



Appendix G

Wetland Treatment Predictive Model

Wetland Treatment Predictive Model

In preparation of the design of the Kugluktuk Sewage Treatment Facility, Nuna Burnside reviewed a number of alternatives as described in the Schematic Design Report.

Based on the study of the existing system and the impacts the system was having on the environment, as well as, the systems in other communities in Nunavut, the concept of a two part treatment system was selected, consisting of a facultative storage lagoon for primary effluent treatment, and a Wetland Treatment Area for secondary treatment.

The “Guidelines for the Approval and Design of Natural and Constructed Treatment Wetlands for Water Quality Improvement”, dated March 2000, prepared by Alberta Environment, provided the best available document for evaluating the use of wetlands for the treatment of sewage lagoon effluent.

The document is divided into four main tasks:

- Task 1 Questionnaire to Determine Feasibility
- Task 2 Preliminary Feasibility
- Task 3 Evaluation of the Proposed Site
- Task 4 Design Guidance of the Site.

The content of the Feasibility Questionnaire was reviewed and an evaluation of feasibility conducted (see summary sheet and check sheets attached). Site specific conditions including climate were considered.

The use of the natural wetlands for polishing of the secondary effluent discharged from the lagoon was selected as the most favourable option. It was also noted that, some engineering assistance such as the use of an exfiltration berm to spread the discharge, would improve the process. Sub-surface flow would also provide some treatment in the seasonally thawed active zone. For the purposes of this evaluation, sub-surface flow is not included. Also for the purposes of this evaluation, “anticipated NWB guidelines” are used, which are more stringent than current NWB guidelines.

The Wetland Treatment Predictive Model used herein is modified from the Alberta Environment Model (2000) and based on the assumptions described below.

Assumptions

- Total year 20 discharge (including sewage ($126,113 \text{ m}^3$) and precipitation ($2,526 \text{ m}^3/\text{year}$) falling into the lagoon) – $128,639 \text{ m}^3$
- Expected sewage lagoon effluent quality prior to wetland treatment in year 2026, assuming 25 percent carbon removal efficiency:

BOD	222 mg/l
TSS	237 mg/l
T-PO ₄	11 mg/l

TKN 59 mg/l
Fecal Coliforms 4.7×10^7 CFU/100ml

- Nunavut guideline requirements for final effluent quality at discharge from the sewage Treatment Facility:

	Current Guidelines	Anticipated Guidelines
BOD mg/l	120	45
TSS mg/l	180	45
T-PO ₄ mg/l	-	1
TKN	-	10
Fecal Coliforms CFU/100 ml	1,000,000	2,000

- Based on Kugluktuk climate data the average temperature of the period mid-June through mid-October is approximately 6.5°C. For conservative calculations purposes 5°C will be used in the predictive model
- Average daily discharge to the wetland during the 120 day biologically active period (mid-June through mid-October) would be approximately 1,072 m³/day
- Discharge will occur annually based on the climatic conditions each year
- The Alberta Environment model was designed for 20°C. To account for an average temperature of 5°C the Area Rate Constant has been modified as follows:

Parameter Area Rate Constant

	@ 20°C	@ 10°C	@ 5°C
BOD	1,000	500	250
TSS	34	17	8.5
T-PO ₄	12	6	3
TKN	22	11	5.5
Fecal Coliforms	77	38.5	19.25

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

TABLE 5.1
SUMMARY SHEET FOR EVALUATION OF ECOLOGICAL FUNCTIONS OF A CANDIDATE SITE (CHECK
APPROPRIATE BOXES AFTER COMPLETING EVALUATION)

Habitat Functions	Desktop Evaluation Significant Features Noted		Field Assessment Significant Features Noted		Negative Impacts Likely?		Mitigation Likely to be Successful?		Basis for Denial Noted	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
5.1: Flood storage capability		☒								
5.2: Water quality improvement		☒	☒			☒	☒			
5.3: Habitat for rare plants or plant communities		☒		☒		☒				
5.4: Significant habitat for breeding waterfowl		☒		☒		☒				
5.5: Significant habitat for migrating waterfowl or shorebirds		☒		☒		☒				
5.6: Habitat for breeding area- and disturbance-sensitive fauna		☒		☒		☒				
5.7: Corridor for floral or faunal distribution		☒		☒		☒				
5.8: Fisheries habitat		☒		☒		☒				
5.9: Habitat for significant animal species		☒		☒		☒				
5.10: Social or economic benefit		☒		☒		☒				

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

Alberta Environment Treatment Wetland Evaluation

5.1: Function: Flood Storage Capability

Rationale: Wetlands function in flood and erosion control, water storage, and protection of groundwater recharge and discharge.

