Keeyask Generation Project

Aquatic Effects Monitoring Plan

Lake Whitefish Movement Monitoring Memo

AEMP-2015-08

Manitoba Hydro

KEEYASK

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KEEYASK GENERATION PROJECT

AQUATIC EFFECTS MONITORING MEMORANDUM

Report #AEMP–2015–08

Lake Whitefish Movement Monitoring 2014: Preliminary Results: Year 1 Construction

Prepared for

Manitoba Hydro

by

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1.0 INTRODUCTION

Construction of the Keeyask Generation Project (the Project), a 695 megawatt hydroelectric generating station 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 Generating Station.

The *Keeyask Generation Project: Response to EIS Guidelines*, completed in June 2012, provides a summary of predicted effects and planned mitigation for the Project. Technical supporting information for the aquatic 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: Aquatic Environment Supporting Volume* (AE SV). As part of the licencing process for the Project, an Aquatic Effects Monitoring Plan (AEMP) was developed detailing the monitoring activities of various components of the aquatic environment including the focus of this memorandum, Lake Whitefish movements, for the construction and operation phases of the Project.

Information about movements of VEC fish species (Lake Sturgeon, Walleye, Northern Pike, and Lake Whitefish) is important to understand the potential need for, and design of, effective fish passage at the Keeyask Generating Station (GS). Pre-construction (baseline) movements of Walleye, Northern Pike, and Lake Whitefish were monitored from 2001 to 2005 (Barth et al. 2003; Murray et al. 2005; Murray and Barth 2007). Long-term acoustic telemetry studies were initiated in 2011 to assess adult Lake Sturgeon movements in the Keeyask Study Area. In this study, 60 adult Lake Sturgeon were tagged with 10-year acoustic transmitters to monitor movements of the same individuals during the preconstruction, construction and operation phases of the Keeyask GS (the Project). In 2013, movement studies were expanded to subadult Lake Sturgeon and Walleye. In fall 2014, 60 Lake Whitefish were tagged acoustically, and their movements were monitored for the rest of the year. The results obtained between 25 September and 25 October, 2014, are reported herein.

Construction of the Project will affect Lake Whitefish movements in the main flow of the Nelson River near the construction site by blocking movements with placement of cofferdams, altering flow patterns, and causing disturbances (*e.g.,* blasting) that may increase emigration from the construction area. The broad objective of movement monitoring is to gain a better understanding of movements and habitat use in the Keeyask Study Area, with particular focus on movements in the vicinity of Gull Rapids, including, but not limited to, upstream and downstream passage.

Specific objectives of monitoring during construction are as follows:

- To quantify the number (or the proportion) of tagged Lake Whitefish that move past the construction site; and
- To determine if fish are utilizing habitat in the vicinity of construction activities (particularly during spawning).

Movements and habitat use of Lake Whitefish may be affected by operation of the Project, as a result of changes in the water regime (e.g., flooding, reduction in water velocity). Specific objectives of monitoring during operation are as follows:

- To determine what types of habitat Lake Whitefish are using in the Keeyask reservoir (i.e., are fish using the upper, middle, or lower end of the reservoir);
- To identify what proportion of the fish population moves from the Keeyask reservoir upstream past Birthday and/or Long rapids;
- To assess the frequency of downstream movement through the Keeyask GS, which size classes are moving downstream, and when are the movements occurring; and
- To determine where fish congregate in the fast water environment immediately below the Keeyask GS.

Construction of the Keeyask GS began in mid-July 2014, and altered flows in the north and central channels of Gull Rapids, diverting them into the south channel (Figure 1). Between 22 July and 4 August, 2014, flow in the north channel was cut off by construction of the Quarry Cofferdam. As construction continued, flow in the central channel of Gull Rapids was gradually cut off (construction of the North Channel Cofferdam began on 10 September and dewatering continued to the end of October, 2014). The Powerhouse Cofferdam was constructed at the downstream end of the north channel of Gull Rapids, and dewatered the remainder of the north channel between 2 and 26 October, 2014. During this time, the receiver at the downstream end of the north channel was removed. Blasting occurred in quarries situated in the north channel intermittently during July – October 2014.

