



Keeyask Generation Project
Aquatic Effects Monitoring Plan

Zebra Mussel Monitoring Report
ZMMP-2020-01



KEEYASK GENERATION PROJECT

ZEBRA MUSSEL MONITORING PLAN

REPORT #ZMMP-2020-01

ANNUAL REPORT

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&

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SUMMARY

Zebra mussels are an aquatic, invasive species that grow on hard materials in the water, such as rocks and pipes, and can become so prolific they cause major problems for utilities. They were first introduced to North America in the 1980s from Europe and/or Asia, where they were carried in the bilge water of oceangoing ships that was released into North American waterways. They are a major problem because they do not have predators in North America and therefore, grow freely on submerged surfaces (Figure 1). The first zebra mussel was found in Lake Winnipeg in 2013 and they have made their way to the Nelson River since that time.



Figure 1: Once present, zebra mussels grow on hard surfaces that are in the water, as shown on this boat propeller. Each mussel is approximately the size of a finger nail.

The *Zebra Mussel Monitoring Plan* (ZMMP) was developed and is being implemented in accordance with the Keeyask *Environment Act* Licence to monitor and manage the impacts of zebra mussels on the Keeyask Project. A key component of the ZMMP is to ensure that Keeyask employees and visitors are aware of zebra mussels and the provincial regulations for cleaning

watercraft, water-related equipment, trailers, and motor vehicles to prevent them from spreading. Zebra mussel education and awareness was promoted in 2019 at Keeyask in the site orientation session, by displaying aquatic invasive species posters in lunch rooms across the Project site, and by distributing an electronic information bulletin to all parties on site.

A hot water decontamination unit is used at site to prevent the spread of zebra mussels to or from Keeyask. All incoming and outgoing watercraft and water-related equipment (anchors, nets, paddles, etc.) were inspected for the presence of zebra mussels and decontaminated, if they were leaving the Nelson River Control Zone.

In 2019, seventy-two inspections were conducted and four hot water decontaminations were performed. At the main entrance to Keeyask off PR 280, a sign was posted reminding site users to report watercraft and water-related equipment for inspection and decontamination. Additionally, the main gate security documented all watercraft and water-related equipment, using a red tagging system and email notification for all arriving equipment.

During 2019, three samples were collected from Gull Lake near Keeyask and analysed for zebra mussel “veligers” (microscopic mussel larvae). In total, forty-six veligers were found, which indicates that zebra mussels may now be present in the Keeyask area. Also, three monitoring sites were established in the Keeyask reservoir and artificial substrates were deployed to track colonization by zebra mussels, however no mussels were observed.

2019 marks the first year that zebra mussel veligers have been observed near the Keeyask site.

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1.0 INTRODUCTION

The Keeyask Generation Project (the Project) is a 695-megawatt (MW) hydroelectric generating station at Gull (Keeyask) Rapids on the lower Nelson River in northern Manitoba. The Project is approximately 725 kilometres (km) northeast of Winnipeg, 35 km upstream of the existing Kettle Generating Station, where Gull Lake flows into Stephens Lake, 60 km east of the community of Split Lake, 180 km east-northeast of Thompson and 30 km west of Gillam. Construction of the Project began in July 2014.

Although none of the aquatic invertebrate species identified during the environmental assessment of the Project were listed as invasive in accordance with the Invasive Species Council of Manitoba's listing at the time (KHLP 2012), the Project's *Environment Act* Licence #3107 (Clause 18) indicated the Keeyask Hydropower Limited Partnership (KHLP) must develop a Zebra Mussel Monitoring Plan to "*monitor and adaptively manage impacts to the Development (Project) associated with zebra mussels and participate with the Government of Manitoba on treatment programs within the Keeyask reservoir.*"

The *Zebra Mussel Monitoring Plan* (ZMMP) was submitted by the KHLP in December 2015 (KHLP 2015) and was subsequently approved by Manitoba Sustainable Development. This report summarizes the results and activities conducted from April 2019 to March 2020 in accordance with the ZMMP.

2.0 ZEBRA MUSSEL MONITORING 2019

The ZMMP methodology is designed to assess zebra mussel presence using four approaches, as follows:

1. Education and awareness;
2. Water quality sampling;
3. Colonization/adult sampling;
4. Visual inspections of in-water infrastructure.

The work undertaken to implement each of these approaches is summarized below.

