July 26, 2017

Appendix B CONSTRAINTS ANALYSIS AND ENVIRONMENTAL REVIEW: INTERNATIONAL POWER LINE PROJECT: WOODSTOCK TO HOULTON, MAINE (TRANSMISSION LINE 0155)

Stantec

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REGISTRATION FOR THE INTERNATIONAL POWER LINE PROJECT: WOODSTOCK TO HOULTON, MAINE (TRANSMISSION LINE 0155)

July 26, 2017

Stantec

Constraints Analysis of Proposed Substation near New Brunswick Route 95 Canada-United States Border Crossing

Construction of New Substation, as part of the Proposed Woodstock to Houlton, Maine 69 kV International Transmission Line

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1.0 INTRODUCTION

The New Brunswick Power Corporation (NB Power) is proposing to construct, operate, and maintain a 15.7 km, 69 kV transmission line that would will start at a connection to an existing transmission line (#0038) near the western banks of the Meduxnekeag River in Woodstock, NB, and proceed west along the Route 95 highway to a new substation location near the New Brunswick-Maine border crossing. The proposed International Power Line Project: Woodstock to Houlton, Maine (Transmission Line 0155), herein referred to as "the Project", would provide a dedicated, reliable, and affordable electrical power supply to the Town of Houlton, Maine, via the Houlton Water Company. In support of the Environmental Impact Assessment (EIA) registration for the Project being developed by Stantec Consulting Ltd. (Stantec) on behalf of NB Power, preliminary environmental, socio-economic, and physical constraints are assessed for the two (2) potential substation options as identified by NB Power.

NB Power originally identified four substation options, however they later determined that only two (Options 3 and 4) were to be considered for the purposes of this report. The proposed substation options are as follows:

- Option 3 has a 0.41 ha footprint and is located south of Highway 95, on PID 10045524 owned by Public Works Government Services Canada and on PID 10174878 owned by the New Brunswick Department of Transportation and Infrastructure (NBDTI)
- Option 4 has a 0.41 ha footprint and is located on private property PID 10176535 north of Highway 95

This report focusses on only the environmental and socio-economic constraints relating to the abovementioned two proposed substations, as well as the physical topographical constraints of the proposed substation footprints. It does not consider other factors that could influence the final option decision by NB Power, such as the cost of the property or the availability of the proposed location. Also, this report does not consider the influence of the substation options on the final alignment of the transmission line. An assessment of the transmission line route, including the final selected substation option, is provided in the EIA Registration document.

For the purposes of this report, all references to environmental constraints within and around the buffers of the proposed footprint for each of the two substation options are limited to those on the Canadian side of the international border only.

2.0 METHODS

Maps of the two substation options was provided by NB Power. The two potential footprints are shown in Figure 2.1.

Publicly available spatial datasets within 500 m of each substation option, including environmental, socio-economic, and physical constraints and attributes, were compiled. The inclusion of the 500 m buffer is consistent with constraints analyses conducted on other similar projects, and is used to identify potential constraints (e.g., residential developments, recreational areas, environmentally sensitive areas (ESAs)) beyond those limited to the physical footprint of the substation. The datasets were for those areas on the Canadian side of the border only, as all environmental constraints and associated permitting on the United States side of the border are the responsibility of the Houlton Water Company. A list of these datasets, including sources, is provided in Table 2.1.

Table 2.1 Datasets used in Constraints Analysis

Dataset	Agency Responsible/Data Source	Year of Dataset
Watercourses, Wetlands and Waterbodies		
Watercourses	New Brunswick Department of Energy and Resource Development (NBDERD)	2014
Wetlands (mapped)	New Brunswick Department of Environment and Local Government (NBDELG) NBDERD	2011 (NBDELG) 2014 (NBDERD)
Provincially Significant Wetlands	NBDELG	2011
Depth to Water Table	University of New Brunswick, Forest Watershed Research Group	2010
Waterbodies	NBDERD	2014
Protected Areas		
Protected Natural Areas	NBDERD	2014
Provincial Parks	NBDERD	2011
Federal Parks and Protected Areas	Service New Brunswick (SNB)	2012
Wildlife Refuges and Management Areas	NBDERD	2013
Protected Wellfields	NBDELG	2015
DNR Old Forest Wildlife Habitat	NBDERD	2015
DNR Old Forest Community	NBDERD	2015
Protected Watersheds	NBDELG	2014
Sensitive Areas/Species at Risk		
AC CDC Managed Area	Atlantic Canada Conservation Data Centre (AC CDC)	2016
Environmentally Significant Area	AC CDC	2016
Fish Hatcheries	SNB	1998
Rare Species (Species at Risk or Species of Conservation Concern)	AC CDC (includes Maritimes Breeding Bird Atlas data)	2016
Deer Wintering Areas	NBDERD	2015