2.0 METHODS

Lake Whitefish, measuring 372 – 565 mm fork length, were tagged with Vemco V13 acoustic transmitters (1141 day battery life) between 25 September and 8 October, 2014. Due to difficulty in capturing Lake Whitefish in Gull Lake, 20 Lake Whitefish were tagged upstream of Gull Rapids, and 40 were tagged downstream. Whitefish were captured using boat electrofishing to increase efficiency and decrease potential stress and mortality. All Lake Whitefish tagged upstream of the Keeyask GS construction site were captured immediately downstream of Birthday Rapids (five along the south shore, and 15 along the north shore), and were released in an off-current area, 32 rkm upstream of Gull Rapids (Figure 2). In Stephens Lake, fish were captured along the north shore, 0.5 to 1.3 rkm downstream of the Keeyask GS construction site. Tagged fish were released in a single off-current area on the north side (Figure 2). Each acoustically tagged Lake Whitefish was measured for fork length and weight, and marked with an external Floy-tag. Acoustic tags were applied through surgical implantation in the coelomic cavity as described in McDougall et al. (2013).

Movements of tagged Lake Whitefish were initially monitored with a stationary acoustic receiver array set throughout the reach of the Nelson River between Clark Lake and the Long Spruce GS (Figure 3). More specifically, 24 receivers were set between Clark Lake and Gull Rapids, one in Gull Rapids proper, 23 were set throughout Stephens Lake, and three were placed in the Long Spruce Reservoir. On 12 October, 2014, the majority of receivers were removed and a subset (n = 22) were redeployed to monitor movements during winter 2014/2015. An additional nine (two upstream and seven downstream of Gull Rapids) were left in until 25 October, 2014, when ice cover began to form. These receivers were left in place to maximize spatial coverage immediately post-tagging and during the spawning period, especially in the area closest to the Keeyask GS construction site.

3.0 PRELIMINARY RESULTS

Fifty of 60 acoustically tagged Lake Whitefish were detected post-tagging, 15 tagged upstream and 35 tagged downstream of the Keeyask GS construction site. Possible explanations for the lack of detection of ten fish include tagging mortality, capture by local resource users, or tag malfunctions. However, given the sparse receiver coverage post-tagging, it is likely that these fish simply remained out of the detection range of the array.

The majority of the tagged fish detected upstream (n = 13; 87%) were relocated exclusively at a receiver placed downstream of Birthday Rapids (#122780), 32.3 rkms upstream of Gull Rapids. However, all 15 fish were relocated only on two days (8 and 9 October) before receivers were removed for the winter period. On these two days, fish were detected between 14 and 1,426 times. No fish were detected by any receiver left in until the end of October (Figure 3), likely because fish remained farther upstream out of receiver range.

Unlike fish tagged upstream, Lake Whitefish tagged downstream of the construction site were relocated between 26 September and 24 October, between 14 and 12,217 times. This is likely simply due to a greater number of receivers in the tagging area. The 35 tagged Whitefish in Stephens Lake generally remained within the upper portions of the reservoir. Eleven fish (31%) were relocated as far upstream as rkm 1.3, while a single fish (3%) was relocated as far downstream as rkm 10.5. However, the majority (n = 22; 63%) of fish were not relocated further downstream than rkm 4.9.

Movements of tagged Lake Whitefish will continue to be monitored by a subset of 22 acoustic receivers left in during winter 2014/2015. A data report describing details of the 2014 tagging program and further analysis of 2014/2015 data will be prepared at the end of the 2015 open-water sampling period when a more complete set of movement data are available.

4.0 REFERENCES

Barth, C.C., Neufeld, L.J., and Olynik, J.R. 2003. Movements of Northern Pike, Walleye, and Lake Whitefish Tagged with Radio and Acoustic Transmitters in the Gull (Keeyask) Study Area, 2001/2002. A report prepared for Manitoba Hydro by North/South Consultants Inc., Winnipeg, Manitoba. 119 pp.