2.1 EDUCATION AND AWARENESS

In fall 2019, the Keeyask Watercraft Transport Procedure was sent to all Manitoba Hydro staff and contractors on site to ensure all Aquatic Invasive Species regulatory requirements are met. Site environmental inspectors received refresher training regarding the requirements related to aquatic invasive species legislation, as well as provincially approved inspection and decontamination techniques for zebra mussels and other common aquatic invasive species (AIS). The site orientation session given to all Keeyask employees, contractors, and visitors includes a section on AIS and provides the regulatory requirements for decontaminating watercraft and water-related equipment. Aquatic invasive species information posters are also displayed in Manitoba Hydro and contractor lunch rooms around the construction site to help familiarize people regarding what to look for, and how they can follow up if they find something. An information bulletin on zebra mussels and other aquatic invasive species was distributed to all contractors on site in May 2018 and it continues to be handed out. A sign posted at the main gate in 2018 remains in place to notify site users that Keeyask is in the Nelson River Control Zone and to remind personnel to report for inspection/decontamination of watercraft and water-related equipment when entering and leaving Keeyask (Figure 2).

A decontamination unit was constructed at Keeyask in September 2016 to prevent the transfer of zebra mussels from boats and equipment used elsewhere to Gull and Stephens lakes, as well as to prevent the spread of zebra mussels or veligers from the Keeyask site. The unit consists of a hot water (≥ 60 °C) sprayer and a drain pad designed to allow wash water to rapidly infiltrate the ground and prevent it from flowing off the pad. The unit meets the Provincial requirements for AIS decontamination.

Watercraft and equipment users were informed that whenever watercraft/equipment are removed from the Nelson River (including Gull Lake and Stephens Lake), general provisions (*i.e.*, clean, drain, dry) should be performed. In addition, when leaving Keeyask, any watercraft or equipment leaving the Nelson River Control Zone needs to be decontaminated prior to departure unless they can 1) provide proof of an exemption permit issued from Manitoba Sustainable Development or

2) the party has access to decontamination facilities and agrees to provide records to Manitoba Hydro after decontamination in accordance with the provincial *Aquatic Invasive Species Regulation*.



Figure 2: A sign is located at the main gate to remind site users to report for inspection of watercraft and water-related equipment

2.1.1 RESULTS

From April 2019 to March 2020, all watercraft and water-related equipment was inspected for AIS upon arrival and departure from Keeyask. In total, seventy-two inspections (Figure 3) were conducted and four hot water decontaminations were performed on incoming and outgoing watercraft and water-related equipment.



Figure 3: A boat being inspected for AIS upon arrival before entering the Nelson River on May 24, 2019.

2.1.2 NEXT STEPS

AIS inspections and decontamination will continue in 2020. During the summer, signs will be posted at the upstream and downstream boat launches to notify site users that Keeyask is in the Nelson River Control Zone, and to remind personnel to report for inspection/decontamination of watercraft and water-related equipment when entering and leaving Keeyask. The signs will also list Keeyask's standard AIS requirements when launching or removing watercraft/equipment from the Nelson River.

2.2 VELIGER SAMPLING

Zebra mussel veligers (larval mussels) were sampled upstream of the Keeyask GS construction site on September 13, 2019. One sample (tow) was collected from three locations within 7 km upstream of the construction site (Figure 4). Sites were similar to those sampled in September 2017 and 2018. These sites were chosen in areas that were near a structure suitable for zebra mussel colonization (*i.e.*, ice booms at GUL-01 and acoustic receiver at GUL-02) and subject to heavy use with the potential for zebra mussel introduction (*i.e.*, Gull Lake boat launch; GUL-03).

Samples were collected with a plankton net consisting of a 30 cm diameter ring with bridle; a 1 meter long, 63 micron mesh net; and a removable weighted cod end for sample retrieval. Samples

were collected using the horizontal tow (used in areas of low water velocity; boat is driven) method. The net was released, allowed to sink ~3 m, and tied to the stern of the boat. The boat was driven slowly (travelling approximately 1 m every 3 seconds) for a total of 20 m.

2.2.1 RESULTS

All sampling information was recorded onto field data sheets that included sample date and time, sample ID, water temperature (°C), location (UTM), Secchi depth (m), water depth (m), water velocity (m/sec), start time, and tow distance (m). Site specific data are presented in Table 1.

After retrieval, the entire net was rinsed from the outside to ensure all of the sample material was washed into the cod end. Contents were thoroughly rinsed into a labelled sample jar. Samples were preserved using 70% denatured ethanol (alcohol to sample ratio = 2:1). All samples were stored for transport in a cooler and sent to ALS Laboratories (Winnipeg, MB) for analysis.

