Keeyask Generation Project Terrestrial Effects Monitoring Plan

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Bank Swallow Habitat Monitoring Report

TEMP-2021-09





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2020 - 2021

KEEYASK GENERATION PROJECT

TERRESTRIAL EFFECTS MONITORING PLAN

REPORT #TEMP-2021-09

BANK SWALLOW MONITORING 2020

Prepared for

Manitoba Hydro

By Wildlife Resource Consulting Services MB Inc.

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SUMMARY

Background

Construction of the Keeyask Generation Project (the Project) at Gull Rapids began in July 2014 and the reservoir was impounded from August 31 to September 5, 2020. The Keeyask Hydropower Limited Partnership (KHLP) was required to prepare a plan to monitor the effects of construction and operation of the generating station on the terrestrial environment. Monitoring results will help the KHLP, government regulators, members of local First Nation communities, and the general public understand how construction and operation of the generating station will affect the environment, and whether or not more needs to be done to reduce harmful effects.

Banks swallows are small, insect-eating birds that excavate nesting burrows in sandy riverbanks and gravel pits. Relatively few bank swallows were observed in the Clark Lake to Stephens Lake area during pre-Project field studies; at most 40 individuals were identified in a single year. Potential construction-related effects on bank swallow identified in the Project's environmental assessment were loss or alteration of some breeding or foraging habitat; sensory disturbances from people, machinery, and equipment near breeding colonies; and possibly increased mortality. Construction monitoring for bank swallows began in 2016 and continued in 2018 and 2020.

Why is the study being done?

Bank swallow is a priority bird to be monitored because of its designation as Threatened by the Committee on the Status of Endangered Wildlife in Canada in 2013. It was officially listed as Threatened under the federal *Species at Risk Act* in 2017. The main objectives of the 2020 bank swallow studies were to evaluate their presence or absence in the Keeyask region during construction and to assess accidental mortality associated with the Project. Verification of anticipated Project effects will be conducted after construction is completed, using a habitat quality model.

What was done?

Bank swallow colonies initially identified in summer 2016 and/or 2018 were surveyed again in 2020. Most colonies were surveyed twice by boat or on foot in late June and July. Birds and nesting burrows were counted, and a series of photographs was taken at most sites. Two observers independently counted the number of swallows flying three times over a 10-minute period. The highest single count of individuals was recorded at each colony. Two independent observers also counted the number of burrows in the photographs, and an estimate of the bank swallow population in the study area (Study Zone 4) was generated with the field and photograph counts. Additional surveys were conducted daily from August 25 to September 4, 2020 to monitor bank swallow colonies shortly before and during reservoir impoundment.





Sites Surveyed for Bank Swallow Colonies, Summer 2020

What was found?

Bank swallow colonies were observed at 14 sites in 2020. A total of 784 birds were counted during the first survey and 403 during the second. No birds were observed at five sites, including two rehabilitated Project borrow areas, during either survey. Colonies ranged in size from 2 to 956 burrows, not all of which were expected to be occupied. An estimated 2,033 breeding pairs (or 4,066 adults) inhabited Study Zone 4 in 2020, a 10% decrease from 2018. The estimated number of breeding pairs was 1% greater in 2020 than when monitoring surveys began in 2016.

Up to 50 bank swallows, some of which were feeding their young, were observed at two nesting colonies in the future reservoir area and at one colony outside of the area to be affected during the pre-impoundment surveys in late August. However, no activity was observed at these sites, or any other colonies, during impoundment. Undercutting of the bank and erosion were observed at three colonies in the reservoir area during impoundment, resulting in some collapse of unoccupied burrows. The steep, sandy banks required for nesting remained at each site, however, and no loss of nesting habitat was observed during impoundment monitoring. All burrows at these sites were above the reservoir water level and none were flooded.

What does it mean?

Bank swallows rely on eroding mineral soils and steep sandy banks for nesting habitat. Natural sites tend to support larger colonies but excavations in borrow areas are also used for nesting.



