



Keeyask Infrastructure Project

Terrestrial and Aquatic Monitoring Plan

Amphibian Monitoring

Annual Report 2013-2014



KEYYASK INFRASTRUCTURE PROJECT

TERRESTRIAL AND AQUATIC MONITORING PLAN

Amphibian Monitoring: Annual Report 2013 - 2014

Report for

MANITOBA CONSERVATION AND WATER STEWARDSHIP

Prepared on Behalf of the
Keyyask Hydropower Limited Partnership

Prepared By
Stantec Consultants Ltd.

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TECHNICAL SUMMARY

The Keeyask Hydropower Limited Partnership (KHLP) 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 KHLP is conducting terrestrial effects monitoring during the KIP construction. This annual report covers the period from April 1, 2013 through to March 31, 2014 and presents results from the second year of construction-related amphibian monitoring for the Project. Amphibian monitoring in 2013 included evening road call surveys along the access road, as well as investigations of, and deployment of recording units at wetlands located within and adjacent to construction areas. Areas within the Local Study Area (LSA) were surveyed to document impacts from construction activities of the KIP. Areas within the Regional Study Area (RSA) were also surveyed as a reference to assess amphibian communities in non-impacted areas. Data collected were used to verify anticipated construction-related effects on amphibians.

Targeted amphibian species with potential breeding ranges within the KIP RSA include: wood frog, boreal chorus frog, and northern leopard frog. Surveys were conducted at 38 potential breeding ponds located within and adjacent to the KIP LSA, and at 27 stops along the access road. Wood frogs and boreal chorus frogs were the only species of amphibian detected. Although the historical breeding range for northern leopard frog (listed as a species of **special concern**¹ under Schedule 1 of the *Species at Risk Act* (SARA) and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) includes the LSA, none were observed during the KIP monitoring studies (2012 and 2013).

¹ Words indicated in bold are defined the glossary.

Results from the 2013 amphibian monitoring studies indicate that boreal chorus frogs and wood frogs continue to be widely dispersed throughout the KIP LSA. Construction activity did not appear to have any measureable effect on frog occupancy of the majority of wetlands located adjacent to construction areas. Retention of vegetated buffers and set-backs from active construction sites are factors contributing to the continued use of breeding ponds by frogs. The second year of construction monitoring has contributed to information on changes to amphibian populations and **habitat** use in the KIP LSA and impacted areas. Future years of amphibian monitoring will help to gain a greater understanding of the impact of construction on the local amphibian community.

ACKNOWLEDGEMENTS

Stantec Consultants Ltd. would like to thank Manitoba Hydro for their support throughout these studies, and the local First Nations Partners for contributing to these studies within their resource management areas and areas of community interest. We wish to thank Peter Massan of Tataskweyak Cree Nation for his assistance during the 2012 field studies. We also wish to express our gratitude to the other Keeyask consulting teams that assisted in providing input and logistical support for this project. We appreciate the efforts of Mr. Ron Bretecher, Ms. Mary Lang and Ms. Shari Fournier of North/South Consultants Inc. for their organizational assistance.

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LIST OF ACRONYMS

COSEWIC	Committee on the Status of Endangered Wildlife in Canada
EA	Environmental Assessment
KHLP	Keyask Hydropower Limited Partnership
KIP	Keyask Infrastructure Project
LSA	Local Study Area
MESEA	<i>Manitoba Endangered Species and Ecosystems Act</i>
PR	Provincial Road
RSA	Regional Study Area
SARA	<i>Species at Risk Act</i>

1.0 INTRODUCTION

1.1 OVERVIEW

The Keeyask Hydropower Limited Partnership is constructing the Keeyask Infrastructure Project (“the Project” or “KIP”). The Project is located approximately 180 km northeast of Thompson and 40 km southwest of Gillam, extending between PR 280 and Gull Rapids on the Nelson River (Map 1-1). 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.

Construction of the KIP was initiated in January 2012². As outlined in the KIP Environmental Assessment (EA) Report (KHLP 2009), an Environmental Monitoring Program was developed to verify anticipated effects, including those on local amphibian populations. The amphibian monitoring was developed with specific objectives to:

- Verify/test EA Report predictions regarding the effects of construction activities on local amphibian abundance and distribution;
- Determine if any unexpected impacts on amphibian abundance and distribution are occurring as a result of construction activities; and
- Determine if mitigation options are required, as a result of unexpected impacts to amphibians occurring due to construction-related activities.

This annual report covers the period from April 1, 2013, through to March 31, 2014. As outlined in the KIP Terrestrial and Aquatic Monitoring Plan (2012), amphibian monitoring surveys were conducted in the spring 2013. This document reports the findings of these monitoring studies.

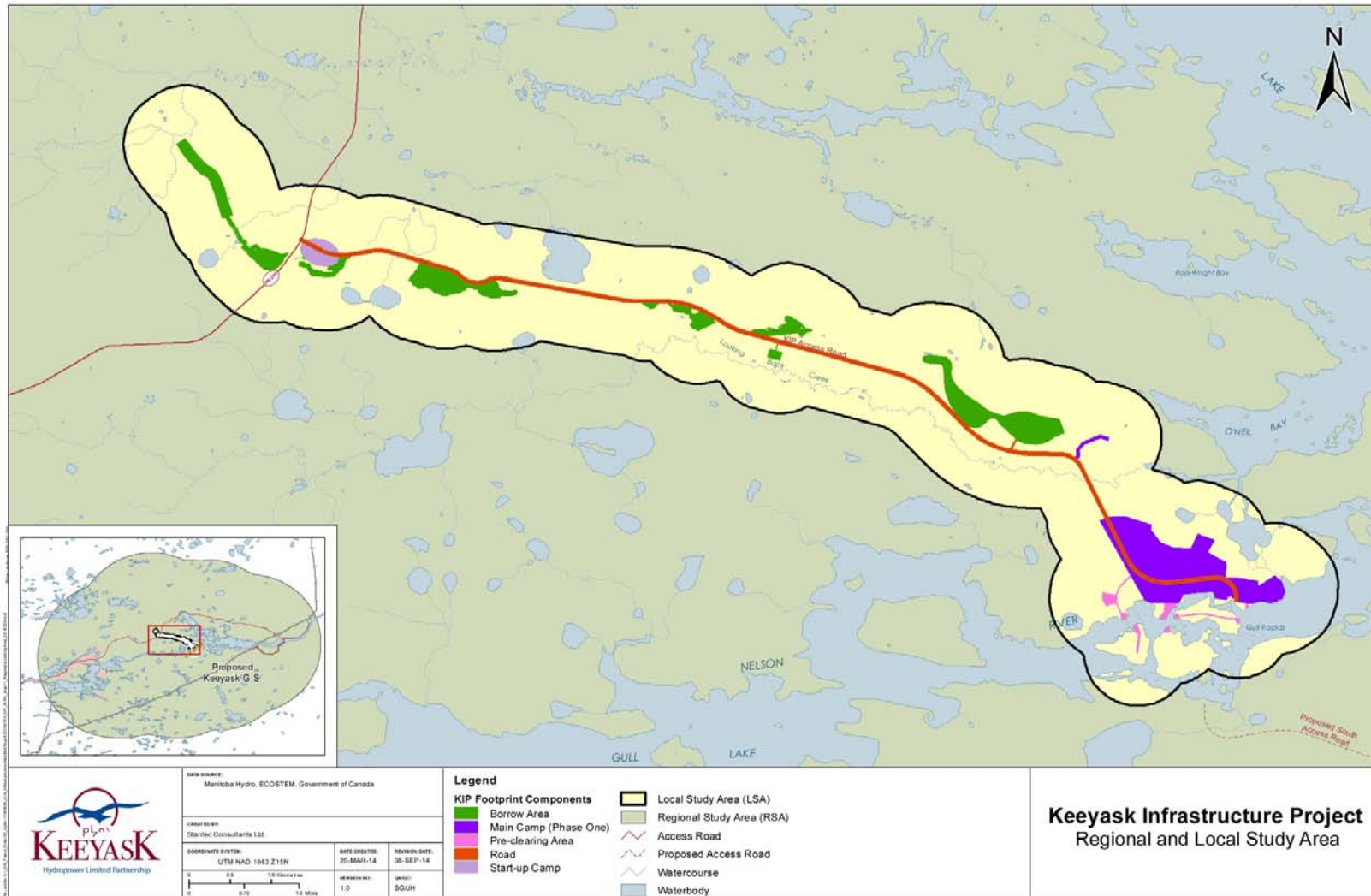
Previous baseline studies have indicated the presence of breeding populations of boreal chorus frogs (*Pseudacris triseriata*) and wood frogs (*Rana sylvatica*) within the KIP region (KHLP 2009). Historic breeding ranges of the northern leopard frog (*Lithobates pipiens*) include the KIP region, however none have been observed there in recent decades, nor were any observed or

