Keeyask Generation Project

Terrestrial Effects Monitoring Plan

Muskrat Habitat Effects and Mortality Monitoring Report

TEMP-2019-14

KEEYASK

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KEEYASK GENERATION PROJECT

TERRESTRIAL EFFECTS MONITORING PLAN

REPORT #TEMP-2019-14

MUSKRAT HABITAT EFFECTS 2018

Prepared for

Manitoba Hydro

By

Wildlife Resource Consulting Services MB Inc.

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SUMMARY

Background

Construction of the Keeyask Generation Project (the Project) at Gull Rapids began in July 2014. The Keeyask Hydropower Limited Partnership (KHLP) was required to prepare a plan to monitor the effects of construction and operation of the generating station on the terrestrial environment. Monitoring results will help the KHLP, government regulators, members of local First Nation communities, and the general public understand how construction and operation of the generating station will affect the environment, and whether more needs to be done to reduce harmful effects.

This report describes the results of the first year of construction monitoring conducted for muskrat. The monitoring occurred during the spring of 2018, the fourth year of Project construction. Monitoring occurred along the shorelines of waterbodies in the Keeyask region.

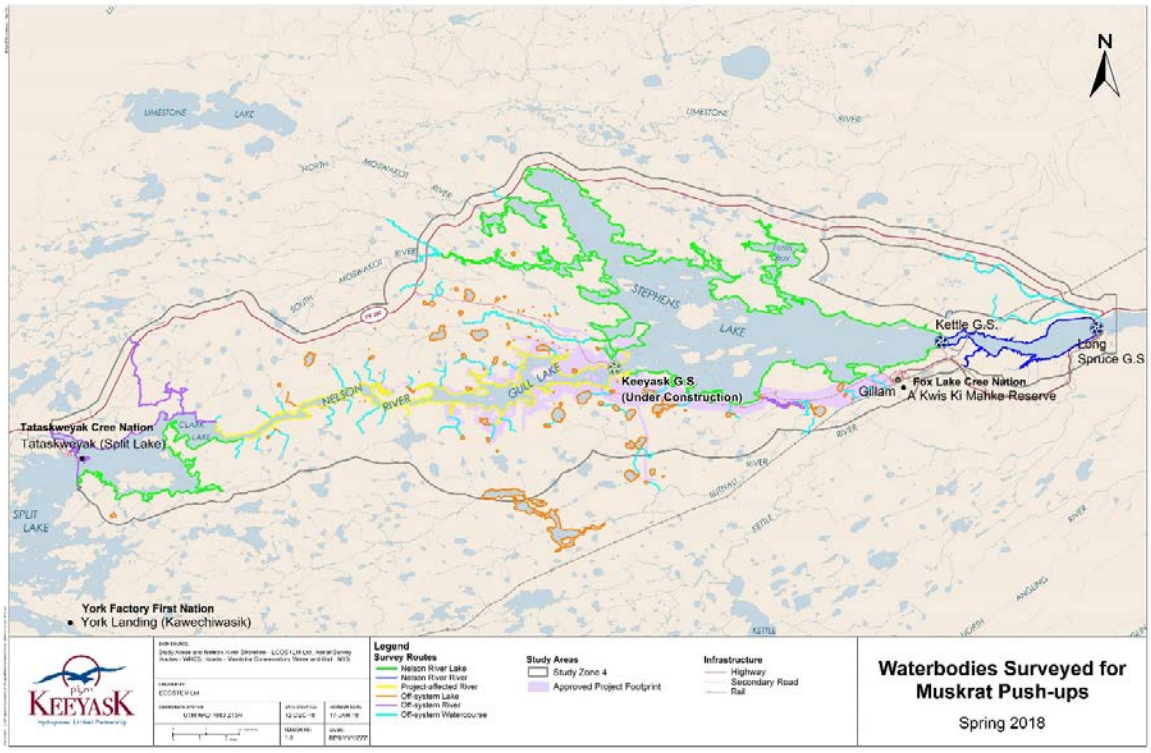
Why is the study being done?