Methods for Evaluation

Office evaluation-document the following

- Conduct preliminary calculation to determine the area of the watershed draining into the wetland.
 - Calculate wetland area (if wetland mapping is digitized, this may be done with the same software; otherwise a polar planimeter may be used).
 - Calculate catchment area.
 - Calculate average monthly rainfall (Reference Environment Canada 1982 (Appendix D).
 - Multiply average monthly rainfall by catchment area (minus the area of the wetland).
 - Multiply by an appropriate runoff coefficient.
 - Add this figure to figure for effluent volume: assume the wetland is an average of 1m deep.
-

Is this wetland large enough to hold both natural and effluent inputs?

If wastewater inputs total 10% or more of natural inputs, conduct modelling studies to determine flooding probabilities more accurately. Note ratio of wastewater to natural inputs, and recommend further studies if needed.

Wastewater would contribute less than 10 percent of total annual natural inputs.

Flooding is not a concern, as area is not sensitive to flooding.

Determine the effects that additional wastewater inflows are predicted to have on flood-related impacts associated with a 1:50 rainfall event.

(mitigation may be required if probability is high)

Compare flooding with and without effluent:

The area is not flood sensitive and effluent discharge is controlable, so it can be stopped

during high flow events. This is part of the D&O Plan.

☒ Wastewater will not increase magnitude or frequency of flooding. Impact on flood control function is not a basis for denial of treatment wetland.

☐ Wastewater will increase magnitude or frequency of flooding. Proceed to evaluation of mitigation.

If Impacts Predicted, Examine Potential for Mitigation

Can a control structure be erected? Yes ☐ No ☐

Describe:

The lagoon discharge can be controlled to avoid discharge during storm events.

Can storage capacity for water be increased (i.e. by underground or above ground storage structures)?

Note: reconsider possibilities of impacts on other wetland functions as a result of increasing storage.

Describe:

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

Final Analysis: Predicted Net Impacts and Action
Mitigation Potential:

Lagoon discharge is controllable from value. D&O Plan includes protocols for halting discharge during significant storm events. The area is not sensitive to flooding. There is nothing a flood could damage downgradient of the lagoon.

Conclusions:

No significant concerns. Area suitable for use.

- ☒ No negative impact likely. Impact on flood control is not a basis for denial of treatment wetland.
☐ Negative impact likely. Impact on flood control is a basis for denial of treatment wetland.
-

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

Alberta Environment Treatment Wetland Evaluation

5.2: Function: Water Quality Improvement

Rationale: Wetlands function to store and transform certain chemical elements, which could otherwise affect downstream surface or groundwater quality. Additional inputs from effluent may result in unacceptable water quality downstream.

Increases in water flow can affect this function by reducing the hydraulic retention time in the wetland, (thereby reducing treatment time), and by keeping sediment suspended or resuspending settled material.

Groundwater can become contaminated by recharge from contaminated surficial water table.

Methods for Evaluation (note water quality measurements are part of the initial assessment).

Measure water quality entering and leaving wetland (as reported in preliminary assessment of wetland, Table 1 Section 1). Note where measurements taken (map if necessary).

*Note: in wetlands where inflow or outflow is dispersed, measurements should be taken at several points.

List the following water quality parameters :

Phosphorus:	Inflow_____	Outflow_____	See historic sampling results.
Nitrogen:	Inflow_____	Outflow_____	
Suspended solids:	Inflow_____	Outflow_____	

List other potential contaminating inputs (i.e. feedlot operations, storm water runoff, industries; note both point and non-point sources of contamination).

No other contaminant inputs exist. Landfill inputs not expected.

Recommend other water quality parameters, which should be measured, based on potential for contamination from surrounding area.

A complete suite including metals and general chemistry (with Nitrite, Nitrate, TKN, Total Phosphorous, Ammonia-N, BOD, Fecal Coliforms) in order to monitor a broad spectrum of water quality.

1. Assess whether this wetland already plays a significant role in improving surface water quality from surrounding inputs.

Explain:

Existing raw sewage discharge.

- ☒ Wetland does not receive significant inputs. Negative impacts on this function are not a basis for denial of treatment wetland.
- ☐ Wetland significantly treats water from incoming sources. Proceed to evaluation of impacts.

If wetland currently provides significant water quality improvement, determine potential for impact (based on Section 2 calculation).

Predict impacts from increase in hydroperiod:

Existing raw sewage discharge will be halted once the new lagoon is built.

Predict impacts from increased nutrient loading:

No increase - No impacts.

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2. Assess potential for contamination of the groundwater table through recharge of surface water

Determine soil type from existing soils data or obtain soil core from the wetland:

Sandy soil.

Estimate:

Soil permeability $K = 0.036$ cm/sec

Water balance of wetland

Note whether contaminated water could reach the local aquifer through recharge:

Permafrost area. Only a 0.9 m active layer.

- ☒ No negative impact likely. Impact on water quality is not a basis for denial of treatment wetland.
☐ Negative impact likely. Proceed to evaluation of mitigation.

If potential impact is determined, examine potential for mitigation of impacts. Refer to table of Impacts and Mitigation (Appendix E).