² A detailed Project and study area description is provided in the Keeyask Infrastructure Project Environmental Assessment Report (Keeyask Hydropower Limited Partnership 2009).

detected during Project-related amphibian surveys³. Northern leopard frog is listed as a species of **special concern** under Schedule 1 of the *Species at Risk Act* (SARA) and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Details of 2013 amphibian survey results and surveyed vegetation communities are provided in Appendices B and C. Pertinent photographs, and photographs of representative habitats surveyed are provided in Appendix D. Incidental data gathered outside of the amphibian survey period are listed in Appendix E. Weather data recorded during 2013 surveys are provided in Appendix F.

³ The KIP region falls within the northern range limit of the northern leopard frog and therefore has the potential to occur within the Project area.



Map 1-1: Local Study Area for the Keeyask Infrastructure Project

2.0 METHODS

Male frogs and toads use calling to attract mates as breeding partners. These calls are counted, using standardized survey methods, to determine the abundance of amphibians within given areas. Standardized amphibian survey methods have been developed by Bird Studies Canada and accepted by government agencies such as Environment Canada and Manitoba Conservation and Water Stewardship (Gartshore et al. 2004, Bird Studies Canada 2008). These methods have been used during previous monitoring years.

Amphibian survey methods focused on gathering information on amphibians and their potentially affected habitat. The environmental assessment for the Project concluded that effects to amphibians would include road mortality, as well as effects to habitat quality in adjacent wetlands due to construction activities. As a result, survey methods included a combination of auditory-based evening road call surveys and wetland surveys. Automated recording units were deployed for monitoring wetland use by amphibians in remote areas. Together, these methods aimed at gathering information on amphibian breeding activity along the access road and in reference areas away from the road.

The amphibian survey locations were selected using an evaluation process that involved examining: topographic mapping, ortho photography, Biological Land Classification data (Smith et al., 1998), habitat classification data (ECOSTEM 2005), and data and mapping from previous years of sampling. Sites surveyed in previous years were resurveyed in 2013 regardless of their condition. Even heavily impacted sites were resurveyed in order to accurately reflect construction effects.

2.1 EVENING ROAD CALL SURVEYS

Between May 23 and 27, 2013, construction phase amphibian monitoring surveys were conducted along the access road. For comparative purposes, Regional Study Area (RSA) sites along PR 280 and the Butnau Road were also sampled as a reference (Map 2-1). Road surveys were conducted for the first time in 2013, as in previous years the road bed had not been constructed and truck access was not possible.

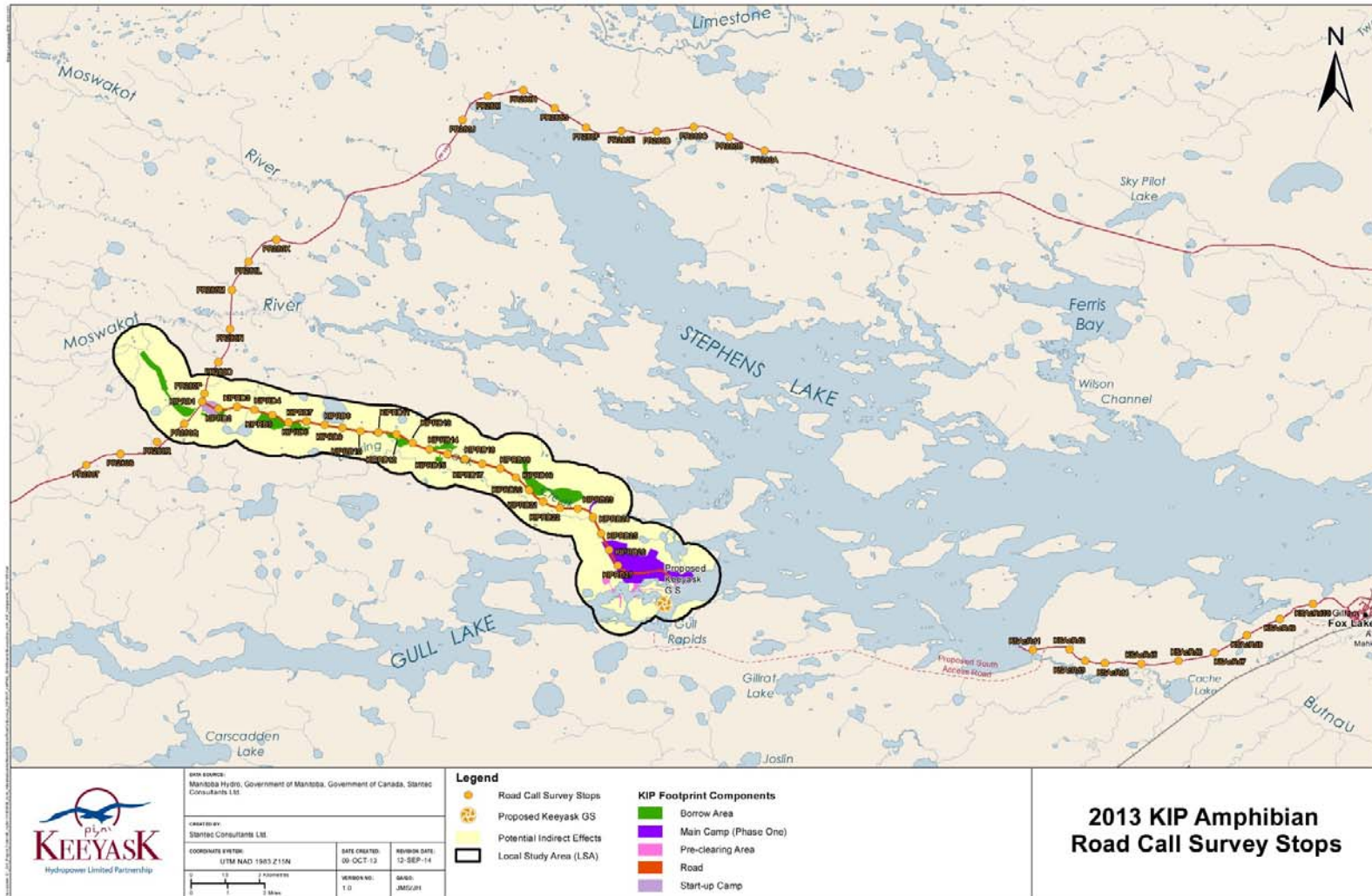
A total of 57 road call counts (27 along the access road, as well as 10 along the Butnau Road and 20 along PR 280) were surveyed using a combination of auditory detection and visual observation techniques during the peak calling times (2000 hr to midnight). The 10 stops along the Butnau Road were repeated in the afternoon to investigate the effects of time of day on sampling accuracy.

Road call counts involved two observers stopping at survey points located at 800-m intervals along the access road. Each survey was conducted within the recommended timing window: between a half hour after sunset and midnight (BSC 1994; Gartshore et al. 2004). This protocol involves the observers standing at each selected station and listening for a total of three minutes. All amphibians heard or seen within the surrounding right-of-way (ROW) and forest edge habitat were identified to species. At each stop, frog presence/abundance was estimated using the following coding system (“calling code”):

- 0 = no frogs can be heard;
- 1 = individuals can be counted, no overlapping calls;
- 2 = individual calls are distinguishable but overlapping; and
- 3 = full chorus, calls are continuous and overlapping (number cannot be estimated without precision).