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Murray, L., Barth, C.C., and Olynik, J.R. 2005. Movements of Radio- and Acoustic- Tagged Northern Pike, Walleye, and Lake Whitefish in the Keeyask Study Area: May 2002 to April 2003. A report prepared for Manitoba Hydro by North/South Consultants Inc., Winnipeg, Manitoba. 107 pp.

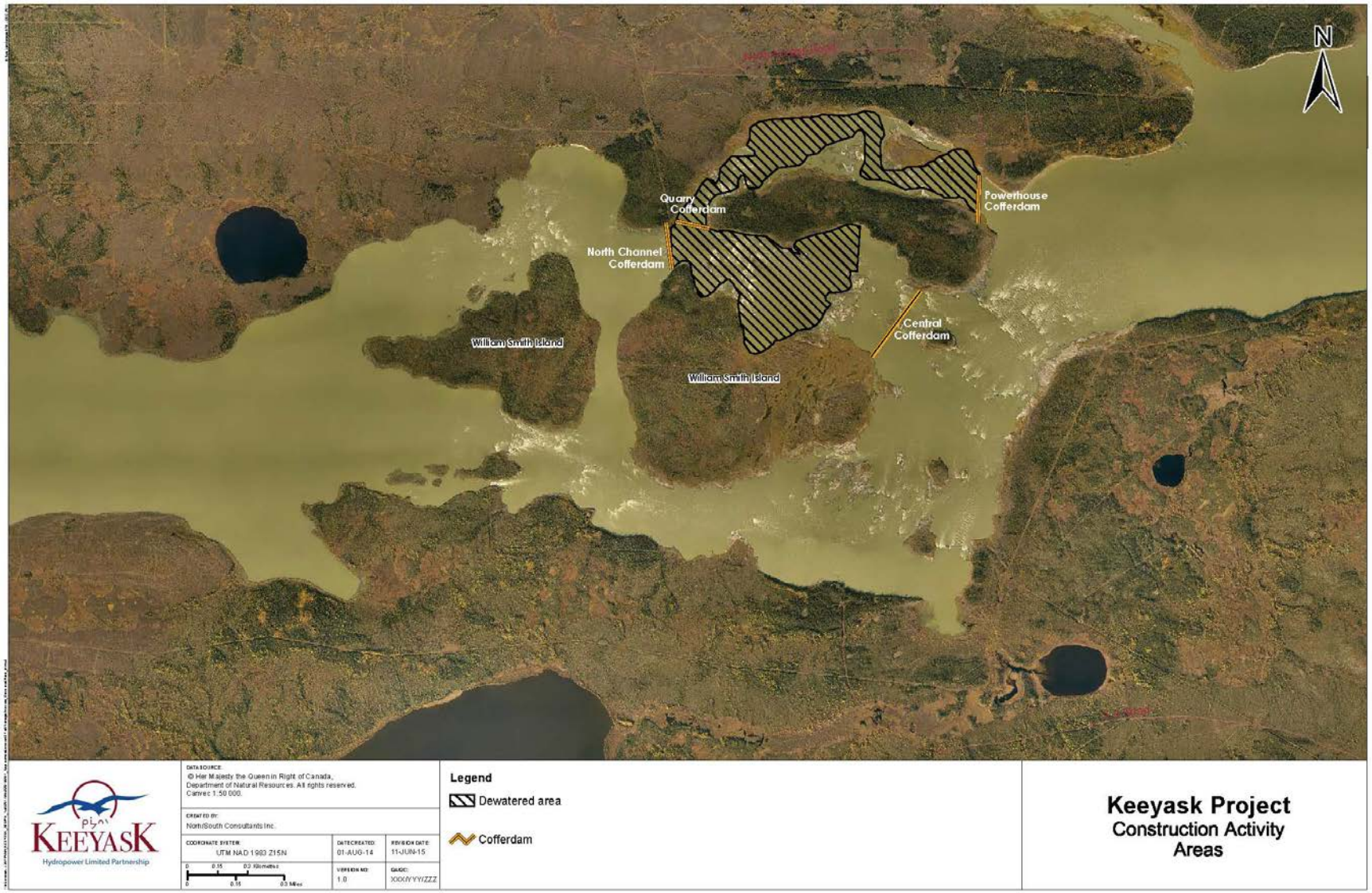

Figure 1: Locations of construction activities within the north and central channels of Gull Lake, July to October, 2014

