sign observations across three monitoring areas in complexes and calving islands, 2011 and 2012.	43
Table 6: Number of peatland complexes and habitat islands where caribou adult and calf sign were observed based on distance classes associated with the distance of Project Effects Area and Control Area transects from the future KIP Road.	44
Table 7: Number of peatland complexes and habitat islands where caribou adult and calf sign were observed based on distance classes associated with the distance of Road Control transects from Provincial Road 280.....	45
Table 8: Species list of mammals identified and number of trail camera detections in 2012.	46
Table 9: Total number of sign observations per species, and sign composition for KIP mammal monitoring in 2011 and 2012.....	47
Table 10: Moose and caribou sign composition recorded on KIP mammal monitoring transects in 2011 and 2012.....	48
Table 11: Distribution of tracking transects and number of sign observations across mammal monitoring transects in 2011 and 2012.	49
Table 12: Total numbers of moose, caribou, black bear and gray wolf sign on mammal monitoring transects in 2011 and 2012.....	49

LIST OF MAPS

	Page
Map 2-1	Keeyask Infrastructure Project Regional Study Area, Local Study Area and Project Footprint.4
Map 2-2	Caribou calving islands identified in the Keeyask Infrastructure Project Regional Study Area in 2012.9
Map 2-3	Locations of Control and Project Effects Area transects on potential caribou calving complexes.....10
Map 2-4	Locations of Road Control transects on potential caribou calving complexes.....11
Map 2-5	Locations of trail camera traps installed on or adjacent to potential caribou calving islands.12
Map 2-6	Mammal tracking lines installed adjacent to the KIP Road to monitor mammal activities in 2012.14
Map 2-7	Location of den surveys completed in October and November 2011 in the KIP Local Study Area.17
Map 2-8	Location of the gray wolf den search in the borrow area west of Provincial Road 280, May 2012.18
Map 2-9	Location of the black bear den search in the main camp area, November 2012. ..19
Map 2-10	Location of the black bear den search in Site KM11, November 2012.20

LIST OF PHOTOS

	Page
Photo 3-1	Bull caribou photographed on trail camera EA018b, August 19, 2012.25
Photo 3-2	Bull caribou photographed on trail camera EA018a, June 24, 2012.....25
Photo 3-3	Bull moose photographed on trail camera EA017, June 1, 2012.....26
Photo 3-4	Moose cow and calf photographed on trail camera EA009, August 10, 2012.....26
Photo 3-5	Black bear photographed on trail camera EA020b, September 7, 2012.27

APPENDICES

APPENDIX A - TRANSECT ESTABLISHMENT AND RESAMPLE DATES
2012 FOR PROJECT EFFECTS AREA (EA), CONTROL AREA (CA)
AND ROAD CONTROL AREA (RC) LINES BY TRANSECT50

APPENDIX B - TRAIL CAMERA LOCATION, SET-UP AND REMOVAL
DATES IN 2012 BY CAMERA.....63

APPENDIX C - KIP ROAD TRANSECT ESTABLISHMENT AND
RESAMPLE DATES 2012 BY TRANSECT66

1.0 INTRODUCTION

The Keeyask Hydropower Limited Partnership is constructing the Keeyask Infrastructure Project (the Project or KIP). The Project is located approximately 40 km southwest of Gillam, extending between Provincial Road (PR) 280 and Gull Rapids on the Nelson River (Map 2-1). The Project includes a start-up camp and associated infrastructure, a 25 km all-weather access road and the first phase of a main camp.

The mammals monitoring addresses caribou and other large mammals and is described in detail in the *Keeyask Infrastructure Project Terrestrial and Aquatic Monitoring Plan* (TAMP). Monitoring is undertaken, in order to ascertain whether Project activities could affect caribou and other large mammals, as predicted in the KIP Environmental Assessment (EA) Report. This annual report covers the period beginning at the start of construction, January 2012, through to March 31, 2013 and bear den surveys in 2011. Wildlife observations are reported in the *Keeyask Infrastructure Project Environmental Protection Plan Annual Report 2012 -2013*.

Construction of KIP began in January 2012 and was ongoing at the end of the reporting period, March 31, 2013. Construction activities within this period included: clearing trees, stripping, grubbing, stockpiling materials, burning slash, setting up the Start-up camp, blasting, road construction, installation of culverts, installation of the Looking Back Creek bridge and construction of a security gate.

Caribou (*Rangifer tarandus*) is an important species in the region, having cultural, ecological and economic value. As such, direct and indirect Project effects, including the road and other infrastructure components, must be considered. While some studies propose that single linear corridors have a negligible effect on caribou movement (Curatolo and Murphy 1986), potential consequences of road construction include, but are not limited to, physical habitat loss, loss of effective habitat due to noise and other disturbances and partial disruption of caribou movements due to barriers created by the road. Potential caribou mortality due to increased predation resulting from the development of linear corridors, increased harvest opportunity due to new access (James and Stuart-Smith 2000) and vehicle-wildlife collisions is also a concern. These

Mammals Monitoring

effects will be monitored in the caribou monitoring program. The program was primarily designed for caribou effects monitoring, and in particular, for the summer resident caribou population; however, other large mammal species and habitats were monitored opportunistically.

As described in the TAMP, mammals monitoring studies were developed to determine and document whether unexpected effects from the construction of the Project are occurring on large mammals and if so, make recommendations to mitigate these unanticipated effects. These mammal monitoring programs were also developed using an adaptive approach to support recommendations for changes to mitigation and protection measures where unexpected difficulties arise. The caribou monitoring program focuses primarily on Project effects at the local level. Moose (*Alces alces*) and other terrestrial mammal monitoring was designed to consider other regionally significant mammal species, such as moose and caribou, in the sampling program. It is expected that depending on the species, the potential degree of effects will range from small to large (e.g., from fire), while the spatial extent of effects would likely be limited to the Local Study Area, unless there is a large fire.

In studying the potential for summer resident caribou to be affected by clearing and construction activities, it was necessary to examine habitat areas potentially important to caribou and monitor caribou use of these areas over time. Of importance in demonstrating the use of habitat areas by caribou includes the measurement of caribou activity in sampled areas as well as monitoring instances of caribou calving and calf-rearing. Caribou calving and calf-rearing is thought to only occur in acceptable habitat areas which have minimal levels of anthropogenic disturbance and reduced mammalian predator species presence. In the Keeyask Regional Study Area, peatland complexes are habitat areas potentially used as calving and calf-rearing sites. Peatland complexes are areas which can be generally defined as muskegs or wetland areas interspersed with raised islands of mature black spruce forest. The presence of these 'habitat islands' provide a means for caribou to become spatially isolated during calving and calf-rearing season which allows for the avoidance of predator species, which often play a determining factor in calf survival rates and population growth over the longer term.

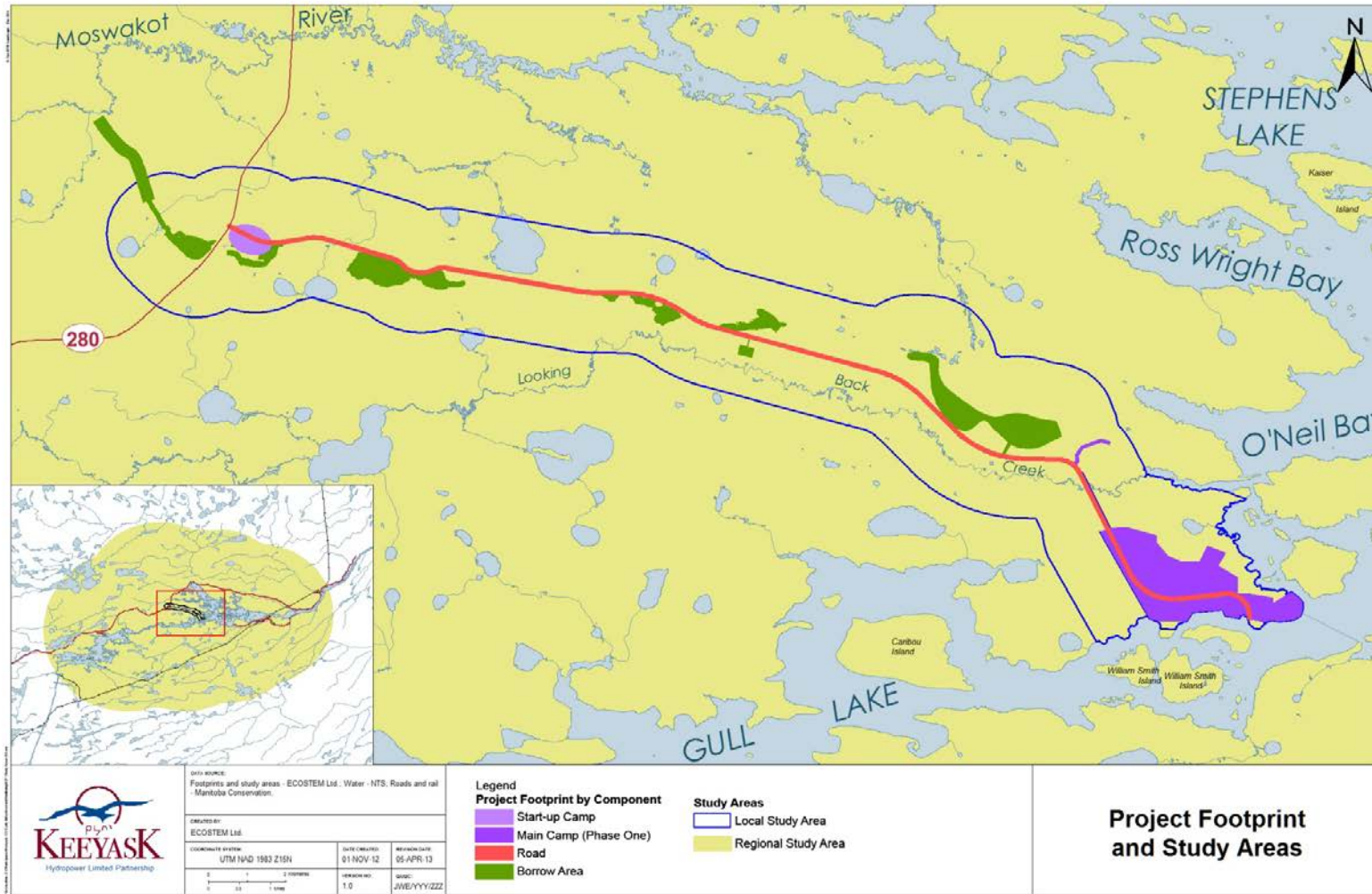
Mammals Monitoring

In order to ensure denning mammals will not be affected by clearing activities, pre-clearing searches for black bear (*Ursus americanus*) and gray wolf (*Canis lupus*) dens were carried out prior to the start of construction activities.

2.0 METHODS

A number of monitoring programs were developed to monitor caribou, moose and other terrestrial mammals prior to and during construction activities of the Keeyask Infrastructure Project. Monitoring activities were completed in the Regional and Local Study Areas (Map 2-1). Monitoring programs include summer resident caribou (hereinafter known as caribou) calving island monitoring, which included both mammal sign surveys and trail camera traps. In conducting caribou calving island monitoring, other mammal species including moose, black bear and gray wolf occurrences were also noted as potentially affecting caribou use of habitat islands. Den surveys were also completed prior to the start of Project clearing and construction activities.

Mammals Monitoring



Map 2-1 Keyask Infrastructure Project Regional Study Area, Local Study Area and Project Footprint.

2.1 CARIBOU MONITORING

Caribou calving and calf rearing islands were selected through a desktop exercise using habitat data from the KIP Environmental Assessment, orthophotos, maps and other data obtained from caribou island studies conducted between 2001 - 2010 (Map 2-2). In the Keeyask Region, caribou calving and rearing habitats consist of relatively undisturbed islands in lakes or raised black spruce surrounded by expansive wetlands or treeless areas (peatland complexes). Through the sampling of peatland complexes and potential caribou calving and calf-rearing islands, the objectives of caribou calving island monitoring included:

- determining whether there is caribou calving activity on islands in bogs and/or lakes near the road, start-up camp, main camp and borrow areas;
- determining whether there are Project effects on caribou and/or caribou behaviour by quantifying distribution, relative abundance, and assessing the loss of effective habitat on caribou calving and calf-rearing complexes and islands resulting from construction of the KIP;
- providing baseline data and information for future use on this and other projects; and,
- identifying unexpected impacts and effects of the Project.

To evaluate Project related effects and other effects on caribou during Project construction and operation, different transect types including Project Effects Areas, Control areas and Road Control areas were considered (Map 2-2). The sampling of these transect types took place through use of mammal sign surveys where trail camera monitoring was also done to examine identified Project Effects Areas transects.

2.1.1 Mammal Sign Surveys

A total of 252 transects, ranging from 100 metres to 26 km in length, were installed on a total of 50 complexes and 342 islands. Changes to the sample design included the addition of four complexes and 12 islands, and as recommended by Manitoba Conservation and Water Stewardship, an earlier installation date for hip-chain thread on caribou calving islands,

Mammals Monitoring

conducted in April 2012 (to avoid the caribou calving period). Cameras were installed along a selected portion of these lines (see Section 2.1.2). General methods for sign and thread monitoring activities follow Schemnitz (1980) and Elzinga et al. (2001). Each transect, regardless of length, was made up of 50 metre segments and oriented along an island so as to best detect caribou movements. During the initial placement of hip-chain thread, all animal sign visible up to 1 m on either side of the thread was recorded, including tracks, trails, droppings, shelters, browse or feeding sites, and visual observations. The specific locations of all sign, including signs of caribou activity, were recorded using GPS units.

During subsequent site visits, which occurred in July and September/October 2012, caribou distribution and activity were monitored by assessing thread breaks along each transect. The specific locations of all breaks were recorded with GPS. Sign such as tracks and droppings confirmed the species responsible for each thread break. All thread breaks were repaired so that species activity could be properly evaluated on subsequent site visits. The timing of sampling events for the placement of hip-chain thread and subsequent site visits are as indicated in Appendix A.

The number of calving and rearing islands being used by caribou in the Local and Regional Study Areas during spring, summer and fall are described with presence/absence data and by thread-break activity counts. Caribou calving and rearing activities in sampled areas were identified through the presence of caribou calf sign on sampled complexes and islands.

