MANITOBA MINNESOTA TRANSMISSION PROJECT

AMPHIBIAN MONITORING PROGRAM 2021

TECHNICAL REPORT

March 2022

Prepared for:

Manitoba Hydro

By:

SENSITIVE DATA REDACTED

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EXECUTIVE SUMMARY

As part of Manitoba Hydro's Manitoba-Minnesota Transmission Project (MMTP), North/South Consultants Inc. conducted studies on the amphibians within the MMTP Study Area in an effort to provide a post-construction description of Northern Leopard Frog and Tiger Salamander populations on and adjacent to the Project Development Area (PDA). Wetland mitigation compliance monitoring was also conducted, as outlined in Sections 4.5.1 of the MMTP Environmental Monitoring Plan (EMP).

Wetlands and streams surveyed for Northern Leopard Frogs and/or Eastern Tiger Salamanders during the first year of post-construction surveys (i.e., 2020) were prioritized for visits during the 2021 spring, summer and fall for amphibian and water quality surveys. Spring anuran call surveys could not be undertaken during the 2020 survey period due to construction not being complete, therefore, wetlands surveyed during pre-construction surveys (2014 and 2017) were prioritized for visits during spring surveys in 2021. Sampling included anuran call surveys in the spring, amphibian visual encounter surveys (VES) in the spring, summer and fall, and summer salamander surveys. Water quality parameters were also measured at spring, summer, and fall VES sites. During the course of amphibian surveys, any observations of Least Bittern were to be recorded and reported.

Overall, there did not appear to be any unanticipated project effects on Northern Leopard Frogs, Eastern Tiger Salamanders, or water quality at surveyed amphibian wetland sites within or adjacent to the PDA. No Least Bittern were observed during amphibian surveys.

During anuran call surveys, Northern Leopard Frogs were heard at four of the 15 survey sites. During 2017 pre-construction surveys, Northern Leopard Frogs were heard at eight of the survey sites. Warmer spring temperatures during spring sampling in 2017 likely contributed to the higher call frequency when compared to the 2020 study year.

During spring VES, Northern Leopard Frogs were observed at two of the 15 survey sites and were also observed incidentally at one additional site. During summer VES, Northern Leopard Frogs were observed at seven of the 18 sites. Northern Leopard Frogs were also observed incidentally at two of these sites, outside of the VES, as well as at three additional sites. Northern Leopard Frog tadpoles were also captured incidentally in funnel traps during salamander surveys at two of these sites. Site 26 had the greatest number of Northern Leopard Frogs observed, followed by Site 17.5. During fall VES, Northern Leopard Frogs were observed at five of the 16 surveyed sites and incidentally at one additional site.

Of the 15 spring sites examined in 2021, 10 sites were also examined during pre-construction surveys. Northern Leopard Frogs were observed in greater abundance at one site, in lower abundances at two sites, and equal abundances at the remaining seven sites in 2021. Of the 18 summer sites examined in 2021, seven were also examined during pre-construction surveys in

2017 and during the first year of post-construction, in 2020. Northern Leopard Frogs were observed in equal or greater abundance at all seven summer sites when compared with the pre-construction surveys. Similarly, 2021 surveys had equal or greater abundances of Northern Leopard Frogs at all sites except for two when compared to the first year of post-construction monitoring. Of the 16 fall sites examined in 2021, 13 were also examined during pre-construction surveys in 2014 or 2017. Northern Leopard Frog abundance was variable at fall survey sites, with six sites having greater abundances of Northern Leopard Frogs during pre-construction surveys, and five sites having greater abundance of Northern Leopard Frogs during post-construction surveys. Although the overall abundance at river sites was lower during post-construction surveys compared with pre-construction surveys, abundances indicate staging is still occurring at these overwintering sites, but surveys may have been conducted at difference points in the overwintering staging process.

Summer salamander surveys were conducted at 10 wetland ponds. No salamanders were caught during the course of surveys; *REDACTED*, where larval salamanders were caught in 2020, was dry during 2021 surveys.

Water quality parameters were variable at sites dependent on the size, depth and flow pattern of the waterbodies. During fall VES, Northern Leopard Frogs were consistently observed at river sites where the dissolved oxygen concentration was relatively high. Overall, water quality at sites did not appear to differ between pre and post-construction.

Follow-up mitigation compliance and effectiveness was evaluated using visual on-site inspections during amphibian surveys at two sites. Surveys conducted at Sites 17.5 and 19 found re-establishment of vegetation was occurring at both of these sites. Water quality and amphibian abundance at Site 17.5 was within the range of other sites surveyed. During spring surveys at Site 19, water quality did not appear to be affected negatively and Northern Leopard Frog abundance was the same as during pre-construction surveys. During summer surveys, conditions at Site 19 were dry; no water quality measurements were taken.

ACKNOWLEDGEMENTS

Manitoba Hydro is thanked for the opportunity to conduct this project, as well as support with land access, and logistics.

The collection of amphibian samples was authorized by Manitoba Agriculture and Resource Development under terms of wildlife scientific permit # WB24553.

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1.0 INTRODUCTION

In September 2015, Manitoba Hydro filed an Environmental Impact Statement (EIS) in support of the Manitoba-Minnesota Transmission Project (MMTP), a 500 kilovolt (kV) alternating current (AC) international transmission line in southeastern Manitoba (Map 1). The transmission line originates at the Dorsey Converter Station, located near Rosser, Manitoba, northwest of Winnipeg, and continues south-east to the Manitoba-Minnesota border near Piney, Manitoba, where it connects to Minnesota Power's Great Northern Transmission Line. MMTP also includes additions and upgrades to three associated transmission stations at Dorsey, Riel and Glenboro South.

As outlined in MMTP's Environmental Impact Statement (EIS, Chapter 9) and supporting materials, the MMTP Environmental Protection Plan (EPP) and supporting Environment Monitoring Plan (EMP), amphibians favoring wetland habitat for part or all of their life cycle may be vulnerable to changes in habitat availability as a result of Project activity. The prairie population of the Eastern Tiger Salamander (*Ambystoma tigrinum*) that overlaps MMTP's Local Assessment Area (LAA) is listed as Endangered under the *Species at Risk Act* (SARA; COSEWIC 2013). Similarly, the Northern Leopard Frog (*Lithobates pipiens*) is SARA listed as a species of Special Concern within portions of Manitoba (COSEWIC 2009). This species is found in wetlands within the MMTP Development Area (PDA) and surrounding LAA.

In 2014, as part of a multi-disciplinary study, existing conditions were described for amphibians and their habitat in the general region that would support the project (Stantec 2015). Additional pre-construction amphibian surveys were conducted on wetlands and waterbodies within the LAA in 2017 (Dyszy 2018). As outlined in Section 4.2.1 of the EMP, North/South Consultants Inc. (NSC) conducted studies in 2020 and 2021 on amphibians within the MMTP LAA in an effort to provide a post-construction description of Northern Leopard Frog and Eastern Tiger Salamander populations on and adjacent to the MMTP footprint. Sites were also examined to assess mitigation compliance, as outlined in the EMP. This report presents the findings from 2021 field surveys conducted on the amphibian communities and associated waterbodies within the MMTP Assessment Area. This is the second and final year of post-construction amphibian monitoring.

2.0 STUDY AREA

MMTP lies within the transitional zone of 3 Ecozones: Boreal Shield, Boreal Plains and Prairie Ecozones. Within the Regional Assessment Area (RAA), ecoregions are represented predominately by Lake Manitoba Plain, Interlake Plain, and Lake of the Woods, with additional smaller representation by Aspen Parkland and Southwest Manitoba Uplands. Within the MMTP LAA, all ecoregions but the Southwest Manitoba Uplands are represented.

The Study Area is primarily restricted to the area overlapping the transmission line and 30 m right-of-way corridor, from the Dorsey Converter Station near Rosser Manitoba, west and south of

Winnipeg, and south-east of Winnipeg to the Manitoba-Minnesota border near Piney, Manitoba (Map 1). The Study Area also includes some wetlands and waterbodies within the LAA, which extends 1 km on either side of the MMTP centerline.

3.0 METHODS

Amphibian Surveys

As outlined in Sections 4.2.1 and 7.3.1.1 of the EMP, wetlands and streams surveyed for Northern Leopard Frogs and/or Eastern Tiger Salamanders during the first year of post-construction surveys (i.e., 2020) were prioritized for visit during the 2021 spring, summer and fall amphibian and water quality surveys. As spring anuran call surveys could not be undertaken during the 2020 survey period as construction was not yet complete, wetlands surveyed during pre-construction surveys (2014 and 2017) were prioritized for the 2021 call surveys.

Spring Anuran Call Surveys

Day and night-time breeding call surveys were conducted in spring (May 10-16, 2021) to determine the distribution of anurans (frogs and toads), particularly northern leopard frogs, throughout the LAA. Each anuran call survey site was visited twice: first, during the day to determine if it was accessible and to collect habitat information including water quality measurements; and second at night, when breeding calls are known to peak (Saskatchewan Ministry of Environment 2014). When a site was not directly accessible, but field crews were able to get within 200 m of the targeted location, a call survey was conducted from the nearest access location. Survey site location, distance (up to 200 m) and direction from the target location were recorded using a Garmin GPSMAP® 78 handheld GPS. At each site, a number of physical parameters were collected, including air temperature (°C), wind direction and speed (average and maximum; km/hr), cloud cover (%), and precipitation (Y/N). Pictures of the site were taken during the day using a Nikon Coolpix AW120 GPS linked camera. Ecological information about each site was recorded, including habitat type, vegetation type, land use, and water level. Only one site (Site 11) was located outside the PDA Right-of-Way (RoW) on private land and required permission to be accessed.

Anuran nighttime call surveys started approximately 30 min after sunset and were completed before 01:00 hrs (Kendell 2002, Weir 2011). Call surveys were conducted according to standard protocol, under optimal survey conditions (Kendell 2002); temperatures were 6°C or greater, and wind conditions were predominantly light or not existent. Call surveys were first conducted on May 3, but temperatures were still low and as such surveys were repeated May 10, with the May 3 surveys not included in analysis. Each call survey was conducted for 5 minutes, during which time individuals heard were identified to species and their call rank was recorded. Call ranks were as follows:

1 = one individual calling

2 = calls not overlapping, and distinguishable (several individuals)

3 = calls overlapping but still distinguishable (several + individuals calling)

4 = calls overlapping and indistinguishable (full chorus)

The approximate number of individuals of each species calling and their approximate location was also estimated and recorded, where possible. Anuran calls heard outside of the call survey time frame were also recorded, identified as incidental.

Northern Leopard Frog Surveys

The Visual encounter surveys (VES) were conducted during three time periods coincident with important Northern Leopard Frog life history stages: (1) in spring during the breeding season (May10-16, 2021); (2) in mid-summer during the post-breeding season when larvae (tadpoles) and emerging young of year are abundant (July 9-13, 2021); and (3) in fall during the pre-hibernation period (October 12-14, 2021). Sites were selected for each survey period based on their relative suitability for that life history stage. As with the call surveys, spring VES were first conducted on May 3 but temperatures were still low and as such, surveys were repeated May 10, with the May 3 surveys not included in analysis. During the summer survey period, two additional sites not surveyed in 2020 were surveyed including Site 6 which had been surveyed previously in the spring of 2014, and Site 26 which was found to have suitable breeding habitat. Although Site 23 was surveyed in 2020, private access limitations prevented this site from being surveyed during summer surveys in 2021.

VES were conducted during daylight hours between 08:00 and 20:30 hrs. Prior to VES, attributes measured included: ambient air temperature (°C), water temperature (°C), wind speed (km/hr) and direction, cloud cover (%), and precipitation (Y/N). Ideal survey conditions include water and air temperatures greater than 10°C, calm winds, and precipitation not exceeding light to intermittent rains (Kendell 2002). The VES commenced with two field biologists walking the perimeter of the wetland for a maximum of 20 min, or until the field crew encircled the entire circumference of the wetland, whichever came first. The path walked approximately followed the 2017 and 2020 VES tracks and was mapped using the handheld GPS. The two field biologists walked side-by-side along the wetland circumference, with one individual disturbing the vegetation along the wetland edge and monitoring for amphibians while the other individual monitored and recorded all amphibians observed. Where possible, all amphibians observed during the VES were identified to species, and either the individual or the habitat in which the individual was found was photographed. Observation locations were recorded using the handheld GPS. Survey start and end time, start and end location, and shoreline photographs were recorded.

Abundances from VES were standardized to Catch per Unit Effort (CPUE), or number of individuals observed per hour as follows: (number of inds observed x (60mins/1hr))/survey length (mins).