Table 2.1 Datasets used in Constraints Analysis

Dataset	Agency Responsible/Data Source	Year of Dataset
Socio-economic		
Pits/Quarries/Mines	SNB	1998
Educational Buildings	SNB	1998
Cemeteries	SNB Archaeological Services	1998 (SNB) 2016
Religious Buildings	SNB	1998
Buildings	SNB	1998
Towers	SNB	1998
Landfills	SNB	1998
Historic Sites	SNB Archaeological Services	1998 (SNB) 2016
Industrial Sites	NBDERD	2015
Recreation Sites	NBDERD	2015
Transformer Stations	SNB	1998
Agricultural Land	NBDERD	2015
Forested Land	NBDERD	2015
Shrub land	NBDERD	2015
Blueberry Fields	NBDERD	2015
Designated Lands/Public vs. Private Lands		
Crown Lands	NBDERD	2015
Private Land	NBDERD	2016
Freehold Land	NBDERD	2016
Property Boundaries	SNB	2016
First Nations Lands	SNB	2016
Military Bases	SNB	2005
Municipal Areas	NBDELG	2016
Mining Claims	NBDERD	2016
Mining Agreements	NBDERD	2016
Archaeological Constraints		
Palaeo Shorelines	Archaeological Services	2016
Registered Archaeological Sites	Archaeological Services	2016
High and Medium Archaeological Potential Areas	Archaeological Services	2016
Watercourse Confluences	Archaeological Services	2016
Waterbody Confluences	Archaeological Services	2016
Physical Constraints		
Topography: Steep slopes (> 25%)	SNB	2017
Topography: LiDAR	SNB	2017
Bedrock Outcrops	NBDERD	2013
Infrastructure		
Pipelines	NBDERD, SNB	1998 (SNB) 2013 (NBDERD)
Roads	New Brunswick Road Network (NBRN), SNB	2016
Railroads	SNB	2015

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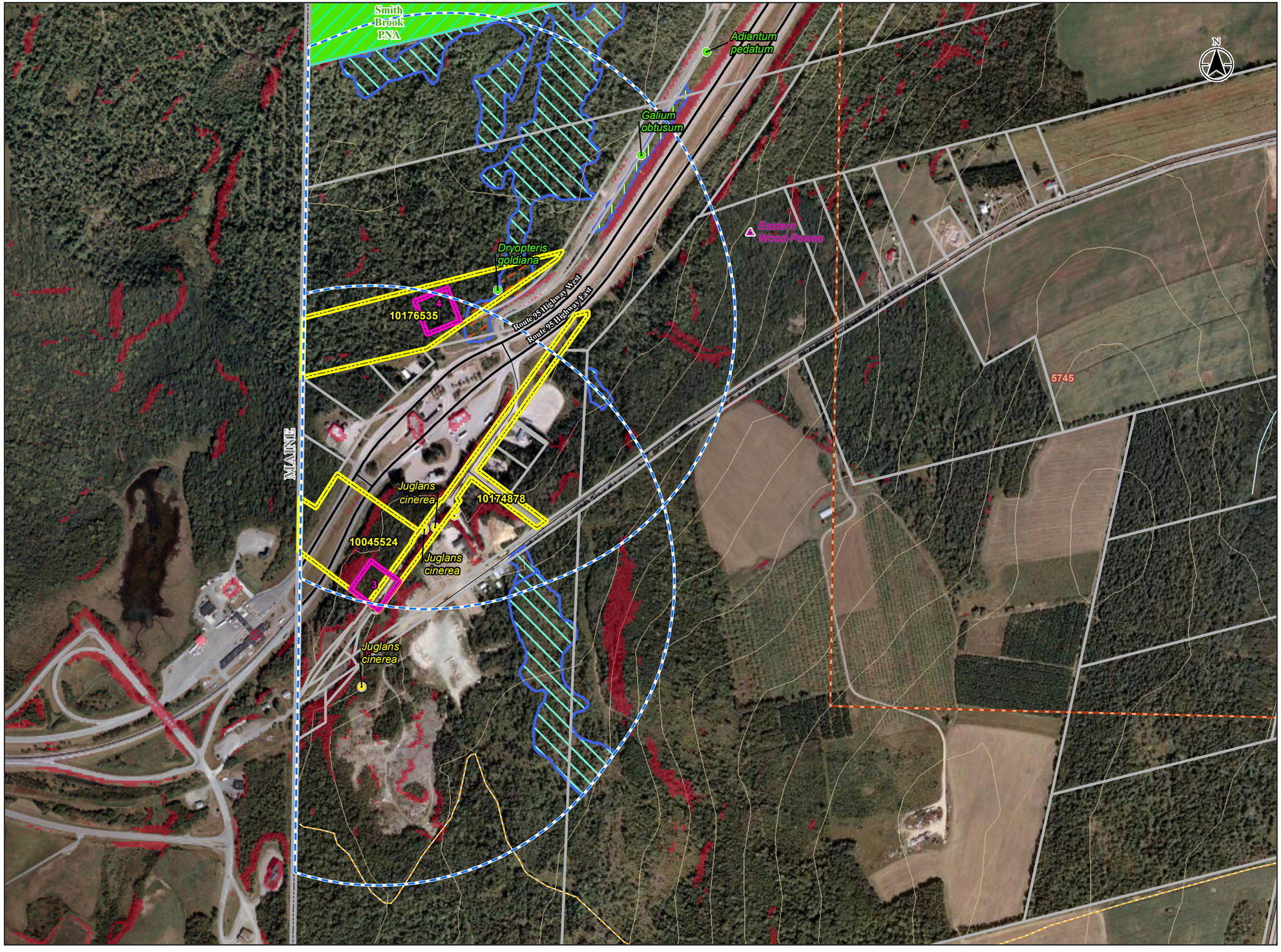