The evaluation of caribou (and other species) activity within the sampled Control area and Project Effects Areas was done to evaluate potential Project related effects on caribou following clearing and construction activities associated with the KIP road and other infrastructure (Map 2-3). For analysis purposes, six distance classes were considered in assessing the extent to which the potential effects of clearing and construction could affect caribou activity: 0 to 1 km, 1 to 2 km, 2 to 3 km, 3 to 4 km, 4 to 5 km and 5+ km away. In jointly considering the number of peatland complexes in the sampled Control and Project Effects Areas, 15 were located 0 metres (m) to 5 km from the KIP road and 18 were located 5 km or more from the KIP road. In considering complexes sampled 5km or more from the KIP road, four more were sampled in comparison to those sampled in 2011.

Road Control transects were established on peatland complexes and habitat islands adjacent to Highways 280 and 290 to identify levels of caribou activity in proximity to this landscape feature (Map 2-4). In this way, sampled caribou activity levels on Road Control transects will be used to corroborate the predictions of how the KIP road may affect adjacent caribou calving islands under future conditions. For analysis purposes, six distance classes were considered in assessing the extent to which Provincial Roads 280 and 290 have affected caribou activity: 0 to 1 km, 1 to 2 km, 2 to 3 km, 3 to 4 km, 4 to 5 km and 5+ km away. Of sampled Road Control area peatland complexes, 14 were located approximately 0 m to 5 km from Provincial Road 280 and 3 were located 5 km or more from Provincial Road 280.

2.1.2 Trail Camera Monitoring

A total of 48 Reconyx™ PM35C31 trail cameras were deployed on heavy use game trails and/or near the edges of potential caribou calving islands to document mammal activity in the Local and Regional Study Areas (Map 2-5). The cameras were left to monitor species activity for a five-month period (mid-April to mid-September). Islands were selected within a complex where optimal island habitat characteristics and juxtaposition requirements between camera locations appeared to be suitable for caribou calving activities. Refer to Appendix B for trail camera set-up and maintenance dates.

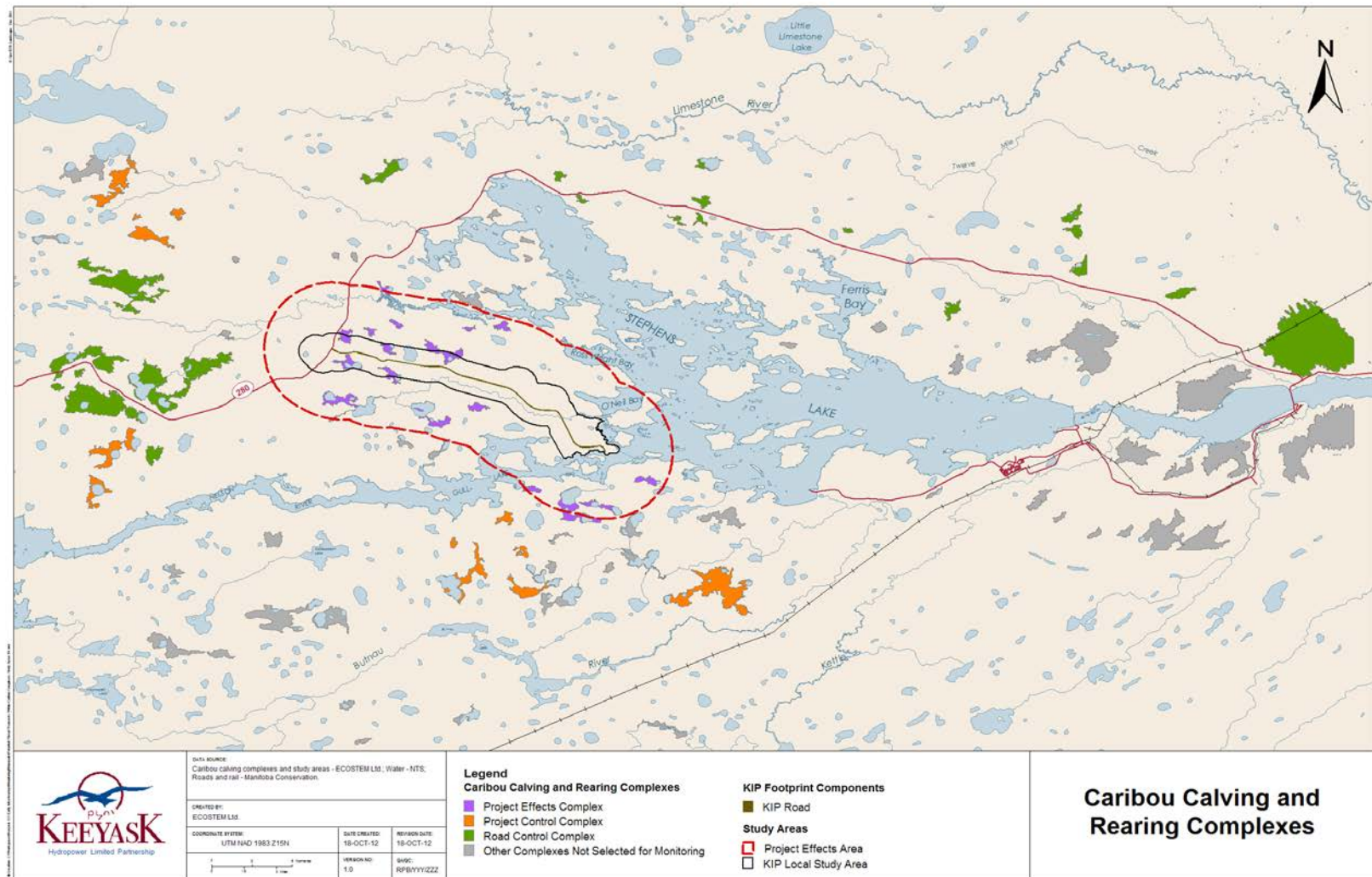
Trail cameras were used to gather additional data on the timing of caribou movements and occurrences in and around the calving complexes in the Local and Regional Study Areas. Trail cameras were installed in Project Effects Areas to corroborate activity, age and sex classifications, and to document the movements of individuals among islands and calving complexes.

Cameras were set to high sensitivity and programmed to take a series of five rapid-fire photographs once triggered, and continue taking photographs one second after the first series as long as movement was still detected. The setup for each trail camera varied slightly but efforts were made to affix each camera approximately 1.5 to 2 metres high on a large stable tree. Brush

Mammals Monitoring

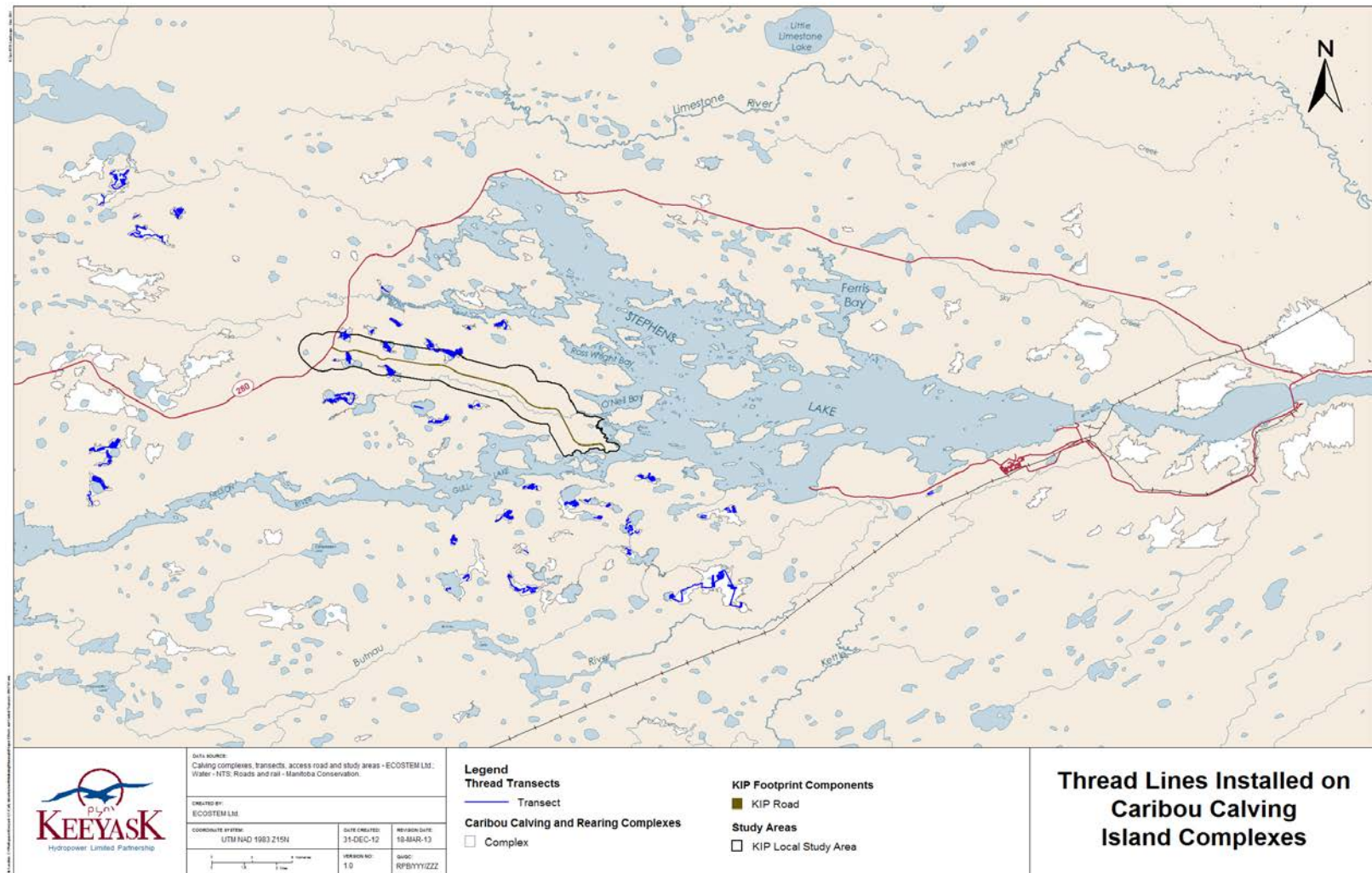
and other vegetation that was likely to trigger the camera were removed from the immediate area of the camera line-of-sight.

Mammals Monitoring



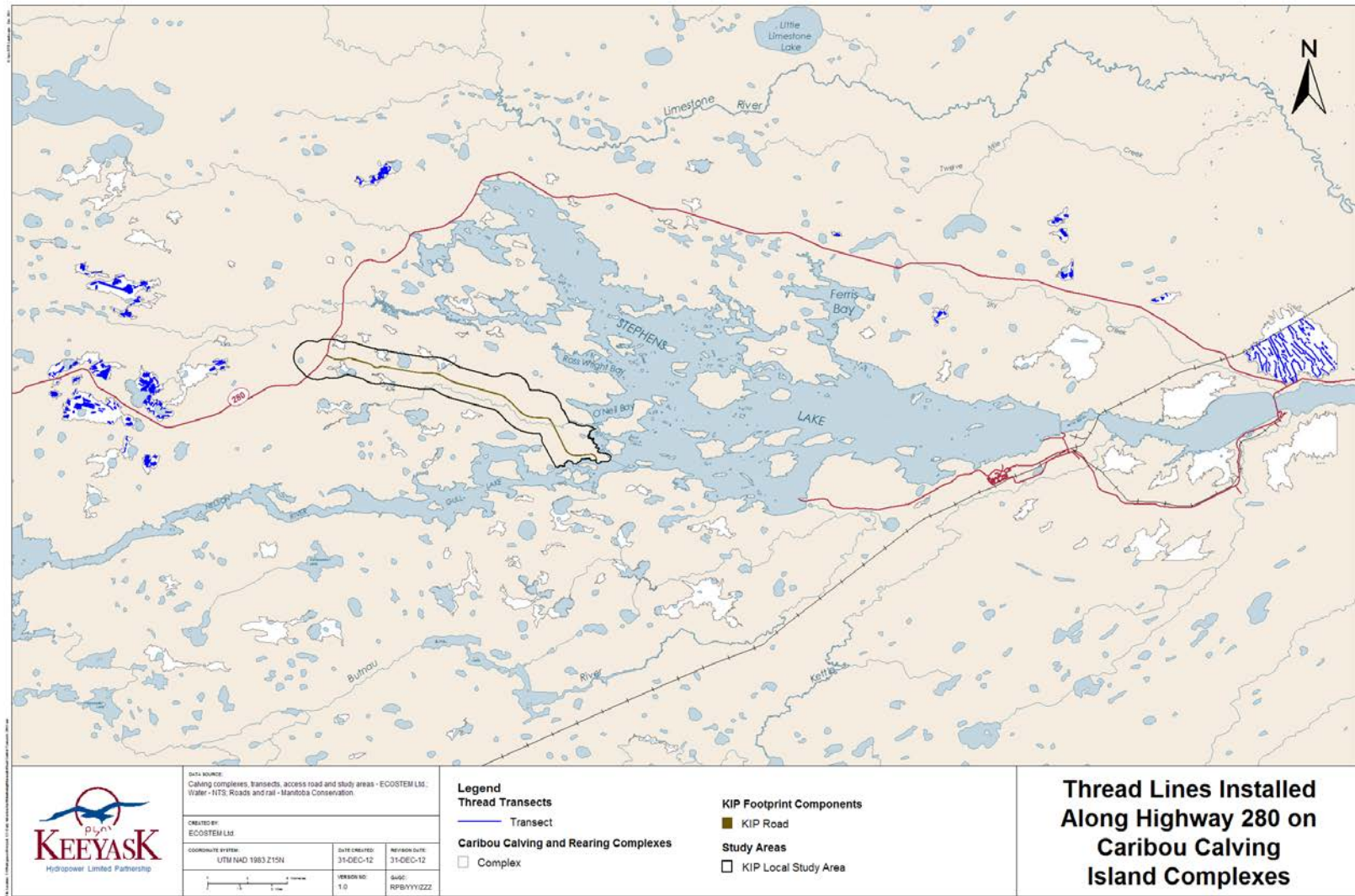
Map 2-2 Caribou calving islands identified in the Keyask Infrastructure Project Regional Study Area in 2012.