While bank swallows may return to sites where they have previously bred successfully, the temporary nature of their nesting habitat means that they are not strongly attached to a particular area. More bank swallows were observed in Study Zone 4 in 2016, 2018, and 2020 than were observed incidentally during the pre-Project surveys that began in 2001. The numbers observed during construction monitoring do not likely indicate a large population increase but rather were a result of the more intensive, focused surveys conducted since the bank swallow was first assessed as a species at risk in 2013. To date, one nesting site has been removed for Project-related bank stabilization and at least two sites in rehabilitated Project borrow areas are no longer being used for nesting. The similar estimates of the number of bank swallows in Study Zone 4 since 2016 suggest that the population is currently stable. No accidental bank swallow mortality was reported during construction monitoring.

What will be done next?

Following reservoir impoundment in fall 2020 new shorelines formed rapidly and abruptly altered some unoccupied bank swallow burrows in the affected area. It is unknown if these sites will remain suitable for nesting in the near future, particularly if this high rate of bank erosion continues in the reservoir. It is recommended that the frequency of near-term monitoring be increased to include the year after impoundment (2021), to assess for immediate population change. Long-term monitoring that began in 2016 will also continue every two years until 2024. A habitat quality model for bank swallow will be developed and will be validated with monitoring data. Nesting habitat loss due to Project development will be determined and will be used to quantify the overall loss or alteration of bank swallow habitat.



STUDY TEAM

We would like to thank James Ehnes of ECOSTEM Ltd. for providing maps, and Sherrie Mason and Rachel Boone of Manitoba Hydro for reviewing the report. Biologists, technicians, and other personnel who designed, participated in, and drafted the survey results included:

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1.0 INTRODUCTION

Construction of the Keeyask Generation Project (the Project), a 695-megawatt hydroelectric generating station (GS) and associated facilities, began in July 2014. The Project is located at Gull Rapids on the lower Nelson River in northern Manitoba where Gull Lake flows into Stephens Lake, 35 km upstream of the existing Kettle GS. Reservoir impoundment began August 31, 2020 and was completed on September 5, 2020.

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

Bank swallows are small, insect-eating birds that migrate to Manitoba in spring (Weatherhead et al. 1985; Committee on the Status of Endangered Wildlife in Canada [COSEWIC] 2013). In the Keeyask region, the breeding season typically extends from late May to early August (Taylor 2018). Bank swallow is a priority bird for Project monitoring because it was assessed as Threatened by COSEWIC in 2013 (COSEWIC 2013) and was officially listed as Threatened under the federal *Species at Risk Act* (SARA) in 2017. It is not listed as a species at risk under *The Endangered Species and Ecosystems Act* of Manitoba.

Bank swallows are colonial breeders that excavate nesting burrows in sandy riverbanks and gravel pits (Grieef 2003). Steep, nearly vertical banks are typically selected (Hjertaas 1984; COSEWIC 2013). Many burrows may be excavated in a single colony, but up to two thirds are unoccupied in a typical breeding season (Grieef 2003; Burke 2017). The availability of suitable nesting habitat is a major factor limiting the size and distribution of breeding populations in Canada (COSEWIC 2013).

Relatively few bank swallows were observed in the region during pre-Project field studies for other birds from 2001 to 2014; at most 40 individuals were identified in the Clark, Gull, and Stephens lakes area in a single year. No surveys targeting bank swallow were conducted during the EIS field studies and all observations were incidental. Potential construction-related effects on bank swallow were loss or alteration of some breeding or foraging habitat; sensory disturbances from people, machinery, and equipment near breeding colonies; and possible increased mortality. The objectives of the bank swallow monitoring study, outlined in Section 5.8.6 of the TEMP, were to evaluate their presence or absence in suitable habitat in the study area (Study Zone 4) and to assess accidental mortality, in order to verify anticipated Project effects on these SARA-listed birds.



