Manitoba Hydro

Keeyask Transmission Project
Environmental Effects Monitoring Plan
Technical Reports

Prepared by:
Manitoba Hydro
Winnipeg, Manitoba
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KEEYASK TRANSMISSION PROJECT WATERCOURSE CROSSINGS

POST-CONSTRUCTION MONITORING REPORT – 2016

June 2017

Prepared for:

Manitoba Hydro

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EXECUTIVE SUMMARY

As outlined in *The Environment Act* Licence for the Keeyask Transmission Project (Licence No. 3106), construction, operation, and maintenance of the Project will adhere to mitigation found within the EIS and supporting materials, as well as Environmental Protection Plans (EnvPP). Included in the Project EnvPP is an obligation to monitor the effectiveness of mitigation measures. This report provides documentation of site visits conducted at 41 watercourse crossing sites located along the temporary 138 KV AC Construction Power Line, four 138 kV AC Unit Transmission lines, and three 138 kV AC Generation Outlet Transmission lines during spring 2016.

The stage of construction varied between and within each component. The Construction Power Line (KN36) was completed in 2015 and was not evaluated this season. The temporary Construction Power Line was completed in 2016. The right-of-way (RoW) and riparian buffer zones had been cleared along the full extent of the Generation Outlet Transmission lines and the KR1 towers erected and strung. Clearing of the RoW and riparian buffer zones had begun for the Unit transmission lines but was not completed.

Of the 41 crossing sites assessed, a potentially unnecessary crossing of the watercourse at KGOT-Aqua-100, 101 and 102 was the only mitigation measure not in compliance. A follow-up visit at KGOT-Aqua-128, 129 and 130 was also conducted to evaluate the effectiveness of erosion control efforts at the site where the riparian buffer zone was cleared to ground level in 2015. Other than the natural re-vegetation of the stream, no other erosion control measures were applied. Small shrubs and forbes were observed growing along the stream banks and no active sedimentation of the stream was noted. Due to the naturally occurring re-vegetation and the marginal nature of the stream to fish, no further remediation is recommended.

ACKNOWLEDGEMENTS

Manitoba Hydro is thanked for the opportunity to conduct this project.

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1.0 INTRODUCTION

As outlined in *The Environment Act* Licence for the Keeyask Transmission Project (Licence No. 3106), construction, operation, and maintenance of the Project will adhere to mitigation found within the EIS and supporting materials as well as Environmental Protection Plans (EnvPP). Included in the Project EnvPP is an obligation to monitor the effectiveness of mitigation measures. Stream crossing monitoring consists of a minimum of one site visit to each identified stream crossing in the first spring and/or summer following construction and subsequent site visits as required. This report provides documentation of site visits conducted at 41 watercourse crossings located along the 138 KV AC temporary Construction Power Line, three 138 kV AC Generation Outlet Transmission lines, and four 138 kV Unit Transmission lines during spring 2016 (Maps 1 to 3).

2.0 STUDY AREA

The Keeyask Transmission Project Study Area (approximately 600 km^2) is found within the Nelson River watershed basin and the Lower Nelson River sub-basin. It includes the Nelson River from Gull Rapids and the southern shore of Stephens Lake east to the Kettle Generating Station. In addition, the study area includes the land south of these waterbodies to and beyond Butnau Lake.

The land bordering Stephens Lake includes areas of poor, moderate and well-drained soils, dominated by black spruce forest in upland areas and black spruce bogs, peatland and fens in low lying areas. Sand, gravel, cobble, and areas of organic material dominate the shoreline, with much of the shoreline being prone to erosion. Riparian vegetation typically includes willow and alder, black spruce, tamarack, and scattered stands of trembling aspen typically found where there is well drained soil. Typical of the Lower Nelson River sub-basin the study area consists of a large number of small round lakes, marsh and bog areas and numerous ephemeral and perennial tributaries.

Of the Project components, the Unit Transmission lines (KUL) and the Construction Power Line (KN36) cross the Nelson River at the base of Gull Rapids. Fish habitat sensitivity was assigned ’moderate/high’; numerous forage fish species and larger bodied species such as Freshwater Drum, Goldeye, Lake Sturgeon, Lake Whitefish, Longnose Sucker, Mooneye, Northern Pike, Sauger, Walleye, White Sucker and Yellow Perch have been documented in this region.