In addition to recording frog calls and amphibian sightings, the following were recorded during surveys:

- Location of transect and survey point;
- Time of day;
- Weather information (temperature, wind direction and speed, cloud cover and precipitation);
and
- Habitat description (dominant plant species, crown cover, understory, ground cover).



Map 2-1: 2013 KIP Amphibian Road Call Survey Stops

2.2 WETLAND SURVEYS

During the same time period as evening road call surveys (May 23 to 27, 2013), 38 wetlands were assessed for frog breeding activity and suitability (Map 2-2). Eight of these sites had been visited in 2012 as part of the first year of construction monitoring using the same survey methods. As these sites were accessed by helicopter, investigations occurred during the afternoon, as done in 2012. Frogs were given at least 10 minutes to acclimate to the presence of the survey crew before the survey period began and calling code was recorded. In addition to recording frog call activity at each wetland, using the above coding method, time spent at wetlands also involved attempts to visually observe amphibians not calling (e.g., female frogs or other amphibian species) residing within the sampling area. Visual efforts focused on observing:

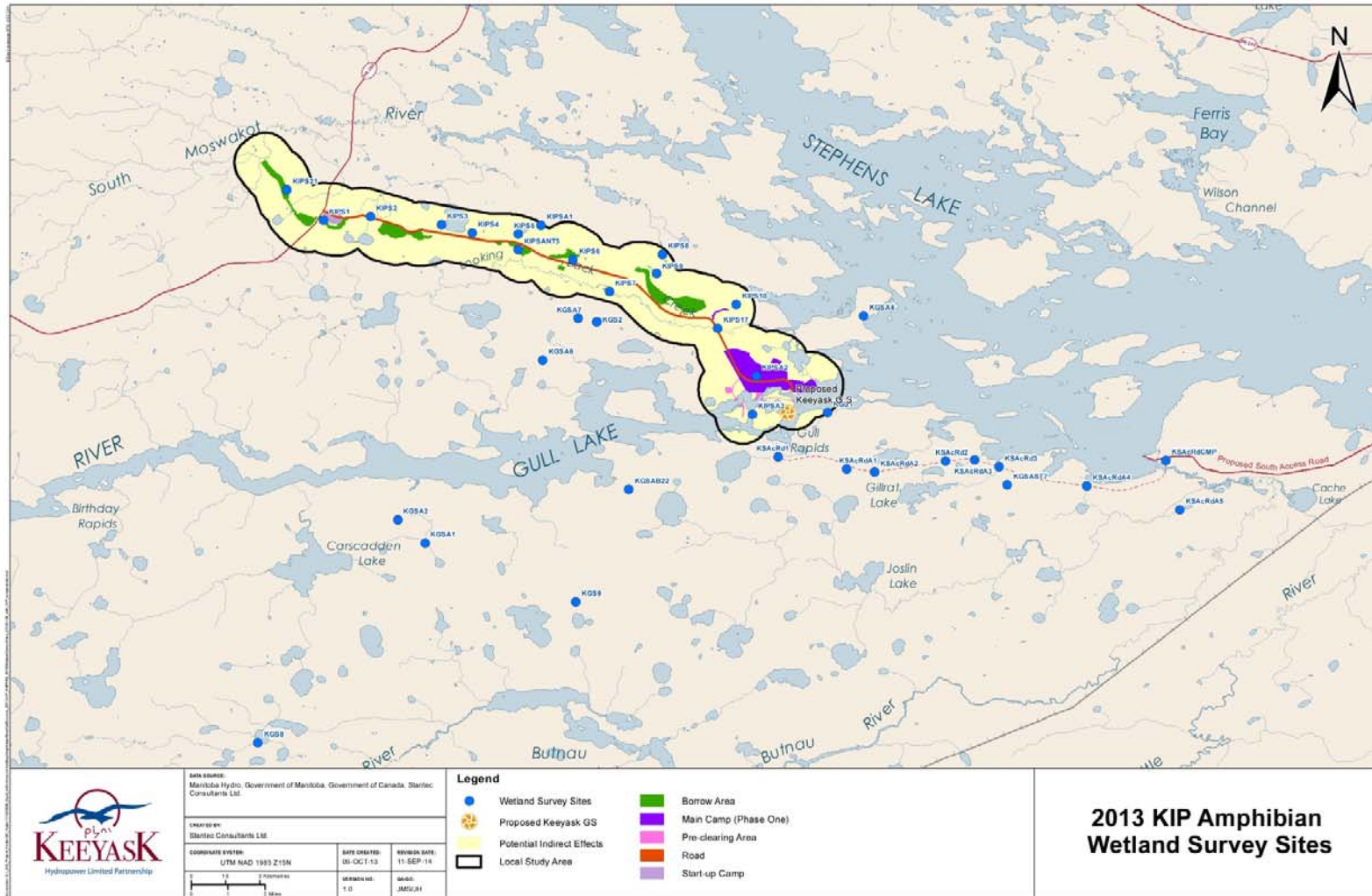
- Individual adults or earlier life stages; and
- Eggs or egg masses.

Temperature, **pH**, and **TDS** were also recorded at each water body, in order to describe wetland water quality.

Recording units were utilized where site conditions prevented the helicopter from shutting down during site visits, or at sites where no, or few, frogs were heard during the initial visit. If a code 3 (maximum frog breeding activity) was heard during the site visit, the site was recorded as such and considered completed. If calling activity could not be determined during the site visit, or if the calling code was less than 3, a recording unit was left and retrieved the next day, allowing observers to monitor calling activity remotely. For each site where a remote recorder was used, the recording was reviewed by the same observers conducting the site visit, and calling code was definitively established from the recording using the same methods as used during site visits (Appendix D, Photo D-1). It is expected that this method removed any bias from sampling during the day.

2.3 OTHER WILDLIFE DATA

Incidental observations such as amphibians observed or heard outside of survey stops and other wildlife observations were recorded when encountered during amphibian surveys (Appendix E, Table E-1). Non-amphibian related observations (e.g., birds, mammals, and species at risk) were passed on to other study teams.



Map 2-2: 2013 KIP Amphibian Wetland Survey Sites

3.0 RESULTS AND DISCUSSION

3.1 EVENING ROAD CALL RESULTS

During surveys of the access road, 27 stops were surveyed and all had amphibians present (Appendix B, Table B-1). Amphibian habitat suitability was ranked using the system shown in Table 3-1.

Table 3-1: Amphibian Abundance Ranking System	
Rank	Description
None	No amphibian calls recorded during surveys.
Low	Some amphibian calls recorded (one species only and less than 20 individuals in total).
Medium	Significant ¹ amphibian calls recorded (at least two species or more than 20 individuals in total).
High	Full chorus of multiple species recorded.

¹ Significant according to the Ontario MNR's Eco region6E Criteria (MNR, 2011)

Using the ranking system described above, 74% of the sites visited along the access road are ranked as areas of high amphibian abundance, compared with 80% along the Butnau Road (evening survey only) and 75% along PR 280 (Table 3-2, Map 3-1). These results appear to indicate that amphibians are using the available habitat along the KIP access road to a similar degree as habitat along PR 280 and the Butnau Road (Appendix D, Photo D-2). As road surveys were not possible prior to access road construction, 2013 data cannot be compared against previous years.

It is also noted that data from afternoon and evening surveys along the same transect (Butnau Road) yielded markedly different results. Evening surveys are preferable over surveys at other times of the day where at all possible. Where evening surveys are not possible, recording units should be considered in order to augment data gathered at other times of the day.