Further pretreatment of incoming wastewater:

N/A

Pretreatment of wastewater from other sources, or source controls:

Increase the size of treatment wetland (note that potential for impacts to other habitat functions must be re-evaluated):

Final Analysis: Suggested Net Impacts and Action

No impact expected.

Conclusions:

Only active layer groundwater could be potentially impacted. No sensitive receptors. Active layer groundwater would provide attenuation.

- ☒ No negative impact likely. Impact on water quality is not a basis for denial of treatment wetland.
☐ Negative impact likely. Impact on water quality is a basis for denial of treatment wetland.

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Alberta Environment Treatment Wetland Evaluation

5.3: Function: Provision of Habitat for Rare Plants or Plant Communities

Rationale: Some plant communities, for example, native prairie, have been almost eliminated by development for agriculture, etc. Rare plants and plant communities are often highly sensitive to changes in nutrient and moisture regimes.

**Note:* In some areas where soil disturbance and a high proportion of "weeds" is the norm, predominantly native plant assemblages, even without rare plants, can be considered significant.

Methods for Evaluation

Office Evaluation

Contact and document correspondence with agencies re. rare species mapping for area (e.g. Alberta Environment, Natural Resources Service; University of Alberta; Alberta Museum of Natural History).

Airphoto and document review indicate no sensitive species at risk.

Contact and document correspondence with local sources (Naturalist Clubs, FAN, botany groups, and local landowners).

On site discussions with Hamlet staff. No issues of concern.

Refer to examples of significant landscape types and localities in Appendix G. Note whether site falls into categories listed as potentially significant.
Refer to Packer and Bradley (1984) (Appendix D) for comprehensive list of rare plants and dot maps of distribution.

- ☐ Sufficient survey data exist, i.e. botanical inventory of site. No significant plant species, community found (see Appendix F for rare plant species). Site is not in an area or landscape noted for potential significance (Appendix G). Presence of significant plant species is not a basis for denial of treatment wetland.
 - ☒ Sufficient survey data do not exist. Proceed to preliminary field evaluation.
Preliminary field evaluation must be conducted if no inventory exists, or if the site falls into area or landscape categories noted for their potentially significant vegetation (see Appendix G).
-

Preliminary Field Evaluation (to be conducted by a qualified vegetation specialist)

Summarize from field notes habitat conditions at the site, which may indicate presence of significant plants or plant communities.

Discussion with local Inuit indicate no concerns with this wetland.

Summarize from field notes indicators of significant plants or plant communities at the site (e.g. certain plant species, soils or landform coupled with absence of disturbance by tilling or intensive grazing; history of fire) or presence of significant plant species in similar habitat nearby).

No conflicting land use.

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

If such indicators are found, particularly if the site is in an area or landscape type noted for potentially significant flora (Appendix G), conduct intensive field evaluation and give rationale for conducting full inventory.

N/A

Intensive Field Evaluation

Botanical Inventory (conducted on at least two visits: approximately coinciding with summer and fall. Woodlands should be additionally evaluated in spring).

From field notes, list significant species or plant communities found. Note ratio of native plant species to total species. Append plant community mapping, plant list.

N/A

If indicator detected, determine potential for impact: refer to table of impacts and mitigation found in Appendix E.

- 1 Summarize features, which likely contribute to the presence of significant species or communities.

N/A

- 2 Determine zone where impacts may be expected, and:

A. Assess expected impacts from increase in hydroperiod (e.g. potential replacement of extant plant communities by communities more tolerant of inundation).

N/A

B. Assess expected impacts from increased nutrient loading (e.g. potential invasion by fast-growing non-native species, change in vegetation, change in water quality, decrease in species diversity).

N/A

C. Assess expected impacts from earthworks, if proposed.

N/A

☒ No impact likely. Impact on significant plant species or communities is not a basis for denial of treatment wetland.

☐ Impact likely. Proceed to examination of mitigation.

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

If potential impact determined, examine the potential for mitigation afforded by the following techniques

Restoration of habitat (e.g. planting of native species, etc.):

N/A

Further treatment of wastewater:

N/A

Pretreatment of wastewater from other sources, or source controls:

N/A

Final Analysis: Suggested Net Impacts and Action

Mitigation Potential:

N/A

Summary of Projected Net Impacts After Mitigation. Qualify Projections.

N/A

Conclusions: are net impacts acceptable? Explain:

N/A

-
- ☒ No negative impact likely. Impact on significant plant species or communities is not a basis for denial of treatment wetland.
- ☐ Negative impact likely. Impact on significant plant species or communities is a basis for denial of treatment wetland.
-

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

Alberta Environment Treatment Wetland Evaluation

5.4: Function: Significant Habitat for Breeding Waterfowl

Rationale: Even small wetlands have been shown to be important in waterfowl production, particularly in prairie and parkland ecoregions. Initiatives like the North American Wetland Management Program (NAWMP) recommend protection of potholes.