Mammals Monitoring



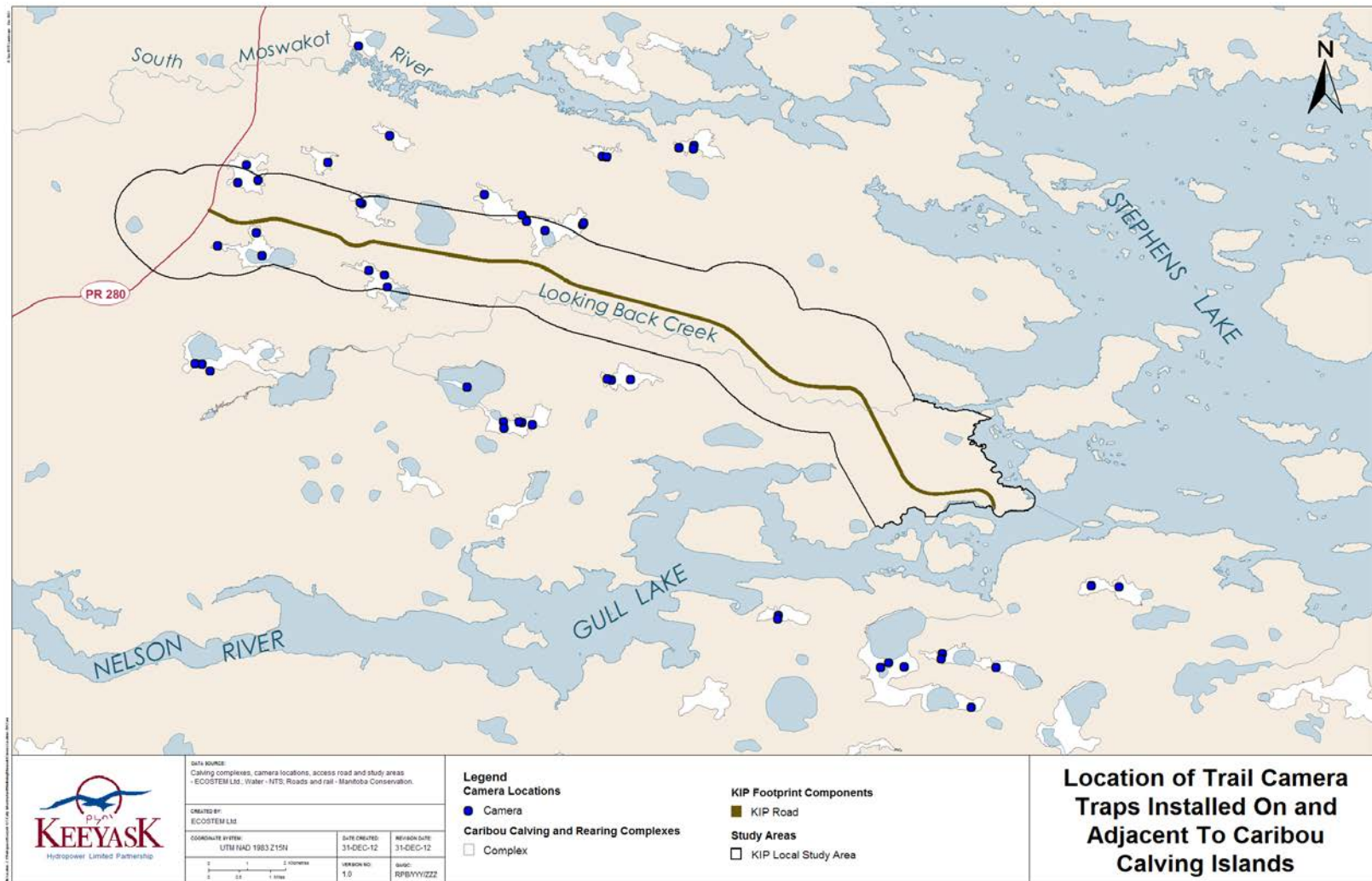
Map 2-3 Locations of Control and Project Effects Area transects on potential caribou calving complexes.

Mammals Monitoring



Map 2-4 Locations of Road Control transects on potential caribou calving complexes.

Mammals Monitoring



Map 2-5 Locations of trail camera traps installed on or adjacent to potential caribou calving islands.

2.2 MOOSE AND OTHER TERRESTRIAL MAMMALS MONITORING

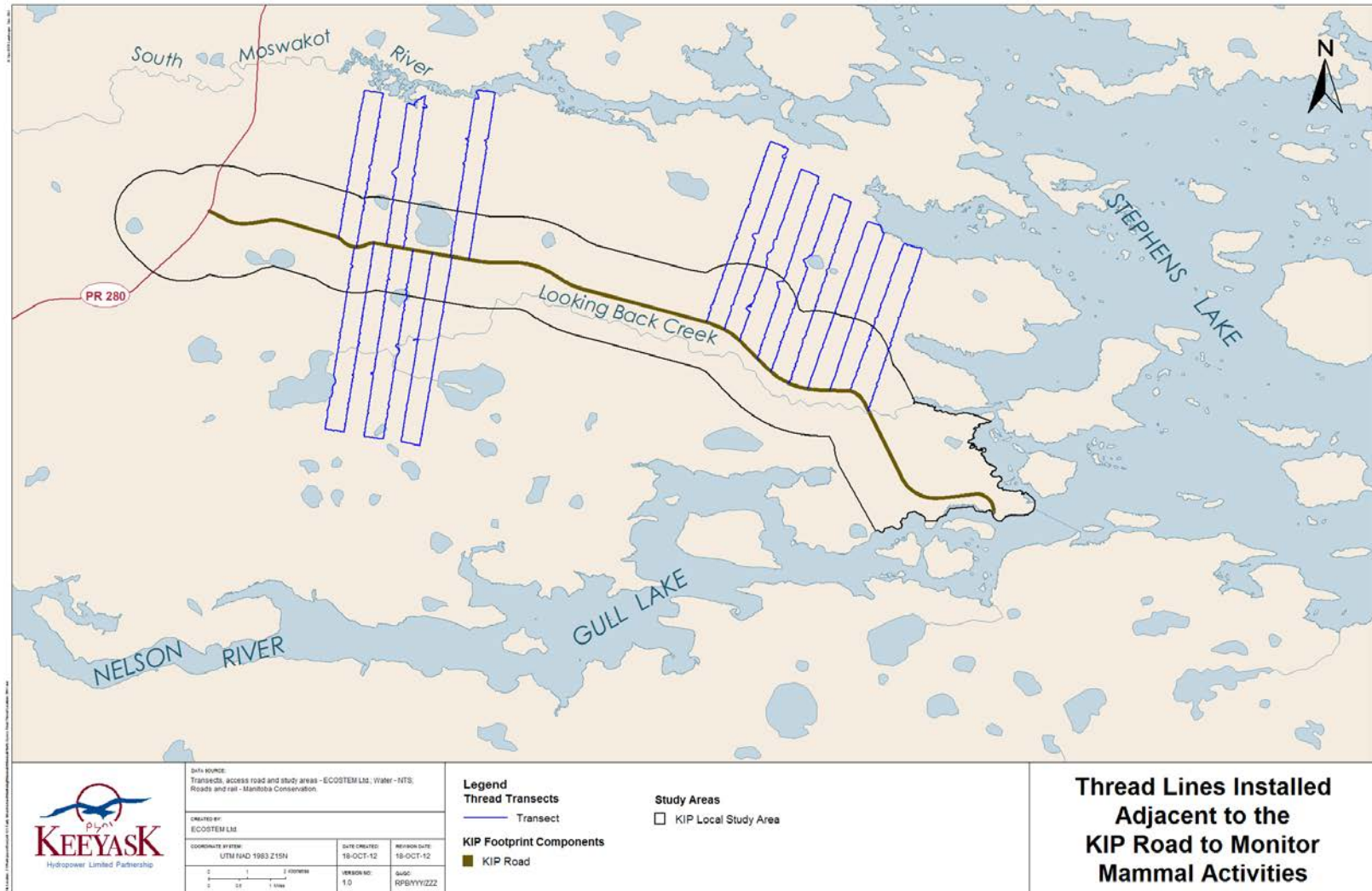
Monitoring for moose and other large mammals, including caribou, black bear and gray wolf was completed along the north and south sides of the KIP road (NNR and SNR transects respectively) in order to:

- determine whether there are Project effects on terrestrial mammal behaviours by quantifying distribution, abundance, and measuring the loss of effective habitat resulting from construction of the road and infrastructure areas during the construction phase;
- collect data that could attribute differences in caribou activity; and
- provide baseline data and information for future use on this and other projects.

A total of eight northern lines and three southern lines, ranging from 9 to 11 km in length for a total length of 109 km (across three visits) were installed in April 2012 using biodegradable hip-chain thread (Map 2-6). Trail cameras were not installed along these lines. General methods for sign and thread monitoring activities follow Schemnitz (1980) and Elzinga et al. (2001). A series of paired transects up to 5 km in length and oriented perpendicular to the Project Footprint were established in the vicinity of the road, set-up camp, main camp and borrow areas by stringing hip chain thread through all habitat types. All animal sign visible up to 1 m on either side of the thread was recorded during the first site visit. Sign included tracks, trails, droppings, shelters, browse or feeding sites, and visual observations. The specific locations of all sign, and in particular, moose, caribou, black bear, and gray wolf were recorded with portable GPS units.

During subsequent site visits, moose, caribou, black bear and gray wolf distribution and activity were monitored by thread breaks observed along the transects. The specific locations of all breaks were recorded with GPS units. If possible, sign such as tracks and droppings confirmed the species responsible for each thread break. All thread breaks were repaired so that subsequent movements would be detected. Transects were established in April, and were resampled on two occasions in July and September/October of 2012 (Appendix C).

Mammals Monitoring



Map 2-6 Mammal tracking lines installed adjacent to the KIP Road to monitor mammal activities in 2012.

2.3 TERRESTRIAL MAMMAL DEN MONITORING

Den surveys were conducted in both 2011 and 2012 as clearing along the KIP road and borrow areas were to occur during the black bear and wolf denning periods.

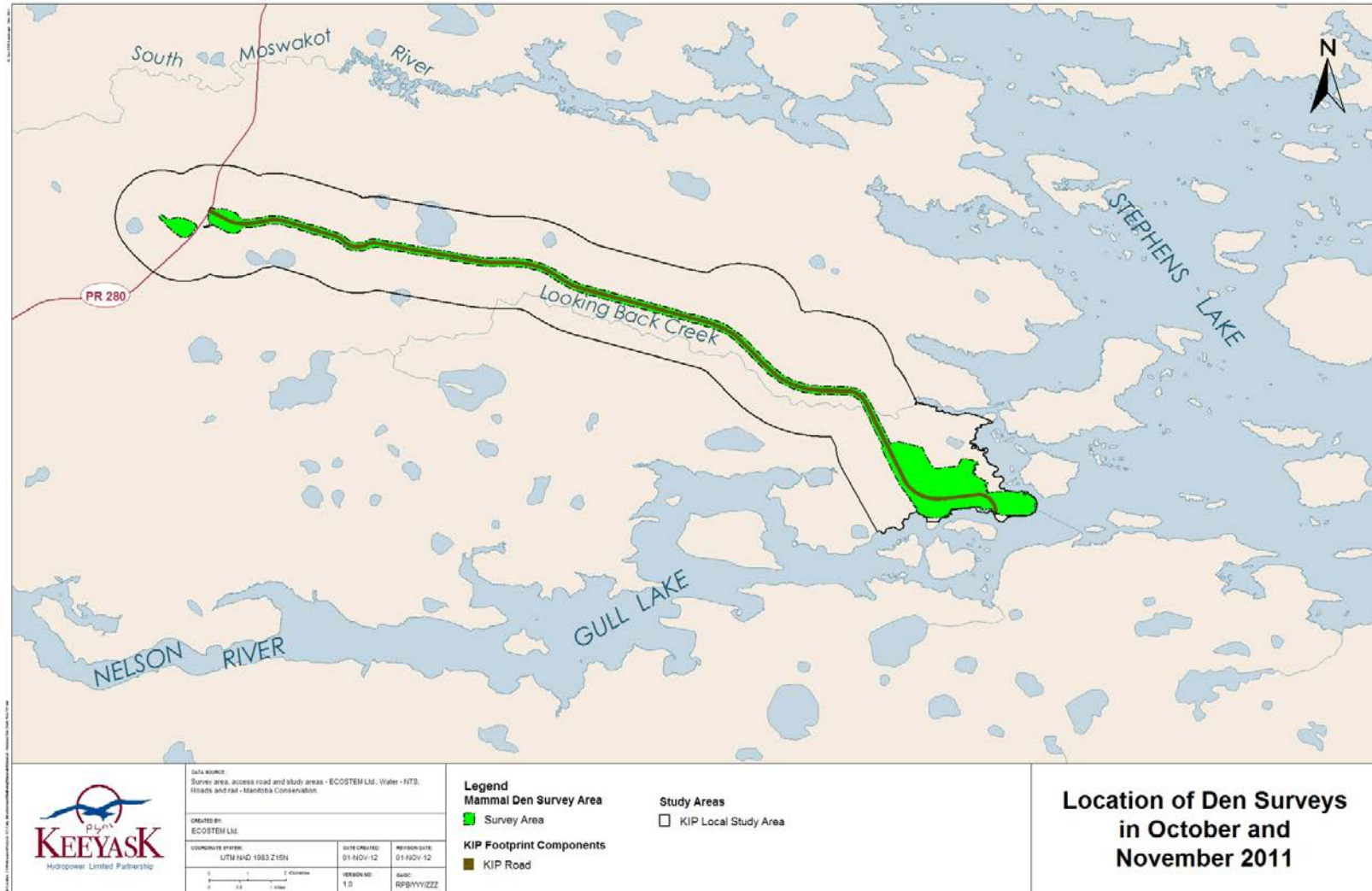
In 2011 a total of 1,390 hectares of land designated for clearing within 100 m of the Project Footprint, including the road right-of-way, camp sites and borrow areas was searched with a crew of eight personnel. Surveys occurred from October 24 to 28 and from November 7 to 12 (Map 2-7).

In 2012 a systematic ground-search method was used to survey for dens prior to clearing of the road right-of-way at the following locations: the borrow area west of Provincial Road 280; the main camp area, and the quarry KM11. The borrow area located west of Provincial Road 280 was intensively searched for wolf dens within 100 m of the Project Footprint including the road right-of-way from May 9 and 10, 2012 (Map 2-8). However, clearing in this area was delayed and did not occur until September 2012.