Two medium-sized perennial rivers are present within the study area; the Butnau and the Kettle rivers. The Butnau River was diverted away from Stephens Lake through Cache Lake and into the Kettle River when the Kettle Generating Station was

constructed. Similar to the smaller creeks in the area, habitat in the upper reaches of the Butnau and Kettle rivers are characterized by low water velocities, soft substrates, and abundant cover. Lower reaches of the Kettle River and the Butnau River Diversion Channel are shallow, with moderate water velocity, and rocky substrate.

Fish habitat within the Butnau and Kettle rivers is considered to be of 'moderate' and 'moderate/high' sensitivity, respectively. Both rivers were found to be used extensively by Northern Pike for various life stages including spawning. Relatively uncommon, Walleye occur in both rivers and suitable spawning habitat is present in the Butnau River Diversion Channel and the lower Kettle River. White and Longnose sucker are also known to spawn in both rivers. Although documented in the Kettle/Butnau river system, Lake Whitefish were found to be uncommon.

The Generation Outlet Transmission lines (GOT) and KN36 each cross the Butnau River once. The Kettle River is crossed at three locations by the three GOT lines.

3.0 METHODS

Stream crossing sites were evaluated using Manitoba Hydro's Daily Inspection Reports and site visits in the spring of 2016 to assess the adherence to prescribed mitigation. Mitigation measures included those prescribed in the Keeyask Transmission Project Aquatic Environment Technical Report (2012) and the Keeyask Transmission Project Construction Environmental Protection Plan (2014) for the Construction Power, Generation Outlet and Unit Transmission Lines and Stations.

Daily Inspection Reports on Manitoba Hydro's Environmental Protection Information Management System (EPIMS) were reviewed to identify where mitigation compliance was documented during construction and to focus field studies.

Field studies consisted of an initial aerial reconnaissance at each site along the Construction Power, Generation Outlet and Unit transmission lines. Stream crossing sites rated as 'moderate' and 'moderate/high' fish habitat sensitivity were chosen for closer examination to obtain an overall evaluation of the state of the site. Once at the site, buffers were evaluated by measuring their width from the stream or floodplain and comparing to the width prescribed, as well as evaluating the amount of vegetation left in the buffer and the clearing method used. Stability of stream banks and floodplain were evaluated visually and rutting, slumping, or other damage to the ground noted. The presence of slash or disturbed sediment within the buffer was noted, as well as any evidence of erosion.

Vehicle crossings were evaluated for appropriate grade and angle across the stream, and the presence of any organic debris remaining from a bridge. If any erosion control measures were in place (blankets, silt fences) their effectiveness was evaluated. Tower locations were assessed to determine if they adhered to prescribed mitigation. Photos of sites were taken to capture the overall state of the sites as well as any particular concerns. Any further reclamation needed to meet the prescribed mitigation was noted and if a follow-up site visit was needed for further monitoring of reclamation this was also noted.

4.0 RESULTS

Manitoba Hydro is currently constructing several components of the Keeyask Transmission Project. This report focuses on three of the components. Once completed, three 138 kV AC GOT lines will transmit power from the new Keeyask Switching Station to the existing Radisson Converter Station over a distance of 38 km in a single corridor approximately 200 m wide. The GOT lines cross seven watercourses, including the Kettle and Butnau rivers, and consist of 29 crossing sites. The completed 138 kV Construction Power Transmission Line (KN36) extends from the existing 138 kV KN36 transmission line in the south to the new construction power station located north of the Keeyask Generating Station. This line is approximately 21 km long, with a RoW 60 m wide along most its length (except for the locations where the line shares the RoW with GOT lines), crosses five watercourses and includes six distinct crossing sites. Two additional sites at the Nelson River include the temporary Construction Power line. To transmit power from the Keeyask Generation Station to the new Keeyask Switching Station four 138 kV AC Unit Transmission Lines (KUL) will be erected in a single corridor 4 km long and 265 m wide, cross two watercourses and include seven crossing sites in total.

Site visits to stream crossings were conducted June 21, 2016. The stage of construction varied between components (Appendix 1). The Construction Power Line was completed in 2015 and was excluded from the site evaluations this season. At the time of the monitoring, construction of temporary line (KN36T) was complete. Clearing of the RoW and riparian buffer zones was completed at all watercourse crossings along the GOT and Unit Transmission lines, though only towers for the KR1 line were erected and strung. Construction had not begun on the KR2, KR3 and the four Unit Transmission Lines.