2.0 METHODS

2.1 BANK SWALLOW MONITORING

Surveys for bank swallow were conducted from June 30 to July 20, 2020 in Study Zone 4, mainly at sites along the Nelson River from Birthday Rapids downstream to the Kettle GS area on Stephens Lake (Map 1). In 2016, a preliminary aerial survey was conducted by helicopter to identify bank swallow nesting colonies in the study area. Shorelines on the Nelson River, Gull Lake, and Stephens Lake were surveyed. All 16 sites identified in 2016 were revisited and 6 additional sites were surveyed in 2018. Sixteen sites were surveyed in 2020, all of which were surveyed in 2018. Two sites that were identified as separate colonies in previous survey years (sites 11 and 19) were considered a single colony in 2020 due to the continuity of the burrows observed along the bank. Four sites surveyed in 2018 were not revisited in 2020, including two at which no bank swallow activity was observed in 2018. One colony in a Project borrow area (G1) could not be located and was not included in the 2020 survey.

Most nesting sites were surveyed twice by boat on July 2 or 3 and July 18 or 20, 2020 (Table 1), in the primary breeding season. Five sites were visited on foot on June 30, July 3, and July 20, 2020. Observers counted birds and nesting burrows at each colony. Two observers independently counted the number of bank swallows flying near the colony three times over a 10-minute period. The greatest number of birds observed during a single count was recorded for each colony during each site visit. During boat surveys, two observers counted the number of burrows from the boat, which was driven parallel to the colony at a distance ranging from 30 to 50 m offshore. A series of photographs was taken at all active nesting colonies for additional burrow counts; no photos were taken where no burrows were observed. Sites where no bank swallows or nesting burrows were observed during the first survey were not revisited.

Photos taken at each colony were magnified in Paint 3D, and the number of burrows was counted independently by two observers (Appendix 1). The mean of these counts and the preliminary field count, plus standard deviation and 95% confidence interval were calculated at each site for each of the two visits.

The mean number of burrows at each colony (the larger of the observations during each site visit) was multiplied by 0.5 to provide an estimate of the number of breeding pairs in Study Zone 4. There are typically more burrows in a colony than there are nesting pairs of bank swallows (Garrison 1999; Falconer et al. 2016; Burke 2017). New burrows are constructed each season (Garrison 1999; Falconer et al. 2016) leaving older, intact burrows unoccupied. In some cases, burrow excavation is abandoned as obstacles are encountered (Garrison 1999; Falconer et al. 2016), resulting in more holes than birds to occupy them. Mean occupancy of bank swallow burrows ranges from 43 to 74% (Garrison 1999; Bird Studies Canada unpubl. data in COSEWIC 2013). It was recently suggested that the number of breeding pairs in a colony can be estimated as 50% of the number of burrows (Wright et al. 2011; Falconer et al. 2016). Based on this



information, it was assumed that 50% burrow occupancy would provide a reasonably conservative estimate of the bank swallow population in Study Zone 4.

Site	Location	Date Surveyed	Survey Type
01	15 V 328638 6242168	July 3, July 20	Boat
02	15 V 331606 6243531	July 3, July 20	Boat
04	15 V 347288 6243533	July 3, July 20	Boat
06	15 V 358235 6245942	July 3, July 20	Boat
07	15 V 357720 6247397	July 3, July 20	Boat
09	15 V 363536 6245149	June 30, July 20	Foot
10	15 V 364806 6247412	July 2, July 18	Boat
11+19 ¹	15 V 365483 6246626	July 2, July 18	Boat
12	15 V 366476 6246968	July 2, July 18	Boat
13	15 V 369874 6247761	July 2, July 18	Boat
14	15 V 378819 6246929	July 2, July 18	Boat
15+16 ²	15 V 378855 6249312	July 2, July 18	Boat
17	15 V 394806 6251246	July 2, July 18	Boat
18	15 V 365871 6246745	July 2, July 18	Boat
G3 ³	15 V 365611 6249820	July 3	Foot
Km 1 ³	15 V 344120 6254920	June 30	Foot

 Table 1:
 Bank Swallow Nesting Colonies Surveyed, Summer 2020

1. Sites 11 and 19 were identified separately during field studies in 2018 but were subsequently considered a single colony due to continuity of burrows observed along the shoreline.