Incidental Sightings

Incidental observations of amphibians were defined as all auditory and visual observations made outside of intended surveys. These included individuals observed before or after VES, during water quality measurements, and those seen or caught incidentally during salamander surveys. All incidental amphibian observations, where possible, were enumerated and identified to species, photographed, and location recorded using the handheld GPS.

As outlined in Section 4.5.1 of the EMP, any incidental observations of the Least Bittern (*Ixobrychus exilis*) during the course of amphibian surveys were to be recorded and reported.

Eastern Tiger Salamander Surveys

Larval amphibian surveys were conducted in summer (July 9-13, 2021) at wetland ponds previously surveyed in 2020. At each wetland, physical parameters collected included: ambient air temperature (°C), water temperature (°C), wind speed (km/hr) and direction, cloud cover (%), and precipitation (Y/N). The habitat at each site was described and photographed.

At each wetland, five funnel traps were set along the shoreline. Funnel traps were set in the evening partially submerged in approximately 15-25 cm deep water, baited with 2 glow sticks (Grayson and Roe 2007), left overnight, and checked the following morning. Each funnel trap location was recorded using the handheld GPS. In addition to funnel traps, wetland site was also sampled for larval salamanders (and other amphibians) using a dipnet. Larval amphibians captured were to be identified, salamanders measured for snout-length and total length and all individuals released. Tissue samples were to be collected from salamander individuals captured for potential DNA analysis.

Water Quality

Water quality parameters were measured at spring, summer and fall VES sites where water was of sufficient depth. *In situ* measurements were recorded at three subsample locations spaced along the shore at each VES site. Measurements were made at the interface between emergent and submergent vegetation at 0.3 m from the surface (Archer et al. 2010). *In situ* parameters were measured using an Analite NEP-160 (Turbidity) and the YSI-Pro Plus (pH, Specific Conductance, Water Temperature, and Dissolved Oxygen) in the spring and summer. During fall surveys, the YSI-Pro Plus was replaced by a YSI 550A and a Hanna Combo pH and EC meter. During the spring surveys, a water sample was collected at one subsample location at each VES site for laboratory analysis of pH, Turbidity and Total Suspended Solids (TSS). Samples were analyzed at ALS Laboratories in Winnipeg, MB.

Pre-construction water quality measurements were taken during 2017 spring and fall sampling surveys. Spring water quality measurements were not collected during 2020 post-construction surveys as construction was not yet complete at the time. As such, summer surveys were completed in 2020. In 2021, water quality measurements were completed during all spring, summer and fall surveys to help with pre- and post- construction comparisons.

Mitigation Compliance Monitoring

Follow-up mitigation compliance and effectiveness surveys were conducted using visual on-site inspections during amphibian surveys at two of the 2020 amphibian sites (i.e., Sites 17.5 and 19). In 2020, wetland buffers were less than 30 m at these two sites. According to the CEnvPP (Manitoba Hydro 2019), natural vegetated buffer areas of 30 m will be established around wetlands, and riparian zones will be maintained to the extent possible (EC-8.03). Surveys focused on the re-establishment of vegetation at wetland buffers.

4.0 RESULTS

Amphibian Surveys

Amphibians were observed during call surveys, VES, as incidental observations during water quality sampling, and during summer salamander surveys. Amphibians recorded included American Toad (*Anaxyrus americanus*, Photos 1 and 2), Boreal Chorus Frog (*Pseudacris maculata*), Canadian Toad (*Anaxyrus hemiophrys*, Photo 3), Cope's/Gray Treefrog (*Hyla chrysoscelis/versicolor*), Northern Leopard Frog (Photo 4), Spring Peeper (*Pseudacris crucifer*), and Wood Frog (*Lithobates sylvaticus*, Photo 5). Observations are presented in Tables 1-4 and in Maps 2-5. The following results primarily focus on the Northern Leopard Frog and Eastern Tiger Salamander as representatives of the amphibian community.

Anuran Call Surveys

Call surveys were conducted at 15 sites. Fourteen sites had calling frogs, with six anuran species detected (Map 2, Table 1). Site 23 did not have any calling frogs during the daytime survey; it was not surveyed a second time at night as distance from road prevented reasonable access for the additional nighttime survey. Northern Leopard Frogs were heard at four of the call survey sites (i.e., Sites 6, 26, 27 and 28), with one to two individuals heard at each site. The presence of multiple calling individuals at the four survey sites suggests these areas are being used as Northern Leopard Frog breeding sites.

The abundances recorded in 2021 are similar to 2017 pre-construction surveys, where 12 of the 13 sites surveyed had calling frogs, representing six anuran species. In 2017, Northern Leopard Frogs were heard at eight of the call survey sites but had warmer spring temperatures, likely contributing to greater calling during the mid-May surveys.

Northern Leopard Frog Surveys

Visual encounter surveys occurred at 15 sites in the spring, 18 sites in the summer and 16 sites in the fall (Map 3-5; Photos 6-30). Site 11 was surveyed by both VES and dipnet during summer surveys. Seven species of anurans were detected during VES (Table 2).

Northern Leopard Frogs were detected at spring, summer and fall VES sites (Table 2). During spring VES, Northern Leopard Frogs were observed at 13% of sites surveyed (n = 2). This was similar to 2017 pre-construction surveys where Northern Leopard Frogs were observed at two of the sites surveyed. Northern Leopard Frogs represented 13% of all anuran observations during spring VES, similar to 2017 pre-construction surveys where Northern Leopard Frogs represented 12% of all anuran observations during the same survey period.

During summer VES, Northern Leopard Frogs were observed at 39% of all sites surveyed (n = 7). This was an increase from 2017 and 2020 summer VES, where Northern Leopard Frogs were observed at 14% and 12% of sites surveyed, respectively. Northern Leopard Frog observations represented 4% of all anuran observations during summer VES. Relative observation abundance was low due to the disproportionately large abundance of young-of-year toads observed at Sites 27 and 28 (n = 425). The greatest number of Northern Leopard Frogs observed was at Site 26 (n = 6), with the second greatest number at Site 17.5 (n = 4). Observations at these two sites included young-of-year and tadpole stages, suggesting these sites are Northern Leopard Frog breeding sites. One or two individuals of Northern Leopard Frogs were observed at Sites 9a, 15, 18, 21, and 22 during VES.

During fall VES, Northern Leopard Frogs were observed at 31% of all sites surveyed (n = 5). Northern Leopard Frogs were observed at 40% of sites during 2017 surveys, and 60% of sites during 2020 surveys. Northern Leopard Frog observations represented 100% of all anuran observations during 2021 fall VES, with one to three individuals observed at Sites 1, 3, 4, 7US, and 26. Four of these sites are rivers, suggesting staging at overwintering sites was occurring during the fall survey period.

Of the 15 spring sites examined in 2021, ten were also examined during pre-construction surveys (Table 3). Northern Leopard Frogs were found in greater abundance (CPUE) at Site 27, in lower abundances at Sites 10 and 21, and equal abundances at the remaining seven sites in 2021, when compared with the pre-construction surveys.

Of the 18 summer sites examined in 2021, seven were also examined during pre-construction surveys and during the first year of post-construction, in 2020 (Table 3). Northern Leopard Frogs were found in equal or greater abundance (CPUE) at all seven sites surveyed in 2021 when compared with the pre-construction surveys. Similarly, 2021 surveys had equal or greater abundances (CPUE) of Northern Leopard Frogs at all sites except for two when compared to the first year of post-construction monitoring; Site 17.5 had overall lower anuran abundances in 2021 and Site 19 was dry in 2021, compared to 2020.

Of the 16 fall sites examined in 2021, 13 were also examined during pre-construction surveys in 2014 or 2017 (Table 3). Northern Leopard Frog CPUE was variable at fall survey sites, with six sites having greater abundances of Northern Leopard Frogs during pre-construction surveys, and five sites having greater abundance of Northern Leopard Frogs during post-construction surveys. Although the overall abundance (CPUE) at river sites was lower during post-construction surveys compared with pre-construction surveys, abundances indicate staging is still occurring at these overwintering sites, but surveys may have been conducted at difference points in the overwintering staging process. Overall, post-construction fall surveys had similar Northern Leopard Frog abundance (CPUE) at the river sites in 2020 and 2021. In 2020, the shallow creek sites of Pine Creek (Sites 26, 27, and 28) all had high CPUE values during the fall surveys, compared with other sites in 2020, 2021 surveys, and pre-construction surveys. This reinforces the fact that Northern Leopard Frogs that were likely still present at summering sites during fall 2020 surveys.

Amphibian breeding populations, and consequently larval, summering and overwintering populations, naturally undergo wide fluctuations in numbers, making them especially sensitive to stochastic events (Pechmann et al. 1991); water availability, temperatures, and other extraneous factors may all contribute to abundance variability observed between survey years.

Incidental Sightings

Incidental observations of amphibians seen or heard before or after VES surveys, or caught incidentally during salamander surveys, are presented in Table 4.

During spring surveys, one Northern Leopard Frog was observed incidentally at Site 6; no individuals were observed during spring VES at this site.

During summer surveys, one Northern Leopard Frog was observed incidentally outside of the VES, at each of Sites 9b, 14, 17.5, 18, WA10, and 27. At Site 21, eight Northern Leopard Frogs were observed incidentally. Incidental observations were the only Northern Leopard Frogs observations at Sites 9b, 14, WA10, and 27; no individuals were observed at these sites during summer VES. Northern Leopard Frog tadpoles were also captured incidentally in funnel traps during salamander surveys at Sites 17.5 (n = 7; Photo 31) and 21 (n = 42), indicating these sites were successful Northern Leopard Frog breeding sites.

During fall surveys, two Northern Leopard Frogs were observed incidentally at Site 13. Northern Leopard Frogs were not observed at Site 13 during fall VES.

Least Bittern was not identified incidentally during the course of amphibian surveys.

Eastern Tiger Salamander Surveys

Summer salamander surveys were conducted at 10 wetland ponds (Maps 6 and 7). No salamanders were caught during the course of surveys; *REDACTED*, where larval salamanders were caught in 2020, was dry during 2021 surveys.

Water Quality

In situ water quality was measured at 14 of the 15 VES sites in the spring, 13 of the 18 VES sites in summer and 11 of the 16 fall VES sites (Table 5). Site 22 was too dry during spring surveys for water quality measurements. Five of the summer VES sites (Sites 18, WA10, 19, 22, and 27) were too shallow for water quality measurements during summer surveys. During fall surveys, Site 7US, 21, 26, 27, and 28 were too shallow for water quality measurements. While all sites were sampled at three locations and measurements represent averages of the three subsamples, Site 28 could only be measured at one sub-sample location. Overall, water quality parameters were variable at sites dependent on the size, depth and flow pattern of the waterbodies and did not appear to differ post-construction when compared to pre-construction.

During spring surveys, water temperatures ranged from 9.3 to 20.1 °C. Dissolved Oxygen (DO) ranged from 3.6 to 13.1 mg/L (avg = 9.0 mg/L; Table 5). All sites except for Site WA10 were above minimum acceptable DO concentration guidelines set out in the Manitoba Water Quality Standards, Objectives and Guidelines (MWQSOG) for the protection of early life stages of cool-water species (i.e., 6.0 mg/L; MWS 2011). In general, DO can vary in daily and seasonal patterns and decreases with higher temperatures. Specific conductance at sites ranged from 204-1118 µS/cm. The pH was circum-neutral to alkaline (7.2-8.5) at sites and was within MWQSOG (i.e., 6.5-9.0, MWS 2011). *In situ* turbidity was generally low (usually <12 NTU) with the exception of Site 6 (23.7 NTU).

During summer surveys, water temperatures ranged from 15.6 to 29.0 °C. Dissolved Oxygen ranged from 1.0 to 18.7 mg/L (avg = 8.1 mg/L; Table 5) of which eight sites were above minimum acceptable concentration guidelines set out in the MWQSOG for the protection of early life stages of cool-water species (i.e., >6.0 mg/L; MWS 2011). Sites with very low DO levels were associated with very shallow, stagnant waters, often covered in duckweed. Very high DO and associated oxygen saturation at Site 11 (18.7 mg/L, 245.5%) was likely a result of unusually high productivity. Specific conductance at sites ranged from 270-1112 µS/cm. The pH was circum-neutral to alkaline (6.9-8.5) at sites and was within MWQSOG (i.e., 6.5-9.0, MWS 2011). The exception to this was Site 11, where pH was measured at 9.4. Site 11 also had the lowest Specific conductance (i.e. 270 µS/cm). Both were again likely a result of unusually high productivity in such a shallow site with lots of sun and no water flow. *In situ* turbidity at sites was generally low (usually <14 NTU) with the exception of Site 6 (Seine River siphon site, 41.47 NTU), Site 14 (very dense duckweed, 64.8 NTU), and WA9 (cattle dugout, 497.7 NTU).