Methods for Evaluation

Office Evaluation:

Contact Ducks Unlimited; Alberta Environment Natural Resource Service for pre-existing information re: breeding waterfowl. Note whether site is subject to NAWMP agreement.

Refer to the following references (Appendix D): Strong et al. (1993) for information on value of wetlands in the Settled Area to waterfowl, Nietfield et al. (1985) for list of priority duck production habitat in Alberta, and Refer to D.A. Westworth & Associates (1990) for significant breeding habitat in Boreal Forest region

Document known level of significance:

No documentation available.

Contact local sources (Naturalist clubs, FAN, Alberta Fish and Game Association). List or append sources including name, phone number of contact and significance of habitat.

Document level of significance from these sources:

No documentation available. Discussions with Hamlet staff indicates no concerns.

- ☒ Wetland is not considered significant and has been evaluated within past 5 years. Significant habitat for breeding waterfowl is not a basis for denial of treatment wetland. If information not available, conduct preliminary field visit.
- ☐ Wetland is considered significant. Proceed to evaluate potential for impact.

If information is not available, conduct preliminary field visit to determine potential significance.

Preliminary field visit:

Note following variables:

- ☒ 50m (diameter) or more standing water until late summer
- ☒ Concealing vegetation
- ☒ Discrete areas of short, grass-like plants
- ☒ Submerged or floating aquatic vegetation
- ☒ Shrubby areas
- ☒ Check if other wetlands with standing water (as above) are within 5 km; linked by natural habitat; linked by agricultural land, i.e. not separated by ecological barrier

If standing water plus three or more of these conditions apply, a field evaluation must be conducted: note whether field evaluation advised.

Yes ☐ No ☒

- ☒ Wetland is not considered significant, and preliminary field visit does not indicate potential significance. Habitat for breeding waterfowl is not a basis for denial of treatment wetland.
- ☐ Wetland is considered significant. Habitat for breeding waterfowl is a basis for denial of treatment wetland.

No Hamlet evaluation conducted. Site visit and discussions with Hamlet staff indicates the wetland is a small insignificant component of a huge similar bio-environment stretching for 1,000's of kilometers.

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

Intensive field evaluation (to be conducted by a qualified waterfowl biologist)

Conduct and provide record of one of the following waterfowl surveys:

- Conduct observational and nest (dragging) surveys in late April to June.
 - Conduct surveys of downy young and post-breeding adults in May-July.
-

Estimate number and species of waterfowl pairs observed

Assess significance of habitat

As estimated from field surveys: _____
In consultation with agencies noted above: _____

- ☒ Wetland is not considered significant. Breeding habitat for waterfowl is not a basis for denial of treatment wetland.
- ☐ Wetland is considered significant. Determine and record the potential for impact.
-

Determination of Potential for Impact

1. Assess factors contributing to significance of habitat based on:

- Factors noted above
- High percentage of wetlands in the region
- Large and undisturbed habitat tract
- Other

2. Determine zone where impacts may be expected, and

- A Predict impacts from increase in hydroperiod (also note potential for positive impact from increase in permanence of water, area of wetland, etc.). Refer to table of impacts in Appendix E.

No significant impacts.

- B Predict impacts from increased nutrient loading.

No significant impacts.

- C Assess expected impacts from earthworks, if proposed:

No significant impacts.

If potential negative impact expected, examine potential for mitigation:

Refer to table of impacts and mitigation techniques in Appendix E and habitat matrix (Appendix H) to aid in determining impacts due to vegetation shifts.
Potential for mitigation offered by creating habitat.

N/A

Potential for mitigation offered by further pretreatment of wastewater.

N/A

Assess potential for success of mitigation:

N/A

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

Summary of net impacts after mitigation:

N/A

Final Analysis: Suggested Net Impacts and Action

- ☒ No negative impact likely. Impact on waterfowl breeding habitat is not a basis for denial of treatment wetland.
- ☐ Negative impact likely. Impact on waterfowl breeding habitat is a basis for denial of treatment wetland.

Conclusions:

A small wetland area in a huge area of similar tundra. Hamlet staff and site observations indicate that, should the use of this wetland slightly impact waterfront, the impact will be insignificant.

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Alberta Environment Treatment Wetland Evaluation

5.5: Function: Significant Habitat for Migrating Waterfowl or Shorebirds

Rationale: Migrating shorebird and waterfowl populations are vulnerable to human interference, since they concentrate in great numbers in only a few locations along migratory pathways (Dickson and Smith 1991).

Methods for Evaluation

*Note: Field evaluation of significance of habitat for migrating waterfowl and shorebirds is sufficiently complex to be beyond the scope of this evaluation. Evaluation of this criterion will be general and based on existing information only.

Office Evaluation:

Contact agencies re. Mapping of significant staging areas (e.g. Alberta Environment Natural Resources Service, Canadian Wildlife Service, and Ducks Unlimited). Tabulate below agency, contact person, phone number and date of call.