Construction-related effects on muskrat include habitat loss or alteration and mortality due to reservoir impoundment. Muskrats have been and will continue to be humanely trapped by the registered trapper prior to reservoir impoundment, to prevent the potential for prolonged deaths from starvation and drowning. Along with beaver, which occupy similar habitat, the muskrat is an important furbearer in the Keeyask region. Due to the cultural, economic, and ecological significance of beaver and muskrat, a monitoring program was developed to quantify the loss and alteration of habitat in the Keeyask region and to record the removal of individuals humanely trapped prior to reservoir impoundment.

What was done?

Helicopter surveys for muskrat push-ups were conducted from April 30 to May 2, 2018 in Study Zone 4 (see map below). Two observers and a helicopter pilot searched the shorelines of the Nelson River from the eastern portion of Split Lake to the Long Spruce Generating Station and the shorelines of nearby waterways and waterbodies. Observations of muskrat push-ups were recorded.

Muskrats trapped by the Project-based trapping program in winter 2016/17 and 2017/18 were recorded.



What was found?

One hundred and five muskrat push-ups were observed at forty locations during the 2018 aerial survey. The number of push-ups per location ranged from 1 to 10. Five push-ups were found at a single location in the future reservoir area north of Gull Lake and 15 were found within 1 km of the north or south access roads.

Muskrat Push-up, Spring 2018

Aerial surveys for muskrat push-ups were conducted in the Keeyask region in spring 2001, 2003, and 2006 for the Project's environmental impact assessment. The total density of muskrat push-ups was lower in 2018 than in all previous survey years, having decreased 55% from 2006 to 2018.

One muskrat was trapped by the registered trapper along a watercourse north of Gull Lake in February 2018. Five muskrats were harvested in February 2019.

What does it mean?

There appears to be little suitable habitat for muskrat in the Project footprint (the area expected to be directly affected by the Project), given how few push-ups were observed during the aerial survey in spring 2018. While there was little habitat for muskrat in the Project footprint prior to construction, clearing in the future reservoir area has likely further reduced the amount available. More muskrats will likely be trapped out of the Project footprint in the future, to prevent the potential for prolonged deaths from starvation and drowning. The density of muskrat push-ups observed in the Keeyask region was lower in 2018 than in 2001, 2003, and 2006, which could indicate that the population is smaller. However, the decrease is unlikely due only to the Project, as the amount of suitable habitat in the Project footprint was limited before construction began, as described in the EIS.

What will be done next?

Muskrat monitoring that began in 2018 will continue for one more year before the reservoir is impounded.

STUDY TEAM

We would like to thank Sherrie Mason and Rachel Boone of Manitoba Hydro and Ron Bretecher of North/South Consultants Inc. for logistical assistance in the field. We would also like to thank James Ehnes of ECOSTEM Ltd. for GIS support and mapping. Trapper Jonathan Saunders and his assistants Mark Saunders and Anthony Jacobs are acknowledged for their removal of muskrats from the future Keeyask reservoir area. Biologists and other personnel who designed, participated in, and drafted the survey results included:

- Robert Berger (M.N.R.M) – Design and reporting
- Andrea Ambrose (B.Sc.) – Reporting
- Kevin McRae (B. Env. St.) – Survey personnel
- Brendon Gogo (B. Env. Sc.) – Survey personnel

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1.0 INTRODUCTION

Construction of the Keeyask Generation Project (the Project), a 695-megawatt hydroelectric generating station (GS) and associated facilities, began in July 2014. The Project is located at Gull Rapids on the lower Nelson River in northern Manitoba where Gull Lake flows into Stephens Lake, 35 km upstream of the existing Kettle GS.