During fall surveys, average water temperatures ranged from 6.8 to 13.3 °C. The DO range at fall sites was 7.0-16.8 mg/L (avg = 11.4 mg/L), with higher values owing to the focus on overwintering river sites during the survey period. Dissolved Oxygen remained above MWQSOG (i.e., 6.0 mg/L; MWS 2011) at all 11 sites measured. Specific conductance ranged from 384-1592 µS/cm across all sites except for Site 2 (the wastewater pond) where specific conductance averaged 2994 µS/cm. The pH was again circum-neutral to alkaline (6.9-8.8) across sites and was within MWQSOG at all sites except Site 2. *In situ* turbidity was highest at the Site 2, and river and diversion sites (Sites 1, 4, 6, and 7DS; Table 5).

Northern Leopard Frogs are known to overwinter in well oxygenated waters that do not freeze to the bottom (Kendell 2002; Russell and Bauer 2000; Alberta Northern Leopard Frog Recovery Team 2005; Hine et al. 1981). During fall surveys, Northern Leopard Frogs were consistently observed during VES at river sites where the DO average was greater than 11.5 mg/L (Sites 1, 3, and 4). All three of these sites had water depths greater than 1 m suggesting Northern Leopard Frogs are likely overwintering at these sites. Northern Leopard Frogs were also observed at two sites that were too shallow for water quality measurements (Sites 7US and 26). These locations, while not suitable for overwintering, may be in close proximity to sites with deep water habitat (e.g., Site 7US is near the Seine River).

Overall, water quality was similar between pre-construction and post-construction surveys for both spring and fall (Table 6). The variability in water quality readings between study years, seasons and sample sites is likely the result of any number of short- and long-term environmental influences such as ambient temperature, precipitation level, and the timing of surveys.

Mitigation Compliance Monitoring

Follow-up mitigation compliance and effectiveness was evaluated using visual on-site inspections during amphibian surveys at Sites 17.5 and 19 (Table 7). In 2020, wetland buffers were less than 30 m at these two sites. According to the CEnvPP (Manitoba Hydro 2019), natural vegetated buffer areas of 30 m will be established around wetlands, and riparian zones will be maintained to the extent possible (EC-8.03).

Site 17.5

During 2020 surveys, the wetland buffer was less than 30 m at the northern corners of Site 17.5 (Photo 32). Follow-up surveys conducted at the site in 2021 found re-establishment of vegetation was occurring (Photo 33). Water quality and amphibian abundance was within the range of other sites surveyed.

Site 19

During 2020 surveys, the wetland buffer was less than 30 m at Site 19 (Photo 34). In consideration of the presence of Northern Leopard Frogs , it was also recommended that

a 30 m riparian buffer be established around the wetlands at Site 19 for any future RoW maintenance work. Follow-up surveys conducted at the site in 2021 found re-establishment of vegetation was occurring (Photo 25). During spring surveys, water quality did not appear to be affected negatively and Northern Leopard Frog abundance (CPUE) was the same as during pre-construction surveys. During summer surveys, conditions were dry; no water quality measurements were taken. Northern Leopard Frog abundance (CPUE) was the same as during pre-construction surveys; abundance in 2020 was greater, but 2020 also had more water present.

Additional Observations

Rutting along the PDA RoW was noted at Site 17.5 but was likely due to local landowner and cattle land use and was not considered to pose a threat to the nearby amphibian wetland sites and therefore was not considered a mitigation non-compliance issue.

Oily surface sheens were seen within the PDA at some sites, but these are likely the result of iron bacteria naturally occurring at the survey sites, as in previous years.

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6.0 TABLES

Table 1. Max call ranks[1] of anurans heard calling during Anuran Call Surveys, Manitoba-Minnesota Transmission Project, spring 2021.

Site	American Toad	Boreal Chorus Frog	Gray Treefrog	Northern Leopard Frog	Spring Peeper	Wood Frog
6	0	2	0	1	0	0
10	0	2	0	0	0	0
11	0	0	0	0	0	1
14	0	0	0	0	0	2
15	0	1	0	0	0	3
17.5	0	2	0	0	3	2
18	0	1	0	0	0	2
WA10	0	3	0	0	3	2
19	0	2	0	0	3	1
21	0	0	0	0	3	0
22	0	0	0	0	2	2
23	0	0	0	0	0	0
26	4	3	0	2	3	1
27	1	0	0	2	0	0
28	2	4	1	1	3	0

[1]Ranks: 1 = one individual calling; 2 = calls not overlapping & distinguishable (several individuals); 3 = calls overlapping but still distinguishable (several + individuals calling); 4 = calls overlapping & indistinguishable (full chorus)

Table 2. Summary of anurans observed (i.e., seen or heard) during Manitoba-Minnesota Transmission Project visual encounter surveys conducted in 2021.

Season	Site	Survey Length (mins)	BCFR	CATO	NLFR	SPPE	WOFR	Toad
Spring	6	20	0	0	0	0	0	0
	10	20	0	0	0	0	0	0
	11	20	0	0	0	0	0	0
	14	20	1	0	0	0	0	0
	15	20	0	0	0	0	0	0
	17.5	20	0	0	0	0	0	0
	18	15	0	0	0	0	0	0
	WA10	20	0	0	0	0	3	0
	19	20	2	0	0	0	2	0
	21	20	0	0	0	0	0	0
	22	20	0	0	0	0	1	0
	23	20	0	0	0	0	0	0
	26	20	0	0	2	2	1	0
	27	20	0	0	1	0	0	0
	28	20	0	0	0	0	0	0
		Total	**3**	**0**	**3**	**2**	**7**	**0**
Summer	6	20	0	1	0	0	0	0
	8	20	0	0	0	0	0	0
	9a	20	0	0	1	0	2	0
	9b	20	0	0	0	0	1	0
	10	20	0	0	0	0	0	0
	11	20	0	0	0	0	1	0
	14	20	0	0	0	0	0	0
	15	20	0	0	1	0	0	0
	WA9	15	0	0	0	0	1	0
	17.5	20	0	0	4	0	0	0
	18	20	0	0	2	0	0	15
	WA10	20	0	0	0	0	1	0
	19	20	0	0	0	0	0	0
	21	20	0	0	2	0	0	0
	22	20	0	0	1	0	0	0
	26	20	0	0	6	0	0	0
	27	20	0	0	0	0	0	401
	28	20	0	0	0	0	0	24
		Total	**0**	**1**	**17**	**0**	**6**	**440**

Table 2. Continued.

Season	Site	Survey Length (mins)	BCFR	CATO	NLFR	SPPE	WOFR	Toad
Fall	1	20	0	0	1	0	0	0
	2	20	0	0	0	0	0	0
	3	20	0	0	3	0	0	0
	4	20	0	0	1	0	0	0
	6	20	0	0	0	0	0	0
	7DS	20	0	0	0	0	0	0
	7US	20	0	0	1	0	0	0
	9a	20	0	0	0	0	0	0
	9b	20	0	0	0	0	0	0
	10	20	0	0	0	0	0	0
	11	20	0	0	0	0	0	0
	13	20	0	0	0	0	0	0
	21	20	0	0	0	0	0	0
	26	20	0	0	1	0	0	0
	27	20	0	0	0	0	0	0
	28	20	0	0	0	0	0	0
		Total	**0**	**0**	**7**	**0**	**0**	**0**
		Grand Total	**3**	**1**	**27**	**2**	**13**	**440**

Table 3. Summary of catch per unit effort (CPUE[1]) for Northern Leopard Frogs heard and seen within the Manitoba-Minnesota Transmission Project Local Assessment Area, during pre-construction (2014 and 2017) and post-construction (2020 and 2021) visual encounter surveys.

Survey Period	Site	Pre-Construction		Post-Construction	
		2014[2]	2017[3]	2020[4]	2021
Spring	1	0.0	-	-	-
	4	0.0	-	-	-
	6	0.0	-	-	0.0
	10	N/A	3.5	-	0.0
	11	-	-	-	0.0
	14	-	-	-	0.0
	15	-	-	-	0.0
	16	-	0.0	-	-
	17.5	-	0.0	-	0.0
	18	-	0.0	-	0.0
	WA10	-	-	-	0.0
	19	-	0.0	-	0.0
	21	-	6.0	-	0.0
	22	3.0	0.0	-	0.0
	23	-	0.0	-	0.0
	26	-	-	-	6.0
	27	-	0.0	-	3.0
	28	-	0.0	-	0.0
Summer	6	-	-	-	0.0
	8	-	-	0.0	0.0
	9a	-	0.0	0.0	3.0
	9b	-	-	0.0	0.0
	10	N/A	0.0	0.0	0.0
	11	-	0.0	0.0	0.0
	14	-	-	0.0	0.0
	15	-	-	0.0	3.0
	WA9	-	-	0.0	0.0
	17.5	-	2.2	39.0	12.0
	18	-	0.0	0.0	6.0
	WA10	-	-	0.0	0.0
	19	-	0.0	8.6	0.0
	21	-	0.0	0.0	6.0
	22	-	-	0.0	3.0
	23	-	-	0.0	-
	26	-	-	-	18.0
	27	-	-	0.0	0.0
	28	-	-	0.0	0.0

Table 3. Continued.

Survey Period	Site	Pre-Construction		Post-Construction	
		2014[2]	2017[3]	2020[4]	2021
Fall	1	30.0	-	3.0	3.0
	2	-	-	0.0	0.0
	3	-	-	5.7	9.0
	4	39.0	-	0.0	3.0
	6	3.0	-	12.0	0.0
	7DS	-	21.8	5.7	0.0
	7US	-	0.0	-	3.0
	9a	-	4.3	0.0	0.0
	9b	-	-	6.0	0.0
	10	N/A	0.0	0.0	0.0
	11	-	3.0	0.0	0.0
	13	-	30.0	0.0	0.0
	21	-	0.0	6.0	0.0
	26	-	0.0	18.0	3.0
	27	-	0.0	12.0	0.0
	28	-	0.0	8.0	0.0

1 - CUPE is defined as the number of NLFRs observed per hour of survey effort; dashes indicate a survey was not conducted
2 - From Stantec 2015; Results from Site 10 were not presented in Stantec 2015
3 - Dyszy 2018
4 - North/South Consultants Inc. 2020

Table 4. Summary of anurans observed incidentally (seen or heard) during wetland surveys (i.e., visual encounter and water quality surveys), and tadpoles captured in funnel nets (FN) during salamander surveys, Manitoba-Minnesota Transmission Project 2021.

Season	Site	AMTO	BCFR	C/GRTF	NLFR	SPPE	WOFR	Toad	Unid
Spring	6	0	0	0	1	0	0	0	0
	10	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	1	0	0
	17.5	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0
	WA10	0	1	0	0	1	0	0	0
	19	0	1	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0
	27	0	0	0	0	0	0	0	0
	28	1	0	1	0	2	0	0	0
		1	**2**	**1**	**1**	**3**	**1**	**0**	**0**
Summer	6	0	0	0	0	0	0	1	0
	8	0	0	0	0	0	0	0	1
	9a	0	0	0	0	0	3	0	0
	9b	0	0	0	1	0	0	0	0
	10	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0
	14	0	0	0	1	0	0	0	0
	15	0	0	0	0	0	0	0	0
	WA9	0	0	0	0	0	0	0	0
	17.5	0	0	FN(5)	1, FN(7)	0	0	0	0
	18	0	0	0	1	0	0	0	0
	WA10	0	0	0	1	0	1	3	0
	19	0	0	0	0	0	0	0	0
	21	0	0	0	8, FN(42)	0	1	0	0
	22	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0
	27	0	0	0	1	0	0	5	0
	28	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**5**	**54**	**0**	**5**	**9**	**1**

Table 4. Continued.

Season	Site	AMTO	BCFR	C/GRTF	NLFR	SPPE	WOFR	Toad	Unid
Fall	1	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7DS	0	0	0	0	0	0	0	0
	7US	0	0	0	0	0	0	0	0
	9a	0	0	0	0	0	0	0	0
	9b	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0
	13	0	0	0	2	0	0	0	0
	21	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0
	27	0	0	0	0	0	0	0	0
	28	0	0	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**
Grand Total		**1**	**2**	**6**	**57**	**3**	**6**	**9**	**1**

Table 5. Water quality results from *in situ* measurements and laboratory analysis from samples collected in the field during Manitoba-Minnesota Transmission Project amphibian studies, 2021.