Table 3-2: Evening Road Call Survey Results

Survey Transect	Date	Time of Day	Number of Stops	Number of Stops with no Amphibians	Number of Stops with 1 Species Present	Number of Stops with 2 or more Species Present	Calling Code =3	Calling Code <3	Amphibian Abundance*		
									Low	Medium	High
KIP Access Road	May 25-26, 2013	Evening	27	0	0	27	23	4	1	6	20
Butnau Road	May 27, 2013	Afternoon	10	0	10	0	5	5	5	5	0
Butnau Road	May 27, 2013	Evening	10	0	2	8	10	0	0	2	8
Provincial Road 280	May 24, 2013	Evening	20	2	1	17	15	5	3	2	15

*Rank Description:

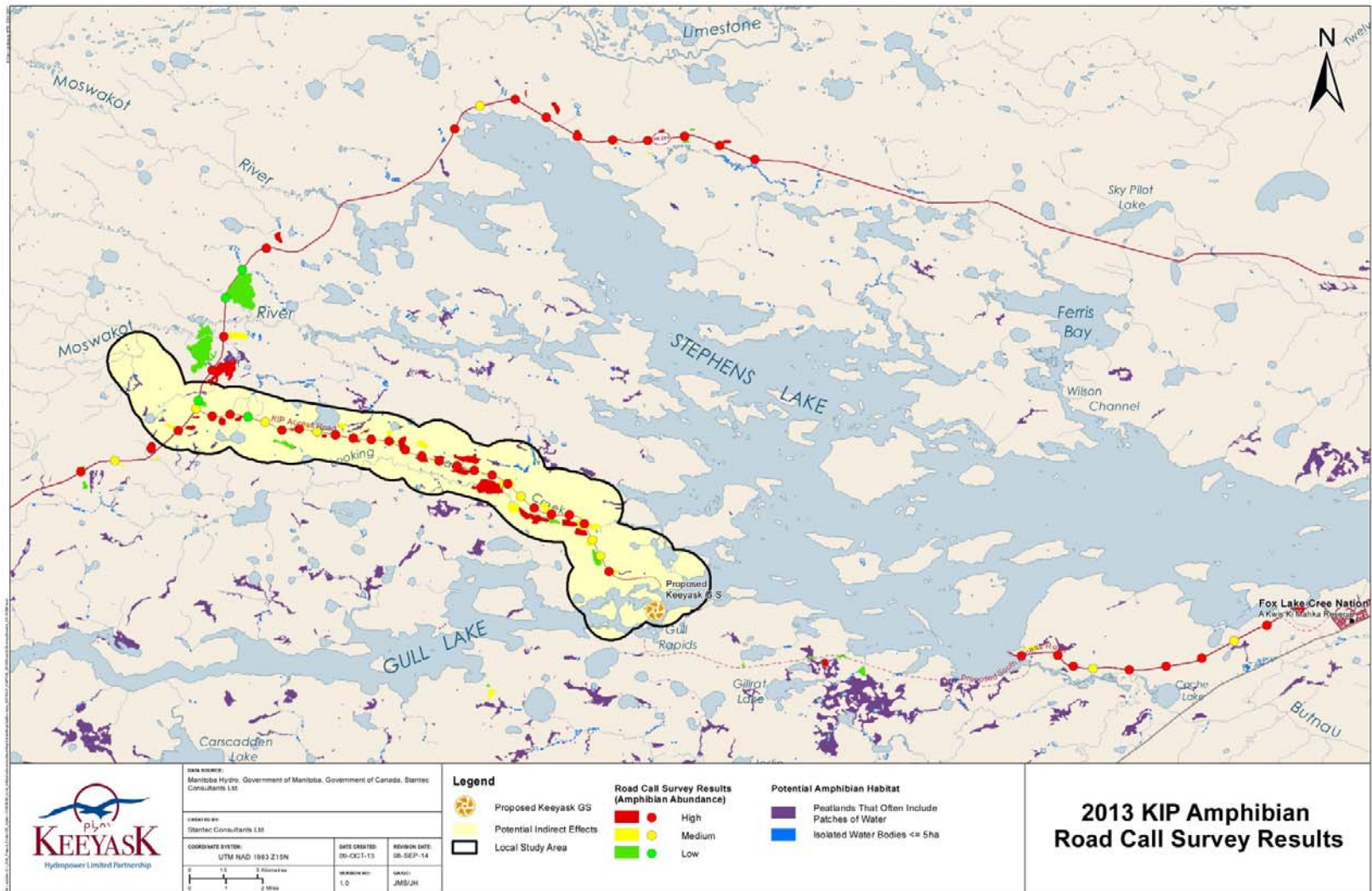
None No amphibian calls observed during surveys.

Low Some amphibian calls observed (one species only and less than 20 individuals in total, code 2 or less).

Medium Significant¹ amphibian calls observed (at least two species or more than 20 individuals total, code 3).

High Full chorus of multiple species observed.

¹ Significant according to the MNR's Eco region 6E Criteria (MNR, 2011)



Map 3-1: 2013 KIP Amphibian Road Call Survey Results

3.2 WETLAND SURVEY RESULTS

Amphibians were observed at 37 of the 38 surveyed wetland sites (Appendix C, Table C-1; Map 3-2). The surveyed sites included 17 sites in areas that are affected by the access road (Table 3-3), as well as 21 reference sites. Results indicate that 44% of surveyed wetlands in the KIP area contain high abundances of amphibians, while 43% of the reference sites are areas of high amphibian abundance (Appendix D, Photo D-3). These results appear to indicate that amphibians are widespread and common in the Regional Study Area (Map 3-2).

When compared with monitoring surveys done in 2012, and baseline surveys done in 2011, the majority of the areas along the access road appear to still support both boreal chorus and wood frogs, even during ongoing construction (Table 3-4). From 2012 to 2013, only three sites experienced a decrease in frog abundance. Site 2 (KIPS2) was covered by the new roadbed, and thus is no longer suitable frog habitat; however habitat wetland located adjacent to this former site (Map 3-2) still supports high frog abundance. Site 5 (KIPS-ANT3) changed from high frog abundance to medium abundance. This may be due to the site's proximity to the access road, however more data is needed to confirm (Appendix D, Photo D-4).

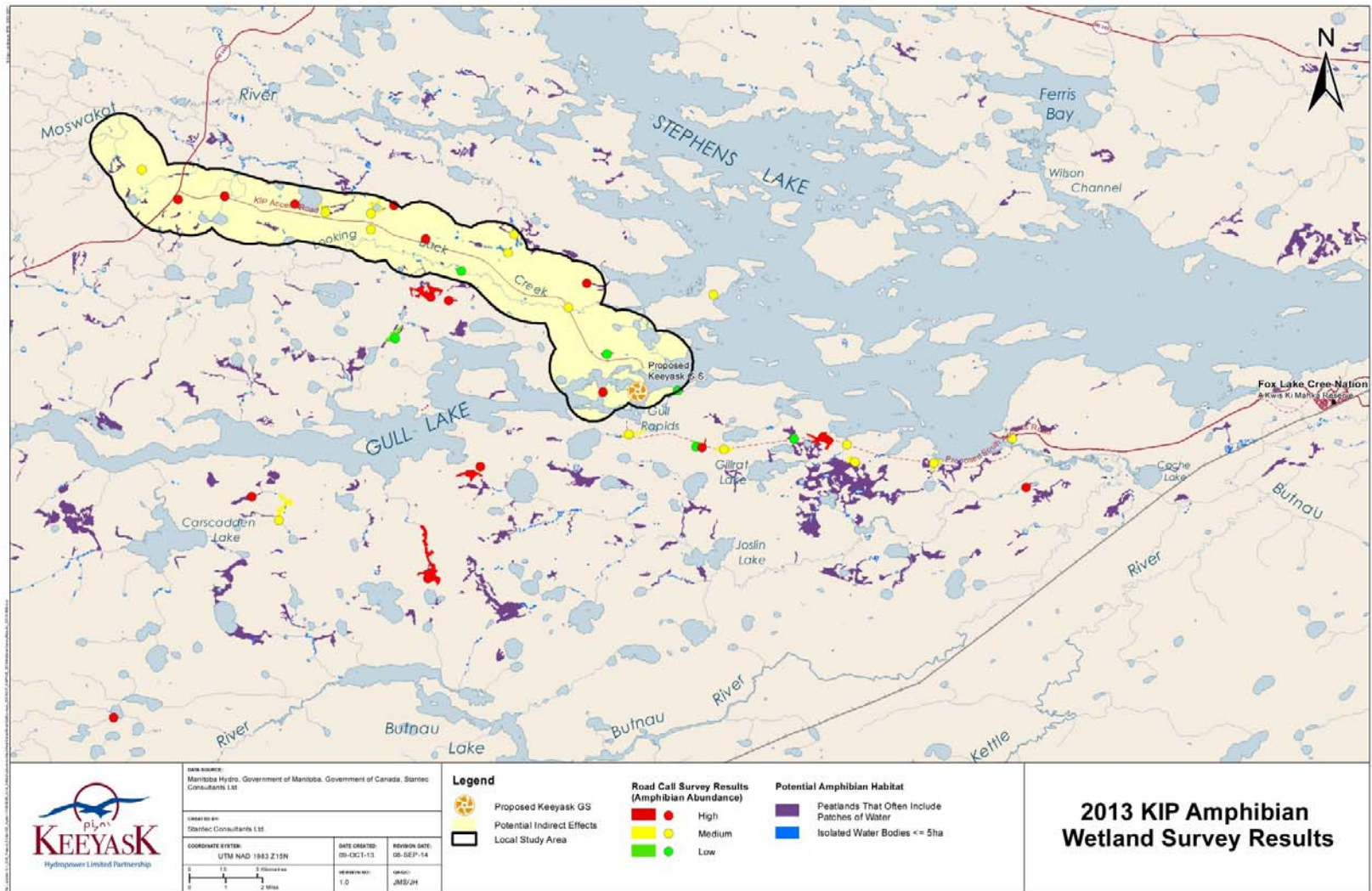
Wetland KIPS21 showed visible signs of habitat change, such as the close proximity to a borrow area and sedimentation in the water (Appendix D, Photo D-5 and D-6). It appeared that standing water from the borrow area was entering the wetland as a result of construction activities. No frogs were heard calling from Site 5 (KIPS21); however, frogs were heard calling from an adjacent wetland less than 50 m away. Water quality measurements will continue to be made at all sites in order to supplement frog monitoring surveys.