The *Keeyask Generation Project Response to EIS Guidelines* (the EIS), completed in June 2012, provides a summary of predicted effects and planned mitigation for the Project. Technical supporting information for the terrestrial environment, including a description of the environmental setting, effects and mitigation, and a summary of proposed monitoring and follow-up programs is provided in the *Keeyask Generation Project Environmental Impact Statement Terrestrial Supporting Volume* (TE SV). The *Keeyask Generation Project Terrestrial Effects Monitoring Plan* (TEMP) was developed as part of the licensing process for the Project. Monitoring activities for various components of the terrestrial environment were described, including the focus of this report, muskrat (*Ondatra zibethicus*), during the construction and operation phases.

The muskrat is a semi-aquatic mammal that requires a source of permanent water for habitat (Boutin and Birkenholz 1998; Erb and Perry 2003). In winter, muskrats construct push-ups by making a hole in the ice and pushing aquatic vegetation up through it, forming a pile of debris that is used as a feeding area and resting site (Erb and Perry 2003). Push-ups, which are temporary structures that collapse into the water when the ice melts, can be counted in late winter for an indication of the abundance of muskrat and their use of habitat in an area (Boutin and Birkenholz 1998).

Along with beaver (*Castor canadensis*), which occupy similar habitat, the muskrat is an important furbearer in the Keeyask region. Predicted Project effects on these species include habitat loss or alteration and mortality due to reservoir impoundment. Individuals have been and will continue to be humanely trapped by a registered trapper prior to reservoir impoundment, to prevent the potential for prolonged death from exposure and displacement. Due to the cultural, economic, and ecological significance of beaver and muskrat, a monitoring program, as outlined in Section 6.4 of the TEMP, was developed to quantify the loss or alteration of habitat in the Keeyask region and to record the removal of individuals humanely trapped prior to reservoir impoundment.