		In-situ measurements							Lab sample results		
Site ID	Sample Date	Sampling Time	Temperature (°C)	Dissolved Oxygen (mg/L)	Oxygen Saturation (%)	Specific Conductance (µS/cm)	pH	Turbidity (NTU)	Turbidity (NTU)	TSS (mg/L)	pH
Spring											
6	10-May-21	16:42	13.9	11.0	106.8	385	8.1	23.73	17.3	13.3	8.28
10	10-May-21	18:30	14.8	10.2	100.8	1033	8.1	3.46	2.26	2.9	8.31
11	10-May-21	20:04	16.6	9.0	91.9	406	8.1	4.70	2.53	6.0	8.33
14	11-May-21	16:09	14.3	10.9	103.5	1118	7.8	2.09	0.68	2.9	8.1
15	11-May-21	17:45	9.3	8.6	74.5	493	7.4	1.27	1.25	5.8	7.68
17.5	11-May-21	19:37	19.2	9.2	99.9	469	8.0	0.43	0.84	2.9	8.31
18	11-May-21	20:40	20.1	9.9	109.2	736	8.5	11.74	4.8	12.4	8.58
19	12-May-21	16:15	16.3	6.3	64.1	391	7.2	0.65	0.65	<1.0	7.85
WA10	12-May-21	18:09	11.5	3.6	34.0	548	7.3	0.61	0.90	2.8	7.98
21	12-May-21	20:24	18.5	7.7	81.4	350	7.9	0.15	0.46	3.7	8.24
22	13-May-21	15:15	-	-	-	-	-	-	-	-	-
23	13-May-21	17:54	9.8	6.6	58.1	335	7.7	-	0.29	4	8.03
26	16-May-21	16:58	15.1	13.1	130.1	231	7.7	0.31	1.06	1.6	7.99
27	16-May-21	18:00	13.7	11.9	115.0	250	8.0	0.40	0.79	1.8	8.1
28	16-May-21	19:10	12.6	8.1	75.8	204	7.7	2.49	0.4	<1.0	7.78
Summer											
6	09-Jul-21	8:34	18.7	6.1	64.7	456	7.8	41.47	-	-	-
8	09-Jul-21	10:09	18.8	5.0	54.3	803	7.8	8.20	-	-	-
9a	09-Jul-21	12:24	19.5	8.5	92.6	520	7.1	0.87	-	-	-
9b	09-Jul-21	13:39	20.3	10.6	117.8	561	7.4	4.66	-	-	-
10	09-Jul-21	15:58	29.0	18.7	245.5	270	9.4	0.80	-	-	-
11	09-Jul-21	17:35	27.0	10.0	125.4	1112	8.1	1.05	-	-	-
14	10-Jul-21	12:16	15.6	1.1	11.4	1035	6.9	64.80	-	-	-
15	10-Jul-21	13:58	16.3	1.0	10.3	644	6.9	13.77	-	-	-
WA9	10-Jul-21	15:28	25.6	12.8	155.7	1107	8.2	497.67	-	-	-
17.5	10-Jul-21	16:35	26.8	8.6	109.1	366	7.8	0.44	-	-	-

Table 5. Continued.

		In-situ measurements							Lab sample results		
Site ID	Sample Date	Sampling Time	Temperature (°C)	Dissolved Oxygen (mg/L)	Oxygen Saturation (%)	Specific Conductance (µS/cm)	pH	Turbidity (NTU)	Turbidity (NTU)	TSS (mg/L)	pH
18	11-Jul-21	11:25	-	-	-	-	-	-	-	-	-
WA10	11-Jul-21	13:07	-	-	-	-	-	-	-	-	-
19	11-Jul-21	13:55	-	-	-	-	-	-	-	-	-
21	12-Jul-21	15:34	24.4	5.2	62.4	479	7.8	0.51	-	-	-
22	11-Jul-20	10:30	-	-	-	-	-	-	-	-	-
26	12-Jul-21	13:50	26.6	14.1	175.9	344	8.5	4.15	-	-	-
27	12-Jul-21	10:30	-	-	-	-	-	-	-	-	-
28	12-Jul-21	12:41	24.8	4.0	48.0	500	7.7	12.14	-	-	-
					Fall						
1	14-Oct-21	16:19	10.8	16.8	151.2	794	8.8	54.10	-	-	-
2	14-Oct-21	14:46	10.5	13.2	118.3	2994	9.5	40.04	-	-	-
3	14-Oct-21	13:17	11.1	13.5	122.0	1592	8.6	4.62	-	-	-
4	14-Oct-21	12:03	13.3	11.7	112.5	878	8.6	34.73	-	-	-
6	13-Oct-21	16:31	9.2	8.4	72.1	555	8.0	32.97	-	-	-
7DS	14-Oct-21	9:35	10.4	8.3	75.0	750	7.8	20.80	-	-	-
7US	14-Oct-21	10:39	-	-	-	-	-	-	-	-	-
9a	13-Oct-21	13:33	9.0	7.0	60.5	537	7.4	0.23	-	-	-
9b	13-Oct-21	14:21	9.4	8.6	70.3	678	6.9	1.86	-	-	-
10	13-Oct-21	12:03	12.8	10.5	102.2	1085	8.2	1.32	-	-	-
11	13-Oct-21	10:40	6.8	14.5	116.2	422	8.4	11.81	-	-	-
13	12-Oct-21	17:35	12.7	13.5	127.5	384	8.0	8.70	-	-	-
21	12-Oct-21	15:10	-	-	-	-	-	-	-	-	-
26	12-Oct-21	13:40	-	-	-	-	-	-	-	-	-
27	12-Oct-21	12:10	-	-	-	-	-	-	-	-	-
28	12-Oct-21	12:40	-	-	-	-	-	-	-	-	-

Table 6. Pre- and Post-construction water quality results from *in situ* measurements during Manitoba-Minnesota Transmission Project amphibian studies.

Site ID	2017						2020						2021					
	Temp. (°C)	Dissolved Oxygen (mg/L)	Oxygen Saturation (%)	Specific Conductance (µS/cm)	pH	Turb. (NTU)	Temp. (°C)	Dissolved Oxygen (mg/L)	Oxygen Saturation (%)	Specific Conductance (µS/cm)	pH	Turb. (NTU)	Temp. (°C)	Dissolved Oxygen (mg/L)	Oxygen Saturation (%)	Specific Conductance (µS/cm)	pH	Turb. (NTU)
Spring Survey							Spring Survey						Spring Survey					
6	-	-	-	-	-	-	-	-	-	-	-	-	13.9	11.0	106.8	385	8.1	23.7
10	14.4	7.9	77.1	842	7.5	0.4	-	-	-	-	-	-	14.8	10.2	100.8	1033	8.1	3.5
11	-	-	-	-	-	-	-	-	-	-	-	-	16.6	9.0	91.9	406	8.1	4.7
14	8.2	0.9	7.6	835	6.2	25.8	-	-	-	-	-	-	14.3	10.9	103.5	1118	7.8	2.1
15	-	-	-	-	-	-	-	-	-	-	-	-	9.3	8.6	74.5	493	7.4	1.3
16	11.7	5.3	49.1	83	6.2	0.5	-	-	-	-	-	-	-	-	-	-	-	-
17.5	17.3	9.4	97.9	342	6.8	-0.8	-	-	-	-	-	-	20.1	9.9	109.2	736	8.5	11.7
18	17.6	10.4	109.3	563	6.9	28.4	-	-	-	-	-	-	19.2	9.2	99.9	469	8.0	0.4
19	9.6	1.9	16.4	426	6.4	-0.9	-	-	-	-	-	-	16.3	6.3	64.1	391	7.2	0.7
WA10	-	-	-	-	-	-	-	-	-	-	-	-	11.5	3.6	34.0	548	7.3	0.6
21	19.1	7.7	83.7	285	6.9	-0.3	-	-	-	-	-	-	18.5	7.7	81.4	350	7.9	0.1
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	11.5	8.3	76.4	334	6.4	-1.0	-	-	-	-	-	-	9.8	6.6	58.1	335	7.7	-
26	-	-	-	-	-	-	-	-	-	-	-	-	15.1	13.1	130.1	231	7.7	0.3
27	10.4	14.3	127.6	243	6.6	0.4	-	-	-	-	-	-	13.7	11.9	115.0	250	8.0	0.4
28	8.8	5.7	49.4	246	6.8	-1.1	-	-	-	-	-	-	12.6	8.1	75.8	204	7.7	2.5
Summer Survey							Summer Survey						Summer Survey					
6	-	-	-	-	-	-	-	-	-	-	-	-	18.7	6.1	64.7	456	7.8	41.5
8	-	-	-	-	-	-	23.6	3.6	42.9	691	7.6	0.3	18.8	5.0	54.3	803	7.7	8.2
9a	-	-	-	-	-	-	25.1	2.3	28.4	444	6.8	1.2	19.5	8.5	92.6	520	7.1	0.9
9b	-	-	-	-	-	-	26.6	4.3	54.9	503	7.1	1.6	20.3	10.6	117.8	561	7.4	4.7
10	-	-	-	-	-	-	27.3	8.3	97.0	920	7.7	1.4	29.0	18.7	245.5	270	9.4	0.8
11	-	-	-	-	-	-	28.7	10.4	135.1	288	8.5	8.2	27.0	10.0	125.4	1112	8.1	1.1
14	-	-	-	-	-	-	-	-	-	-	-	-	15.6	1.1	11.4	1035	6.9	64.8
15	-	-	-	-	-	-	-	-	-	-	-	-	16.3	1.0	10.3	644	6.9	13.8
WA9	-	-	-	-	-	-	28.2	16.3	212.4	792	8.6	359.7	25.6	12.8	155.7	1107	8.2	497.7
17.5	-	-	-	-	-	-	29.5	5.8	76.4	284	7.7	1.1	26.8	8.6	109.1	366	7.8	0.4
18	-	-	-	-	-	-	30.6	9.3	125.0	569	7.9	4.7	-	-	-	-	-	-