The bear den survey at the main camp was conducted by two biologists, one technician, and three First Nation field assistants between November 13 and 19, 2012. The total length surveyed was 131 km. Snow depth was approximately 30 cm centimetres (cm), with a range of weather conditions which would affect day to day visibility (Map 2-9). The borrow area was surveyed by two biologists and two technicians for a total of 8.4 km (Map 2-10) on November 27, 2012. Site KM11 and the borrow area location west of Provincial Road 280 were buffered by 50 m to create a total survey area of 12.5 ha and 61.5 ha, respectively. The main camp was not buffered outside of the original footprints. A search pattern was created in ArcGIS using east/west-running transects in the quarry and main camp and north/south running transects along the access road. Transects were spaced 20 metres (m) apart in site KM11 and 25 meters apart in the main camp area. These transects were superimposed over the survey area and converted to route files that were uploaded to handheld GPS units when conducting surveys. The total length of the planned transects was 116 kilometres (km) in the main camp area, and 6.5 km for site KM11.

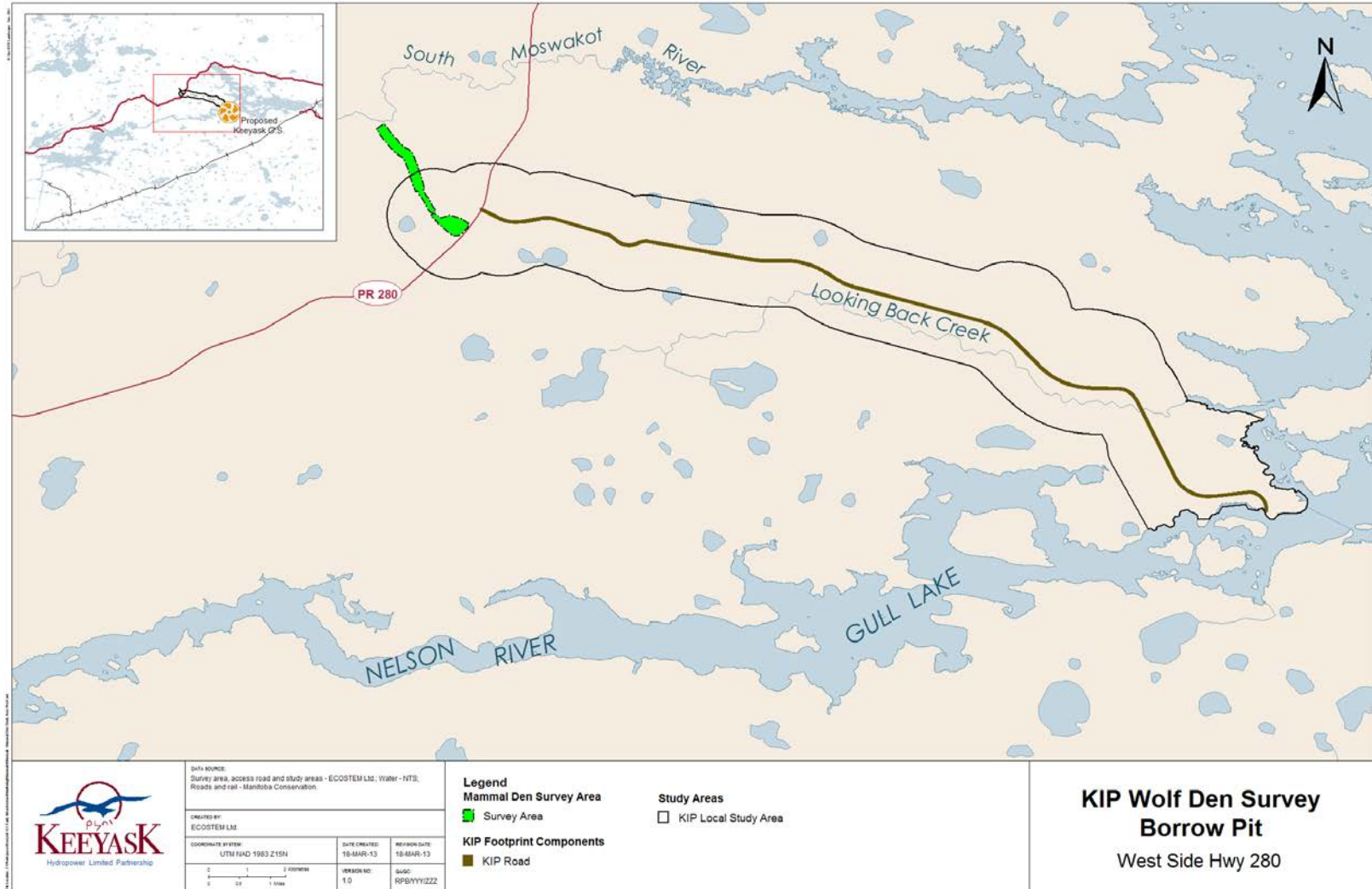
Mammals Monitoring

A systematic ground search was conducted for each survey by slowly walking and intensively searching the ground for dens. Observers walked parallel transect lines spaced 10 to 25 m apart for the main camp and site KM11; however, spacing varied slightly depending on ground conditions, vegetation density, visibility and the number of technicians available for searches. Technicians were trained to key in on structures that may appear to be dens or denning areas around hill sides, woody debris, root masses and other sites that could be easily dug out or were close to food and water sources. Dens, if found, were to be marked with flagging tape, a number of meters away from the den entrance, with their locations recorded using portable GPS units. Location and activity data were also to have been provided to Manitoba Hydro on a timely basis.



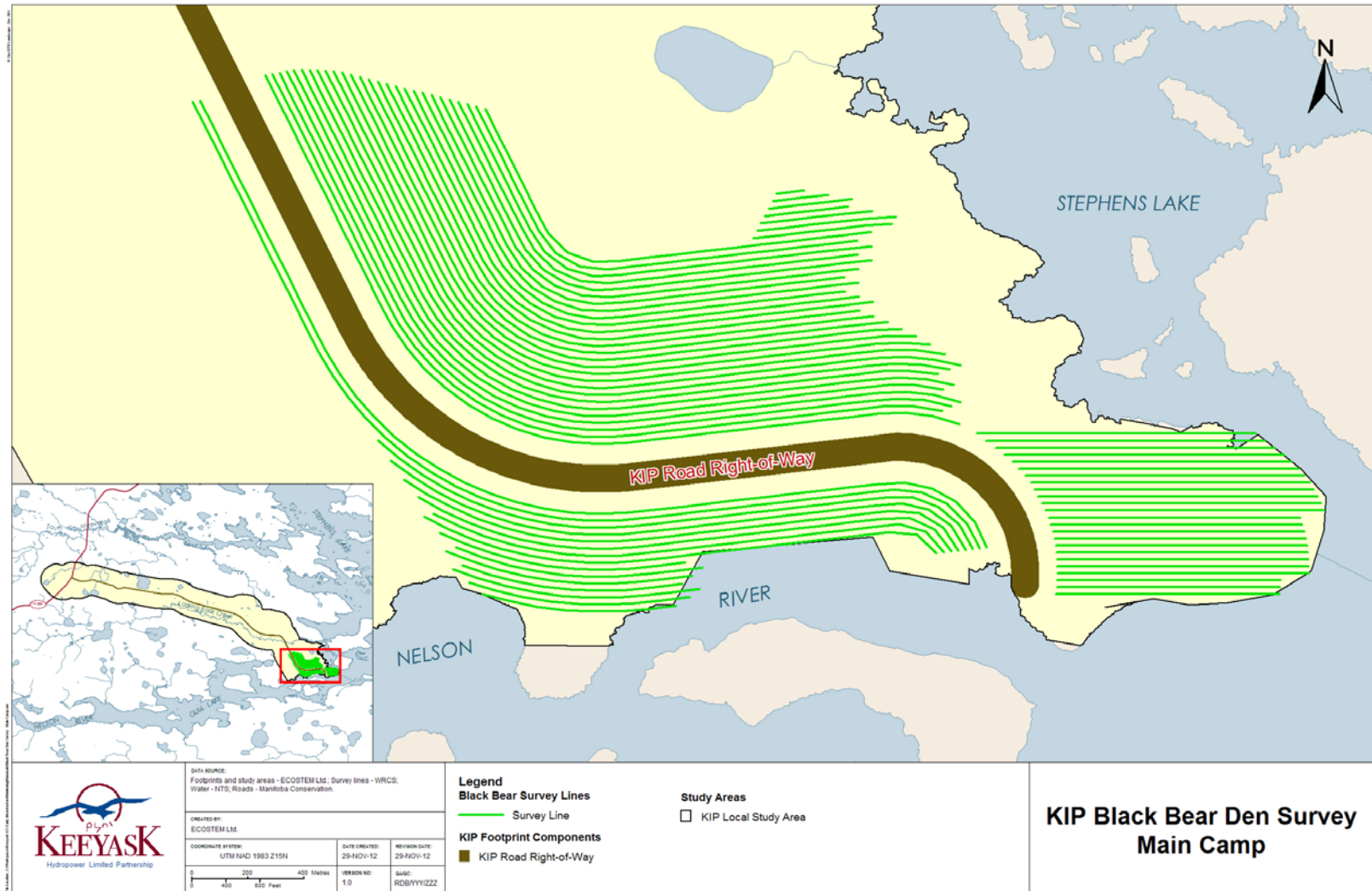
Map 2-7 Location of den surveys completed in October and November 2011 in the KIP Local Study Area.

Mammals Monitoring



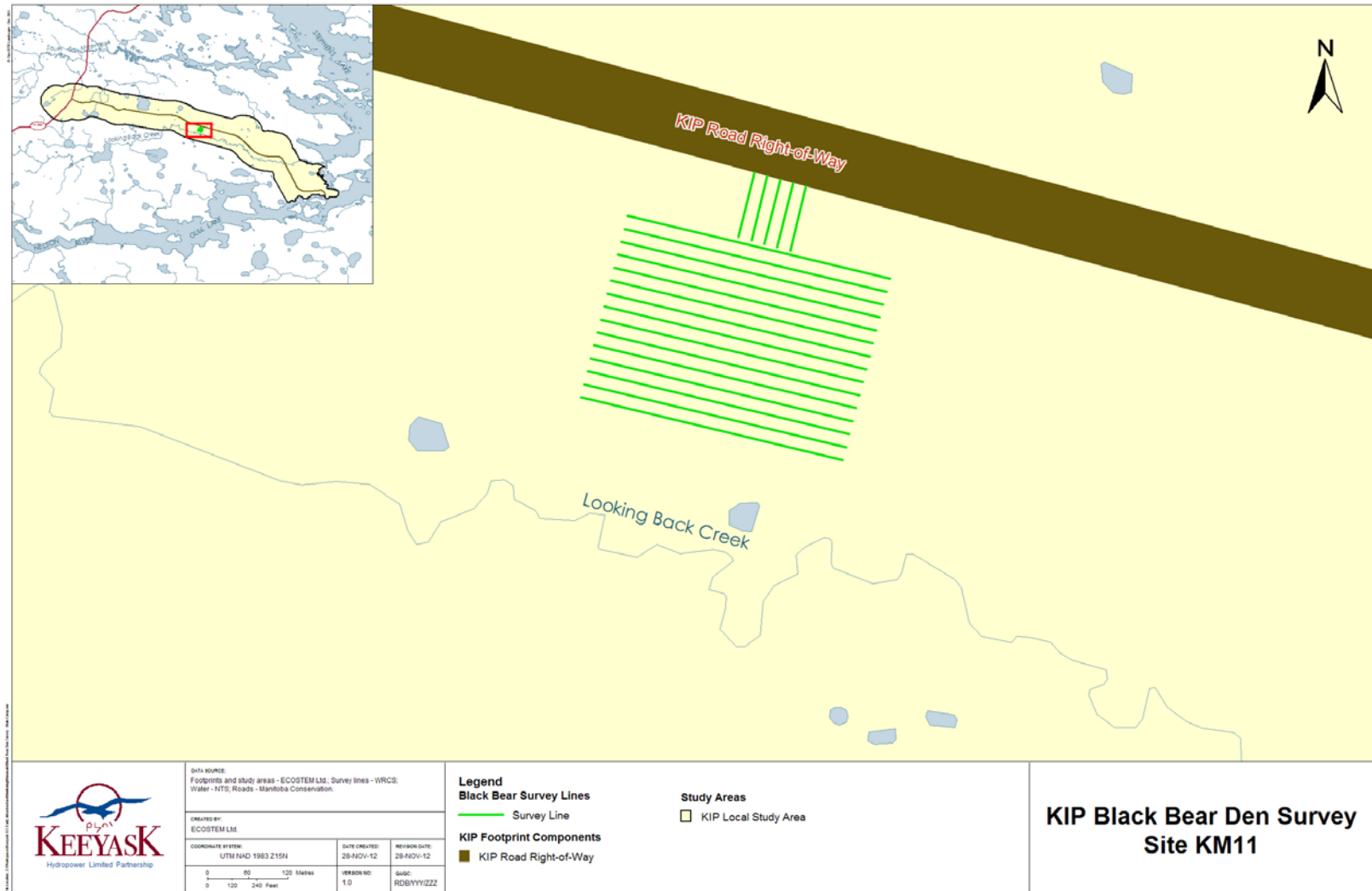
Map 2-8 Location of the gray wolf den search in the borrow area west of Provincial Road 280, May 2012.

Mammals Monitoring



Map 2-9 Location of the black bear den search in the main camp area, November 2012.

Mammals Monitoring



Map 2-10 Location of the black bear den search in Site KM11, November 2012.

3.0 RESULTS

3.1 CARIBOU MONITORING

A total of 867 caribou (*Rangifer tarandus*) sign and 1,210 moose (*Alces alces*) sign were identified during the tracking surveys completed to monitor caribou activity on sampled peatland complexes and habitat islands (Table 1). Total caribou sign in 2012 represented only 28% of the total caribou sign recorded in 2011. Similarly, moose sign was at 56% compared to 2011 total sign. Incidental sign included 70 American marten (*Martes americana*), 1 beaver (*Castor canadensis*), 125 black bear, 1 ermine (*Mustela erminea*), 2 fisher (*Martes pennanti*), 32 gray wolf, 5 mink (*Neovison vison*), 59 red fox (*Vulpes vulpes*), 6 river otter (*Lontra canadensis*), 3 snowshoe hare (*Lepus americanus*) and 10 wolverine (*Gulo gulo*) (Table 1). Moose and caribou sign were the sign types most frequently observed.