2.0 METHODS

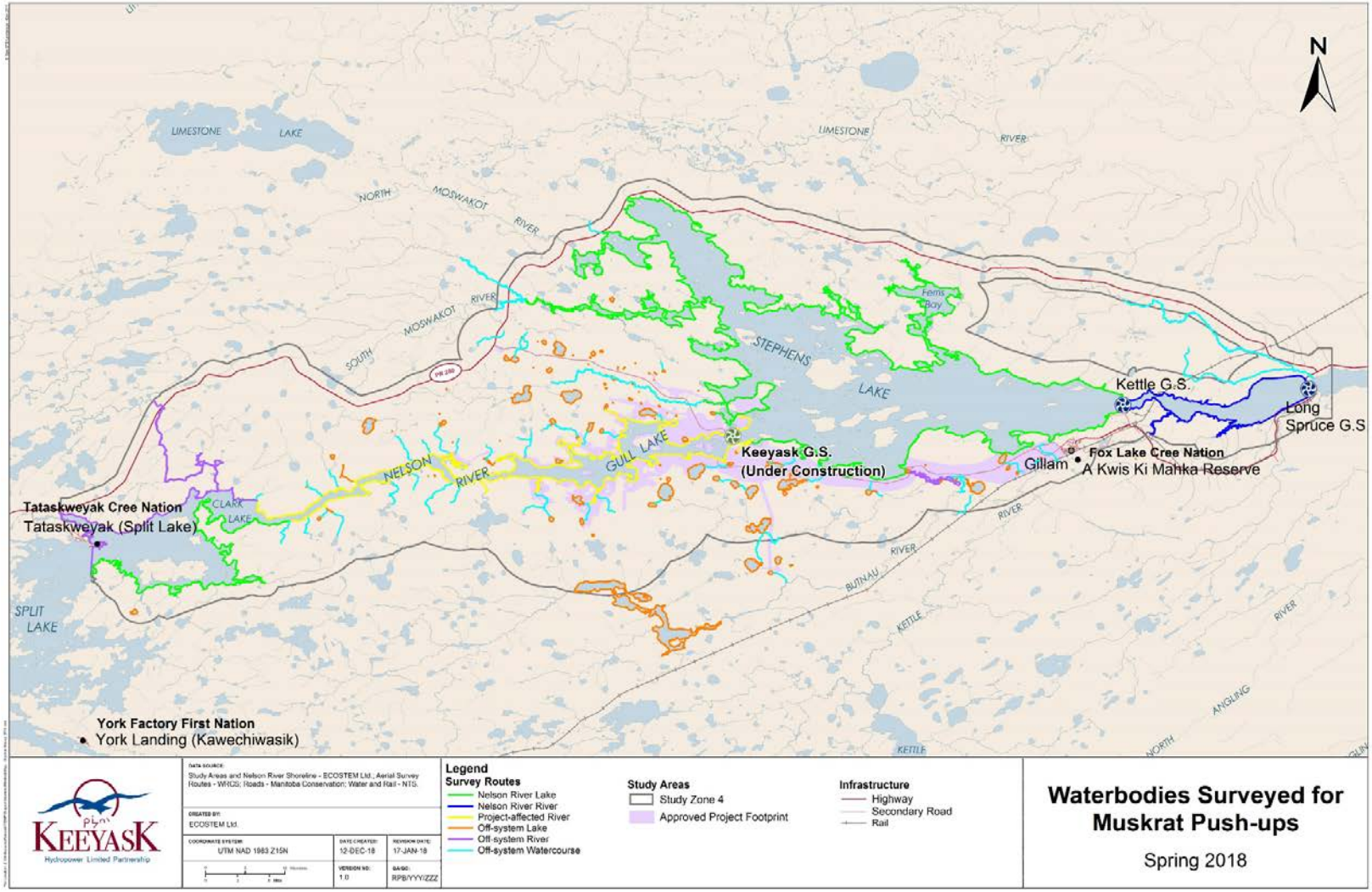
An aerial survey for muskrat push-ups was conducted from April 30 to May 2, 2018 in Study Zone 4 (Map 1). Pre-selected survey routes were flown in a Bell 206 Jet Ranger helicopter. Two observers and a pilot searched the shorelines of the Nelson River from the eastern portion of Split Lake to Long Spruce GS and the shorelines of nearby waterways and waterbodies. The survey was conducted at a speed of approximately 100 kilometres per hour and at roughly 50 metres above ground level. Observers positioned on either side of the helicopter recorded observations of muskrat push-ups (Photo 1) and marked their locations with a handheld Global Positioning System (GPS) unit.

Photo 1: Three Muskrat Push-ups on a Small Lake North of Gull Lake, Spring 2018

Waterbodies were first grouped by hydraulic zone and classified as Project-affected (to be directly affected by the Project and also influenced by existing hydroelectric developments), Nelson River (influenced by existing hydroelectric developments), or off-system (unaffected by the Project or existing hydroelectric development). They were then categorized as lake, river, or watercourse (Table 1). Lakes were defined as non-linear waterbodies with minimal water flow; rivers as large, linear waterbodies with flow; and watercourses as narrow, linear waterbodies with flow (creeks and streams). A total of 1,221 km was surveyed, most of which was on Gull and Stephens lakes (both characterized as a "Nelson River lake"). The density of push-ups on each type of waterbody was calculated as the number of push-ups observed per kilometre surveyed.

Table 1: Shoreline Lengths of Waterbodies Surveyed, Spring 2018

Hydraulic Zone	Waterbody Type	Total Survey Length (km)
Project-affected	River	176
Nelson River	Lake	491
	River	62
Off-system	Lake	211
	River	97
	Watercourse	185



Map 1: Waterbodies Surveyed for Muskrat Push-ups, Spring 2018

3.0 RESULTS

One hundred and five muskrat push-ups were observed at 40 locations during the aerial survey in spring 2018 (Map 2). The number of push-ups per location ranged from 1 to 10 (Appendix 1). One push-up was in an unknown habitat type, as its location was not associated with a waterbody. Most (85%) of the push-ups were observed on off-system lakes, where their density was considerably greater than on other types of waterbodies (Table 2). Eight push-ups were found on Nelson River lakes, all at one location on Split Lake. The single push-up observed on the Nelson River ("Nelson River river") was near the mouth of Boots Creek, upstream of the Long Spruce GS. Five push-ups were found at a single location in the Project footprint (the area expected to be directly affected by the Project), north of Gull Lake. Fifteen (14%) muskrat push-ups were observed less than 1 km from the north or south access roads (identified as secondary roads in Map 2).