Note published reports listing significant staging areas (e.g. Dickson and Smith 1991, Nietfield et al. 1985, Poston et al. 1990; Appendix D).

* Dickson and Smith (1991) note that Regional Shorebird Staging Reserves are those, which have at least 20,000 using the site annually, or at least 5% of a species flyway population.

Site visit and discussions with Hamlet staff indicate no concern.

- ☒ No significant shorebird or waterfowl staging area noted. Presence of staging area is not a basis for denial of treatment wetland.
- ☐ Significant migratory staging area noted. Proceed to examination of impacts and mitigation.

If staging area noted, determine potential for impact:

Refer to table of impacts and mitigation techniques, Appendix E.

1. Summarize features which contribute to significance as a staging area:

- ☐ Extensive open water and concealing vegetation.
Comments: _____
- ☐ Presence of large areas of mud flat or short grass-like vegetation.
Comments: _____ N/A
- ☐ Other: _____
Comments: _____

2. Determine zone of influence where impacts can be expected, and:

- A. Predict impacts from increase in hydroperiod (e.g. particularly inundation of mud flats, or extension of inundation time with consequent failure of forage species to germinate and/or loss of invertebrates).

No significant impacts.

- B. Predict impacts from increased nutrient loading (e.g. rapid growth of suboptimal non-native forage species, elimination of some invertebrates).

No significant impacts.

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

C. Predict impacts from earthworks, if proposed:

No significant impacts.

☒ No negative impact likely. Impact on significant staging area is not a basis for denial of treatment wetland.

☐ Negative impact likely. Proceed to evaluation of mitigation.

If potential impact determined, examine potential mitigation of impacts

1. Restoration of habitat (e.g. creation of gentler grades (1:10) at wetland edges to encourage zonation of vegetation and development of mud flats).

N/A

2. Further pretreatment of wastewater

N/A

Final Analysis: Suggested Net Impacts and Mitigation

Mitigation Potential

N/A

Summary of net impacts after mitigation

N/A

Conclusions

The area of concern is a tiny component of a large area of similar tundra. No significant impacted is likely.

☒ No negative impact likely. Impact on significant staging areas is not a basis for denial of treatment wetland.

☐ Negative impact likely. Impact on significant staging areas is a basis for denial of treatment wetland.

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

Alberta Environment Treatment Wetland Evaluation

5.6: Function: Habitat for Breeding Area - and Disturbance-Sensitive Fauna (see list of species in Appendix H).

*Note: This part of the evaluation should be completed only in developed or agricultural areas where habitat is highly fragmented.

Rationale: Some wildlife species appear to require large expanses of habitat (or many connected patches of habitat) at a distance from human development. These species are becoming increasingly rare in settled landscapes.

Office Evaluation

Contact agencies re. species lists for area (e.g. Alberta Environment Natural Resource Service). List sensitive species recorded (noted in Appendix H). Also note species recorded in contiguous or structurally similar habitat within 1 km.

No inventory conducted. The site is a tiny area within a huge area of similar tundra.

Contact local sources (naturalist clubs, FAN, birding groups) for species lists in area or in contiguous or structurally similar habitat within 1 km. Summarize findings.

No concerns noted by Hamlet staff.

- ☒ Sufficient data exist; no significant fauna found. Or no data available, but habitat consists of small (< 5 ha), isolated patches of natural vegetation in a landscape which consists of <10% of natural habitat. Presence of area-, disturbance- or isolation-sensitive species is not a basis for denial of treatment wetland.
- ☐ Insufficient Data exist (i.e. no surveys within past 4 years): conduct field evaluation

Field Evaluation (to be conducted under the following circumstances):

- If large areas (>5 ha of grassland, woodland or wetland persist in an otherwise highly developed landscape).
- If candidate site is one of many fragments of habitat which together comprise greater than 10% of natural vegetation in the landscape.

*Note: In many cases, the requirement for inventories to detect rare species will provide the opportunity for concurrent surveys for these species.

Note habitat conditions, which indicate the possible presence of area- or disturbance- sensitive species (e.g. above factors).

N/A

Conduct breeding bird, amphibian and reptile, and mammal species as indicated for rare species function. Note area- or disturbance-sensitive indicator species found (refer to list in Appendix H); summarize findings.

N/A

- ☐ Sensitive species not found. Presence of sensitive species is not a basis for denial of treatment

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

wetland.

- ☐ Sensitive species found. Proceed to evaluation of impacts.