Site Visits

Aerial surveys were conducted at 41 stream crossing sites. No ground surveys were deemed necessary. Construction at all but three stream crossings was compliant with prescribed mitigation where applicable, depending on the stage of construction. Of the sites that were non-compliant (3) in 2016, no follow-up remediation in 2017 is recommended. Non-compliance was related to the potentially unnecessary watercourse crossing despite the presence of a road running parallel to the RoW from which both sides of the watercourse could be accessed. A follow-up at KGOT-Aqua 128, 129 and 130 was recommended in 2015 and is discussed below. A summary of sites where non-compliance was observed is found in Table 1 and a summary of compliance with mitigation for all sites is available in Appendix 1.

KGOT

Thirty-two sites at ten watercourse crossings were evaluated along the GOT line. Non-compliance was limited to a single stream crossing (KGOT-Aqua-100, 101 and 102) where it appears the watercourse was crossed with a vehicle or vehicles unnecessarily. A road was present adjacent to the RoW from which the watercourse could be accessed from either side. However, due to the marginal importance of the stream to fish and fish habitat and absence of stream bank damage no remediation or follow-up is recommended.

In 2015 a riparian buffer was not established during clearing at KGOT-Aqua-128, 129 and 130 resulting in erosion and sedimentation of the stream. Erosion control measures and a follow-up visit in 2016 was recommended. Other than the natural re-vegetation of the stream, no other erosion control measures were applied. Small shrubs and forbes were observed growing along the banks of the stream and no sedimentation was observed during the post spring runoff conditions at the time of the survey. It is expected the vegetation will continue to grow and stabilize the banks and riparian zone. No further remediation is recommended.