Table 2: Muskrat Push-ups Observed during the Aerial Survey, Spring 2018

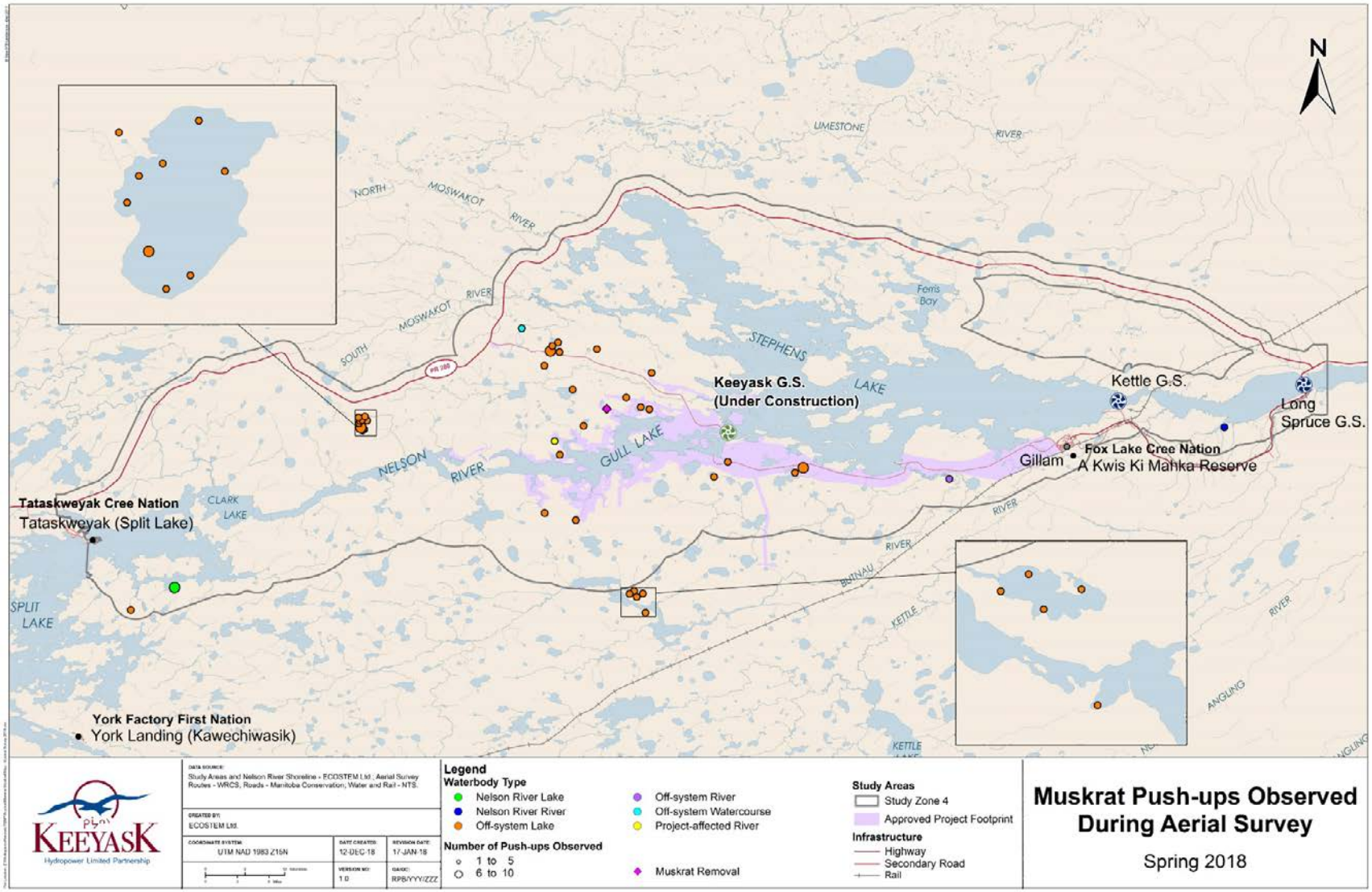
Hydraulic Zone	Waterbody Type	Number	Density (push-ups/km)
Project-affected	River	5	0.03
Nelson River	Lake	8	0.02
	River	1	0.02
Off-system	Lake	88	0.42
	River	1	0.01
	Watercourse	1	0.01