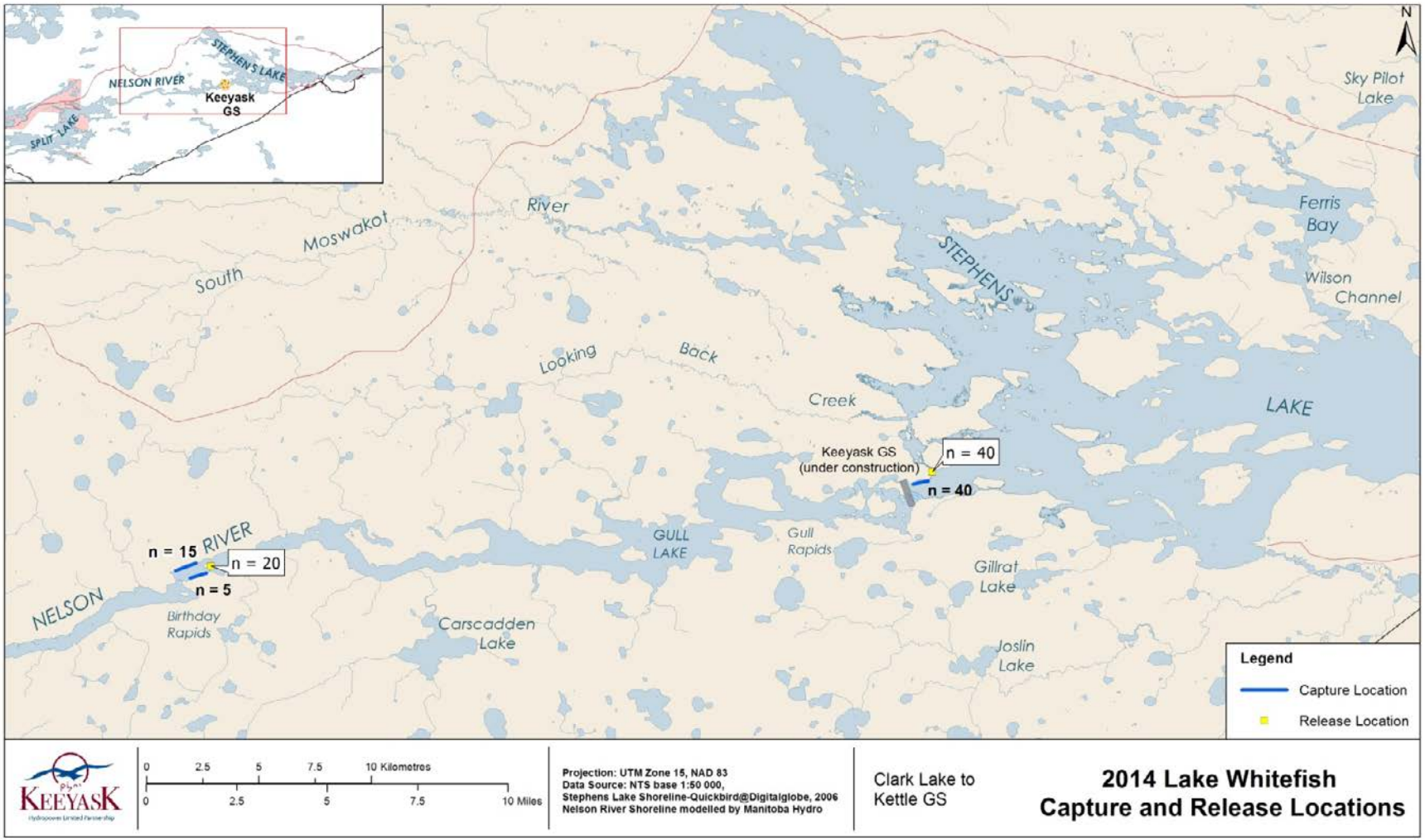

Figure 2: Release sites for Lake Whitefish tagged with acoustic tags in the Keeyask Study Area, 2014