Table 3-3: Wetland Monitoring Survey Results, May 2013

Study Area	Number of Wetlands	Number of Wetlands with no Amphibians	Number of Stops with 1 Species Present	Number of Stops with 2 or more Species Present	Calling Code =3	Calling Code <3	Amphibian Abundance		
							Low (no amphibians or <2 Species AND Code <3)	Medium (2 or more Species OR Code =3)	High (2 or more Species AND Code =3)
KIP	17	1	5	11	10	6	7	2	7
Reference Sites	21	0	7	14	12	9	7	5	9
<p>*Rank Description:</p> <p>None No amphibian calls recorded during surveys.</p> <p>Low Some amphibian calls recorded (one species only and less than 20 individuals in total, code 2 or less).</p> <p>Medium Significant¹ amphibian calls observed (at least two species or more than 20 individuals total, code 3).</p> <p>High Full chorus of multiple species observed.</p> <p>¹ Significant according to the MNR's Ecoregion 6E Criteria (MNR, 2011)</p>									

Table 3-4: Results of Annual Monitoring of Amphibian Abundance

Site Name	Amphibian Abundance Rank		Corresponding Site Name	Amphibian Abundance Rank
	2011	2012		2013
Site 1	NA	Medium	KIPS21	None (site affected by sedimentation)
Site 2	High	High	KIPS2	None (site removed by construction)
Site 3	Medium	Medium	KIPS3	High
Site 4	Low	Medium	KIPS4	Medium
Site 5	NA	High	KIPS-ANT3	Medium
Site 6	Medium	High	KIPS6	High
Site 7	NA	Medium	KIPS9	Medium
Site 8	Low	Low	KIPS17	Medium



Map 3-2: 2013 KIP Amphibian Wetland Survey Results

3.3 INCIDENTALS

A number of frog observations were noted in late spring during remote recorder sampling for species at risk (Appendix E, Table E-1). These observations indicate that some breeding activity does continue into late spring; however a comparison of calling codes between June and May confirms that the bulk of amphibian breeding occurs in late May. Instead, late season observations of frogs in the RSA tended to be limited to visual identifications of wood frogs dispersing or foraging in upland areas (Appendix D, Photo D-7).

3.4 SPECIES AT RISK

Between 2001 and 2013, no amphibian species that are considered at risk as defined by COSEWIC, SARA Schedule 1 and/or *Manitoba Endangered Species and Ecosystems Act* (MESEA), have been identified in the KIP LSA. However, northern leopard frog (Species of Special Concern, SARA Schedule 1) may utilize the larger RSA. Aboriginal traditional knowledge indicates that northern leopard frogs were once common within the RSA, but have not been observed for several decades (Beardy pers. comm. 2006).

4.0 CONCLUSIONS

Results from the 2013 amphibian monitoring studies indicate that boreal chorus frogs and wood frogs continue to be widely dispersed throughout the KIP LSA. Construction activity did not appear to have any measureable effect on frog occupancy of the majority of wetlands located adjacent to construction areas.

Development of the KIP access road has resulted in the infilling or sedimentation of at least two former wetlands, KIPS2 and KIPS21 (Appendix D, Photo D-5 and D-6). The quality of some wetlands has been decreased due to erosion and sedimentation, airborne dust, increased traffic levels, and removal of vegetation (Appendix D, Photos D-5 and D-8). Besides the permanent loss of habitat within the KIP footprint, these effects should be temporary and limited to the construction phase of the Project.

Wetlands located in areas away from the access road do not appear to be affected by construction activities.

Monitoring of affected areas and comparison of these areas to baseline data and reference areas will continue as the Project construction progresses.

5.0 REFERENCES

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5.2 PERSONAL COMMUNICATIONS

Beardy, Stanley. First Nations Guide, Fox Lake Cree Nation. Conversation with Angèle Watrin Prodaehl, Stantec Consultants, Gillam area, Manitoba, June 7, 2006.

APPENDIX A GLOSSARY

Bog – wetland ecosystem characterized by an accumulation of peat, acid conditions, and a plant community dominated by sphagnum moss.

Habitat – the place where a plant or animal lives; often related to a function such as feeding, nesting, etc.

pH- A measure of the acidity or alkalinity of a liquid, numerically equal to 7 for neutral solutions, increasing with increasing alkalinity and decreasing with increasing acidity. The pH scale commonly in use ranges from 0 to 14.

Riparian area – the area along a watercourse or around a lake or pond.

ROW – a “right-of-way,” the strip of land through which roadways, railroads, or power lines are built, operated and maintained.

Special Concern – a wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

Threatened – a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

TDS (Total Dissolved Solids) – A measure of the amount of material dissolved in liquid, essentially measuring the clarity and purity of the liquid.

APPENDIX B

ROAD SURVEY DATA

Table B-1: Results of Evening Road Call Counts				
Date	Time of Day	Stop Location	Species	Calling Code
KIP Access Road				
May 25 2013	Evening	KIPFRNRD1_1	Boreal Chorus Frog	2
			Wood Frog	1
May 25 2013	Evening	KIPFRNRD1_10	Boreal Chorus Frog	2
			Boreal Chorus Frog	3
			Wood Frog	3
May 26 2013	Evening	KIPFRNRD1_11	Boreal Chorus Frog	3
			Wood Frog	3
May 26 2013	Evening	KIPFRNRD1_12	Boreal Chorus Frog	3
			Wood Frog	1
May 26 2013	Evening	KIPFRNRD1_13	Boreal Chorus Frog	3
			Wood Frog	3
May 26 2013	Evening	KIPFRNRD1_14	Boreal Chorus Frog	3
			Wood Frog	1
May 26 2013	Evening	KIPFRNRD1_15	Boreal Chorus Frog	3
			Wood Frog	3
May 26 2013	Evening	KIPFRNRD1_16	Boreal Chorus Frog	1
			Boreal Chorus Frog	3
			Wood Frog	2
			Wood Frog	3
May 26 2013	Evening	KIPFRNRD1_17	Boreal Chorus Frog	3
			Wood Frog	2
May 26 2013	Evening	KIPFRNRD1_18	Boreal Chorus Frog	3
			BOCH	2
			Wood Frog	1
May 26 2013	Evening	KIPFRNRD1_19	Boreal Chorus Frog	3
			Wood Frog	1
			Wood Frog	3
May 25 2013	Evening	KIPFRNRD1_2	Boreal Chorus Frog	1
			Wood Frog	1