If indicator detected, determine potential for impact (refer to Appendix E for summary of impacts and Appendix H for habitat matrixes which aid in determination of affects of shifts in vegetation):

1. Summarize features, which likely contribute to the presence of sensitive species. N/A
 - Large and undisturbed habitat tract: _____
 - High percentage of habitat cover in the region: _____
 - Other: _____
2. Determine zone where impacts may be expected, and:
 - A. Predict impacts from increase in hydroperiod (e.g. replacement of treed habitat by more water-tolerant species; see Appendix E for summary of impacts):
N/A

 - B. Predict impacts from increased nutrient loading (e.g. change in vegetation, change in water quality, decrease in plant species diversity):
N/A

 - C. Predict impacts from earthworks, if proposed:
N/A

- ☒ No negative impact likely. Impact on area-, disturbance- or isolation- sensitive species is not a basis for denial of treatment wetland.
- ☐ Negative impact likely. Proceed to examination of mitigation.

If potential impact determined, examine potential mitigation of impacts; e.g. by creation of corridors to other suitable habitat, restoration of habitat outside area affected by creation of wetland to maintain habitat size, etc.).

N/A

Final Analysis: Suggested Net Impacts and Action

Mitigation Potential:

N/A

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

Summary of Net Impacts after Mitigation:

N/A

Conclusions:

No significant concerns noted. Site is a small area within a huge area of similar tundra.

- ☒ No negative impact likely. Impact on area-, disturbance- or isolation-sensitive species is not a basis for denial of treatment wetland.
 - ☐ Negative impact likely. Impact on area-, disturbance- or isolation-sensitive species is a basis for denial of treatment wetland.
-

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

Alberta Environment Treatment Wetland Evaluation

5.7: Function: Provision of Significant Habitat for Floral or Faunal Distribution and Persistence Within the Landscape

Rationale: Wetlands and other natural areas being considered as candidate sites may be linked to other patches of habitat. Without the pattern of nodes and linkages, habitat becomes fragmented and generally supports lower biodiversity.

Methods for Evaluation

Office Evaluation

Obtain up-to-date aerial photographs of the site and approximately 1-km radius beyond the site. Note discrete patches of vegetation (nodes) and patterns of natural vegetation connecting them (linkages).

Not noted.

Note and record whether candidate site forms a node or part of a linkage.

None.

Note and record whether linkage takes the form of a potential "stepping stone" rather than a direct connection.

None.

Note predominant land use surrounding nodes and linkages.

None.

Contact agencies (as suggested for other functions) to determine whether large animal populations are known to use the site or surrounding habitat as a corridor. List species reported.

Caribou migration. No impact expected.

- ☒ No linkage is evident. Impact on node or linkage function is not a basis for denial of treatment wetland.
☐ Linkage is evident; or large animal populations use the area as a corridor. Proceed to evaluation of impacts.

If candidate site forms part of a node or a linkage, evaluate potential for impacts:

1. Summarize main features contributing to significance of nodes or linkages e.g.
Linkages provide the only natural corridor through otherwise intensively farmed agricultural land or urban development: Yes ☐ No ☐
Comment:

N/A

Site contributes to natural landscape significant for size, configuration, links: Yes ☐ No ☐
Comment:

N/A

2. Evaluate zone of influence, and:
A. Predict impacts from increase in hydroperiod:

N/A

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

B. Predict impacts from increased nutrient loading:

N/A

C. Assess expected impacts from earthworks, if proposed:

N/A

- ☒ No negative impact likely. Impact on node or linkage is not a basis for denial of treatment wetland.
☐ Negative impact likely. Proceed to evaluation of potential for mitigation.
-

If potential impact determined, examine potential mitigation of impacts and summarize:

Restoration of habitat (e.g. restoration of corridor elsewhere, restoration of node edges in order to improve configuration, size):

N/A

Mitigation Potential:

N/A

Final Analysis: Suggested Net Impacts and Action

Summary of Net Impacts after Mitigation:

N/A

Conclusions:

The area is a small portion of a large encompassing tundra eco-system and does not cause isolation or disruption between parts of the eco-system.

- ☒ No negative impact likely. Impact on significant node or linkage is not a basis for denial of treatment wetland.
☐ Negative impact likely. Impact on significant node or linkage is a basis for denial of treatment wetland.
-

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

Alberta Environment Treatment Wetland Evaluation

5.8: Function: Provision of Habitat for Fish

Rationale: Though treatment wetlands will not be permitted to affect major fish habitats such as lakes, rivers and streams, pools in some wetlands can provide habitat for some small fish species. Proposals to alter fish habitat are subject to the federal Fisheries Act.

Methods for Evaluation

Office Evaluation

Contact agencies such as the Alberta Environment Natural Resources Service for existing survey data on the candidate site and hydrologically connected water bodies. List survey data, note significant findings (Refer to list of significant fish species in Appendix I).

Stream reportedly freezes solid.

Contact local fishermen (through angling groups, etc.). List name, phone number, address and date of contact. Note findings.

Hamlet staff indicated it is not used for fishing or known to contain fish.

Refer to D. A. Westworth and Associates (1990) for lists of significant fish habitat in the boreal forest region.

N/A

☒ Suitable information exists. Fish habitat is not found on the site, nor is the site hydrologically connected to larger water bodies. The presence of fish habitat is not a basis for denial of treatment wetland.