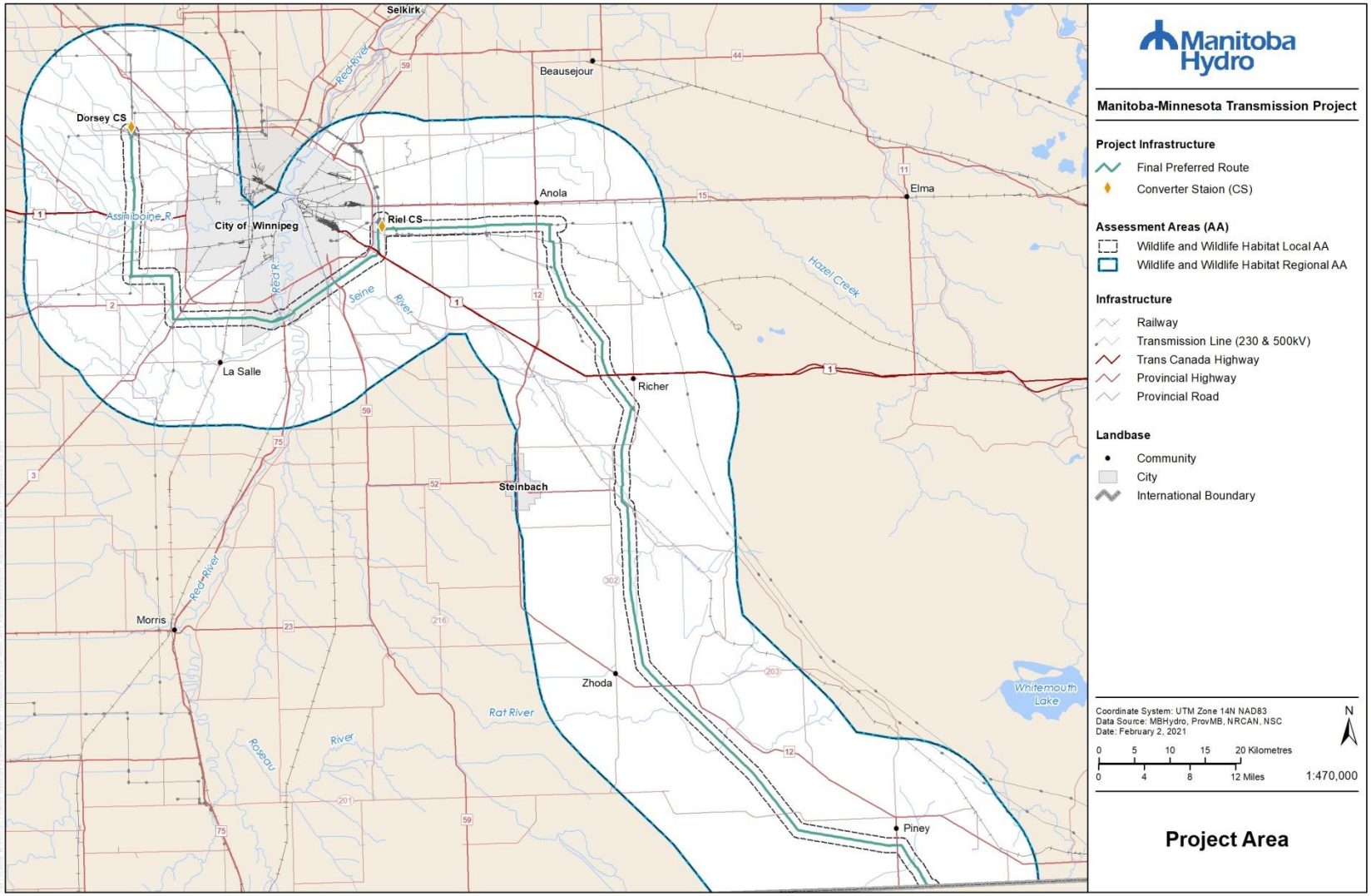
Table 6. Continued

Site ID	2017						2020						2021					
	Temp. (°C)	Dissolved Oxygen (mg/L)	Oxygen Saturation (%)	Specific Conductance (µS/cm)	pH	Turb. (NTU)	Temp. (°C)	Dissolved Oxygen (mg/L)	Oxygen Saturation (%)	Specific Conductance (µS/cm)	pH	Turb. (NTU)	Temp. (°C)	Dissolved Oxygen (mg/L)	Oxygen Saturation (%)	Specific Conductance (µS/cm)	pH	Turb. (NTU)
WA10	-	-	-	-	-	-	19.8	1.8	20.2	730	7.3	25.7	-	-	-	-	-	-
19	-	-	-	-	-	-	21.3	0.8	8.5	415	7.3	1.5	-	-	-	-	-	-
21	-	-	-	-	-	-	26.1	3.7	45.0	287	7.4	0.9	24.4	5.2	62.4	479	7.7	0.5
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	16.7	3.7	37.9	359	7.0	1.5						
26	-	-	-	-	-	-	-	-	-	-	-	-	26.6	14.1	175.9	344	8.5	4.1
27	-	-	-	-	-	-	20.4	7.4	82.1	334	7.4	2.3	-	-	-	-	-	-
28	-	-	-	-	-	-	19.1	2.5	26.8	416	7.1	0.7	24.8	4.0	48.0	500	7.7	12.1
	Fall Survey						Fall Survey						Fall Survey					
1	-	-	-	-	-	-	13.2	11.6	110.4	858	8.3	65.3	10.8	16.8	151.2	794	8.8	54.1
2	-	-	-	-	-	-	12.8	6.8	64.8	2333	8.1	163.4	10.5	13.2	118.3	2994	9.5	40.0
3	-	-	-	-	-	-	14.1	9.7	94.2	1405	8.4	35.3	11.1	13.5	122.0	1592	8.6	4.6
4	-	-	-	-	-	-	17.1	8.2	85.4	852	8.2	106.8	13.3	11.7	112.5	878	8.6	34.7
6	-	-	-	-	-	-	14.4	11.3	110.9	458	8.4	46.7	9.2	8.4	72.1	555	8.0	33.0
7DS	10.9	6.3	56	574	7.4	194.4	14.6	12.8	126.2	709	8.3	6.6	10.4	8.3	75.0	750	7.8	20.8
7US	-	9.6	87.1	545	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9a	14.9	3.3	33.4	546	7.1	0.9	11.2	4.7	42.3	549	7.3	1.3	9.0	7.0	60.5	537	7.4	0.2
9b							11.1	3.2	29.3	564	7.0	2.7	9.4	8.56	70.3	678	6.9	1.9
10	15.2	8.5	87.3	854	7.6	0.7	13.8	5.4	51.9	944	7.7	0.9	12.8	10.5	102.2	1085	8.2	1.3
11	16	7.2	71.2	335.7	7.0	1.1	13.7	9.1	87.9	330	8.0	18.0	6.8	14.5	116.2	422	8.4	11.8
13	14.5	9.1	90	441.5	7.7	4.5	13.3	9.2	88.2	442	8.1	4.6	12.7	13.5	127.5	384	8.0	8.7
21	14.6	5.7	56.2	375.8	7.3	2.7	11.9	7.7	71.0	295	7.4	1.8	-	-	-	-	-	-
26	14.7	7.0	67.2	357	6.8	6.4	8.4	2.9	24.6	337	7.1	19.4	-	-	-	-	-	-
27	15.1	4.5	44.9	412.5	7.2	7.9	15.4	11.7	118.2	465	7.6	5.3	-	-	-	-	-	-
28	13.1	1.7	15.1	292.7	6.6	3.9	14.8	4.2	41.4	441	7.3	11.8	-	-	-	-	-	-

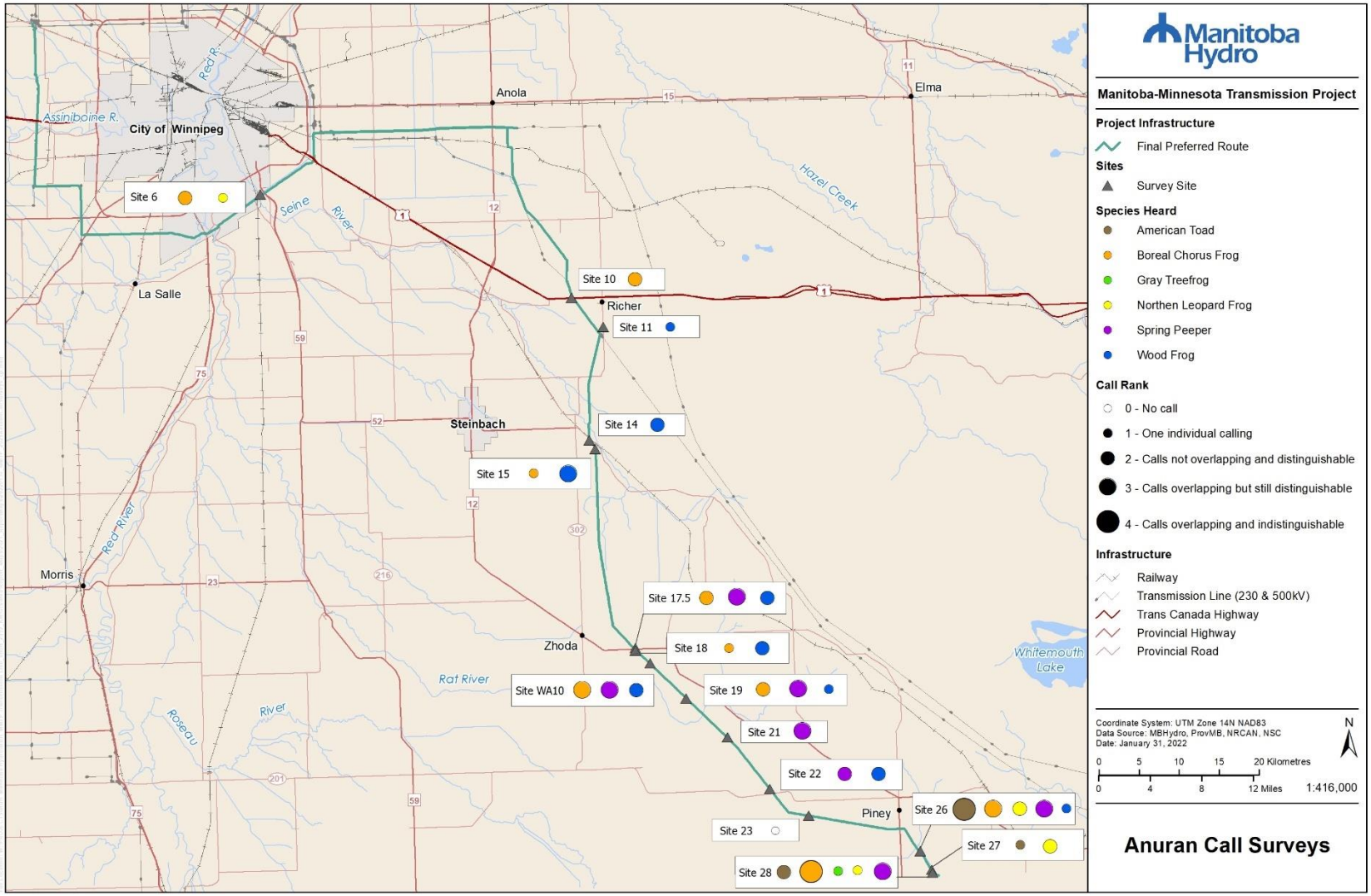
Table 7. Mitigation compliance monitoring at amphibian wetland sites within the Manitoba-Minnesota Transmission Project Development Area, 2021.

Site	ESS ID	Name/Description	Buffer	Rutting	Erosion	Instream Debris	Comments
17.5	N/A	Wetland	YES	NO	NO	NO	Buffer on the NE & NW corners <30m, re-vegetation occurring
19	N/A	Small Shallow Wetland	YES	NO	NO	NO	Re-vegetation occurring at wetland buffers; wetland dry