2. Sites 15 and 16 were identified separately during field studies in 2016 but were subsequently considered a single colony because site 15 was small (mean of nine burrows). Due to their proximity of about 400 m, the sites were viewed as a single colony.

3. Project borrow area sites.





Map 1:Sites Surveyed for Bank Swallow Colonies, Summer 2020



2.2 RESERVOIR IMPOUNDMENT MONITORING

Pre-impoundment surveys for bank swallow were conducted daily from August 25 to 31, 2020. Impoundment of the reservoir started in the evening on August 31, 2020. Impoundment monitoring began September 1, 2020 and continued daily until September 4. Bank swallow nesting colonies in the reservoir area and outside the affected area were surveyed by helicopter or by boat and their condition was recorded.



3.0 RESULTS

3.1 BANK SWALLOW MONITORING

Bank swallow colonies were observed at 14 of the 16 sites visited in 2020 (Map 2). No colonies were observed at sites G3 and Km 1, which were in Project borrow areas. Where burrows were observed, the mean number at each colony ranged from 2 to 956 (Table 2). The largest colony was located at site 12 on an island in Stephens Lake. The colonies at sites 01, 10, and 17 were small, with fewer than 25 burrows at each. In general, there were fewer burrows at colonies on sloped, shrubby banks (Photo 1) than on steep banks with little vegetation (Photo 2). Most nesting burrows were located near the top of the bank.

The mean number of burrows observed was greater during the second survey than the first at all but four sites, likely because additional burrows were excavated as the breeding season progressed. Variations in observer counts at sites 01, 07, 10, and 18 were likely due in part to differences in shadows, photo angles, and direction of travel that could have resulted in more burrows being counted earlier in the season. The lower counts during the second survey could also have been a result of collapsed burrows due to ongoing erosion.

Bank swallows were observed at all but five sites (01, 10, 17, G3, and Km 1) during the two surveys in 2020. A total of 784 birds were counted during the first survey and 403 during the second. Where birds were observed, a minimum of 3 individuals were counted at site 09 during the first survey and a maximum of 189 were observed at site 07, also in during the first survey (Table 2).

Colony	Survey Date	Mean Number of Burrows	Standard Deviation	95% Confidence Interval	Number of Birds Observed
01	July 3	2	1.5	2	0
	July 20	0	0	0	0
02	July 3	368	52.8	60	171
	July 20	505	136.0	154	54
04	July 3	129	20.1	23	49
	July 20	288	83.2	94	74
06	July 3	175	1.2	1	60
	July 20	343	80.3	91	79
07	July 3	359	66.3	75	189
	July 20	313	56.9	64	87
09	June 30	107	12.9	15	3
	July 20	132	40.2	45	0
10	July 2	14	12.5	14	0

 Table 2:
 Mean Number of Bank Swallow Burrows at 16 Colonies, Summer 2020



Colony	Survey Date	Mean Number of Burrows	Standard Deviation	95% Confidence Interval	Number of Birds Observed
	July 18	7	7.5	8	0
11+19	July 2	340	53.3	60	85
	July 18	462	61.9	70	22
12	July 2	793	160.2	181	110
	July 18	956	195.7	221	36
13	July 2	176	40.7	46	11
	July 18	186	78.2	88	4
14	July 2	103	10.0	11	4
	July 18	174	32.7	37	4
15+16	July 2	390	33.5	38	68
	July 18	547	116.8	132	37
17	July 2	10	15.3	17	0
	July 18	24	4.6	5	0
18	July 2	75	13.5	15	34
	July 18	53	17.2	19	6
G3	July 3	0	0	0	0
Km 1	June 30	0	0	0	0





Map 2: Mean Number of Bank Swallow Burrows at Nesting Colonies, Summer 2020



TERRESTRIAL EFFECTS MONITORING PLAN BANK SWALLOW MONITORING 2020



Red oval indicates bank swallow burrow; note toppled trees and bank erosion.





Red oval indicates bank swallow burrows; note undercutting of bank at water level.