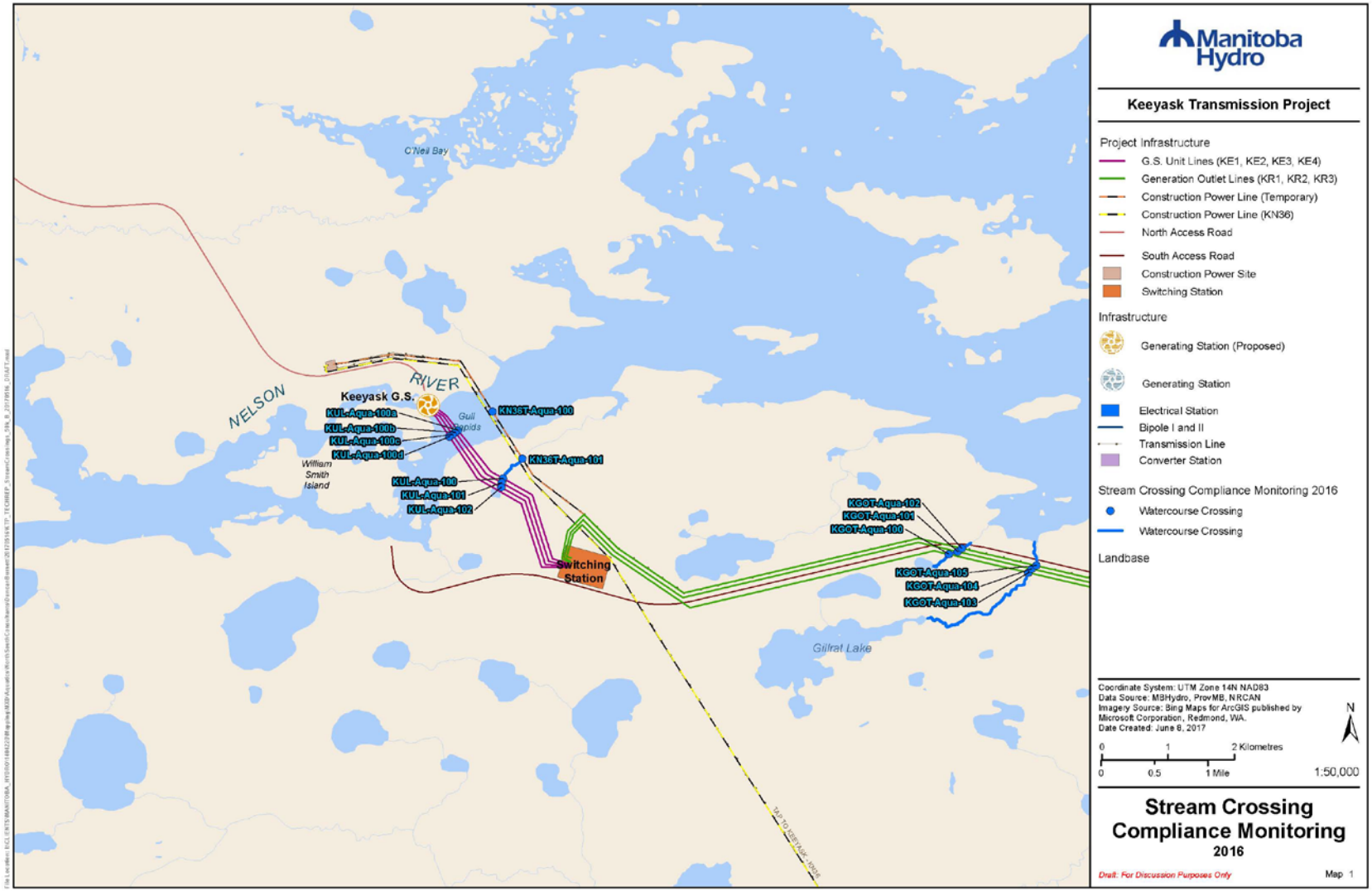
KN36

Two sites crossing two watercourses were evaluated for compliance to mitigation along the temporary Construction Power Line (KN36T-Aqua-100 and 101). Rock armoring and matting used to protect the north bank of the Nelson River from erosion due to excessive clearing of the riparian buffer zone along the centerline within the