3.1.1 Mammal Sign Surveys

Control Areas

A total of 16 Control Area lines were installed in the KIP Regional Study Area in 2012. The total length of these transects, over three visits, covered 261 km, 12 complexes and 80 calving islands (Table 2). A total of 260 caribou sign were detected on Control Area transects, or 1.00 sign per kilometre, (Table 2). Caribou sign was recorded on ten complexes (83%) and on 50 (54%) of the islands (Table 2). Caribou sign observed on Control Area transects in complexes included eight complexes with adult sign (67%), and four complexes with calf sign (33%) (Table 3). Caribou sign observed on islands included 50 islands with adult sign (63%) and nine islands with calf sign (11%) (Table 3). The number of complexes and islands with either adult or caribou calf sign declined from 2011 to 2012 in Control Areas.

Other wildlife species detected on Control Area transects included moose, black bear and gray wolf (Table 4). A total of 568 moose sign were observed on Control Area complexes with 303 sign being observed on islands (Table 5). Of the incidental moose sign observed on complexes and islands, 10 (83%) and 61 (76%) of the complexes and islands contained adult sign while six (50%) and 16 (20%) of the complexes and islands contained calf sign, respectively (Table 5).

Mammals Monitoring

Although total moose sign observed declined from 2011 to 2012, the distribution of detection for calves and adults was about the same for both survey years. Eleven black bear sign and two gray wolf sign were also recorded on sampled Control Area transects (Table 4).

Project Effects Areas

A total of 25 Project Effects Area transects were sampled in the KIP Local Study Area in 2012. The total length of these transects over three visits covered 243 km, 21 complexes and 72 islands (Table 2). Monitoring on the Project Effects Area transects resulted in the detection of 176 caribou sign, or 0.65 sign per kilometre (Table 2). Caribou sign observed on Project Effects Area complexes included 13 complexes with adult sign (63%) and four complexes with calf sign (19%) (Table 3). Caribou sign observed on islands included 35 islands with adult sign (49%) and seven islands with calf sign (10%) (Table 3). The number of complexes and islands with either adult or caribou calf sign declined from 2011 to 2012 in Project Effects Areas.

A total of 496 moose sign were observed on sampled Project Effects Area complexes (Table 4), with 313 sign being observed on sampled islands (Table 5). Of the incidental moose sign observed on complexes and islands, 18 (86%) and 55 (76%) of the complexes and islands contained adult sign, and 10 (48%) and 24 (33%) of the complexes and islands contained calf sign, respectively (Table 5). Although total moose sign observed declined slightly from 2011 to 2012, the distribution of detection on peatland complexes and habitat islands was slightly higher for calves and adults. Seventeen black bear sign and nineteen wolf sign were also identified on Project Effects Area transects (Table 4), which is comparatively higher than detected in 2011.

When Control Area and Project Effects Area transects are combined and distance of sampled areas to the KIP road is considered, 72% of sampled complexes greater than five km away had signs of adult caribou and 22% had calf sign (Table 6). For complexes, < 5 km from the KIP road, the percent of sampled complexes with sign ranged from 0% (2 to 3 km) to 75% (3 to 4 km) (Table 6). For islands located greater than 5 km from the KIP road, 65% of sampled complexes had adult caribou sign and 11% had calf sign. For islands < 5 km from the KIP road, the percent of complexes with adult sign, based on distance class, ranged from 10% (distance of

Mammals Monitoring

0 to 1 km) to 67% (distance of 2 to 3 km) with the portion of calf sign ranging from 0% (0 to 1 km or 2 to 3 km) to 17% (1 to 2 km).

Road Control Areas

Two hundred and eleven Road Control transects were sampled in the KIP Regional Study Area in 2012. The total length of these transects, over three visits, covered 554 km, 17 complexes and 190 islands (Table 2). Some Road Control transects were not walked over multiple visits due to weather and timing constraints. A total of 431 caribou sign were identified resulting in 0.78 signs per kilometre (Table 2). Caribou sign observed on Road Control area complexes included ten complexes with adult sign (58%), and four complexes with calf sign (24%) (Table 3). Caribou sign observed on sampled habitat islands included 80 islands with adult sign (39%) and 24 islands with calf sign (12%) (Table 3). The number of complexes and islands with either adult or caribou calf sign declined from 2011 to 2012 in Road Control Areas.

For sampled Road Control transects, a total of 1,146 moose sign were observed on complexes and 1,026 moose sign were observed on islands (Table 5). Of the incidental moose sign observed, 16 (94%) and 142 (75%) of the complexes and islands contained adult moose sign while four (24%) and 40 (21%) of the complexes and islands contained calf sign, respectively (Table 5). The total moose sign observed declined from 2011 and 2012, including the distribution of detection on peatland complexes and habitat islands for calves and adults. Black bear and gray wolf sign were also identified with 37 and 11 observations respectively (Table 4), which is comparatively higher than detected in 2011.

The number of sampled complexes located greater than 5 km from Provincial Road 280 with adult caribou sign was three (100%) and the number with calf sign was three (100%) (Table 7). The number of sampled complexes < 5 km from Provincial Road 280 with adult caribou sign ranged from 0% (3 to 4 km and 4 to 5 km) to 83% (1 to 2 km) and with caribou calf sign ranged from 0% (3 to 4 km and 4 to 5 km) to 33% (0 to 1 km and 1 to 2 km). It should be noted that no complexes were sampled in the 2 to 3 km range due to the method used in assigning distance classes. The number of islands greater than 5 km from Provincial Road 280 with adult caribou sign was 11 (52%) and, for calf sign, was three (14%). For islands < 5 km from Provincial Road

Mammals Monitoring

280, the number of islands with adult sign ranged from 31% (4 to 5 km) to 44% (0 to 1 km and 1 to 2 km) and for calf sign ranged from 6% (1 to 2 km) to 20% (0 to 1 km and 4 to 5 km) (Table 7).

3.1.2 Trail Camera Monitoring

Four mammal species were identified at 48 cameras installed immediately adjacent to potential caribou calving islands (Table 8). Caribou were identified at four of the 48 cameras (Table 8). Of the caribou observed, 149 photos of males and nine females were identified on multiple dates and at multiple cameras (Table 8). Additionally, of the caribou identified, three male caribou were observed on multiple dates at a single location at or at a second camera site. Of 48 cameras monitored, the number of caribou detections per camera declined from 9 to 4 cameras from 2011 to 2012.

Moose were observed at 16 of 48 cameras (Table 8). Of the moose observed, 160 photos of males and 387 females were identified on multiple dates and at multiple cameras (Table 8). Of photographed moose, two individuals were identified on multiple dates at a single location or at a second camera site. Trail camera locations also recorded the presence of black bear at eight cameras placed throughout the study area (Table 8). Of 48 cameras monitored, the number of moose detections per camera was approximately equal (i.e., 17 to 16 cameras) from 2011 to 2012 respectively.

Mammals Monitoring



Photo 3-1 Bull caribou photographed on trail camera EA018b, August 19, 2012.



Photo 3-2 Bull caribou photographed on trail camera EA018a, June 24, 2012.

Mammals Monitoring



Photo 3-3 Bull moose photographed on trail camera EA017, June 1, 2012.



Photo 3-4 Moose cow and calf photographed on trail camera EA009, August 10, 2012.



Photo 3-5 Black bear photographed on trail camera EA020b, September 7, 2012.

3.2 MOOSE AND OTHER TERRESTRIAL MAMMALS MONITORING

KIP Road (North Side)

Ten mammal species were identified along eight north side future KIP road monitoring transects (Table 9). A total 656 moose sign and 54 caribou sign were observed during monitoring activities resulting in 2.48 and 0.20 sign per kilometre, respectively (Table 10). Of the moose sign identified, 38 were determined to be bulls, 151 were determined to be cows, 176 were determined to be adult and 59 were calves (Table 11). Of the caribou sign identified, four were classified as adult bulls, 11 were identified to be from adult cows, 20 were determined to be from adults of an unknown sex and four were identified as calves (Table 11). From 2011 to 2012, both moose and caribou sign declined substantially. Black bear and gray wolf were also identified during monitoring activities with 13 and 16 sign observed respectively (Table 12). Black bear detections were approximately equal between survey years while gray wolf declined.

Mammals Monitoring

KIP Road (South Side)

Nine mammal species were detected south of the KIP road (Table 9). A total of 191 moose sign and 46 caribou sign were identified, for sign frequencies of 1.72 and 0.41 sign per kilometre, respectively (Table 10). Of the moose sign identified, 22 were determined to be bulls, 45 were determined to be cows, 64 were determined to be adult and 22 were calves (Table 11). Of the caribou sign observed, five were determined to be bulls, 25 were cows, six were adults and seven were calves (Table 11). From 2011 to 2012, both moose and caribou sign declined substantially. Signs from one black bear and one gray wolf were also observed (Table 12); both species declined from 2011 to 2012.

3.3 TERRESTRIAL MAMMAL DEN SURVEYS

No dens were detected during the searches completed for black bear dens in October/November 2011, October/November 2012 or during the searches completed for wolf dens in May 2012.

4.0 DISCUSSION

As part of the Terrestrial and Aquatic Monitoring Plan, caribou and other large mammal species were monitored in the Keeyask Infrastructure Project Regional Study Area in 2011 and 2012. In 2012, tracking and trail camera studies were conducted during the active construction period. Caribou activity in peatland complexes indicates that caribou sign observations declined over all Control, Project Effects, and Road Control areas sampled from 2011 to 2012. The average percent of adult caribou using complexes declined from 98% to 62%, and from 43% to 24% for calves. Habitat island sign activity declined from 80% to 48% for adults, and 14% to 12% for calves.

Decreased caribou activity in Project Effects Area caribou calving complexes and islands coincides with the clearing and construction of Keeyask Infrastructure Project footprints, which is as expected with a loss of effective habitat. However, caribou calving complex and island use also concurrently decreased in Control and Road Control areas. For example, a decline in the use of Control Area complexes and islands located a minimum of seven and up to 20 km away from the KIP Road were also observed. Widespread declines in caribou activity suggest that factors other than direct Project-related effects are likely occurring over a broader area, and are operating at the scale of the Regional Study Area.

Of all locations surveyed, the Control Area transects had the highest proportion of adult caribou sign and calf sign detected on complexes and islands; with exception to the number of islands where calves were recorded being slightly higher for sampled Road Control transects. When considering the combined sampling of the Control Area and Project Effects Area transects, there does not seem to be a clear relationship between sampled distance classes and the presence of caribou, as recorded instances of caribou calf signs occurred relatively consistently across all distance classes. In considering sampled Road Control transects, complexes and islands located within two km of Provincial Road 280 actually had higher proportions of adult caribou sign than seen on average for all distance classes and more calf sign was observed on complexes within two km and islands within one km than expected on average. Based on descriptive statistics alone, this potential relationship is the opposite of 2011 observations, and is unexpected based on

Mammals Monitoring

caribou avoidance of linear features as reported in published literature (James and Stuart-Smith 2000, Dyer *et al.* 2001; 2002).

The total number of caribou sign observed during the caribou monitoring program declined from 3,127 in 2011 to 867 in 2012 during the calving island studies. Conversely, the number of black bear and gray wolf sign increased in Project Effects Areas and Road Control Areas from 2011 to 2012. It is possible that lower numbers of caribou observations in 2012 are not entirely due to sensory disturbances from clearing and construction activities, but may be related to a higher number of predators or increased predator activity in the area. Most gray wolf sign was recorded on Project Effects Area transects. Increased instances of predator species have been linked to reduced caribou calving activities and low calf recruitment rates (Latham *et al.* 2011), but the relationship and significance of these values have yet to be determined.

Trail cameras deployed on potential calving islands and areas adjacent to islands generally corroborated a decrease in the distribution frequency of caribou, where detections by location declined from 9 camera sites in 2011 to 4 camera sites in 2012. The total number of cow and bull observations however, increased on a per camera basis and may suggest increased site use at fewer locations. Finally, more photos of black bear were recorded on the trail cameras in 2012, potentially indicating increased black bear activity in the area. No wolves were detected by the cameras. Decreased caribou sign in the Local Study Area may be supported by distributional shifts in predator activity or by increased predator activity such as by black bears in the Local Study Area as measured from trail cameras.

The decline in caribou and moose sign on sampled transects may be due in part to variation in the timing of sampling visits occurring in 2011 and 2012. In 2011, the initial mammal sign survey occurred in May whereas in 2012, the initial survey took place in April. This may have resulted in differences in the number of sign observed as surveys in April would have been less likely to capture tracks and sign from caribou moving towards potential calving and rearing complexes and islands; as would have been more evident for surveys occurring in May, and the same month in which caribou calving is often initiated. As recommended by Manitoba

Mammals Monitoring

Conservation and Water Stewardship, the change in the survey date for the initial mammal sign survey in 2012 was done to avoid the disruption of caribou calving activities.

It should be noted that other potential calving and rearing areas, aside from complexes and islands sampled as part of the proposed Keeyask Generation Project, are present in the Regional Study Area. Other sample locations in the region include islands on lakes (e.g., Stephens Lake, Gull Lake). Based on a review of island use for caribou calving and calf-rearing, seasonal variation in use is to be expected over the long-term. Between-year variation in the use of calving and calf-rearing areas adds a degree of complexity to understanding what the average level of seasonal caribou use is for these areas.

The presence of large numbers of Pen Islands or Cape Churchill caribou in winter may also play an important role for calving habitat use during subsequent summers, and in part, could explain the large summer resident caribou variability between years. For example, Manitoba Hydro (2011, 2012) reported large numbers of caribou in the Conawapa area during the winter of 2010-11 as compared to winter 2009-10. High caribou use of peatland complexes and islands use was reported in summer 2011 (Keeyask Hydropower Limited Partnership 2013). The large regional decline of caribou calving activities in summer 2012 coincides with an absence of Pen Islands caribou during winter 2011-12 (Keeyask Hydropower Limited Partnership 2012). If Pen Islands caribou abundance in winter can influence summer resident caribou occurrences, regional caribou calving activities should predictably increase in summer 2013, because a large number of Pen Islands caribou migrated into the region in January 2013 (Manitoba Hydro 2013). It should also be noted however, that as of this publication date, two large fires are burning near the KIP road and near Ilford, Manitoba as of June 2013. Peatland complex and island habitat loss due to fire will negatively influence the distribution and abundance of summer resident caribou in the region.