Photo 2: Portion of a Large Bank Swallow Colony at Site 12, July 2020



The subpopulations of individual colonies in Study Zone 4 ranged from 1 to 478 breeding pairs in 2020, based on the largest of the mean numbers of nesting burrows during two surveys at each site. The regional bank swallow population was estimated at 2,033 breeding pairs or 4,066 individuals. The population was estimated at 2,261 breeding pairs or 4,522 individuals in 2018 and at 2,005 breeding pairs or 4,010 individuals in 2016. The estimated number of breeding pairs increased 13% from 2016 to 2018 and then decreased 10% from 2018 to 2020. The estimated number of breeding pairs was 1% greater in 2020 than when surveys began in 2016.

The mean number of bank swallow burrows increased at 8 of 16 colonies from 2018 to 2020, by as little as 17% at site 06 and by as much as 228% at site 14 (Table 3). The mean number of burrows decreased between 13% and 100% at eight sites over the same period. No burrows were found at the G3 and Km 1 Project borrow areas in 2020, where small colonies were observed in 2018. The temporary bank swallow habitat created in these areas during Project development was no longer available due to site rehabilitation activities.

	Mean Number of Burrows ¹			
Colony	2016	2018	2020	Percentage Change 2018–2020
01	5	4	2	-50
02	313	357	505	+41
04	183	386	288	-25
06	69	292	343	+17
07	139	486	359	-26
09	10	151	132	-13
10	2	5	14	+180
11+19	421	248	462	+86
12	1,600	1,694	956	-44
13	89	135	186	+38
14	180	53	174	+228
15+16	463	446	547	+23
17	12	14	24	+71
18	_	125	75	-40
G3	_	53	0	-100
Km 1	_	3	0	-100

Table 3:Mean Number of Bank Swallow Burrows at 16 Colonies, Summer 2016, 2018,
and 2020

1. Greatest mean number observed during the first and second surveys.

The number of bank swallows observed increased at 7 of the 16 colonies from 2018 to 2020 (Table 4). The largest increase (575%) was at site 07, where 28 birds were observed in 2018 and 189 were observed in 2020. The number of bank swallows decreased between 37% and 100% at seven sites. No birds were observed at sites 17 or Km 1 in either survey year. The largest decrease in the number of birds observed was at sites 01, 10, and G3, where between 5 and 27 birds were observed in 2018 and none were observed in 2020.



Maximum Number of Bank Swallows ¹				
Colony	2016	2018	2020	Percentage Change 2018– 2020
01	0	5	0	-100
02	77	95	171	+80
04	34	50	74	+48
06	11	21	79	+276
07	35	28	189	+575
09	12	28	3	-89
10	2	6	0	-100
11+19	77	16	85	+431
12	225	57	110	+93
13	27	25	11	-56
14	7	12	4	-67
15+16	76	31	68	+119
17	0	0	0	-
18	_	54	34	-37
G3	-	27	0	-100
Km 1	_	0	0	_

Table 4:	Maximum Number of Bank Swallows at 16 Colonies, Summer 2016, 2018, and
	2020

1. Greatest number observed during the first and second surveys.

3.2 Reservoir Impoundment Monitoring

All bank swallow nesting colonies in the reservoir area were monitored before and during impoundment (sites 04, 06, 07, 09, 10, and 11+19; see Map 1). Sites outside of the affected area were also monitored. Up to 50 bank swallows, some of which were feeding their young, were observed at sites 04 and 07 during the pre-impoundment surveys in late August. Nesting material was seen in a burrow at site 07 (Photo 3). A single bird was also observed at site 02, outside of the affected area. However, no activity was observed at these sites, or any other colonies, immediately preceding or during impoundment. Undercutting of the bank and erosion were observed at sites 04, 06, and 07 during reservoir impoundment (Photo 4 to Photo 6), resulting in the collapse of an estimated 50% of the burrows at sites 04 and 07 and approximately 10% of the burrows at site 06. None of the burrows at these sites were flooded; all were above the reservoir water level and the bank habitat at each site still appeared to be suitable for future nesting.