shared corridor of KN36-Aqua-100 and KN36T-Aqua-100 was examined in 2016 and shown to be effective. No follow-up is recommended for this site as it is the future site of a coffer dam and haul truck road.

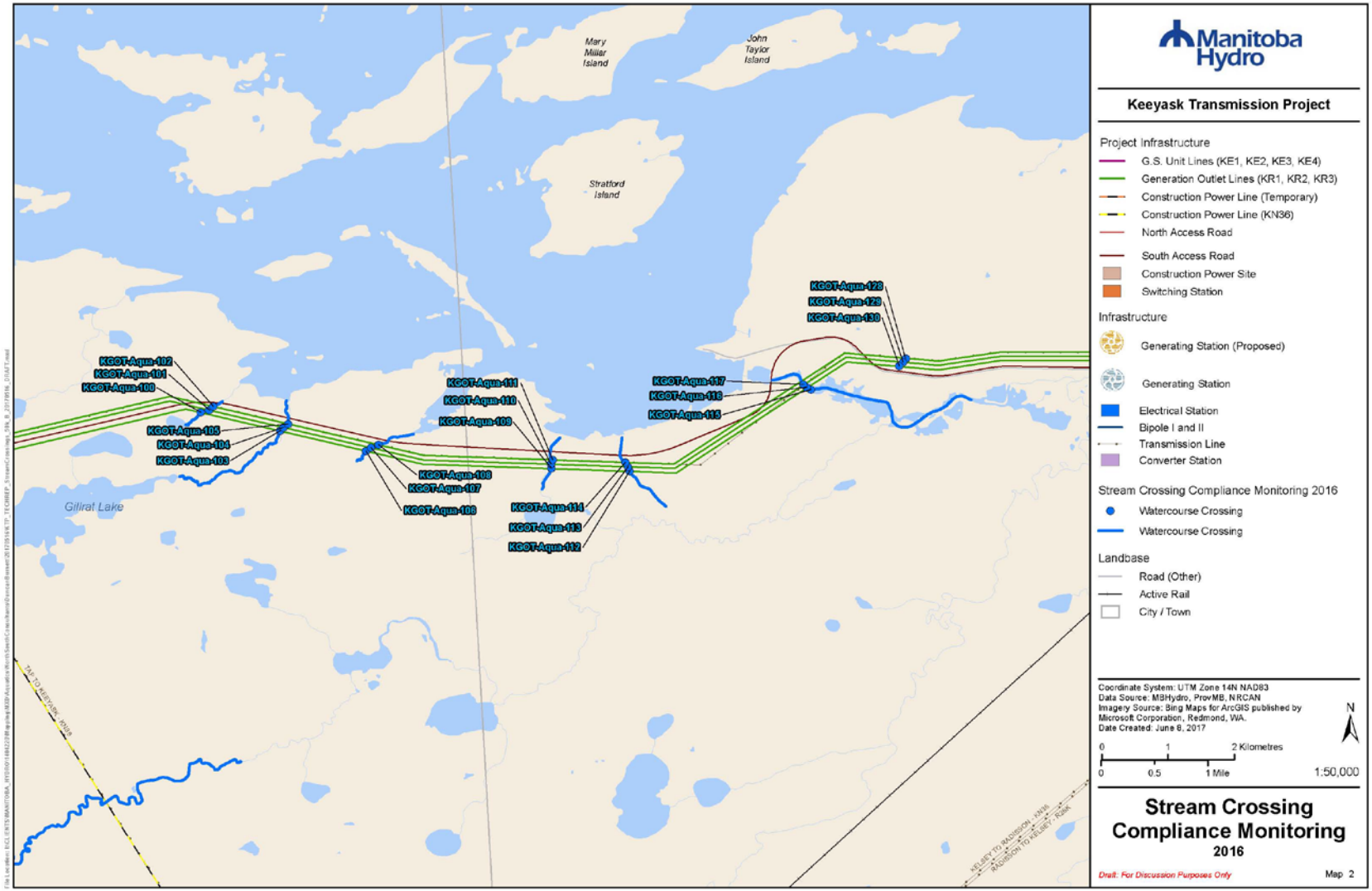
Table 1. Summary of stream crossings on KGOT, KN36 and KUL lines where non-compliance to mitigation was observed, June 2016.