Table B-1: Results of Evening Road Call Counts				
			Wood Frog	3
May 26 2013	Evening	KIPFRNRD1_20	Wood Frog	3
May 26 2013	Evening	KIPFRNRD1_21	Boreal Chorus Frog	3
			Wood Frog	2
May 26 2013	Evening	KIPFRNRD1_22	Boreal Chorus Frog	3
			Wood Frog	2
May 26 2013	Evening	KIPFRNRD1_23	Boreal Chorus Frog	3
			Wood Frog	3
May 26 2013	Evening	KIPFRNRD1_24	Boreal Chorus Frog	2
			Wood Frog	3
May 26 2013	Evening	KIPFRNRD1_25	Boreal Chorus Frog	3
May 26 2013	Evening	KIPFRNRD1_26	Boreal Chorus Frog	2
			Wood Frog	1
May 26 2013	Evening	KIPFRNRD1_27	Boreal Chorus Frog	2
			Boreal Chorus Frog	3
			Wood Frog	1
May 25 2013	Evening	KIPFRNRD1_3	Boreal Chorus Frog	2
			Wood Frog	3
May 25 2013	Evening	KIPFRNRD1_4	Wood Frog	2
May 25 2013	Evening	KIPFRNRD1_5	Boreal Chorus Frog	1
			Wood Frog	1
			Wood Frog	2
May 25 2013	Evening	KIPFRNRD1_6	Boreal Chorus Frog	3
			Wood Frog	2
May 25 2013	Evening	KIPFRNRD1_7	Boreal Chorus Frog	2
			Boreal Chorus Frog	3
			Wood Frog	3
May 25 2013	Evening	KIPFRNRD1_8	Wood Frog	3
May 25 2013	Evening	KIPFRNRD1_9	Boreal Chorus Frog	2
			Wood Frog	1
			Wood Frog	3
Keyask Butnau Road				
May 27 2013	Afternoon	KSACFRRD_1	Boreal Chorus Frog	3

Table B-1: Results of Evening Road Call Counts				
May 27 2013	Afternoon	KSACFRRD_2	Boreal Chorus Frog	3
May 27 2013	Afternoon	KSACFRRD_3	Boreal Chorus Frog	2
May 27 2013	Afternoon	KSACFRRD_4	Boreal Chorus Frog	2
May 27 2013	Afternoon	KSACFRRD_5	Boreal Chorus Frog	2
May 27 2013	Afternoon	KSACFRRD_6	Boreal Chorus Frog	2
May 27 2013	Afternoon	KSACFRRD_7	Boreal Chorus Frog	2
May 27 2013	Afternoon	KSACFRRD_8	Boreal Chorus Frog	3
May 27 2013	Afternoon	KSACFRRD_9	Boreal Chorus Frog	3
May 27 2013	Afternoon	KSACFRRD_10	Boreal Chorus Frog	3
May 27 2013	Evening	KSACFRRD_1	Boreal Chorus Frog	3
			Wood Frog	2
			Boreal Chorus Frog	3
May 27 2013	Evening	KSACFRRD_2	Boreal Chorus Frog	3
			Wood Frog	2
			Boreal Chorus Frog	3
May 27 2013	Evening	KSACFRRD_3	Wood Frog	2
			Boreal Chorus Frog	3
			Boreal Chorus Frog	3
			Wood Frog	1
May 27 2013	Evening	KSACFRRD_4	Boreal Chorus Frog	3
May 27 2013	Evening	KSACFRRD_5	Wood Frog	2
			Boreal Chorus Frog	3
May 27 2013	Evening	KSACFRRD_6	Boreal Chorus Frog	3
			Wood Frog	2
			Wood Frog	2
May 27 2013	Evening	KSACFRRD_7	Boreal Chorus Frog	3
			Wood Frog	3
			Wood Frog	2
May 27 2013	Evening	KSACFRRD_8	Boreal Chorus Frog	3
May 27 2013	Evening	KSACFRRD_9	Boreal Chorus Frog	3
			Wood Frog	3
			Boreal Chorus Frog	3
May 27 2013	Evening	KSACFRRD_10	Wood Frog	3

Table B-1: Results of Evening Road Call Counts				
			Boreal Chorus Frog	3
Provincial Road 280				
May 24 2013	Evening	PR280FR_T	Wood Frog	1
			Boreal Chorus Frog	1
			Wood Frog	3
May 24 2013	Evening	PR280FR_S	Wood Frog	1
			Boreal Chorus Frog	2
			Boreal Chorus Frog	1
			Wood Frog	1
May 24 2013	Evening	PR280FR_R	Wood Frog	1
			Boreal Chorus Frog	3
			Boreal Chorus Frog	1
			Wood Frog	3
May 24 2013	Evening	PR280FR_Q	Boreal Chorus Frog	3
			Wood Frog	2
			Wood Frog	3
			Wood Frog	2
			Boreal Chorus Frog	2
May 24 2013	Evening	PR280FR_P	-	-
May 24 2013	Evening	PR280FR_O	Boreal Chorus Frog	3
			Wood Frog	3
			Boreal Chorus Frog	2
May 24 2013	Evening	PR280FR_N	Boreal Chorus Frog	1
			Boreal Chorus Frog	3
			Wood Frog	3
May 24 2013	Evening	PR280FR_M	Boreal Chorus Frog	2
May 24 2013	Evening	PR280FR_L	-	-
May 24 2013	Evening	PR280FR_K	Wood Frog	1
			Boreal Chorus Frog	3
May 24 2013	Evening	PR280FR_J	Boreal Chorus Frog	3
			Wood Frog	3
May 24 2013	Evening	PR280FR_I	Boreal Chorus Frog	2
			Boreal Chorus Frog	1

Table B-1: Results of Evening Road Call Counts				
			Wood Frog	1
May 24 2013	Evening	PR280FR_H	Wood Frog	2
			Boreal Chorus Frog	3
May 24 2013	Evening	PR280FR_G	Boreal Chorus Frog	3
			Wood Frog	2
May 24 2013	Evening	PR280FR_F	Boreal Chorus Frog	3
			Wood Frog	2
May 24 2013	Evening	PR280FR_E	Boreal Chorus Frog	2
			Wood Frog	3
May 24 2013	Evening	PR280FR_D	Wood Frog	1
			Boreal Chorus Frog	1
			Boreal Chorus Frog	3
May 24 2013	Evening	PR280FR_C	Wood Frog	2
			Boreal Chorus Frog	2
			Wood Frog	3
May 24 2013	Evening	PR280FR_B	Wood Frog	3
			Boreal Chorus Frog	3
May 24 2013	Evening	PR280FR_A	Boreal Chorus Frog	3
			Wood Frog	1