Photo 3: Nesting Material in a Burrow at Site 07, September 2020



Photo 4: Undercutting and Bank Erosion at Site 04, September 2020





Photo 5: Undercutting and Bank Erosion at Site 06, September 2020



Photo 6: Undercutting and Bank Erosion at Site 07, September 2020



4.0 **DISCUSSION**

A small decrease in the estimated bank swallow population was observed in Study Zone 4 from 2018 to 2020. Decreased numbers of burrows at nine sites could be due to localized bank erosion that collapsed older nesting holes. This process "refreshes" the bank face, maintaining it at the steep angle required for bank swallow nesting (Garrison 1999; Florsheim et al. 2008; Falconer et al. 2016). Bank swallows often return to previous nesting sites (Falconer et al. 2016; Government of Canada 2019) but because of the unstable nature of their nesting habitat, colony sites may change from year to year, or individuals will relocate if habitat becomes unsuitable (Government of Canada 2019). The increased number of burrows at eight sites from 2018 to 2020 and similar regional population estimates in 2016, 2018, and 2020 suggest that some individuals nest at different sites from year to year.

In 2020, 784 birds were counted during the first survey and 403 during the second. These numbers are substantially larger than the maximum of 40 individuals counted in July 2011 (Stantec Consulting Ltd. 2013) during helicopter surveys conducted between Clark Lake and Stephens Lake from 2005 to 2012. More bank swallows than expected were counted along the lower Nelson River during Manitoba Breeding Bird Atlas surveys conducted from 2010 to 2014, because its steep, sandy banks provide high-quality habitat for nesting pairs (Taylor 2018). As such, bank swallows were likely more numerous in the Keeyask region than suggested by incidental observations during pre-construction bird surveys, and the numbers observed during construction monitoring do not necessarily indicate a large population increase. They are likely a result of the more intensive, species-specific surveys conducted since bank swallows were assessed as Threatened by COSEWIC in 2013.

The large colony at site 12 was formed from erosion processes shortly after a small peninsula separated from the mainland and formed two islands on Stephens Lake circa 2005. There was no evidence of bank swallow colonies on the small island in 2008. A small to moderate-sized cluster of nesting burrows was first observed in 2011, suggesting that the colony formed between 2009 and 2011. Substantial numbers of burrows were recorded on this island in 2016 and 2018. The size of the pioneering bank swallow colony is unclear, and it is unknown whether the increase in colony size several years later might be attributed to con-specific attraction, high colony productivity and survival, or both. There was a small increase (6%) in the mean number of burrows observed at this site from 2016 to 2018 and a 44% decrease from 2018 to 2020. This relatively large decrease could be due to erosion caused by high water levels in 2020, which may have resulted in the collapse of previous years' burrows (see Photo 2). However, site 12 remained the largest colony in the study area in terms of the mean number of burrows.

Field counts of bank swallows are not censuses of subpopulations, but they can provide an indication of whether a colony is active. Only five birds have been observed at site 01 over the three-year survey period, all in 2018. The greatest mean number of burrows (n = 5) was found in 2016, and then decreased to 2 in 2020, suggesting that it was not a significant bank swallow nesting site. The lack of birds and new burrows observed in 2020 could indicate that it is not



active. The similar estimates of the number of bank swallows in Study Zone 4 since 2016 suggest that the population is stable.

One nesting site was removed for Project-related bank stabilization in 2017 and was not revisited in 2020. Temporary bank swallow nesting habitat created during Project development was subsequently unavailable at two Project borrow areas due to site rehabilitation activities (i.e., grading and tree planting). Relatively few burrows (mean = 53) and birds (n = 27) were observed at site G3 and a mean of three burrows and no birds were found at site Km 1 in 2018, the first bank swallow monitoring year that newly created nesting habitat was available in these borrow areas.

In September 2020, there was bank undercutting and erosion underneath the existing bank swallow burrows at three nesting sites within the reservoir during impoundment, resulting in the collapse of up to half of the unoccupied burrows at each. The steep, sandy banks required for nesting persisted at each site. As such, the collapse of existing burrows will likely have little or no effect on the regional population, given that new burrows are typically constructed each year (Garrison 1999; Falconer et al. 2016). While the remaining habitat appeared be suitable for nesting at the time of the impoundment monitoring survey, it is uncertain if these sites will be suitable in the near future, and nesting success may be reduced if a high rate of bank erosion results in the collapse of active burrows. There are numerous other natural sites available for nesting in the region. No accidental bank swallow mortality was reported during construction or impoundment monitoring.