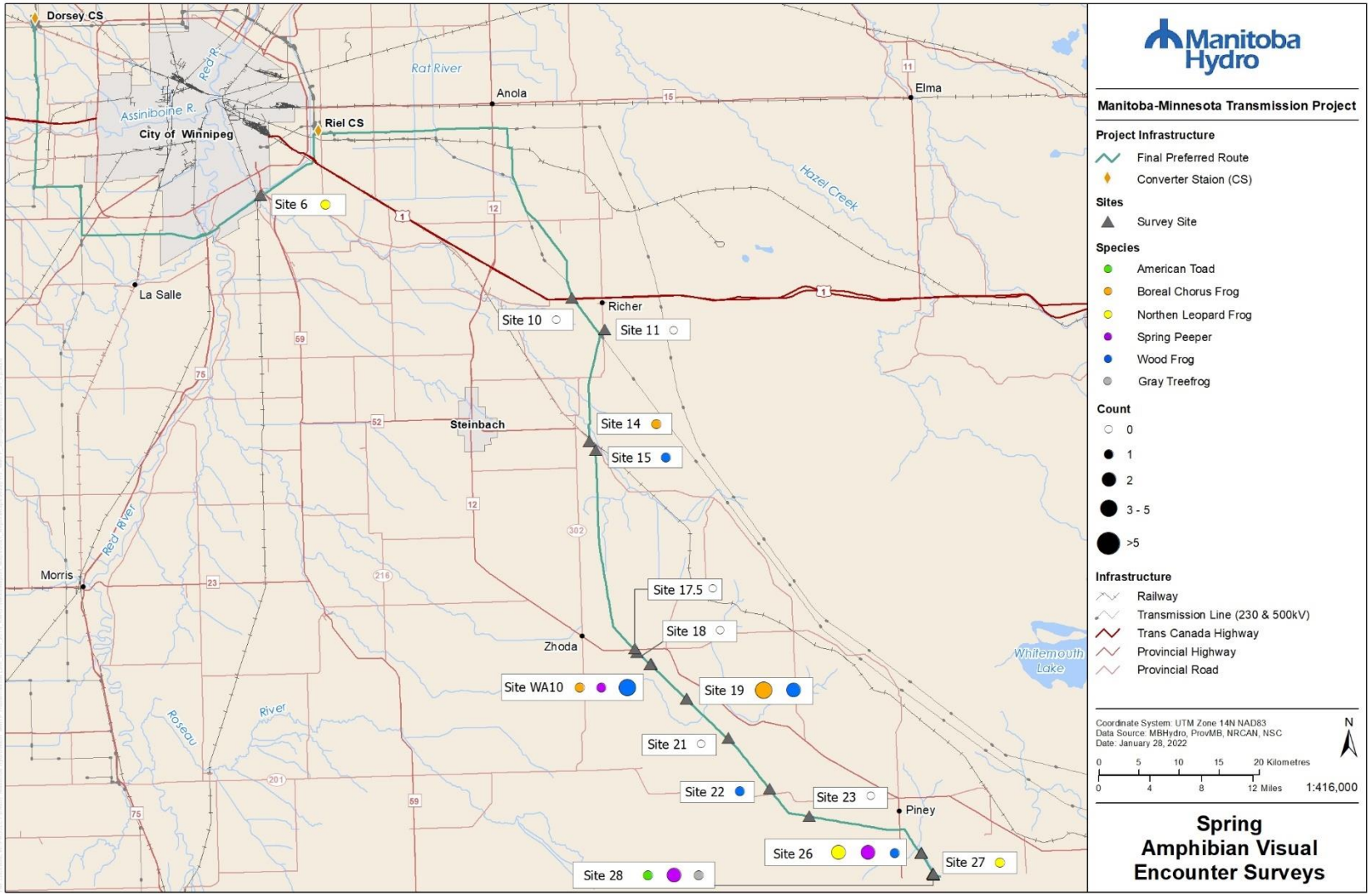
7.0 MAPS



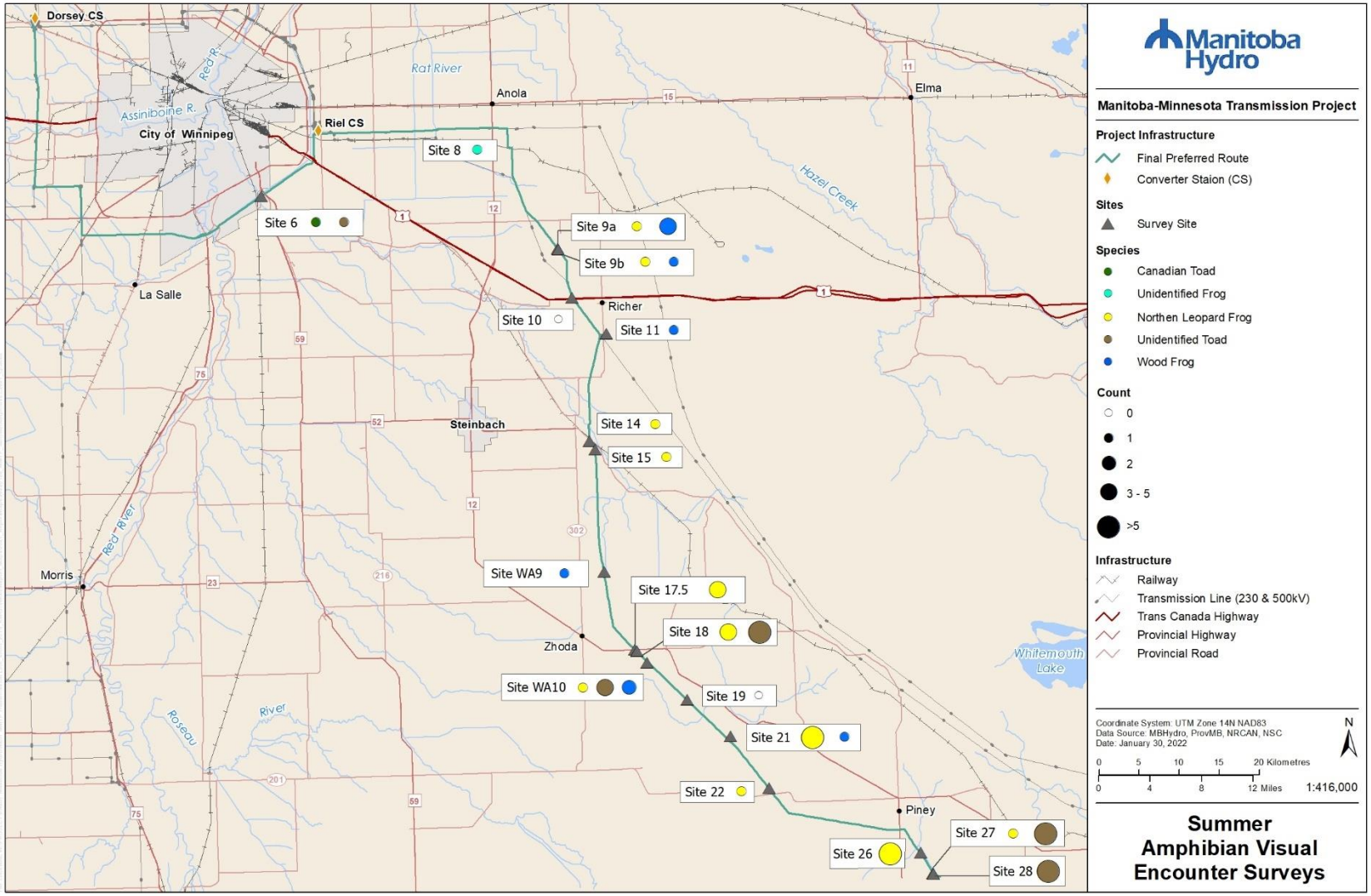
Map 1. The Manitoba-Minnesota Transmission Project Study Area.



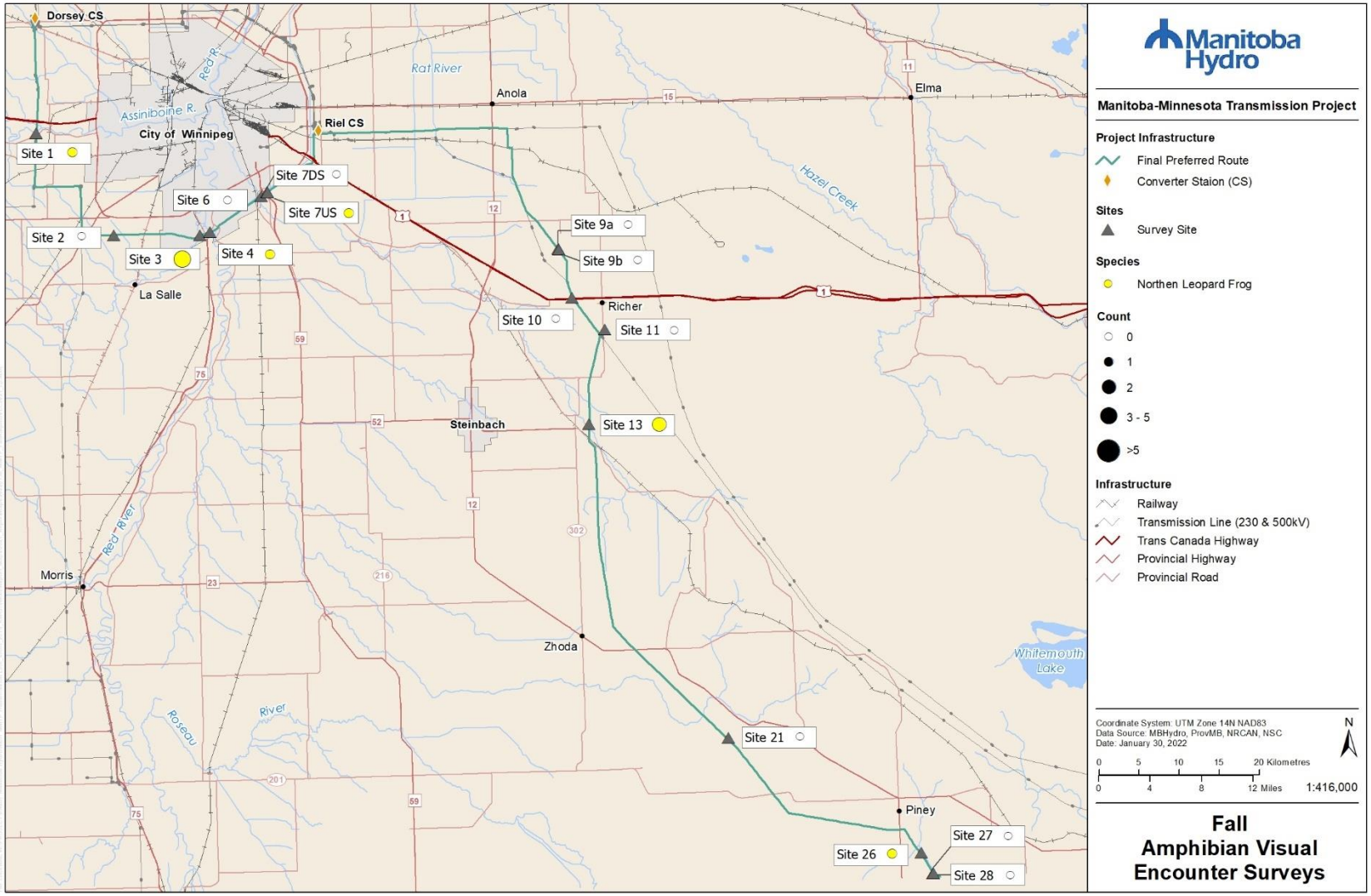
Map 2. Post-construction anuran call survey results for the Manitoba-Minnesota Transmission Project, showing ranks of individuals heard during spring 2021 surveys.



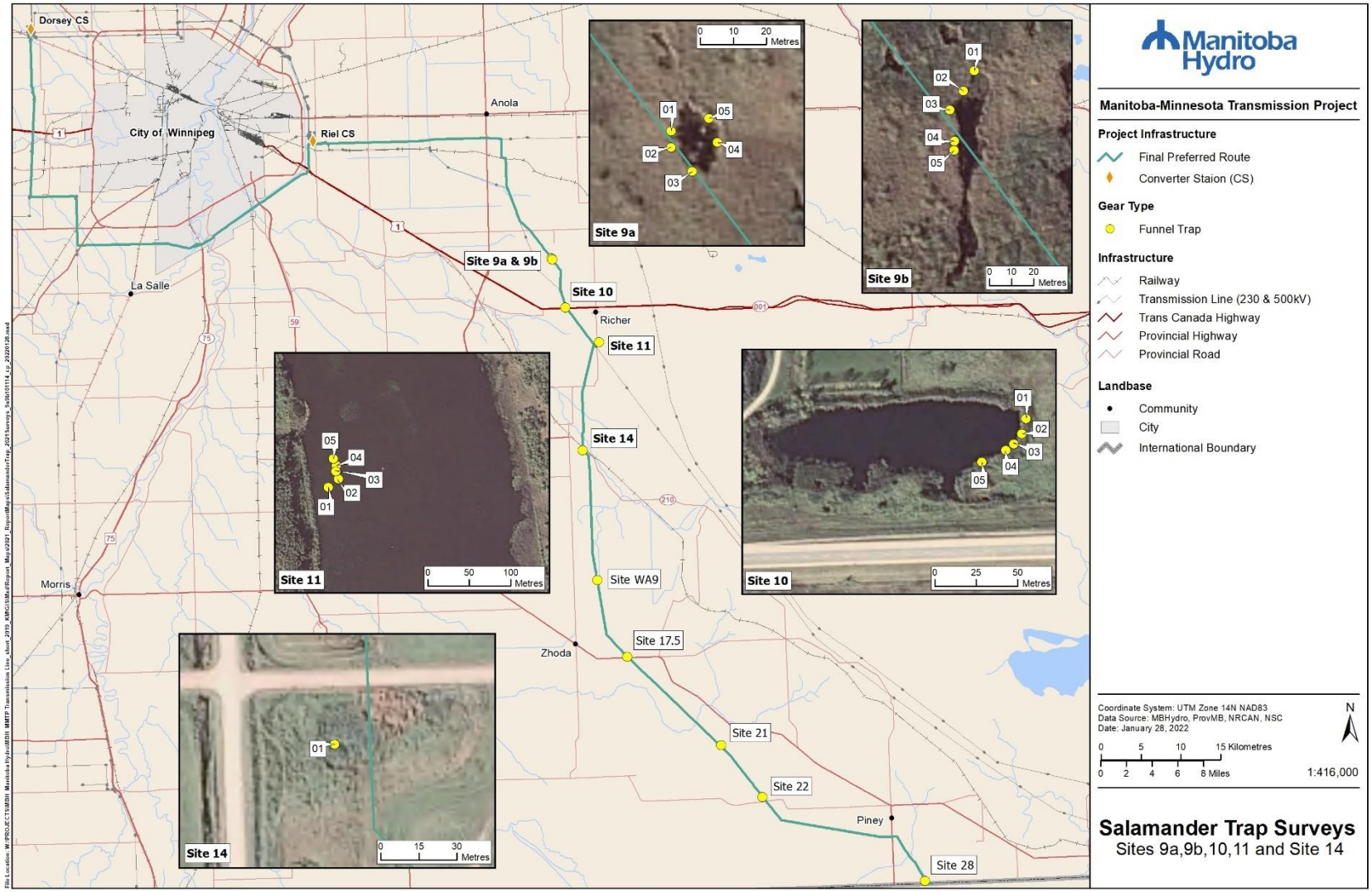
Map 3. Post-construction amphibian survey results for the Manitoba-Minnesota Transmission Project, showing total number of individuals seen and heard incidentally and during visual encounter surveys, spring 2021.