Aerial surveys for muskrat were conducted in the Keeyask region in spring 2001, 2003, and 2006 for the Project's environmental assessment. Total muskrat push-up density ranged from 0.14/km in 2001 to 0.22/km in 2006 and was greatest on watercourses in all survey years (Table 3). In all waterbody types, push-up density increased from 2001 to 2003 and then decreased in 2006. The total density of muskrat push-ups was lower in 2018 than in all previous survey years, having decreased 55% from 2006 to 2018. In 2018, push-up density was within the range observed in the earlier years on lakes but was lower on rivers and considerably lower on watercourses.

One muskrat was trapped along a watercourse north of Gull Lake during the Project-based trapping program in February 2018 (Wildlife Resource Consulting Services MB Inc. 2018; see Map 2). Five muskrats were removed in February 2019.

Table 3: Density of Muskrat Push-ups in the Keeyask Region, Spring 2001, 2003, 2006, and 2018

	Density of Push-ups (number/km)			
Waterbody Type	**2001**	**2003**	**2006**	**2018**
Lake	0.15	0.17	0.12	0.14
River	0.06	0.11	0.04	0.02
Watercourse	0.22	0.38	0.34	0.01
Total	0.14	0.22	0.20	0.09



Map 2: Muskrat Push-ups Observed during Aerial Survey, Spring 2018

4.0 DISCUSSION

Clearing in the future reservoir area during the winters of 2015/16, 2016/17 and 2017/18 has resulted in the loss of some muskrat habitat. Of the 105 muskrat push-ups observed, only 5, found at a single location, were in the future reservoir area. Fifteen push-ups were located less than 1 km from the north or south access roads. These animals are unlikely to be affected by the Project. More muskrats will likely have to be humanely trapped in the future reservoir area, to prevent the potential for death from prolonged exposure and displacement following impoundment. A single muskrat was trapped in the future reservoir area in the winter of 2017–18; no push-ups were observed at that location during the aerial survey in spring.

Little muskrat activity was anticipated or observed on large, open waterbodies such as Clark, Gull, and Stephens lakes (characterized as "Nelson River lakes"). Muskrats typically inhabit smaller, shallower waterbodies and watercourses where there is limited wave action (Errington 1963 in Erb and Perry 2003). The push-ups identified on Split Lake were in a bay, where there is likely less wave action than in the main waterbody.

Muskrat density in the Keeyask region was lower in 2018 than in 2001, 2003, and 2006. This could be due in part to the timing of the 2018 survey; ice was melting on smaller waterbodies and watercourses when the survey was conducted, and push-ups that were collapsing or had sunk may not have been observed. The difference in push-up density could also be due to changes in the muskrat population between the early/mid-2000s and 2018. Muskrat populations are somewhat cyclical (Banfield 1987; Erb et al. 2000), and the lower density of push-ups in 2018 could be an indication of a population at or nearing the low phase of its cycle. As the amount of suitable habitat for beaver and muskrat in the Project footprint was limited prior to construction, the decrease is likely not primarily attributable to Project-related habitat loss.