Zebra mussel veligers were found in all three samples collected in September 2019. A total of four veligers were collected at GUL-01, 17 at GUL-02, and 25 at GUL-03. Zebra mussel veligers have not been previously found in this area.

2.2.2 NEXT STEPS

Annual sampling for zebra mussel veligers will continue. Sampling will next be conducted in August/September 2020.

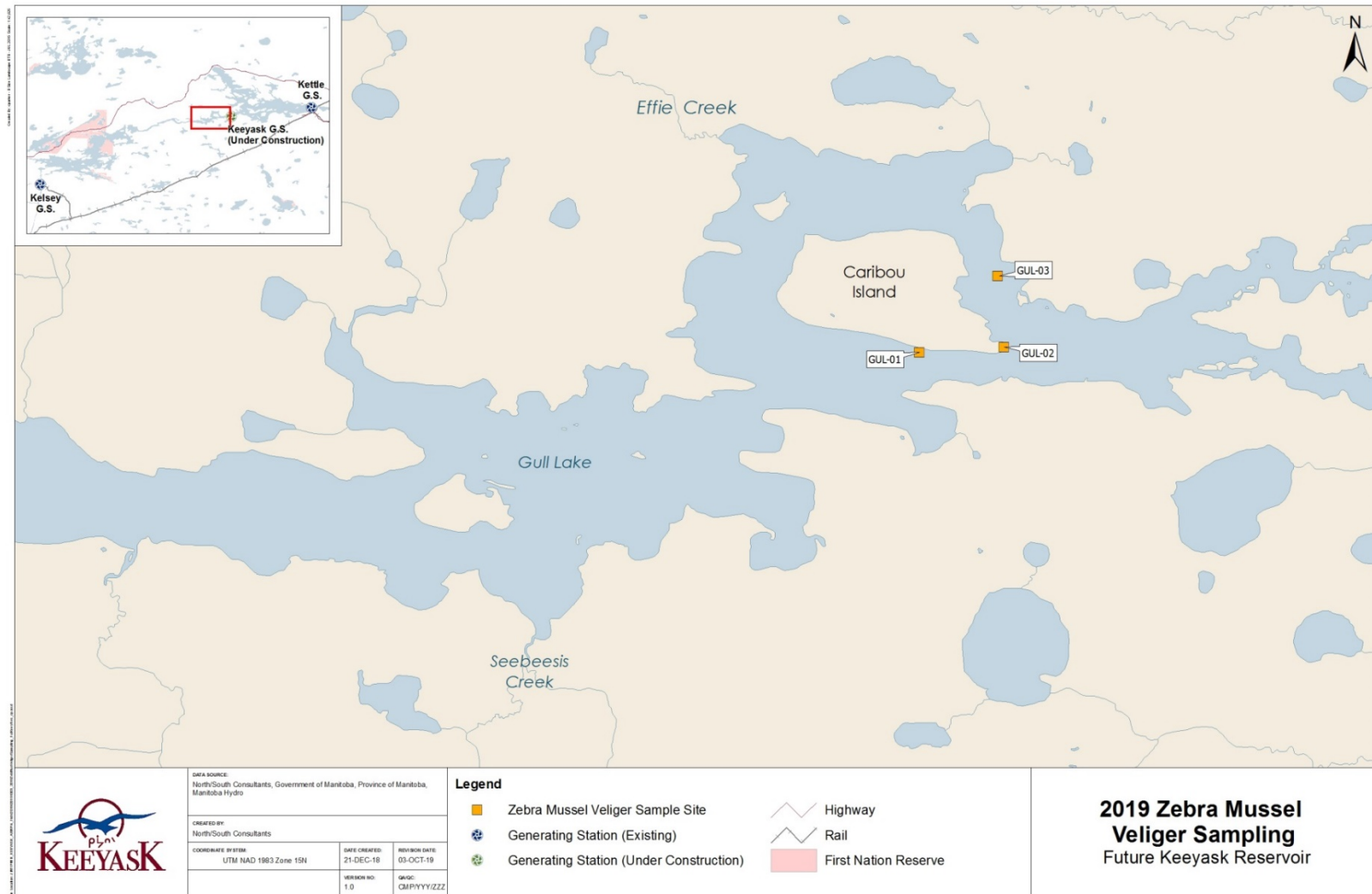


Figure 4: Sampling sites for zebra mussel veliger monitoring in the Keeyask Study Area, September 13, 2019.