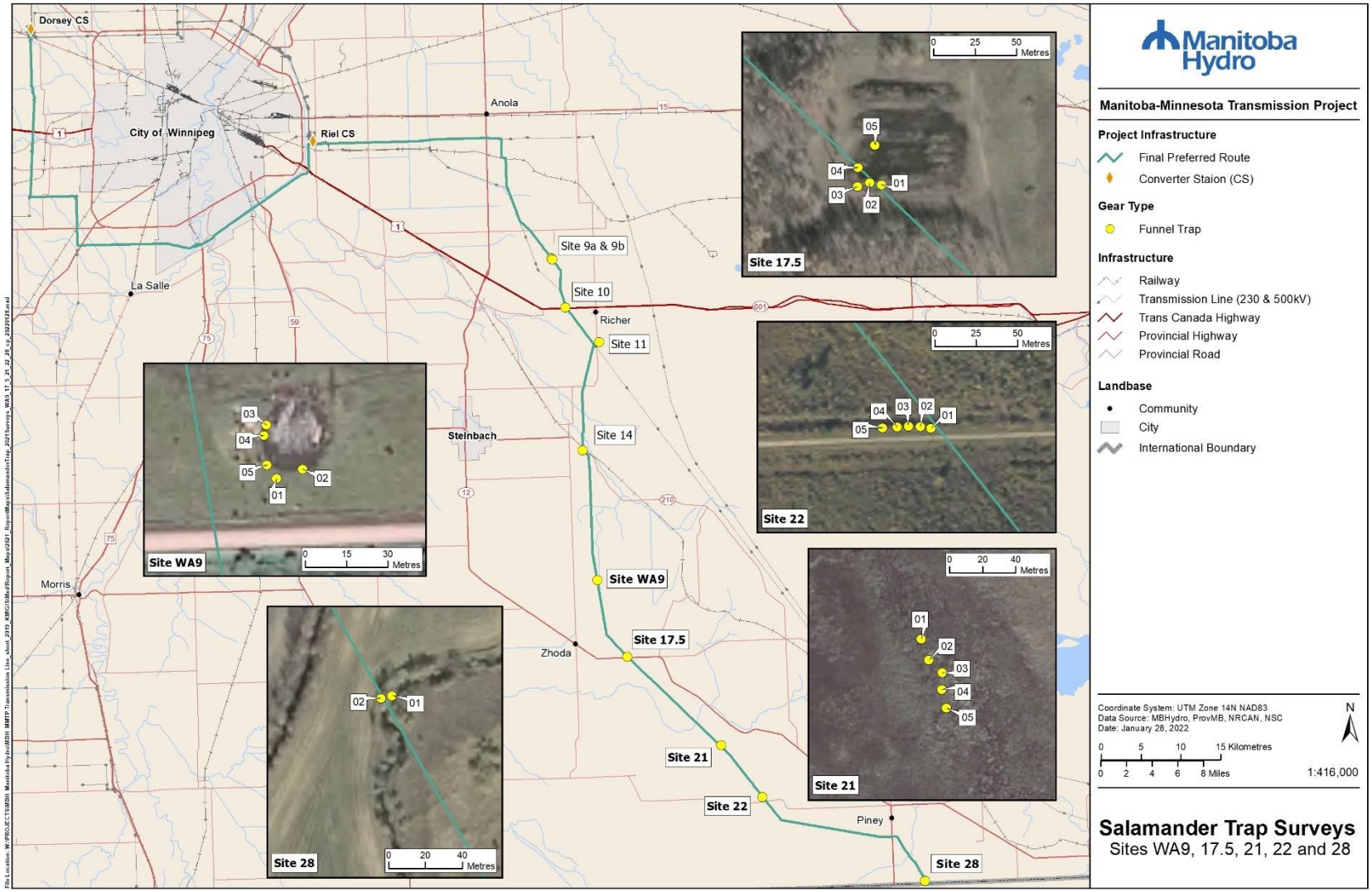
Map 4. Post-construction amphibian survey results for the Manitoba-Minnesota Transmission Project, showing total number of individuals seen and heard incidentally and during visual encounter surveys, summer 2021.



Map 5. Post-construction amphibian survey results for the Manitoba-Minnesota Transmission Project, showing total number of individuals seen and heard incidentally and during visual encounter surveys, fall 2021.



Map 6. Post-construction salamander survey trap locations Site 9 through 14, Manitoba-Minnesota Transmission Project, summer, 2021.



Map 7. Post-construction salamander survey trap locations Site WA9 through 28, Manitoba-Minnesota Transmission Project, summer, 2021.

8.0 PHOTOS

Photo 1. American Toad (*Anaxyrus americanus*) seen during spring Visual Encounter Surveys at Site 28, May 16, 2021.

Photo 2. American Toad (*Anaxyrus americanus*) young of year seen during summer Visual Encounter Surveys at Site 27, July 13, 2021.

Photo 3. Canadian Toad (*Anaxyrus hemiophrys*) seen during summer Visual Encounter Surveys at Site 6, July 9, 2021.

Photo 4. Northern Leopard Frog (*Lithobates pipiens*) adult seen at Site 1 during fall Visual Encounter Surveys, October 14, 2021.

Photo 5. Wood Frog (*Lithobates sylvaticus*) seen during summer Visual Encounter Surveys at Site WA9, July 10, 2021.

Photo 6. Site 1 (Assiniboine River) during fall survey, looking downstream from the south bank at water quality site 1-1, October 14, 2020.

Photo 7. Site 2 during fall survey at water quality site 2-1, October 14, 2021.

Photo 8. Site 3 (La Salle River) during fall survey, looking downstream from water quality site 3-3, October 14, 2021.

Photo 9. Downstream view of Site 4 (Red River) at water quality site 4-1 during fall surveys, October 14, 2021.

Photo 10. Site 6 (Seine River Siphon) during fall surveys at water quality site 6-3, October 13, 2021.

Photo 11. Site 7DS (Seine River Diversion) looking north during fall surveys, October 14, 2021.

Photo 12. Site 7US (Seine River Diversion) looking north during fall surveys, October 14, 2021.

Photo 13. Site 8 (Edie Creek) during summer surveys at water quality site 8-4, July 9, 2021.

Photo 14. Site 9a during summer surveys, with funnel trap in the foreground, July 9, 2021.

Photo 15. Site 9b looking south during summer surveys, with funnel trap in the foreground, July 9, 2021.

Photo 16. Site 10 looking west during summer surveys, July 9, 2021.

Photo 17. Site 11 from funnel trap location FN05 during summer surveys, July 10, 2021.

Photo 18. Site 13 (Seine River) during fall surveys, October 12, 2021.

Photo 19. Site 14, showing shallow water covered with duckweed during summer surveys, July 10, 2021.

Photo 20. Site 15 during summer surveys, at water quality site 15-3, July 10, 2021.

Photo 21. Site WA9 (a cattle dugout) during summer surveys, at funnel trap site FN-01, July 10, 2021.

Photo 22. Overview of Site 17.5 during summer surveys, July 10, 2021.

Photo 23. Overview of Site 18 during summer surveys, July 11, 2021.

Photo 24. Overview of Site 19 during summer surveys, July 11, 2021.

Photo 25. Overview of Site 21 showing the wetted area at water quality site 21-3 during summer surveys, July 12, 2021.

Photo 26. Overview of Site 22 during summer surveys, showing a shallow dry wetland, July 12, 2021.

Photo 27. Overview of Site 23 during spring surveys, May 13, 2021.

Photo 28. Overview of Site 26 during summer surveys, July 12, 2021.

Photo 29. Overview of Site 27 looking upstream during summer surveys, July 12, 2021.

Photo 30. Site 28 during summer surveys at water quality site 28-1, July 12, 2021.

Photo 31. Northern Leopard Frog (*Lithobate pipiens*) tadpole from funnel trap FN02 at Site 17.5, caught during summer surveys July 11, 2021.

Photo 32. Aerial view of Site 17.5 during fly over surveys June 29, 2020.

Photo 33. Site 17.5 during summer surveys, July 10, 2021.

Photo 34. Aerial view of Site 19 during fly over surveys June 29, 2020.

Photo 35. Site 19 during summer surveys, July 11, 2021.

APPENDIX

Table A-1. Summary of amphibian species that have been observed or have the potential to occur in the Manitoba-Minnesota Transmission Project Local Assessment Area and if they were detected during surveys.

Common Name	Scientific Name	Status Listings			Observed in the LAA[3]								
		COSEWIC[1]	SARA[1]	MESEA[2]	2014	2017			2020		2021		
						Spring	Summer	Fall	Summer	Fall	Spring	Summer	Fall
Mudpuppy	*Necturus maculosus*	Not at Risk	No Status	No Status	N	N	N	N	N	N	N	N	N
Blue-spotted Salamander	*Ambystoma laterale*	No Status	No Status	No Status	N	N	N	N	N	N	N	N	N
Eastern Tiger Salamander	*Ambystoma tigrinum tigrinum*	Endangered	Endangered	No Status	Y	N	N	N	Probable	N	N	N	N
American Toad	*Anaxyrus americanus*	No Status	No Status	No Status	N	Y	N	N	Y	N	Y	N	N
Canadian Toad	*Anaxyrus hemiophrys*	No Status	No Status	No Status	Y	N	N	N	N	N	N	Y	N
Boreal Chorus Frog	*Pseudacris maculata*	No Status	No Status	No Status	Y	Y	N	N	N	N	Y	N	N
Gray Tree Frog	*Hyla versicolor*	No Status	No Status	No Status	Y	N	N	N	Y	N	Y	Y	N
Cope's Gray Tree Frog	*Hyla chrysoscelis*	Not at Risk	No Status	No Status	Y	N	N	N					
Spring Peeper	*Pseudacris crucifer*	No Status	No Status	No Status	Y	Y	N	N	Y	N	Y	N	N
Wood Frog	*Lithobates sylvaticus*	No Status	No Status	No Status	Y	Y	Y	Y	Y	Y	Y	Y	N
Northern Leopard Frog	*Lithobates pipiens*	Special Concern	Special Concern	No Status	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mink Frog	*Lithobates septentrionalis*	No Status	No Status	No Status	N	N	Y	N	N	N	N	N	N

[1]Government of Canada, 2020
[2]Government of Manitoba, 2018
[3]2014: Stantec 2015; 2017: Dyszy 2018; 2020: North/South Consultants Inc. 2021

Table A-2. Amphibian observations at wetland and stream sites within the Manitoba-Minnesota Transmission Project Local Assessment Area, 2021. Bolded species denote priority species.

Site	Species[1]	Survey Types[2]	≥5 NLFR	Description
1	**NLFR**	FallVES, WQ		Assiniboine River
2	none	FallVES, WQ		Ditch and wastewater pond
3	**NLFR**	FallVES, WQ		La Salle River
4	**NLFR**	FallVES, WQ		Red River
6	BCFR, CATO, **NLFR**	CS, SpringVES, SummVES, FallVES, WQ		Seine River Siphon
7DS	none	FallVES, WQ		Seine River Diversion (Old Prairie Grove Drain)
7US	**NLFR**	FallVES		Seine River Diversion (Old Prairie Grove Drain)
8	Unid frog	SummVES, WQ		Edie Creek
9a	**NLFR,** WOFR	SummVES, FallVES, FN, WQ		Medium Wetlands
9b	**NLFR,** WOFR	SummVES, FallVES, FN, WQ		Medium Wetlands
10	BCFR	CS, SpringVES, SummVES, FallVES, FN, WQ		Large Wetland
11	WOFR	CS, SpringVES, SummVES, FallVES, FN, WQ		Large Wetland Lake
13	**NLFR**	FallVES, WQ		Seine River
14	BCFR, **NLFR**, WOFR	CS, SpringVES, SummVES, FN, WQ		Small Wetland/Fen
15	BCFR, **NLFR**, WOFR	CS, SpringVES, SummVES, WQ		Small Wetland
WA9	WOFR	SummVES, FN, WQ		Cattle Dugout
17.5	BCFR, C/GRTF, **NLFR**, SPPE, WOFR	CS, SpringVES, SummVES, FN, WQ	YES	Wetland
18	BCFR, **NLFR**, Toadlet, WOFR	CS, SpringVES, SummVES, WQ		Small Wetland
WA10	BCFR, SPPE, **NLFR**, Toadlet, WOFR	CS, SpringVES, SummVES, WQ		Shallow Wetland
19	BCFR, SPPE, WOFR	CS, SpringVES, SummVES, WQ		Small Shallow Wetland
21	**NLFR**, SPPE, WOFR	CS, SpringVES, SummVES, FallVES, FN, WQ	YES	Large Wetland (Sundown Bog)
22	SPPE, **NLFR**, WOFR	CS, SpringVES, SummVES, FN, WQ		Large Shallow Wetland (Sundown Bog)
23	none	CS, SpringVES, WQ		Medium Wetland (Sundown Bog)
26	AMTO, BCFR, **NLFR**, SPPE, WOFR	CS, SpringVES, SummVES, FallVES, WQ	YES	Pine Creek
27	AMTO, **NLFR**, Toadlet	CS, SpringVES, SummVES, FallVES, WQ		Pine Creek
28	AMTO, BCFR, C/GRTF, **NLFR**, SPPE, Toadlet	CS, SpringVES, SummVES, FallVES, FN, WQ		Pine Creek

[1] AMTO: American toad; BCFR: Boreal Chorus Frog; CATO: Canadian Toad; C/GRTF: (Cope's) gray treefrog; NLFR: northern leopard frog; SPPE: spring peeper; WOFR: wood frog

[2] CS: call surveys; FN: tiger salamander funnel trap surveys; SpringVES: spring frog visual encounter survey; SummVES: summer frog visual encounter survey; FallVES: fall frog visual encounter survey; WQ: water quality sampling

Table A-3. Summary of Manitoba-Minnesota Transmission Project visual encounter survey sites visited in 2021.