In considering sampled occurrences of moose during the 2012 moose and other terrestrial mammals monitoring program, adult moose were detected on 88% of complexes and 67% of islands. The data collected in 2012 was widely distributed across complexes and islands, appeared to be robust, and suitable for the detection of potential Project effects. In comparison to 2011 results, moose presence on complexes and islands in 2012 was roughly approximate with

Mammals Monitoring

no substantial decrease in activity on Project Effects Area transects. Preliminary indications are that clearing and construction activities may not have played a substantive role in affecting the distribution and occurrence of this species. Further testing is required.

As stated in the *Keeyask Infrastructure Project Terrestrial and Aquatic Monitoring Plan*, two important large mammal species require dens for the birthing and rearing of young, and in the case of black bears, for torpor during the winter months. Dens are considered important and possibly critical to the life requisites for these two species and because of this, black bear den searches were completed along the KIP road, borrow areas, the start-up camp and the main camp site. No black bear dens were detected during the monitoring activities in October 2011 or October/November 2012. No gray wolf dens were detected in May 2012.

5.0 CONCLUSION

The Keeyask Hydropower Limited Partnership participated successfully in the terrestrial effects monitoring program for the Keeyask Infrastructure Project first established in spring 2011, and continued in 2012. Based on 2012 monitoring activities, it is unclear if there was a change in the use of complexes and islands by caribou for calving and rearing activities based on clearing and construction disturbance alone. This is largely due to the fact that sampled complexes and islands in the Control Areas and Road Control transects also demonstrated a pronounced decline in caribou activity. Reduced caribou sign on both the Control Area and Project Effects Area transects in 2012 may indicate regional and/or seasonal fluctuations in caribou activity and therefore, additional data and analyses are required.

As the sampled number of complexes and islands with caribou calf sign declined in 2012 to a lesser extent than observed for adult caribou sign, there is an indication that calving and rearing activities may still be occurring within expected levels. The decline in the amount of adult caribou sign may be due to a change in the timing of the mammal sign survey between years, from the establishment of transects in May (2011) to April (2012). Factors that could have influenced levels of adult caribou and calves between 2011 and 2012 may be higher occurrences of black bear or gray wolf. Increased instances of predator species have been linked to reduced caribou calving activities and low calf recruitment rates. Other factors that could have influenced the lower number of caribou in 2012 could have been the absence of Pen Island caribou in the region during the winter of 2011-2012.

The caribou calving island monitoring conducted in 2012 continues to establish a baseline for caribou calving island use in the Keeyask Infrastructure Project Regional and Local Study Areas. Although the pre-construction baseline in 2011 suggested that there was a relationship between distance to roads and caribou occurrences, the distance of sampled peatland complexes and habitat islands to the KIP road and Provincial Road 280 did not seem to play a determining role in the presence of caribou adults and calves in 2012. Sampling of moose indicated these species remains widely distributed throughout the Local and Regional Study Areas. Continued

Mammals Monitoring

monitoring of caribou and moose populations will allow for additional insight into caribou and moose use of the KIP area and how this use may change based on expected Project effects.

No black bear or gray wolf dens were found in search areas covering the KIP road, borrow areas, the start-up camp and the main camp site in 2011 or 2012. With increased construction activities occurring along the KIP road, it is increasingly unlikely that black bear and gray wolf denning will take place in the Local Study Area.

6.0 RECOMMENDATIONS

As this is the first full year of mammals monitoring during the construction phase of the Keeyask Infrastructure Project, which was designed to detect changes in caribou activity in the Local and Region Study Areas over time, it is recommended that monitoring efforts continue.

It is recommended that den surveys continue as a means of avoiding potential Project-related effects on gray wolf and black bear for those areas yet to be cleared. It should be noted that the optimal time for black bear den searches is in late fall, and as such, pre-clearing bear den surveys should coincide with this time period.

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Mammals Monitoring

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TABLES

Mammals Monitoring

Table 1: Total sign observations per species, and sign composition on caribou calving island transects in 2011 and 2012.

Species	Number of Sign Identified in 2011						Number of Sign Identified in 2012					
	Male	Female	Unknown Adult	Juvenile	Unknown	Total	Male	Female	Unknown Adult	Juvenile	Unknown	Total
American marten	0	0	0	0	0	23	0	0	36	0	34	70
Beaver	0	0	0	0	0	11	0	0	0	0	1	1
Black bear	0	0	38	1	0	39	8	4	43	4	66	125
Caribou	85	186	939	150	1767	3127	70	142	250	99	306	867
Ermine	0	0	0	0	0	0	0	0	0	0	1	1
Fisher	0	0	0	0	0	7	0	0	2	0	0	2
Gray wolf	0	0	37	1	0	38	0	0	25	0	7	32
Lynx	0	0	0	0	0	1	0	0	0	0	0	0
Mink	0	0	0	0	0	4	0	0	3	0	2	5
Moose	378	530	1014	218	10	2150	117	120	576	214	183	1210
Red fox	0	0	0	0	0	4	0	0	40	0	19	59
River otter	0	0	0	0	0	18	0	0	3	0	0	3
Snowshoe hare	0	0	0	0	0	45	0	0	3	0	3	6
Wolverine	0	0	0	0	0	0	0	0	10	0	0	10

Mammals Monitoring

Table 2: Distribution of tracking transects and number of caribou sign observations across three monitoring types in 2011 and 2012.

	Transect Type	Number of Complexes	Number of Complexes with Caribou Sign	% of Complexes with Caribou Sign	Number of Islands	Number of Islands with Caribou Sign	% of Islands with Caribou Sign	Number of Transects	Total Transect Length	Total number of Caribou Sign	Number of Caribou Sign per km Surveyed
2011	Control Area	12	12	100%	80	65	81%	16	261	769	2.95
	Project Effects Area	17	17	100%	60	47	78%	21	243	683	2.81
	Road Control	17	16	94%	190	153	81%	209	618	2074	3.36
	TOTAL	46	45	98%	330	265	80%	246	1122	3526	3.14
2012	Control Area	12	8	67%	80	50	63%	16	261	260	1.00
	Project Effects Area	21	13	62%	72	37	51%	25	271	176	0.65
	Road Control	17	10	59%	190	88	46%	211	554	431	0.78
	TOTAL	50	31	62%	342	175	51%	252	1086	867	0.80

Mammals Monitoring

Table 3: Number of adult and juvenile sign on virtual complexes and virtual islands for caribou calving island monitoring 2011 and 2012.

	Transect Type	Number of Complexes with Adult Caribou Sign	Number of Complexes with Caribou Calf Sign	% of Complexes with Adult Caribou Sign	% of Complexes with Caribou Calf Sign	Number of Islands With Adult Caribou Sign	Number of Islands with Caribou Calf Sign	% of Islands with Adult Caribou Sign	% of Islands with Caribou Calf Sign
2011	Control Area	12	7	100%	58%	65	16	81%	20%
	Project Effects Area	17	7	100%	44%	47	10	78%	17%
	Road Control	16	6	94%	35%	153	21	81%	11%
	TOTAL	45	20	98%	43%	265	47	80%	14%
2012	Control Area	8	4	67%	33%	50	9	63%	11%
	Project Effects Area	13	4	63%	19%	35	7	49%	10%
	Road Control	10	4	58%	24%	80	24	39%	12%
	TOTAL	31	12	62%	24%	165	40	48%	12%

Mammals Monitoring

Table 4: Total numbers of caribou, moose, black bear and gray wolf sign on caribou calving island transects in 2011 and 2012.

	Transect Type	Caribou	Moose	Black bear	Gray wolf
2011	Control Area	769	1300	20	9
	Project Effects Area	683	977	1	4
	Road Control	2074	2693	16	9
2012	Control Area	260	568	11	2
	Project Effects Area	176	496	17	19
	Road Control	431	1146	37	11

Mammals Monitoring

Table 5: Distribution of moose sign observations across three monitoring areas in complexes and calving islands, 2011 and 2012.

Habitat Type	Study Type	Surveyed	Total Sign Observed	Adult		Calf		
		n	n	n	%	n	%	
2011	Peatland Complex	Control Area	12	867	10	83%	7	58%
		Project Effects Area	17	643	14	82%	8	47%
		Road Control Area	17	1510	17	100%	7	41%
		Total	46	3020	41	89%	22	48%
	Habitat Island	Control Area	80	433	50	63%	17	21%
		Project Effects Area	60	334	36	60%	13	22%
		Road Control Area	190	1183	110	58%	31	16%
Total		330	1950	196	59%	61	18%	
2012	Peatland Complex	Control Area	12	568	10	83%	6	50%
		Project Effects Area	21	496	18	86%	10	48%
		Road Control Area	17	1146	16	94%	4	24%
		Total	50	2210	44	88%	20	40%
	Habitat Island	Control Area	80	303	61	76%	16	20%
		Project Effects Area	72	313	55	76%	24	33%
		Road Control Area	190	1026	142	75%	40	21%
Total		342	1642	258	67%	80	23%	

Mammals Monitoring

Table 6: Number of peatland complexes and habitat islands where caribou adult and calf sign were observed based on distance classes associated with the distance of Project Effects Area and Control Area transects from the future KIP Road.

	Distance From KIP Road	Peatland Complexes							Habitat Islands						
		Total #	Caribou		Adult Caribou		Calf Caribou		Total #	Caribou		Adult Caribou		Calf Caribou	
			#	%	#	%	#	%		#	%	#	%	#	%
2011	0 to 1 km	4	4	100%	4	100%	3	75%	10	6	60%	6	60%	1	10%
	1 to 2 km	3	3	100%	3	100%	2	67%	12	8	67%	8	67%	3	25%
	2 to 3 km	1	1	100%	1	100%	0	0%	3	3	100%	3	100%	0	0%
	3 to 4 km	4	4	100%	4	100%	1	25%	14	13	93%	13	93%	1	7%
	4 to 5 km	3	3	100%	3	100%	0	0%	18	14	78%	14	78%	4	29%
	5+ km	14	14	100%	14	100%	8	57%	83	68	82%	68	82%	17	20%
	TOTAL	29	29	100%	29	100%	14	48%	140	112	80%	112	80%	25	18%
2012	0 to 1 km	4	1	25%	1	25%	1	25%	10	1	10%	1	10%	0	0%
	1 to 2 km	3	2	67%	2	67%	1	33%	12	4	33%	3	25%	2	17%
	2 to 3 km	1	0	0%	0	0%	0	0%	3	2	67%	2	67%	0	0%
	3 to 4 km	4	3	75%	3	75%	1	25%	14	9	64%	9	64%	2	14%
	4 to 5 km	3	2	67%	2	67%	1	33%	18	12	66%	11	61%	2	11%
	5+ km	18	13	72%	13	72%	4	22%	95	59	65%	59	65%	10	11%
	TOTAL	33	21	64%	21	64%	8	24%	152	87	57%	85	56%	16	11%

Mammals Monitoring

Table 7: Number of peatland complexes and habitat islands where caribou adult and calf sign were observed based on distance classes associated with the distance of Road Control transects from Provincial Road 280.

	Distance From Provincial Road 280	Peatland Complexes							Habitat Islands						
		Total #	Caribou		Adult Caribou		Calf Caribou		Total #	Caribou		Adult Caribou		Calf Caribou	
			#	%	#	%	#	%		#	%	#	%	#	%
2011	0 to 1 km	3	3	100%	3	100%	1	33%	41	33	80%	33	80%	2	5%
	1 to 2 km	6	6	100%	6	100%	4	67%	63	48	76%	48	76%	4	6%
	2 to 3* km	0	NA	NA	NA	NA	NA	NA	42	31	74%	31	74%	8	19%
	3 to 4 km	4	3	75%	3	75%	0	0%	13	13	100%	13	100%	2	15%
	4 to 5 km	1	1	100%	1	100%	1	100%	10	10	100%	10	100%	3	30%
	5+ km	3	3	100%	3	100%	0	50%	21	18	86%	18	86%	2	10%
	TOTAL	17	16	94%	16	94%	6	35%	190	153	81%	153	81%	21	11%
2012	0 to 1 km	3	2	67%	2	67%	1	33%	41	23	56%	18	44%	8	20%
	1 to 2 km	6	5	83%	5	83%	2	33%	63	28	44%	28	44%	4	6%
	2 to 3* km	0	0	NA	0	NA	0	NA	42	17	40%	15	36%	5	12%
	3 to 4 km	4	0	0%	0	0%	0	0%	13	5	38%	4	31%	2	15%
	4 to 5 km	1	0	0%	0	0%	0	0%	10	4	40%	4	40%	2	20%
	5+ km	3	3	100%	3	100%	1	33%	21	11	52%	11	52%	3	14%
	TOTAL	17	10	59%	10	59%	4	24%	190	88	46%	80	42%	24	13%

*Centroid of complex was located outside this distance; however this distance does contain islands

Mammals Monitoring

Table 8: Species list of mammals identified and number of trail camera detections in 2012.

Common Name	Number of Cameras	Number of Male Detections	Number of Female Detections	Number of Calf Detections	Number of Unknown Sex Detections
Black bear	8	0	0	0	106
Caribou	4	149	9	0	1
Moose	16	160	387	0	241
Red Fox	2	0	0	0	8

Mammals Monitoring

Table 9: Total number of sign observations per species, and sign composition for KIP mammal monitoring in 2011 and 2012.