☐ Information is not available. Proceed to field evaluation.

Field Evaluation (to be conducted by a qualified fisheries biologist)

Sample fish populations in potential habitat on site (this is most effectively done with an electroshocker). List numbers and species of fish seen.

N/A

Determine if the candidate site contains the following habitat variables:

1. Surface water connection with larger water body containing fish.
2. Areas of emergent vegetation adjacent to larger water body subject to flooding in spring.

☐ Fish are present in the wetland, or habitat variables apply. Proceed to evaluation of impacts.

☐ Fish are not present, or habitat isolated from larger water bodies containing fish. Negative impact on fish habitat is not a basis for denial of treatment wetland.

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

Evaluation of Impacts

Refer to table of impacts and mitigation, Appendix E, and habitat matrix to aid in determination of impacts due to vegetation shifts, Appendix H).

- 1 Assess factors contributing to presence of fish in water bodies on candidate site (noting whether the population in these water bodies is likely killed off in some years and some seasons but maintained by colonization by fish from adjacent habitat).

N/A

- 2 Determine zone where impacts may be expected and:

- A. Predict impact of increased nutrient levels (i.e. note tolerance to changes in water chemistry of fish species present; also consider tolerance of prey items):

N/A

- B. Predict impact of increased hydroperiod (i.e. potential introduction of predatory species, increased flow rates through habitat):

N/A

- C. Predict impacts of earthworks, if proposed:

N/A

- ☐ Potential impact predicted. Proceed to examination of mitigation.
- ☐ No negative impact likely. Impact on fisheries habitat is not a basis for denial of treatment wetland.

If potential impact determined, examine potential mitigation of impacts:

Restoration of habitat i.e. creation of sheltered pools, protective structures, fish barriers:

N/A

Further pretreatment of incoming wastewater:

N/A

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

Final analysis: suggested net impacts and action

Mitigation potential:

N/A

Summary of net impacts after mitigation:

N/A

Conclusions:

The stream freezes solid and Hamlet staff indicate there is no significant use of the stream by fish.

- ☒ No negative impact likely. Impact on fish habitat is not a basis for denial of treatment wetland.
- ☐ Negative impact likely. Impact on fish habitat is a basis for denial of treatment wetland.
-

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

Alberta Environment Treatment Wetland Evaluation

5.9: Function: Habitat for Significant Animal Species

Rationale: Wetlands provide breeding and foraging habitat for a large proportion of the province's significant species; particularly in grassland regions.

Methods for Evaluation

Office Evaluation

- Contact agencies re rare species mapping for area (e.g. Alberta Environment Natural Resource Service; Provincial Museum of Alberta). List significant species recorded. Refer to lists of significant animal species, Appendix I.

Brief review of species indicate most are mobile tundra dwellers, not likely to be impacted.

- Contact local sources (local naturalist clubs, FAN, birding groups). List sources including name, phone number of contact, and significant species sighted. Refer to lists of significant animal species, Appendix I.

Discussions with Hamlet staff, Caribou migration is not impacted by sewage discharge.

- ☒ Sufficient data exists (surveys within the past 5 years), and no significant animal species found. Presence of significant species is not a basis for denial of treatment wetland.
- ☐ Insufficient data exist. Proceed to field evaluation.

Field Evaluation (scoped to reflect effort required as determined by questions answered in the office) to be conducted by a qualified wildlife biologist.

Refer to provincially significant, bird, mammal, reptile, and amphibian species (Appendix I for lists).

N/A

- List habitat conditions, which may indicate rare species. Refer to habitat matrices, Appendix H and habitat notes in Appendix I.

N/A

- Conduct breeding bird surveys (generally from last week in May to first week in July, but certain groups may be better inventoried earlier, e.g. raptors, waterfowl - conspicuous displays in late April). Many species can be detected by song and call identification, so there is a high return in detecting a large diversity of species with least effort. List significant findings from field notes. Append complete species list.

N/A

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

- Conduct scoped breeding amphibian and reptile surveys (surveys of frogs in late evening through April to July bring high return because frogs can be discerned by call; surveys of amphibian eggs or larvae are time-consuming and require uncommon expertise; generally searches under debris can be conducted during other surveys, but bring low return for effort). List significant species from field notes. Append complete species list.

N/A

- Conduct mammal surveys if likelihood of rare mammals is high; techniques include searches for mammal signs (generally reveals only a few common species); - mammal trapping (to be used only if strong indications rare mammals may be present and their determination is critical, as return for effort is low, expertise required high and mortality of trapped animals high). List significant species from field notes. Append complete species list.