Site[1]	Date	Zone	Start Easting	Start Northing	Survey Time (min)	Water Temp (°C)	Air Temp (°C)	Avg Wind (km/hr)	Depth (m)	Habitat Type	NLFR	Anurans
						Spring						
6	10-May-21	14U	640867	5516977	0:20	13.9	11.6	3.6	1-2	River Siphon	NO	NO
10	10-May-21	14U	679768	5504249	0:20	14.8	13.9	7.8	>2	Wetland	NO	NO
11	10-May-21	14U	683961	5499848	0:20	16.6	13.3	3.7	1-2	Wetland	NO	NO
14	11-May-21	14U	681917	5486349	0:20	14	19.4	4.3	<1	Wetland/Fen	NO	YES
15	11-May-21	14U	682656	5485426	0:20	9.3	23.6	0.0	<1	Wetland	NO	NO
17.5	11-May-21	14U	687587	5460472	0:20	19.2	18.1	2.1	<1	Wetland	NO	NO
18	11-May-21	14U	687823	5460040	0:15	20.1	13.8	0.0	<1	Wetland	NO	NO
WA10	12-May-21	14U	689568	5458510	0:20	11.5	21.1	5.0	<1	Wetland	NO	YES
19	12-May-21	14U	694086	5454191	0:20	16.3	24.3	2.1	<1	Wetland	NO	YES
21	12-May-21	14U	699362	5449406	0:20	18.5	21.2	5.1	<1	Wetland	NO	NO
22	13-May-21	14U	704460	5442950	0:20	N/A	23.5	3.2	0/1-2	Wetland/Ditch	NO	YES
23	13-May-21	14U	709371	5439505	0:20	9.8	20.6	2.7	<1	Wetland	NO	NO
26	16-May-21	15U	284733	5434650	0:20	15.1	25.8	6.2	<1	Creek	YES	YES
27	16-May-21	15U	286033	5431977	0:20	13.7	25.5	2.8	<1	Creek	YES	YES
28	16-May-21	15U	286069	5431942	0:20	12.6	20.5	6.8	<1	Creek	NO	NO
						Summer						
6	9-Jul-21	14U	640910	5516925	0:20	18.7	25.1	1.7	1-2	River Siphon	NO	YES
8	9-Jul-21	14U	668033	5525506	0:20	18.8	27.8	2.7	<1	Creek	NO	NO
9a	9-Jul-21	14U	677963	5510414	0:20	19.5	25.9	2.1	>2	Wetland	YES	YES
9b	9-Jul-21	14U	678086	5510263	0:20	20.3	26.5	5.6	>2	Wetland	NO	YES
10	9-Jul-21	14U	679811	5504186	0:20	27.0	29.7	0.0	1-2	Wetland	NO	NO
11	9-Jul-21	14U	683834	5499891	0:20	29.0	30.9	0.0	1-2	Wetland	NO	YES
14	10-Jul-21	14U	681901	5486373	0:20	15.6	29.5	8.0	<1	Wetland/Fen	NO	NO
15	10-Jul-21	14U	682675	5485278	0:20	16.3	31.3	10.3	<1	Wetland	YES	YES
WA9	10-Jul-21	14U	683721	5470050	0:15	25.6	30.0	5.1	<1	Dugout	NO	YES
17.5	11-Jul-21	14U	687702	5460395	0:20	26.8	33.1	2.6	<1	Wetland	YES	YES
18	11-Jul-21	14U	687740	5460243	0:20	N/A	28.7	7.1	0	Wetland	YES	YES
WA10	11-Jul-21	14U	689535	5458517	0:20	N/A	34.8	1.6	0	Wetland	NO	YES
19	11-Jul-21	14U	694159	5454002	0:20	N/A	36.8	2.9	0	Wetland	NO	NO

Table A-3. Continued.

Site[1]	Date	Zone	Start Easting	Start Northing	Survey Time (min)	Water Temp (°C)	Air Temp (°C)	Avg Wind (km/hr)	Depth (m)	Habitat Type	NLFR	Anurans
21	12-Jul-21	14U	699230	5449282	0:20	24.5	26.3	12.7	<1	Wetland	YES	YES
22	12-Jul-21	14U	704492	5442866	0:20	N/A/21.5	22.7	3.2	0/<1	Wetland/Ditch	YES	YES
26	12-Jul-21	15U	284739	5434651	0:20	26.6	29.0	7.7	<1	Creek	YES	YES
27	13-Jul-21	15U	285989	5431935	0:20	N/A	28.0	7.7	0	Creek	NO	YES
28	13-Jul-21	15U	286042	5431967	0:20	24.8	28.0	7.7	<1	Creek	NO	YES
						Fall						
1	14-Oct-21	14U	612751	5524822	0:20	10.8	10.9	10.4	>2	River	YES	YES
2	14-Oct-21	14U	622517	5512044	0:20	10.5	10.9	7.8	1-2	Pond (wastewater)	NO	NO
3	14-Oct-21	14U	633343	5512102	0:20	11.1	12.0	6.6	1-2	River	YES	YES
4	14-Oct-21	14U	634354	5512368	0:20	13.3	10.8	6.4	>2	River	YES	YES
6	13-Oct-21	14U	640828	5516984	0:20	9.2	11.3	10.2	1-2	River Siphon	NO	NO
7DS	14-Oct-21	14U	641637	5517534	0:20	10.4	10.5	6.5	<1	River Diversion	NO	NO
7US	14-Oct-21	14U	641684	5517440	0:20	N/A	10.6	3.6	<1	River Diversion	YES	YES
9a	13-Oct-21	14U	677962	5510414	0:20	9.0	10.8	10.8	1-2	Wetland	NO	NO
9b	13-Oct-21	14U	678010	5510344	0:20	9.4	11.4	14.8	1-2	Wetland	NO	NO
10	13-Oct-21	14U	679804	5504188	0:20	12.8	10.0	14.5	1-2	Wetland	NO	NO
11	13-Oct-21	14U	683937	5499844	0:20	6.8	8.3	9.9	<1	Wetland	NO	NO
13	12-Oct-21	14U	681848	5488419	0:20	12.7	11.0	5.0	1-2	River	NO	NO
21	12-Oct-21	14U	699241	5449296	0:20	N/A	12.1	7.7	<1	Wetland	NO	NO
26	12-Oct-21	15U	284707	5434578	0:20	N/A	17.4	2.0	<1	Creek	YES	YES
27	12-Oct-21	15U	285953	5431793	0:20	N/A	15.0	3.9	<1	Creek	NO	NO
28	12-Oct-21	15U	286047	5431974	0:20	N/A	13.8	6.5	<1	Creek	NO	NO

[1]Site 11 was surveyed by VES and dipnet during summer surveys

Table A-4. Summary of Manitoba-Minnesota Transmission Project funnel trap catch, summer 2021.

Site	Trap ID	Zone	Easting	Northing	Set Date	Set Time	Pull Date	Pull Time	Anurans	Salamanders
9a	1	14U	677976	5510401	9-Jul-21	12:54	10-Jul-21	8:46	No	No
	2	14U	677976	5510396	9-Jul-21	12:55	10-Jul-21	8:48	No	No
	3	14U	677982	5510389	9-Jul-21	12:57	10-Jul-21	8:50	No	No
	4	14U	677990	5510398	9-Jul-21	12:58	10-Jul-21	8:54	No	No
	5	14U	677987	5510405	9-Jul-21	12:59	10-Jul-21	8:56	No	No
9b	1	14U	678098	5510276	9-Jul-21	14:03	10-Jul-21	9:03	No	No
	2	14U	678093	5510267	9-Jul-21	13:57	10-Jul-21	9:05	No	No
	3	14U	678087	5510259	9-Jul-21	14:07	10-Jul-21	9:08	No	No
	4	14U	678089	5510244	9-Jul-21	14:18	10-Jul-21	9:10	No	No
	5	14U	678089	5510240	9-Jul-21	14:10	10-Jul-21	9:11	No	No
10	1	14U	679770	5504254	9-Jul-21	17:41	10-Jul-21	18:13	No	No
	2	14U	679767	5504245	9-Jul-21	17:50	10-Jul-21	18:16	No	No
	3	14U	679762	5504239	9-Jul-21	17:52	10-Jul-21	18:18	No	No
	4	14U	679758	5504235	9-Jul-21	17:56	10-Jul-21	18:21	Yes	No
	5	14U	679743	5504228	9-Jul-21	17:59	10-Jul-21	18:24	No	No
11	1	14U	684005	5499761	9-Jul-21	16:05	10-Jul-21	10:45	No	No
	2	14U	684017	5499771	9-Jul-21	16:07	10-Jul-21	10:40	No	No
	3	14U	684014	5499781	9-Jul-21	16:14	10-Jul-21	10:29	No	No
	4	14U	684015	5499788	9-Jul-21	16:20	10-Jul-21	10:26	No	No
	5	14U	684011	5499796	9-Jul-21	16:25	10-Jul-21	10:08	No	No
WA9	1	14U	683739	5470064	10-Jul-21	15:27	11-Jul-21	9:15	No	No
	2	14U	683748	5470067	10-Jul-21	15:31	11-Jul-21	9:17	No	No
	3	14U	683735	5470083	10-Jul-21	15:40	11-Jul-21	9:18	No	No
	4	14U	683734	5470080	10-Jul-21	15:42	11-Jul-21	9:19	No	No
	5	14U	683735	5470069	10-Jul-21	15:43	11-Jul-21	9:20	No	No
17.5	1	14U	687538	5460441	10-Jul-21	16:33	11-Jul-21	10:06	No	No
	2	14U	687531	5460442	10-Jul-21	16:41	11-Jul-21	10:08	Yes	No
	3	14U	687524	5460440	10-Jul-21	16:44	11-Jul-21	11:08	Yes	No
	4	14U	687524	5460451	10-Jul-21	16:49	11-Jul-21	10:20	Yes	No
	5	14U	687534	5460465	10-Jul-21	17:16	11-Jul-21	10:23	Yes	No
21	1	14U	699516	5449502	12-Jul-21	10:26	13-Jul-21	9:12	Yes	No
	2	14U	699521	5449489	12-Jul-21	10:33	13-Jul-21	9:20	Yes	No
	3	14U	699529	5449482	12-Jul-21	10:40	13-Jul-21	9:27	Yes	No
	4	14U	699528	5449472	12-Jul-21	10:48	13-Jul-21	9:34	Yes	No
	5	14U	699531	5449460	12-Jul-21	10:52	13-Jul-21	9:40	Yes	No
22	1	15U	704496	5442850	11-Jul-21	15:58	12-Jul-21	9:18	No	No
	2	15U	704489	5442852	11-Jul-21	16:00	12-Jul-21	9:20	No	No
	3	15U	704482	5442852	11-Jul-21	16:01	12-Jul-21	9:21	No	No
	4	15U	704475	5442851	11-Jul-21	16:02	12-Jul-21	9:23	No	No
	5	15U	704466	5442851	11-Jul-21	16:03	12-Jul-21	9:25	No	No
28	1	15U	286081	5431948	12-Jul-21	12:50	13-Jul-21	11:39	No	No
	2	15U	286075	5431947	12-Jul-21	12:51	13-Jul-21	11:42	No	No

Available in accessible formats upon request