Species	Transect Type	Number of Sign Identified in 2011						Number of Sign Identified in 2012					
		Male	Female	Unknown Adult	Calf	Unknown	Total	Male	Female	Unknown Adult	Calf	Unknown	Total
American marten	NNR	0	0	0	0	0	9	0	0	0	0	0	39
	SNR	0	0	0	0	0	1	0	0	0	0	0	16
Beaver	NNR	0	0	0	0	0	5	0	0	0	0	0	0
	SNR	0	0	0	0	0	6	0	0	0	0	0	1
Black bear	NNR	0	0	6	0	0	12	0	0	8	1	1	13
	SNR	0	0	0	0	0	5	0	0	1	0	0	1
Caribou	NNR	11	3	328	11	76	429	4	11	20	5	14	54
	SNR	4	15	286	6	56	367	5	25	6	7	3	46
Fisher	NNR	0	0	0	0	0	3	0	0	0	0	0	2
	SNR	0	0	0	0	0	0	0	0	0	0	0	0
Gray wolf	NNR	0	0	0	0	0	21	0	0	10	1	5	16
	SNR	0	0	0	0	0	6	0	0	0	0	1	1
Lynx	NNR	0	0	0	0	0	1	0	0	0	0	0	0
	SNR	0	0	0	0	0	0	0	0	0	0	0	0
Mink	NNR	0	0	0	0	0	1	0	0	0	0	0	13
	SNR	0	0	0	0	0	0	0	0	0	0	0	2
Moose	NNR	91	75	507	67	312	1052	38	153	180	61	224	656
	SNR	26	32	188	9	74	329	22	45	64	22	39	192
Red fox	NNR	0	0	0	0	0	0	0	0	0	0	0	13
	SNR	0	0	0	0	0	0	0	0	0	0	0	8
River otter	NNR	0	0	0	0	0	8	0	0	0	0	0	4
	SNR	0	0	0	0	0	0	0	0	0	0	0	3
Snowshoe hare	NNR	0	0	0	0	0	38	0	0	0	0	0	1
	SNR	0	0	0	0	0	0	0	0	0	0	0	0

Mammals Monitoring

Table 10: Moose and caribou sign composition recorded on KIP mammal monitoring transects in 2011 and 2012

	Transect Type	Number of Transects	Total Length (km)	Number of Moose Sign	Number of Moose Sign per km Surveyed	Number of Caribou Sign	Number of Caribou Sign per km Surveyed
2011	KIP Road North Side (NNR)	8	261	1052	4.03	429	1.64
	KIP Road South Side (SNR)	3	111	329	2.96	637	5.74
2012	KIP Road North Side (NNR)	8	261	648	2.48	51	0.20
	KIP Road South Side (SNR)	3	111	191	1.72	46	0.41

Mammals Monitoring

Table 11: Distribution of tracking transects and number of sign observations across mammal monitoring transects in 2011 and 2012.

	Transect Type	Species	Total Number	Number of Male Sign Identified	Number of Female Sign Identified	Number of Unknown Adult Sign Identified	Number of Calf Sign Identified	Number of Unknown Caribou Sign Identified
2011	KIP Road North Side (NNR)	Caribou	429	11	3	328	11	76
		Moose	1052	91	75	507	67	312
	KIP Road South Side (SNR)	Caribou	367	4	15	286	6	56
		Moose	329	26	32	188	9	74
2012	KIP Road North Side (NNR)	Caribou	51	4	11	20	4	12
		Moose	648	38	151	176	59	224
	KIP Road South Side (SNR)	Caribou	46	5	25	6	7	3
		Moose	191	22	45	63	22	39

Table 12: Total numbers of moose, caribou, black bear and gray wolf sign on mammal monitoring transects in 2011 and 2012.

	Transect Type	Moose	Caribou	Black bear	Gray wolf
2011	KIP Road North Side (NNR)	1052	429	12	21
	KIP Road South Side (SNR)	329	367	5	6
2012	KIP Road North Side (NNR)	648	51	13	16
	KIP Road South Side (SNR)	191	46	1	1

APPENDIX A - TRANSECT ESTABLISHMENT AND RESAMPLE
DATES 2012 FOR PROJECT EFFECTS AREA (EA), CONTROL
AREA (CA) AND ROAD CONTROL AREA (RC) LINES BY
TRANSECT

Mammals Monitoring

Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date
CA001	1	16/04/2012	CA009	1	22/04/2012	EA001	2	25/07/2012	EA010	1	18/04/2012
	2	11/07/2012		2	22/07/2012		3	22/09/2012		2	20/07/2012
		13/07/2012		3	16/10/2012	1	19/04/2012	3		18/09/2012	
	3	15/09/2012	CA010A	1	23/04/2012	EA002	2	25/07/2012	EA011	1	18/04/2012
CA002	1	18/04/2012		2	22/07/2012		3	22/09/2012		2	20/07/2012
	2	13/07/2012		3	14/10/2012	EA003	1	19/04/2012		3	17/09/2012
3	16/09/2012	1	23/04/2012	20/04/2012	1			12/04/2012			
CA003	1	18/04/2012	CA010B	2	22/07/2012		2	19/07/2012	EA012	2	19/07/2012
	2	13/07/2012		3	14/10/2012	3	22/09/2012	3		17/09/2012	
	3	16/09/2012	1	24/04/2012	1	08/04/2012	1	19/04/2012			
CA004	1	18/04/2012	CA011	2	22/07/2012	EA004	2	10/07/2012	EA013	2	25/07/2012
	2	11/07/2012		3	14/10/2012		3	12/09/2012		3	17/09/2012
		12/07/2012	CA012	1	21/04/2012	EA005	1	08/04/2012	EA014	1	19/04/2012
		13/07/2012		2	26/07/2012		2	10/07/2012		2	27/07/2012
	3	16/09/2012	3	12/10/2012	3		12/09/2012	3		18/09/2012	
CA005	1	17/04/2012	CA013	1	21/04/2012	EA006	1	08/04/2012	EA015	1	19/04/2012

Mammals Monitoring

Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date	
	2	13/07/2012		2	17/07/2012		2	26/07/2012		2	21/09/2012	
		14/07/2012		3	11/10/2012		3	22/09/2012		3	22/09/2012	
		16/09/2012			12/10/2012		1	19/04/2012		1	17/04/2012	
CA006A	1	17/04/2012	CA014	1	21/04/2012	EA007	2	19/07/2012	EA016A	2	14/07/2012	
	2	12/07/2012		2	17/07/2012		3	22/09/2012		3	16/09/2012	
	3	17/09/2012		3	13/10/2012		1	19/04/2012		1	17/04/2012	
CA006B	1	17/04/2012	CA015	1	21/04/2012	EA008	2	25/07/2012	EA016B	2	14/07/2012	
	2	12/07/2012		2	17/07/2012			26/07/2012		3	16/09/2012	
	3	17/09/2012		3	11/10/2012		3	21/09/2012		1	17/04/2012	
CA007	1	18/04/2012	CA016	3	12/10/2012	EA009A	1	19/04/2012	EA017	2	13/07/2012	
	2	13/07/2012			1		21/04/2012	2		23/07/2012	3	16/09/2012
	3	17/09/2012			2		18/07/2012	3		18/09/2012	1	17/04/2012
CA008	1	23/04/2012	CA016	3	11/10/2012	EA009B	1	23/04/2012	EA018	2	14/07/2012	
	2	22/07/2012			12/10/2012		2	23/07/2012		3	16/09/2012	
	3	14/10/2012	EA001	1	19/04/2012		3	18/09/2012	EA019	1	17/04/2012	
EA019	2	13/07/2012		3	16/09/2012	RC006	1	24/04/2012	RC017	2	23/07/2012	

Mammals Monitoring

Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date
	3	16/09/2012		1	17/04/2012		2	24/07/2012		3	16/10/2012
EA020	1	17/04/2012	EA025B	2	12/07/2012		3	16/10/2012	RC018	1	22/04/2012
	2	14/07/2012		3	16/09/2012	RC007	1	24/04/2012		2	23/07/2012
	3	16/09/2012		1	17/04/2012		2	24/07/2012		3	22/10/2012
EA021A	1	17/04/2012	EA025C	2	12/07/2012			3	16/10/2012	RC019	1
	2	14/07/2012		3	16/09/2012	RC008	1	19/04/2012	2		23/07/2012
	3	16/09/2012		1	17/04/2012		2	22/07/2012	3		22/10/2012
EA021B	1	17/04/2012	EA025D	2	12/07/2012			3	14/10/2012	RC020	1
	2	14/07/2012		3	16/09/2012	RC009	1	22/04/2012	2		24/07/2012
	3	16/09/2012		1	17/04/2012		2	22/07/2012	3		16/10/2012
EA022	1	17/04/2012	EA025E	2	12/07/2012			3	14/10/2012	RC021	1
	2	13/07/2012		3	18/09/2012	RC010	1	19/04/2012	2		23/07/2012
	3	10/10/2012		1	17/04/2012		2	22/07/2012	RC022		1
EA023A	1	17/04/2012	EA025F	2	12/07/2012			3	14/10/2012	RC023	1
	2	14/07/2012		3	18/09/2012	RC011	1	23/04/2012	2		26/07/2012
	3	21/09/2012		RC001	1		22/04/2012	2	24/07/2012		3

Mammals Monitoring

Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date	
EA023B	1	17/04/2012	RC002	2	23/07/2012	RC012	3	16/10/2012	RC024	1	24/04/2012	
	2	14/07/2012		3	16/10/2012		1	23/04/2012		2	26/07/2012	
	3	21/09/2012		1	24/04/2012		2	23/07/2012		3	22/10/2012	
EA023C	1	17/04/2012	RC003	2	24/07/2012	RC013	1	23/04/2012	RC025	1	24/04/2012	
	2	14/07/2012		3	22/10/2012		2	23/07/2012		2	26/07/2012	
	3	18/09/2012		1	22/04/2012		1	24/04/2012		3	22/10/2012	
EA024A	1	17/04/2012	RC004	2	26/07/2012	RC014	2	23/07/2012	RC026	1	24/04/2012	
	2	12/07/2012		3	22/10/2012		3	16/10/2012		2	26/07/2012	
	3	21/09/2012		1	22/04/2012		1	24/04/2012		3	22/10/2012	
EA024B	1	17/04/2012	RC005	2	26/07/2012	RC015	2	23/07/2012	RC027	1	09/04/2012	
	2	12/07/2012		3	22/10/2012		1	22/04/2012		RC028	1	09/04/2012
	3	21/09/2012		1	24/04/2012		RC016	2		23/07/2012	RC029	1
EA025A	1	17/04/2012	2	24/07/2012	3	22/10/2013	RC029	2	22/07/2012			
	2	12/07/2012	3	16/10/2012	RC017	1	22/04/2012	3	22/10/2012			
RC030	1	09/04/2012	RC041	1	20/04/2012	RC052	3	18/10/2012	RC063	1	20/04/2012	
RC031	1	09/04/2012		2	24/07/2012	RC053	1	09/04/2012		2	26/07/2012	

Mammals Monitoring

Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date
	2	24/07/2012		3	19/10/2012		2	26/07/2012		3	18/10/2012
	3	19/10/2012		1	20/04/2012		3	19/10/2012		1	20/04/2012
RC032	1	26/04/2012	RC042	2	26/07/2012	RC054	1	20/04/2012	RC064	2	26/07/2012
	2	22/07/2012		3	18/10/2012		2	26/07/2012		3	18/10/2012
	3	22/10/2012		1	09/04/2012		3	22/10/2012		1	20/04/2012
RC033	1	09/04/2012	RC043	2	26/07/2012	RC055	1	09/04/2012	RC065	2	24/07/2012
	2	24/07/2012		3	18/10/2012		2	26/07/2012		3	22/10/2012
	3	19/10/2012		1	20/04/2012		3	19/10/2012		1	20/04/2012
RC034	1	09/04/2012	RC044	2	26/07/2012	RC056	1	20/04/2012	RC066	2	26/07/2012
	2	24/07/2012		3	18/10/2012		2	26/07/2012		3	18/10/2012
	3	19/10/2012		1	09/04/2012		3	18/10/2012		1	20/04/2012
RC035	1	09/04/2012	RC045	2	26/07/2012	RC057	1	26/04/2012	RC067	2	26/07/2012
	2	24/07/2012		3	18/10/2012		2	24/07/2012		3	18/10/2012
	3	16/10/2012		1	09/04/2012		3	22/10/2012		1	20/04/2012
RC036	1	09/04/2012	RC046	2	26/07/2012	RC058	1	20/04/2012	RC068	2	26/07/2012
	2	24/07/2012		3	18/10/2012		2	26/07/2012		3	18/10/2012

Mammals Monitoring

Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date
	3	16/10/2012		1	20/04/2012		3	18/10/2012		1	20/04/2012
RC037	1	23/04/2012	RC047	2	24/07/2012	RC059	1	20/04/2012	RC069	2	26/07/2012
	2	24/07/2012		3	19/10/2012		2	26/07/2012		3	18/10/2012
	3	16/10/2012	RC048	1	22/04/2012		3	18/10/2012		1	26/04/2012
RC038	1	24/04/2012	RC049	1	09/04/2012	RC060	1	26/04/2012	RC070	2	24/07/2012
	2	24/07/2012		2	26/07/2012		2	24/07/2012		3	22/10/2012
	3	16/10/2012		3	18/10/2012		3	22/10/2012		1	26/04/2012
RC039	1	24/04/2012	RC050	1	26/04/2012	RC061	1	20/04/2012	RC071	2	26/07/2012
	2	26/07/2012	RC051	1	20/04/2012		2	26/07/2012		3	22/10/2012
	3	22/10/2012		2	26/07/2012		3	18/10/2012		1	26/04/2012
RC040	1	24/04/2012	RC052	3	22/10/2012	RC062	1	20/04/2012	RC072	2	26/07/2012
	2	26/07/2012		1	20/04/2012		2	24/07/2012		3	22/10/2012
	3	22/10/2012		2	26/07/2012		3	22/10/2012	RC073	1	24/04/2012
RC073	2	24/07/2012	RC084	1	19/04/2012	RC094	2	18/07/2012	RC104	2	17/07/2012
	3	22/10/2012		2	17/07/2012		3	12/10/2012		3	11/10/2012
RC074	1	23/04/2012			3		13/10/2012		3	13/10/2012	RC105

Mammals Monitoring

Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date
	2	26/07/2012	RC085	1	22/04/2012	RC095	1	22/04/2012	RC118	3	11/10/2012
	3	22/10/2012		2	17/07/2012		2	23/07/2012		1	18/04/2012
RC075	1	23/04/2012		3	13/10/2012		3	13/10/2012		2	24/04/2012
	2	26/07/2012	RC086	1	23/04/2012	RC096	1	21/04/2012	RC119	2	14/07/2012
	3	22/10/2012		2	17/07/2012		2	23/07/2012		3	10/10/2012
RC076	1	23/04/2012		3	13/10/2012		3	13/10/2012		1	26/04/2012
	2	26/07/2012	RC087	1	22/04/2012	RC097	1	22/04/2012	RC120	2	27/07/2012
	3	22/10/2012		2	17/07/2012		2	23/07/2012		3	10/10/2012
RC077	1	23/04/2012		3	13/10/2012		3	13/10/2012		1	26/04/2012
	2	24/07/2012	RC088	1	22/04/2012	RC098	1	22/04/2012	RC121	2	27/07/2012
	2	26/07/2012		2	17/07/2012		2	23/07/2012		3	10/10/2012
	3	22/10/2012		3	13/10/2012		3	13/10/2012		1	26/04/2012
	1	24/04/2012	RC089	1	22/04/2012	RC099	1	21/04/2012	RC122	2	27/07/2012
RC078	2	24/07/2012		2	23/07/2012		2	17/07/2012		3	10/10/2012
	3	22/10/2012		3	13/10/2012		3	12/10/2012		1	26/04/2012
RC079	1	24/04/2012	RC090	1	22/04/2012	13/10/2012		2	27/07/2012		