APPENDIX C WETLAND SURVEY DATA

Table C-1: Wetland Survey Data

Date	Location Description. (i.e., pond, ditch)	Wpt	Easting	Northing	Amphibian presence? (Describe)	Code	Habitat Description							
							Water Depth (cm)	Temp (°C)	TDS (µS)	pH	Submergent Vegetation	Emergent Vegetation	Margin	Upland
24-May-13	wetland	KIPFRS_KIP_21	341787	6256181	-	-	<100	15.3	168	7.3	flooded grasses	dead standing cattails	salix	5% birch, labtea, BS
24-May-13	wetland	KIPFRS_3	348546	6254656	Wood Frog	3	15	14.4	127	7.85	grasses	grasses willow	willow, BS	BS
24-May-13	wetland	KIPFRS_3	348546	6254656	Boreal Chorus Frog	1	15	14.4	127	7.85	grasses	grasses willow	willow, BS	BS
24-May-13	wetland	KIPFRS_4	349894	6254302	Wood Frog	3	50	11.5	301	7.5	flooded grasses	grasses	labtea, moss B	BS
24-May-13	wetland	KIPFRS_5	351902	6254258	Wood Frog	1	30	10.9	27	7.11	none (moss)	none	grasses, willow upp	BS
24-May-13	wetland	KIPFRS_5	351902	6254258	Boreal Chorus Frog	2	30	10.9	27	7.11	none (moss)	none	grasses, willow upp	BS
24-May-13	wetland	KIPFRS_6	354301	6253126	Boreal Chorus Frog	3	30	14.2	139	7.93	flooded grasses & sedges	sedge grasses	birch, larch, willow	BS snags, some burnt upland ~100 m JP
26-May-13	wetland	KIPFRS_6	354301	6253126	Wood Frog	1	30	14.2	139	7.93	flooded grasses & sedges	sedge grasses	birch, larch, willow	BS snags, some burnt upland ~100 m JP
24-May-13	wetland	KIPFRS_7	355896	6251723	Boreal Chorus Frog	2	30	18.8	21	6.65	flooded grasses & moss	grasses	grasses, labtea, BS saplings(<10%)	standing dead BS snags
24-May-13	wetland	KGSFRS_2	355333	6250411	Wood Frog	3	200	19	10	4.72	none, murky	none	moss, bog rosemary	BS
24-May-13	wetland	KGSFRS_2	355333	6250411	Boreal Chorus Frog	2	200	19	10	4.72	none, murky	none	moss, bog rosemary	BS
24-May-13	wetland	KIPFRS_8	358211	6253348	Wood Frog	1	<200	15.5	161	6.94	flooded grasses	grasses BS snags	grasses	BS
24-May-13	wetland	KIPFRS_8	358211	6253348	Boreal Chorus Frog	1	<200	15.5	161	6.94	flooded grasses	grasses BS snags	grasses	BS
24-May-13	wetland	KIPFRS_9	357946	6252516	Wood Frog	2	40	17.2	52	7.41	flooded grasses	grasses, moss, willow		
24-May-13	wetland	KIPFRS_9	357946	6252516	Boreal Chorus Frog	2	40	17.2	52	7.41	flooded grasses	grasses, moss, willow	willow, grasses	TL, BS
24-May-13	wetland	KIPFRS_10	361434	6251184	Boreal Chorus Frog	3	30	10.3	5	6.95	flooded grasses	grasses, willow (<5%)bog rosemary	grasses, shrubs	BS snags & saplings
24-May-13	wetland	KIPFRS_10	361434	6251184	Wood Frog	1	30	10.3	5	6.95	flooded grasses	grasses, willow(<5%)bog rosemary	grasses, shrubs	BS snags & saplings
24-May-13	-	KIPFRS_A2	362314	6248049	-	-	50	-	-	-	grasses	grasses, sedge	Willow	T/90, BS/10
24-May-13	wetland	KIPFRS_A3	362139	6246377	Boreal Chorus Frog	3	<30	14	68	6.6	shrubs	Shrubs (buffberry?) labtea	shrubs	some BS<10%, shrubs
24-May-13	wetland	KIPFRS_A3	362139	6246377	Wood Frog	2	<30	14	68	6.6	shrubs	Shrubs (buffberry?) labtea	shrubs	some BS<10%, shrubs
24-May-13	(fen?) no open water	KSACFRS_A1	366258	6243970	Boreal Chorus Frog	1	-	-	-	-	-	-	-	-
24-May-13	-	KSACFRS_1(new)	366502	6243949	Boreal Chorus Frog	3	25	18.5	129	7.03	flooded grasses	grasses, willow, snags, labtea	willow	BS, TL(<10%)
24-May-13	-	KSACFRS_1(new)	366502	6243949	Wood Frog	1	25	18.5	129	7.03	flooded grasses	grasses, willow, snags, labtea	willow	BS, TL(<10%)
24-May-13	-	KSACFRS_2	367467	6243852	Boreal Chorus Frog	2	-	-	-	-	-	-	-	
24-May-13	-	KSACFRS_2	367467	6243852	Wood Frog	2	-	-	-	-	-	-	-	

Table C-1: Wetland Survey Data

Date	Location Description. (i.e., pond, ditch)	Wpt	Easting	Northing	Amphibian presence? (Describe)	Code	Habitat Description							
							Water Depth (cm)	Temp (°C)	TDS (µS)	pH	Submergent Vegetation	Emergent Vegetation	Margin	Upland
25-May-13	open water wetland	KIPFRS_A1(new)	352906	6254621	Wood Frog	3	100	20	79	7.2	grasses along edge, centre bare	open water, some grasses	Shrubby (leatherleaf) labtea, grasses	TL(<5%)BS
25-May-13	open water wetland	KIPFRS_A1(new)	352906	6254621	Boreal Chorus Frog	1	100	20	79	7.2	grasses along edge, centre bare	open water, some grasses	Shrubby (leatherleaf) labtea, grasses	TL(<5%)BS
25-May-13	quarry	KIPFRS_ANT3	351898	6253555	Boreal Chorus Frog	3	50	17.2	70	8.1	quarry	-	sand	BS & near???
25-May-13	little open water flooded grasses	KGSFRS_A7	354530	6250570	Wood Frog	3	30-100	16.4	50	8.03	flooded grasses	grasses	grasses, some willow(5%)	flooded BS & willow
25-May-13	little open water flooded grasses	KGSFRS_A7	354530	6250570	Boreal Chorus Frog	3	30-100	16.4	50	8.03	flooded grasses	grasses	grasses, some willow(5%)	flooded BS & willow
25-May-13	-	KGSFRS_A6	352968	6248741	Wood Frog	1	30	13.5	50	8.01	-	grasses, moss	shrubs	BS 100%
25-May-13	-	KGSFRS_A2(new)	346639	6241778	Boreal Chorus Frog	3	15	16.5	67	7.07	-	grasses	BS, grasses	BS, grasses, lichen, moss
25-May-13	-	KGSFRS_A2(new)	346639	6241778	Wood Frog	3	15	16.5	67	7.07	-	grasses	BS, grasses	BS, grasses, lichen, moss
25-May-13	wetland	KGSFRS_A1(new)	347833	6240749	Boreal Chorus Frog	1	15	15	68	7.8	flooded grasses & moss	grasses, BS snags(20%)	shrubs, grasses	BS
25-May-13	wetland	KGSFRS_A1(new)	347833	6240749	Wood Frog	1	15	15	68	7.8	flooded grasses & moss	grasses, BS snags(20%)	shrubs, grasses	BS
25-May-13	wetland	KGSFRS_AB22(new)	356729	6243090	Wood Frog	1	500	19.5	209	7.58	flooded grasses	grasses, shrubs, moss	BS snags, willow (old burn)	BS
25-May-13	wetland	KGSFRS_AB22(new)	356729	6243090	Boreal Chorus Frog	3	500	19.5	209	7.58	flooded grasses	grasses, shrubs, moss	BS snags, willow (old burn)	BS
25-May-13	wetland adj. to cutline	KSACFRS_1(new)	363272	6244520	Wood Frog	3	150	10.7	88	7.93	-	-	grasses, willow, snags	BS, TL
25-May-13	wetland	KGSFRS_1	365430	6246452	Wood Frog	2	50	14	158	7.72	flooded grasses	grasses	grasses, willow, snags	BS, TL
25-May-13	wetland on a cutline	KSACFRS_2	370580	6244332	Boreal Chorus Frog	2	30	18.8	16	6.4	flooded grasses & moss	grasses	grasses along cutline & shrubs	BS, TL(5%)
25-May-13	wetland	KSACFRS_A3	371848	6244392	Wood Frog	3	15	15	158	7	grasses	shrubs, grasses	shrubs	TL/90 BS/10
25-May-13	wetland	KSACFRS_A3	371848	6244392	Boreal Chorus Frog	1	15	15	158	7	grasses	shrubs, grasses	shrubs	TL/90 BS/10
25-May-13	wetland	KSACFRS_3	372905	6244074	Wood Frog	3	60	14.8	59	7.6	-	willow, lily	grasses, willow, snags	willow, birch, TL, BS(5%)
25-May-13	lots of emerg veg, no open water	KGSFRS_AST7	373271	6243305	Boreal Chorus Frog	1	<100	17.6	17	7.6	flooded grasses & moss	moss, shrubs, grasses	shrubs	BS & snags
25-May-13	lots of emerg veg, no open water	KGSFRS_AST7	373271	6243305	Wood Frog	2	<100	17.6	17	7.6	flooded grasses & moss	moss, shrubs, grasses	shrubs	BS & snags
25-May-13	beaver lodge, wetland & stream	KSACFRS_A4	376751	6243248	Wood Frog	1	200	17.9	279	7.25	-	-	shrubs, grasses	BS, TL(<5%)
25-May-13	beaver lodge, wetland & stream	KSACFRS_A4	376751	6243248	Boreal Chorus Frog	2	200	17.9	279	7.25	-	-	shrubs, grasses	BS, TL(<5%)
25-May-13	open water, wetland on	KGSFR_A4	367008	6250667	Boreal Chorus Frog	2	200	18.2	72	8	-	-	grasses	TL 5% snags BS