Segment	ESS ID	Name	Easting	Northing	Habitat Class	Compliance	Issue	Mitigation	2017 Site Visit
KGOT	KGOT-Aqua-100, 101, 102	Unnamed tributary	371556 371691 371759	6244280 6244305 6244351	NA	N	Vehicle crossing; when access likely available via extant road	None recommended	N
KGOT	KGOT-Aqua-128, 139, 130	Unnamed tributary	382229	6244240	NA	N	Excessive clearing of riparian buffer	Continued monitoring of Riparian Buffer recovery	N
KN36T	KN36T-Aqua-100	Nelson River	364883	6247024	NA	N	Excessive clearing of riparian buffer	None recommended; rock armouring appears to be effective	N

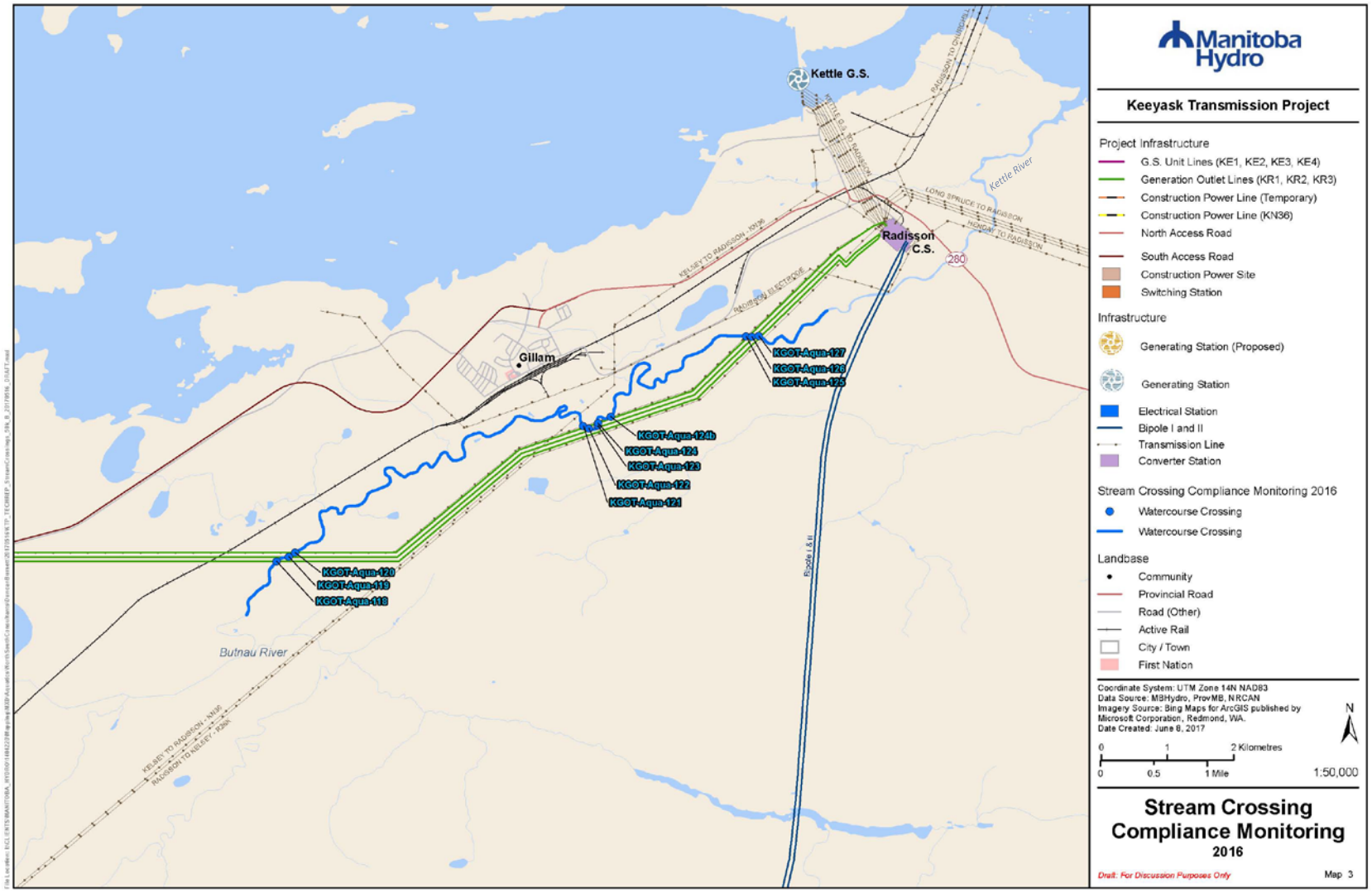
5.0 MAPS



Map 1. Watercourse crossing locations for the proposed Unit Transmission Line and the western section of the Generation Outlet Transmission Lines, 2016.



Map 2. Watercourse crossings along the west-central section of the Generation Outlet Transmission Line, 2016.



Map 3. Watercourse crossings along the eastern section of the Generation Outlet Transmission Line, June 2016.

6.0 PHOTOS

Photo 1. KGOT-Aqua-128 to 130 (tributary of the Butnau River). Un-mitigated stream crossing cleared June 15, 2015 (top) and state as of June 21, 2016 (bottom).

Photo 2. KGOT-Aqua-100 to 102 (unnamed tributary). Evidence of a stream crossing despite the presence of the road adjacent to the RoW, June 21, 2016.

7.0 APPENDIX 1: STREAM CROSSING COMPLIANCE SUMMARY

Table A1. Compliance with 21 mitigation measures for stream crossings on the 138 kV Generation Outlet and Unit transmission lines, and the Construction Power line, June 2016.

ESS	Name	Construction Status 2016	Cross Perpendicular to Channel	Structures Above Tree Line	Riparian Ground Cover Remain	Machine Free Zone 7 m	Riparian Buffer 30 m	Clearing Limits Marked	Construction on Frozen Ground	Riparian Vegetation Roots Intact	Slash Above the Tree Line	Revegate Disturbed Areas	Erosion Sediment Control Implemented	Temp. Crossings Only As Needed	Appropriate Temp. Crossing Design	Existing Access Used	Temp. Crossings Perpendicular	Clean Material for Temp. Crossing Removed	One-time Fording	Timing Window for Instream Work	Fording Under Acceptable Conditions	Stream Bank Protection	Temp. Bridge As Needed	Follow-up Site Inspection 2017
Watercourse Crossings of the three 138 kV AC Generation Outlet Transmission Lines																								
KGOT-Aqua-100	Unnamed Trib.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	N	Y	Y	Y	Y	NA	Y	Y	U	NA	N
KGOT-Aqua-101	Unnamed Trib.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	N	Y	Y	Y	Y	NA	Y	Y	U	NA	N
KGOT-Aqua-102	Unnamed Trib.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	N	Y	Y	Y	Y	NA	Y	Y	U	NA	N
KGOT-Aqua-103	Unnamed Trib.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-104	Unnamed Trib.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-105	Unnamed Trib.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-106	Unnamed Trib.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-107	Unnamed Trib.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-108	Unnamed Trib.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-109	Unnamed Trib.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-110	Unnamed Trib.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-111	Unnamed Trib.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-112	Unnamed Trib.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-113	Unnamed Trib.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-114	Unnamed Trib.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-115	Butnau R.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	NA	Y	Y	NA	Y	Y	U	Y	N

Table A1. Continued.