5.0 SUMMARY AND CONCLUSIONS

There is a large bank swallow population in the Keeyask region. While substantially more bank swallows were observed in 2016, 2018, and 2020 than during pre-construction surveys, the increase was more likely attributable to the increased survey effort during the latter studies than to a large population increase. In 2020, the estimated bank swallow population in Study Zone 4 was 2,033 individuals, a decrease of 10% from 2018. The estimated population was 1% greater in 2020 than when surveys began in 2016.

Bank swallows rely on eroding mineral soils and steep sandy banks to form suitable nesting habitat substrate, especially in the Keeyask region. During Project construction, one bank swallow nesting site was removed for Project-related bank stabilization and two areas of temporary habitat, created during Project development in a borrow area, were unavailable due to rehabilitation efforts. Reservoir impoundment affected the existing unoccupied burrows at three additional sites, however the habitat at each appeared to be suitable for future nesting. Because a similar number of nesting colonies and estimated number of individuals in Study Zone 4 have been observed since 2016, the population currently appears to be stable and Project effects on bank swallows appear to be minimal.

Following reservoir impoundment in fall 2020, new shorelines formed rapidly and abruptly altered unoccupied bank swallow burrows in the affected area. While the habitat at three sites affected by erosion in the reservoir appeared suitable for nesting during impoundment, it is uncertain if it will remain suitable in the future, or if erosion will result in the collapse of active burrows. It is recommended that the frequency of near-term monitoring be increased to include the year after impoundment (2021) to assess for immediate population change. Long-term monitoring that began in 2016 will then continue every two years until 2024, as outlined in the TEMP. A habitat quality model for bank swallow will be developed and validated with these data. The validated habitat quality model will be applied to the post-Project terrestrial habitat map to identify and measure suitable nesting habitat. Nesting habitat loss due to Project infrastructure and indirect Project effects on terrestrial habitat and surface water types included in the model will be determined and will be used to quantify the loss or alteration of bank swallow habitat.



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APPENDIX 1: EXAMPLE COUNT OF BURROWS IN PHOTOGRAPH





Note: Alternating colours were used for each group of 10 burrows to facilitate counting.



TERRESTRIAL EFFECTS MONITORING PLAN BANK SWALLOW MONITORING 2020

APPENDIX 2: BANK SWALLOW BURROW COUNTS 2020



Colony	Survey Date	Observer 1 (Field Count)	Observer 2 (Photo Count)	Observer 3 (Photo Count)
01	July 3	2	4	1
	July 20	0	_	-
02	July 3	429	343	333
	July 20	350	563	603
04	July 3	110	150	126
	July 20	195	312	356
06	July 3	174	176	176
	July 20	250	391	387
07	July 3	283	389	405
	July 20	379	283	278
08	June 30	0	0	0
09	June 30	121	96	103
	July 20	88	140	167
10	July 2	27	2	14
	July 18	3	3	16
11+19 ¹	July 2	401	313	305
	July 18	394	515	477
12	July 2	625	810	944
	July 18	733	1,036	1,099
13	July 2	129	201	198
	July 18	174	114	269
14	July 2	113	104	93
	July 18	149	211	162
15+16 ²	July 2	375	366	428
	July 18	426	556	659
17	July 2	28	1	2
	July 18	19	25	28
18	July 2	89	62	74
	July 18	34	67	59
G3	July 3	0	_	-
Km 1	June 30	0	-	_

1. Sites 11 and 19 were identified separately during field studies in 2016 and 2018 but were subsequently considered a single colony due to the continuity of burrows observed along the shoreline.

2. Sites 15 and 16 were identified separately during field studies in 2016 but were subsequently considered a single colony due to their proximity (approximately 400 m).