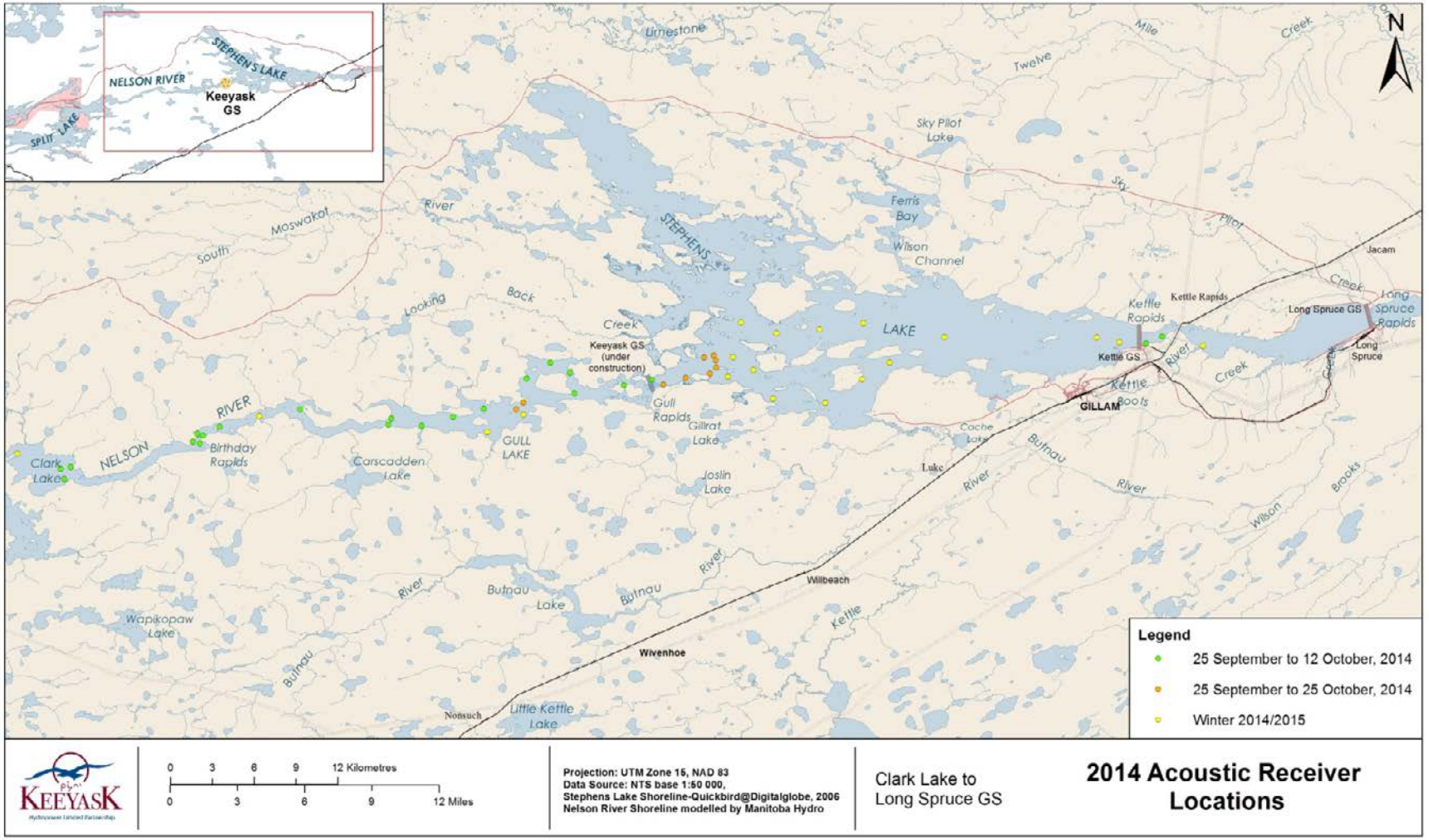

Figure 3: Stationary acoustic receivers set throughout the Keeyask Study Area during open-water 2014 and winter 2014/2015