Table C-1: Wetland Survey Data														
Date	Location Description. (i.e., pond, ditch)	Wpt	Easting	Northing	Amphibian presence? (Describe)	Code	Habitat Description							
							Water Depth (cm)	Temp (°C)	TDS (µS)	pH	Submergent Vegetation	Emergent Vegetation	Margin	Upland
	peninsula													shrubs
25-May-13	open water, wetland on peninsula	KGSFR_A4	367008	6250667	Wood Frog	1	200	18.2	72	8	-	-	grasses	TL 5% snags BS shrubs
25-May-13	wetland bordered by 2 roads	KIPFRS_1	343380	6254862	Boreal Chorus Frog	3	50	16	161	8.12	flooded grasses	willow & grass	-	-
25-May-13	wetland bordered by 2 roads	KIPFRS_1	343380	6254862	Wood Frog	3	50	16	161	8.12	flooded grasses	willow & grass	-	-
26-May-13	flooded areas around lakes	KGSFR_8	340529	6232046	Boreal Chorus Frog	2	15	14.5	47	9	lake edges: flooded grasses	grasses	shrubs	BS TL(5%)
26-May-13	flooded areas around lakes	KGSFR_8	340529	6232046	Wood Frog	3	15	14.5	47	9	lake edges: flooded grasses	grasses	shrubs	BS TL(5%)
26-May-13	fen, some BS saplings~20%	KGSFR_9	354411	6238176	Boreal Chorus Frog	3	15	16.7	83	8.9	moss, flooded grasses	grasses, moss	shrubs	BS
26-May-13	fen, some BS saplings~20%	KGSFR_9	354411	6238176	Wood Frog	3	15	16.7	83	8.9	moss, flooded grasses	grasses, moss	shrubs	BS
26-May-13	open water	KSACFRS_A5	380815	6242191	Boreal Chorus Frog	3	200	16.6	36	8.5	moss & grasses	snags	shrubs	TL5% BS
26-May-13	open water	KSACFRS_A5	380815	6242191	Wood Frog	2	200	16.6	36	8.5	moss & grasses	snags	shrubs	TL5% BS
26-May-13	open water 200 m S of gravel pit	KSACFRS_CMP(new)	380203	6244352	Boreal Chorus Frog	3	>200	19	85	7.6	-	snags, open water	shrubs, willow, snags	birch TL BS
26-May-13	stream under a bridge & road	KIPFRS_KIP17	360622	6250121	Boreal Chorus Frog	3	>200	15.5	129	8.6	-	grasses	braided stream w/?? Spruce	mature treed banks
27-May-13	near Butnau stream road adjacent & thru cutline	KIPFRS_A2	362314	6248049	Boreal Chorus Frog	1	40	6.8	171	9.73	-	grasses	shrubs & grasses	BS willow
25-May-13	KIP Access road	KIPFRS2	345445	6255010	Wood Frog (from adjacent area)	3	-	-	-	-				new construction, wetland filled in
25-May-13	KIP Access road	KIPFRS2	345445	6255010	Boreal Chorus Frog (from adjacent area)	3	-	-	-	-				new construction, wetland filled in

APPENDIX D PHOTOGRAPHS



Photo D-1: Remote Recorder Unit Set-up



Photo D-2: Typical Roadside Amphibian Habitat



Photo D-3: Typical Surveyed Wetland



Photo D-4: Site 5 (KIPS-ANT3) Showing Close Proximity to Access Road



Photo D-5: Sedimentation of Wetland (KIPS21) Near Active Borrow Area



Photo D-6: KIPS21 Prior to Construction of KIP



Photo D-7: Foraging Wood Frog (late June 2013)



Photo D-8: Removal of Roadside Vegetation for the Development of a Borrow Area

APPENDIX E INCIDENTAL DATA

Table E-1: Incidental Frog Observations

Date	Time	Site	Project	Easting	Northing	Frog Species	Frog Code
17-Jun-13	22:00	G-025-13	KIP	367404	6247054	Boreal Chorus Frog	2
18-Jun-13	22:00	KGSR6-13	KGS	354718	6238600	Boreal Chorus Frog	1
18-Jun-13	23:00	KGSR6-13	KGS	354718	6238600	Boreal Chorus Frog	2
19-Jun-13	5:00	KGSR6-13	KGS	354718	6238600	Boreal Chorus Frog	2
19-Jun-13	23:00	KGSR6-13	KGS	354718	6238600	Boreal Chorus Frog	1
28-Jun-13	5:00	F-006	KIP	351965	6254326	Boreal Chorus Frog	2
23-Jun-13	22:00	KGSR_11A	KGS	350220	6262059	Boreal Chorus Frog	1
23-Jun-13	23:00	KGSR_11A	KGS	350220	6262059	Boreal Chorus Frog	1
24-Jun-13	0:00	KGSR_11A	KGS	350220	6262059	Boreal Chorus Frog	1
18-Jun-13	23:00	B-044-14	KGS	363123	6243972	Boreal Chorus Frog	2
19-Jun-13	0:00	B-044-14	KGS	363123	6243972	Boreal Chorus Frog	2
22-Jun-13	22:00	KGSR_2A	KGS	339986	6245660	Boreal Chorus Frog	1
22-Jun-13	23:00	KGSR_2A	KGS	339986	6245660	Boreal Chorus Frog	2
23-Jun-13	22:00	A-019	KIP	344925	6250534	Boreal Chorus Frog	2
23-Jun-13	23:00	A-019	KIP	344925	6250534	Boreal Chorus Frog	2
24-Jun-13	0:00	A-019	KIP	344925	6250534	Boreal Chorus Frog	3
18-Jun-13	23:00	F-110-13	KIP	366123	6243972	Boreal Chorus Frog	1
19-Jun-13	0:00	F-110-13	KIP	366123	6243972	Boreal Chorus Frog	2
19-Jun-13	0:00	KGSR5_13	KGS	359714	6237256	Boreal Chorus Frog and Wood Frog	2
22-Jun-13	23:00	B-109A	KIP	359635	6245023	Wood Frog	1
27-Jun-13	22:00	F-006	KIP	351965	6254326	Wood Frog	1
20-Jun-13	23:00	KGSR_16	KGS	361982	6242562	Wood Frog	1
26-Jun-13	5:00	KGSR_11A	KGS	350220	6262059	Wood Frog	1
28-Jun-13	22:00	D-001	KIP	353519	6254092	Wood Frog	1
21-Jun-13	6:00	KGSR_15	KGS	362746	6243648	Wood Frog	1
24-Jun-13	22:00	KIPRC_4	KIP	348940	6258679	Wood Frog	1
17-Jun-13	22:00	KGSR_10	KGS	blank	blank	Wood Frog and Boreal Chorus Frog	1

APPENDIX F

WEATHER CONDITIONS

Table F-1: Weather Observations During 2013 Surveys		
Date	Survey Type	Weather Range During Survey Period
May 25, 2013	Road Call	10-7°C; wind 1 (beaufort scale) from south; 60% cloud cover
May 26, 2013	Road Call	12-7°C; wind calm; 60% cloud cover
May 24, 2013	Road Call	4°C; wind 2 (beaufort scale); clear, full moon and aurora
May 27, 2013	Road Call (afternoon)	17°C; wind 2 (BF) from west; 50% cloud cover
May 27, 2013	Road Call (evening)	10°C; wind 4 (BF) from south; 90% cloud cover