ESS	Name	Construction Status 2016	Cross Perpendicular to Channel	Structures Above Tree Line	Riparian Ground Cover Remain	Machine Free Zone 7 m	Riparian Buffer 30 m	Clearing Limits Marked	Construction on Frozen Ground	Riparian Vegetation Roots Intact	Slash Above the Tree Line	Revegate Disturbed Areas	Erosion Sediment Control Implemented	Temp. Crossings As Needed	Appropriate Temp. Crossing Design	Existing Access Used	Temp. Crossings Perpendicular	Clean Material for Temp. Crossing Removed	One-time Fording	Timing Window for Instream Work	Fording Under Acceptable Conditions	Stream Bank Protection	Temp. Bridge As Needed	Follow-up Site Inspection 2017
KGOT-Aqua-116	Butnau R.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	NA	Y	Y	NA	Y	Y	U	Y	N
KGOT-Aqua-117	Butnau R.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	NA	Y	Y	NA	Y	Y	U	Y	N
KGOT-Aqua-118	Kettle R.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	NA	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-119	Kettle R.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	NA	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-120	Kettle R.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	NA	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-121	Kettle R.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-122	Kettle R.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-123	Kettle R.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-124	Kettle R.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-124b	Kettle R.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-125	Kettle R.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-126	Kettle R.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-127	Kettle R.	RC/TW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-128	Unnamed Trib. to the Butnau R.	RC/TW	Y	Y	N	N	N	NA	Y	Y	Y	Y	Y	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-129	Unnamed Trib. to the Butnau R.	RC/TW	Y	Y	N	N	N	NA	Y	Y	Y	Y	Y	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KGOT-Aqua-130	Unnamed Trib. to the Butnau R.	RC/TW	Y	Y	N	N	N	NA	Y	Y	Y	Y	Y	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N

Table A1. Continued.

ESS	Name	Construction Status 2016	Cross Perpendicular to Channel	Structures Above Tree Line	Riparian Ground Cover Remain	Machine Free Zone 7 m	Riparian Buffer 30 m	Clearing Limits Marked	Construction on Frozen Ground	Riparian Vegetation Roots Intact	Slash Above the Tree Line	Revegate Disturbed Areas	Erosion Sediment Control Implemented	Temp. Crossings Only As Needed	Appropriate Temp. Crossing Design	Existing Access Used	Temp. Crossings Perpendicular	Clean Material for Temp. Crossing Removed	One-time Fording	Timing Window for Instream Work	Fording Under Acceptable Conditions	Stream Bank Protection	Temp. Bridge As Needed	Follow-up Site Inspection 2017
Watercourse Crossings of the Construction Power Line and the Temporary Construction Power Line																								
KN36T-Aqua-100	Nelson R.	C	Y	Y	N	N	N	U	Y	N	Y	Y	Y	NA	NA	Y	NA	NA	NA	Y	NA	NA	NA	N
KN36T-Aqua-101	Unnamed Trib.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
Watercourse Crossings of the four Unit Transmission Lines																								
KUL-Aqua-100	Unnamed Trib.	RC	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KUL-Aqua-101	Unnamed Trib.	RC	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KUL-Aqua-102	Unnamed Trib.	RC	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KUL-Aqua-100a	Nelson R.	RC	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	NA	NA	NA	NA	Y	NA	NA	NA	N
KUL-Aqua-100b	Nelson R.	RC	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	NA	NA	NA	NA	Y	NA	NA	NA	N
KUL-Aqua-100c	Nelson R.	RC	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	NA	NA	NA	NA	Y	NA	NA	NA	N
KUL-Aqua-100d	Nelson R.	RC	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	NA	NA	NA	NA	Y	NA	NA	NA	N

Compliance: Y- compliant; N - non-compliant; NA - not applicable; U - uncertain

Contstruction Status 2016: NC - no clearing; CL - center line only cleared; RI - riparian buffer incomplete; RC -RoW clearing complete; TF- tower footprint cleared; TA - tower anchors installed; TW - towers complete; C - construction complete

Other: R. - river; Temp. - temporary; Trib. - tributary

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