Table 1: Site specific data collected at zebra mussel veliger sampling sites upstream of the Keeyask GS construction site during September 2019

Sample ID	Sample Date	Sample Time	Water Temperature (°C)	15V (NAD 83)		Water Velocity (m/s)	Water Depth (m)	Secchi Depth (m)	Sample Method	Distance (m)
				Easting	Northing					
GUL-01	13-Sep-19	09:30	12	357360	6245955	0.60	4.8	0.45	Horizontal	20
GUL-02	13-Sep-19	09:45	12	358430	6245981	0.05	3.1	0.45	Horizontal	20
GUL-03	13-Sep-19	10:00	12	358372	6246949	0.40	8.7	0.45	Horizontal	20

2.3 COLONIZATION/ADULT SAMPLING

Monitoring for adult zebra mussel colonization was done by establishing three sites in the Keeyask reservoir for placement of artificial substrates. Artificial substrates were deployed on May 30, 2019. Sites were located in low-flow areas (0.1-1.0 m/s) with a depth of approximately 4 m (Figure 5). At each site, terra cotta flower pots were used as artificial substrates; they were suspended in series along a rope at 1, 2, and 3 m depths, anchored in place with a cinderblock, and kept suspended in the water column by a buoy at the surface (Figure 6).



Figure 5: Location of sites in the Keeyask reservoir where artificial substrates were deployed to monitor for zebra mussel colonization.



Figure 6: Installing artificial substrate to monitoring for zebra mussel colonization, May 30, 2019.

All three sites were checked monthly during the open-water period for the presence/absence of zebra mussels and a photograph was taken of each side of the substrate. If present, adult zebra mussels were to be counted and recorded. Site visits also included visual inspections of adjacent rocks, crevices, woody debris, docks, and vegetation for the presence of zebra mussels. On September 23, 2019, the artificial substrate and anchors (cinderblocks) were removed for the season, were inspected for the presence of zebra mussels and were photographed on all sides.

A more robust design was used for the deployments this monitoring season and fewer issues with lost or damaged equipment were encountered when compared to 2017. At each location, separate lines were used to suspend the pots (substrates) and anchor the monitoring site, so there was no need to remove the cinderblock each time the substrates were checked. More durable ropes were also used to protect from wear and tear and to reduce the potential for the substrates to be lost. Nonetheless, due to the fragility of the terra cotta substrates, there were a few instances where substrates were found to be damaged and were replaced.

On July 11, 2018, three substrates were found to be damaged—two at the north shore site and one at the south shore. The broken substrates were replaced on July 13, 2018. One substrate was found damaged at the south shore site on August 17, 2018 and was replaced immediately. On September 14, 2018, one of the substrates was damaged at the north shore site but it was not replaced because the monitoring equipment was being removed for the season.

2.3.1 RESULTS

At the beginning of September 2019, a plastic artificial substrate was suspected to have the zebra mussels on the surface. The artificial substrate was transported to ALS laboratory in Winnipeg Manitoba where it was mistakenly discarded prior to analysis. As a result, a second artificial substrate from the same rope was sent to ALS labs for analysis. The second artificial substrate was also made of plastic. Results came back negative for zebra mussels.



Figure 7: Photo of a monitoring substrate being checked for colonization by zebra mussels at the upstream boat launch site on June 24, 2019.

2.3.2 NEXT STEPS

Monitoring will take place again in 2020. Staff will continue to replace broken terra cotta pots with plastic pots, as required. The use of plastic pots was shown to be successful in reducing equipment damage and loss during the monitoring season.

3.0 CONCLUSIONS

The Keeyask ZMMP was implemented in 2019 in accordance with the Keeyask *Environment Act* Licence and included education and awareness activities to mitigate the introduction of zebra mussels at the Keeyask site, as well as to conduct veliger sampling, colonization sampling, and visual inspections of in-water infrastructure as the means to locate zebra mussels, if any, at the Keeyask site.

In 2019, forty-six zebra mussel veligers were collected during instream monitoring, but no zebra mussel have been found at Keeyask to date. 2019 marks the first year of the potential presence of zebra mussels around Keeyask.

Monitoring will continue in 2020 following the same approach.

4.0 LITERATURE CITED

Keeyask Hydropower Limited Partnership. 2012. Keeyask Generation Project Environmental Impact Statement: Response to EIS Guidelines, Winnipeg, Manitoba. June 2012. 1,200 pp.

Keeyask Hydropower Limited Partnership (KHLP), 2015. Keeyask Generation Project: Zebra Mussel Monitoring Plan. Winnipeg, Manitoba. June 2015.