Mammals Monitoring

Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date	
	2	24/07/2012		2	23/07/2012		1	21/04/2012		3	10/10/2012	
	3	22/10/2012		3	13/10/2012	RC100	2	17/07/2012	RC123	1	24/04/2012	
RC080	1	19/04/2012	RC091	1	22/04/2012		3	12/10/2012	RC124	1	24/04/2012	
	2	18/07/2012			1	21/04/2012	RC125	1	24/04/2012			
	3	11/10/2012		RC101	2	17/07/2012	RC126	1	24/04/2012			
RC081	1	19/04/2012		1	22/04/2012		3	12/10/2012	RC127	1	24/04/2012	
RC082	1	19/04/2012	RC092	2	18/07/2012		1	22/04/2012		1	26/04/2012	
	2	18/07/2012			2	17/07/2012	RC128	2	27/07/2012			
	3	11/10/2012		1	22/04/2012	RC102	3	12/10/2012		3	10/10/2012	
RC083	1	22/04/2012	RC093	2	18/07/2012		1	18/04/2012		1	26/04/2012	
	2	17/07/2012			3	12/10/2012	RC103	2	12/10/2012	RC129	2	27/07/2012
	3	13/10/2012	RC094	1	21/04/2012	RC104	1	18/04/2012		3	10/10/2012	
RC130	1	26/04/2012	RC141	1	25/04/2012		2	28/07/2012	RC165	1	25/04/2012	
	2	27/07/2012			2	28/07/2012	RC153	3	17/10/2012		1	25/04/2012
	3	10/10/2012			3	17/10/2012		1	25/04/2012	RC166	2	19/09/2012
RC131	1	26/04/2012	RC142	1	26/04/2012	RC154	2	27/07/2012	RC167	1	25/04/2012	

Mammals Monitoring

Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date
	2	27/07/2012		2	21/07/2012		3	17/10/2012		2	21/07/2012
	3	10/10/2012		3	19/09/2012	RC155	1	26/04/2012		3	19/09/2012
RC132	1	26/04/2012	RC143	1	26/04/2012	RC156	1	25/04/2012	RC168	1	25/04/2012
	2	12/07/2012		2	21/07/2012		2	21/07/2012		2	21/07/2012
	3	10/10/2012		3	19/09/2012		3	19/09/2012		3	19/09/2012
RC133	1	26/04/2012	RC144	1	26/04/2012	RC157	1	25/04/2012	RC169	1	25/04/2012
	2	12/07/2012	RC145	1	26/04/2012		2	21/07/2012		2	19/09/2012
	3	10/10/2012		2	21/07/2012		3	19/09/2012	1	25/04/2012	
RC134	1	26/04/2012		RC146	3	19/09/2012	RC158	1	25/04/2012	RC170	2
	2	12/07/2012	1		25/04/2012	2		27/07/2012	3	17/10/2012	
	3	10/10/2012	2		21/07/2012	3		17/10/2012	RC171	1	25/04/2012
RC135	1	26/04/2012	RC147	3	19/09/2012	RC159	1	26/04/2012	RC172	1	25/04/2012
	2	12/07/2012		1	25/04/2012		2	21/07/2012		2	27/07/2012
	3	10/10/2012		2	27/07/2012		3	19/09/2012		3	17/10/2012
RC136	1	26/04/2012	RC148	3	17/10/2012	RC160	1	25/04/2012	RC173	1	25/04/2012
	2	12/07/2012		1	26/04/2012		2	27/07/2012		2	27/07/2012

Mammals Monitoring

Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date
	3	10/10/2012		1	25/04/2012		3	17/10/2012		3	17/10/2012
RC137	1	25/04/2012	RC149	2	21/07/2012	RC161	1	25/04/2012	RC174	1	25/04/2012
	2	22/07/2012		3	19/09/2012		2	21/07/2012		2	21/07/2012
	3	19/09/2012	RC150	1	25/04/2012		3	10/10/2012		3	19/09/2012
RC138	1	26/04/2012		2	21/07/2012	RC162	1	25/04/2012	RC175	1	25/04/2012
RC139	1	25/04/2012	RC151	3	19/09/2012		2	28/07/2012	RC176	1	25/04/2012
	2	28/07/2012		1	26/04/2012	3	17/10/2012	2		21/07/2012	
	3	17/10/2012	RC152	1	26/04/2012	RC163	1	26/04/2012		3	19/09/2012
RC140	1	26/04/2012		2	21/07/2012		2	21/07/2012	RC177	1	25/04/2012
	2	21/07/2012	3	19/09/2012	3		19/09/2012	2		28/07/2012	
	3	19/09/2012	RC153	1	25/04/2012	RC164	1	25/04/2012		3	17/10/2012
RC178	1	25/04/2012	RC191	1	25/04/2012	RC202	3	19/09/2012	RC213	3	10/10/2012
	2	21/07/2012		2	27/07/2012	RC203	1	25/04/2012	RC214	1	26/04/2012
	3	19/09/2012		3	17/10/2012		2	27/07/2012		2	27/07/2012
RC179	1	25/04/2012	RC192	1	25/04/2012		RC204	3		17/10/2012	3
	2	27/07/2012		2	27/07/2012	1		25/04/2012	RC215	1	25/04/2012

Mammals Monitoring

Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date
	3	17/10/2012		3	17/10/2012		2	27/07/2012		2	27/07/2012
RC180	1	25/04/2012	RC193	1	25/04/2012		3	17/10/2012		3	17/10/2012
	3	19/09/2012		1	25/04/2012		1	26/04/2012		1	25/04/2012
RC181	1	26/04/2012	RC194	2	22/07/2012	RC205	2	21/07/2012	RC216	2	27/07/2012
	2	27/07/2012		3	19/09/2012		3	10/10/2012		3	17/10/2012
RC182	1	25/04/2012	RC195	1	25/04/2012	RC206	1	25/04/2012	RC217	1	25/04/2012
	2	27/07/2012		2	27/07/2012		1	26/04/2012		2	27/07/2012
	3	17/10/2012		3	17/10/2012	RC207	2	27/07/2012		3	17/10/2012
RC183	1	25/04/2012	RC196	1	25/04/2012		3	17/10/2012	RC218	1	25/04/2012
	2	27/07/2012		2	22/07/2012		1	26/04/2012		2	27/07/2012
	3	17/10/2012		3	19/09/2012	RC208	2	27/07/2012		3	17/10/2012
RC184	1	25/04/2012	RC197	1	25/04/2012		3	17/10/2012	RC219	1	25/04/2012
	3	19/09/2012		2	22/07/2012		1	26/04/2012		2	21/07/2012
RC185	1	25/04/2012		3	19/09/2012	RC209	2	27/07/2012		3	10/10/2012
RC186	1	25/04/2012	RC198	1	25/04/2012		3	17/10/2012	RC220	1	25/04/2012
	2	27/07/2012		2	27/07/2012	RC210	1	26/04/2012		2	27/07/2012

Mammals Monitoring

Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date	Transect	Visit	Date
	3	17/10/2012		3	17/10/2012		2	27/07/2012		3	17/10/2012
RC187	1	26/04/2012	RC199	1	25/04/2012	RC211	3	17/10/2012	RC221	1	25/04/2012
	2	21/07/2012		2	27/07/2012		1	26/04/2012		2	27/07/2012
	3	19/09/2012		3	17/10/2012		2	21/07/2012		3	17/10/2012
RC188	1	25/04/2012	RC200	1	25/04/2012	RC212	3	10/10/2012	RC222	1	26/04/2012
	3	19/09/2012	RC201	1	25/04/2012		1	25/04/2012		2	27/07/2012
RC189	1	25/04/2012			2	27/07/2012		2	27/07/2012		3
RC190	1	25/04/2012	RC202	3	17/10/2012	RC213	3	17/10/2012	RC223	1	26/04/2012
	2	27/07/2012		1	25/04/2012		1	25/04/2012		2	21/07/2012
	3	17/10/2012		2	22/07/2012		2	21/07/2012		3	19/09/2012

APPENDIX B - TRAIL CAMERA LOCATION, SET-UP AND
REMOVAL DATES IN 2012 BY CAMERA

Mammals Monitoring

Name	Install Date	Pull Date	Location	Name	Install Date	Pull Date	Location
EA001_1	19-Apr-12	22-Sep-13	15 V 348117 6257275	EA011_2	18-Apr-12	17-Sep-12	15 V 351490 6249727
EA002_1	19-Apr-12	22-Sep-13	15 V 346498 6256572	EA011_3	18-Apr-12	17-Sep-12	15 V 351086 6249723
EA003_1	19-Apr-12	22-Sep-13	15 V 347298 6259638	EA011_4	18-Apr-12	17-Sep-12	15 V 351104 6249557
EA004_1	8-Apr-12	12-Sep-12	15 V 344780 6254104	EA011_5	18-Apr-12	17-Sep-12	15 V 351837 6249652
EA004_2	8-Apr-12	12-Sep-12	15 V 344631 6254705	EA012_1	12-Apr-12	17-Sep-12	15 V 350137 6250636
EA005_2	8-Apr-12	12-Sep-12	15 V 344670 6256098	EA013_1	24-Apr-12	17-Sep-12	15 V 353908 6250818
EA005_3	8-Apr-12	12-Sep-12	15 V 344377 6256500	EA013_2	24-Apr-12	17-Sep-12	15 V 353797 6250851
EA005_1	8-Apr-12	12-Sep-12	15 V 344155 6256034	EA013_3	24-Apr-12	17-Sep-12	15 V 354407 6250839
EA006_1	8-Apr-12	22-Sep-13	15 V 343628 6254365	EA014_2	18-Apr-12	18-Sep-12	15 V 353664 6256733
EA007_3	19-Apr-12	22-Sep-13	15 V 347395 6255476	EA014_1	18-Apr-12	18-Sep-12	15 V 353784 6256715
EA007_1	19-Apr-12	22-Sep-13	15 V 347348 6255503	EA015_1	17-Apr-12	16-Sep-12	15 V 355664 6256955
EA008_2	19-Apr-12	21-Sep-13	15 V 348058 6253275	EA015_2	17-Apr-12	16-Sep-12	15 V 356068 6257012
EA008_3	19-Apr-12	21-Sep-13	15 V 347985 6253600	EA015_3	17-Apr-12	16-Sep-12	15 V 356040 6256926
EA008_1	19-Apr-12	21-Sep-13	15 V 347565 6253720	EA016_1	17-Apr-12	16-Sep-12	15 V 367157 6245357
EA009_3	23-Apr-12	18-Sep-12	15 V 343213 6251243	EA016_2	17-Apr-12	16-Sep-12	15 V 366437 6245386

Mammals Monitoring

EA009_2	19-Apr-12	18-Sep-12	15 V 343420 6251066	EA017_1	17-Apr-12	16-Sep-12	15 V 363951 6243243
EA009_1	19-Apr-12	18-Sep-12	15 V 343029 6251262	EA018_2	17-Apr-12	16-Sep-12	15 V 362543 6243591
EA010_3	23-Apr-12	18-Sep-12	15 V 353148 6254929	EA018_1	17-Apr-12	16-Sep-12	15 V 362518 6243470
EA010_2	23-Apr-12	18-Sep-12	15 V 351691 6255018	EA019_1	17-Apr-12	16-Sep-12	15 V 363300 6242183
EA010_4	23-Apr-12	18-Sep-12	15 V 353181 6254962	EA020_2	17-Apr-12	16-Sep-12	15 V 360937 6243232
EA010_5	23-Apr-12	18-Sep-12	15 V 352168 6254769	EA020_3	17-Apr-12	16-Sep-12	15 V 361544 6243252
EA010_6	23-Apr-12	18-Sep-12	15 V 350590 6255726	EA020_1	17-Apr-12	16-Sep-12	15 V 361140 6243358
EA010_1	23-Apr-12	18-Sep-12	15 V 351567 6255176	EA021_1	17-Apr-12	16-Sep-12	15 V 358251 6244512
EA011_1	18-Apr-12	17-Sep-12	15 V 351568 6249708	EA021_2	17-Apr-12	16-Sep-12	15 V 358265 6244612

APPENDIX C - KIP ROAD TRANSECT ESTABLISHMENT AND
RESAMPLE DATES 2012 BY TRANSECT

Mammals Monitoring

Transect	Visit	Date	Transect	Visit	Date
NNR001	1	04/04/2012	NNR005	2	25/07/2012
		05/04/2012		3	22/09/2012
		06/04/2012			23/09/2012
	2	15/07/2012	NNR006	1	10/04/2012
		16/07/2012		2	19/07/2012
		19/07/2012		3	23/09/2012
	3	20/09/2012		1	11/04/2012
					12/04/2012
	NNR002	1	04/04/2012	NNR007	2
05/04/2012			3		23/09/2012
06/04/2012					24/09/2012
2		16/07/2012			
3		20/09/2012		1	11/04/2012
NNR003	1	04/04/2012	NNR008	2	19/07/2012
		06/04/2012		3	24/09/2012
		07/04/2012		1	12/04/2012
	2	15/07/2012	SNR001	2	20/07/2012
		16/07/2012		3	24/09/2012
	3	20/09/2012			
		21/09/2012		1	12/04/2012
NNR004	1	04/04/2012	SNR002	2	20/07/2012
		07/04/2012			25/07/2012

Mammals Monitoring

		08/04/2012			26/07/2012
		10/04/2012			24/09/2012
	2	16/07/2012		3	25/09/2012
	3	22/09/2012	SNR003	1	13/04/2012
		23/09/2012			20/07/2012
	1	10/04/2012		2	25/07/2012
NNR005		11/04/2012		3	25/09/2012