N/A

- ☐ No significant species detected. Significant animal species is not a basis for denial of treatment wetland.
- ☐ Significant species detected. Proceed to evaluation of impacts.
-

If indicator detected, determine potential for impact:

- 1. Summarize features which probably contribute to presence of significant species** (see habitat matrices, Appendix H; habitat notes, Appendix I):

N/A

- large and undisturbed habitat tract: _____
- specific vegetation type: _____
- other: _____

- 2. Assess zone where impacts can be expected, and:**

- A. Predict impacts from increase in hydroperiod (e.g. replacement of treed habitat by more water-tolerant species; see Appendix E for summary of impacts and mitigation, Appendix H (habitat matrix) to aid in determining impacts due to vegetation shifts).

N/A

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

- B. Predict impacts from increased nutrient loading (e.g. potential invasion by fast-growing exotic species, change in vegetation, change in water quality, decrease in species diversity).

N/A

- C. Predict impact from earthworks, if proposed.

N/A

- ☐ No negative impact likely. Impact on significant animal species is not a basis for denial of treatment wetland.
- ☐ Negative impact likely. Proceed to examination of mitigation.
-

If potential impact determined, examine potential mitigation of impacts.

Restoration of habitat (e.g. peripheral planting, creation of nesting, foraging, or wintering habitat structures):

N/A

Further pretreatment of incoming wastewater:

N/A

Final Analysis: Suggested Net Impacts and Action

Mitigation Potential:

N/A

Summary of Net Impacts After Mitigation:

N/A

Conclusions:

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

No significant disruptions to animals expected. Local animals can easily move to the large surrounding area of similar tundra.

- ☒ No negative impact likely. Impact on significant animal species is not a basis for denial of treatment wetland.
- ☐ Negative impact likely. Impact on significant animal species is a basis for denial of treatment wetland.

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

Alberta Environment Treatment wetland evaluation

5.10: Function: Provision of Significant Human Economic or Social Benefits

Rationale: Humans derive social and economic benefits from natural areas such as passive and active recreation, derivation of marketable goods and agricultural use.

Methods for Evaluation

Office Evaluation

Contact the following potential users to determine passive recreational use: schools, naturalist clubs, trail clubs, etc. List sources including names, phone numbers.

Hamlet staff indicate the area is not used for any purpose except the ATV trail.

Contact agencies and non-governmental organizations such as Alberta Environment Natural Resource Service, Ducks Unlimited, Alberta Fish and Game Association to determine active recreational use; document as above.

Hamlet staff indicate the area is off limits except for the ATV trail.

Contact agencies, NGO's and local band councils re. Value of activities such as trapping, fishing, peat extraction, wild rice harvest, livestock use, haying, and forestry.

Hamlet staff indicate no concerns with traditional use.

- ☐ No information available: conduct preliminary field visit.
- ☒ Contacts inform that site is not used for human purposes. Negative impact on social and economic benefits is not a basis for denial of treatment wetland.

Preliminary Field Visit

Note the following in the field:

- ☒ Presence of hiking, bicycle, snowmobile paths **ATV Trail**
- ☐ Shotgun shells
- ☐ Signage
- ☐ Wild Rice (harvest to be determined from contact with above sources)
- ☐ Signs of peat extraction
- ☐ Grazing, trampling by livestock; haying
- ☐ Forestry
- ☒ Human use is detectable. Proceed to public consultation or evaluation of potential mitigation.
- ☐ No human use is detectable. Proceed to public consultation (Option 1).

5. GUIDELINES FOR FUNCTIONS TO BE EVALUATED FOR APPROVAL OF CANDIDATE SITE FOR TREATMENT WETLAND

Option 1: Preliminary (optional) public consultation

If the site is used to treat wastewater, it will be inaccessible to the public.

Conduct preliminary Public Information Centre or distribute information to inform potential users of benefits and impacts of using site for constructed wetland. Obtain public comment. Append summarized responses.

*Note: If the most important impact of using the site for a treatment wetland is that it will no longer be accessible for public use, evaluation of other impacts is not necessary.

- ☐ Public concerns not resolved. Proceed to evaluation of potential mitigation
- ☒ Public concerns resolved. Negative impact on social and/or economic benefits is not a basis for denial of treatment wetland

Option 2: Proceed directly to evaluation of potential mitigation.

Mitigation of Potential Impacts

Refer to table of impacts and mitigation, Appendix E.

1. Determine zone where impacts can be expected, and:

Assess potential for relocation of passive recreation elsewhere:

N/A

Assess potential for relocation of active recreation elsewhere:

N/A

Assess potential for relocation of consumptive activities elsewhere:

N/A

2. Mandatory public consultation: Present benefits of proposed treatment wetland, projected impacts and proposed mitigation at Public Information Centre.

Summarize public comment, append responses:

Hamlet staff have approved area for use for sewage treatment.

Hold subsequent meetings to resolve individual concerns

Summarize comments and responses:

- ☒ Public concerns can be resolved. Negative impacts on human social and economic benefits are not a basis for denial of treatment wetland.
- ☐ Public concerns cannot be resolved because negative impacts on social and economic benefits of site are likely. Negative impacts on human social and economic benefits of site are a basis for denial of treatment wetland.