5.0 SUMMARY AND CONCLUSIONS

There appears to be little suitable habitat for muskrat in the Project footprint, given how few push-ups were observed during the aerial survey in spring 2018. While there was little habitat for muskrat in the Project footprint prior to construction, clearing in the future reservoir area has likely further reduced the amount available. More muskrats will likely have to be trapped out of the future reservoir area prior to impoundment, to prevent the potential for prolonged exposure and displacement death.

The density of muskrat push-ups was lower in the Keeyask region in 2018 than in 2001, 2003, and 2006, which could indicate that the population is smaller. However, the decrease is unlikely due only to the Project, as the amount of suitable habitat in the Project footprint was limited before construction began, as described in the EIS. Monitoring that began in 2018 will continue for at least one more year during Project construction to establish a baseline before the reservoir is impounded.

6.0 LITERATURE CITED

Banfield, A.F.W. 1987. The Mammals of Canada. University of Toronto Press, Toronto, ON.

Boutin, S. and Birkenholz, D.E. 1998. Muskrats. In Wildlife Furbearer Management and Conservation in North America. Edited by M. Novak, J.A. Baker, M.E. Obbard, and B. Malloch. Ontario Ministry of Natural Resources, Peterborough, ON. pp. 314–325.

Erb, J. and Perry, H.R. Jr. 2003. Muskrats. In Wild Mammals of North America Biology, Management, and Conservation Second Edition. Edited by G.A. Feldhamer, B.C. Thompson, and J.A. Chapman. The Johns Hopkins University Press, Baltimore, MD. pp. 311–348.

Erb, J., Stenseth, N.C., and Boyce, M.S. 2000. Geographic variation in population cycles of Canadian muskrats (*Ondatra zibethicus*). Canadian Journal of Zoology 78: 1009–1016 pp.

Wildlife Resource Consulting Services MB Inc. 2018. Keeyask Generation Project Terrestrial Effects Monitoring Plan Report #TEMP-2018-19: Beaver Habitat Effects and Mortality 2016 to 2018. Prepared for Manitoba Hydro by Wildlife Resource Consulting Services MB Inc., Winnipeg, MB. 25 pp.

APPENDIX 1:
MUSKRAT PUSH-UPS OBSERVED IN STUDY ZONE 4, SPRING 2018

System	Waterbody Type	Location	Number of Push-ups
Project-affected	River	15V 349149 6246535	5
Nelson River	Lake	15V 315551 6233613	8
	River	15V 408388 6247769	1
Off-system	Lake	14V 83960 6231398	2
		15V 331798 6248635	1
		15V 331858 6248124	2
		15V 331944 6248319	1
		15V 332016 6247770	10
		15V 332118 6248408	3
		15V 332143 6247496	1
		15V 332318 6247594	4
		15V 332380 6248721	2
		15V 332569 6248352	5
		15V 348241 6253213	1
		15V 348270 6240175	1
		15V 348780 6254525	7
		15V 348955 6254960	5
		15V 349455 6255275	1
		15V 349581 6254419	3
		15V 349608 6245325	2
		15V 350737 6251092	2
		15V 351025 6239546	5
		15V 351714 6247884	2
		15V 352888 6254679	1
		15V 355486 6250396	1
		15V 355777 6233021	2
		15V 356184 6233274	2
		15V 356405 6232760	3
		15V 356771 6249545	5
		15V 356955 6233050	1
		15V 357190 6231360	2
		15V 357534 6249354	1
		15V 357727 6252539	1
		15V 363249 6243369	1
		15V 364466 6244699	1
		15V 370413 6243740	1
		15V 371148 6244191	6
	River	15V 384064 6243191	1
	Watercourse	15V 346243 6256511	1
Unknown	Unknown	15V 356641 6250841	1