Substation Options, and Associated Environmental, Socio-economic, and Physical Constraints

- Proposed Substation Option
- Proposed Substation Property Boundary
- Study Area (500 m Buffer)

Field Observed Species at Risk and Species of Special Concern

- Vascular Plant (Species of Conservation Concern)
- Vascular Plant (Species at Risk)
- Bird (Species at Risk)
- NBFSC Trail
- Watercourse
- Contour (10 m)
- Crown Land
- Mining Claim
- Old Forest Community and Old Forest Wildlife Habitat
- Property Boundary
- Protected Natural Area
- Slope Greater than 25 %

Field Delineated / Desktop Interpreted Wetland

- Mixedwood Treed Swamp
- Softwood Treed Swamp
- Tall Shrub Swamp

Sources: Base Data obtained from Service New Brunswick. Rare species observation data provided by the Atlantic Canada Conservation Data Centre and Stantec. Service Layer Credits: Service New Brunswick/Service Nouveau Brunswick

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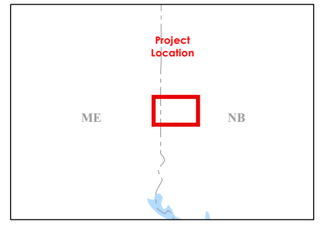

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CONSTRAINTS ANALYSIS OF PROPOSED SUBSTATION NEAR NEW BRUNSWICK ROUTE 95 CANADA-US BORDER

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Fig. 2.1

Service Layer Credits: Service New Brunswick/Service Nouveau Brunswick

The constraints map was generated by overlaying the applicable datasets identified in Table 2.1 on to the layer with the two substation options in order to visually identify the potential constraints for the footprint of each substation option.

The number of interactions of the various environmental and socio-economic features (e.g., watercourses, agricultural land), and the spatial area of the footprint traversing these features were calculated for the two substation options, as applicable, using ArcGIS 10.2 software. Maps were generated at a 1:7,000 scale showing all identified constraints within a 500 m buffer around each of the two options (on the Canadian side of the International border only).

2.1 CONSTRAINTS AND ATTRIBUTES

The following sections, presented by environmental, socio-economic, and physical criteria, provide details on the constraints considered in this analysis.

2.1.1 Environmental Criteria

Environmental criteria are natural features or areas identified as important habitats that may interact with construction or operational activities associated with the substations.

2.1.1.1 Watercourses, Waterbodies, and Wetlands

All watercourses (e.g., streams, brooks) and waterbodies (e.g., lakes), within 500 m of each substation option were identified and included in the analysis.

The location and extent of current wetlands within the review area were determined by combining wetland datasets from GeoNB (www.geonb.snb.ca), which includes the identification of mapped wetlands, Provincially Significant Wetlands (PSW), and NB Hydro Network wetlands (NBHN, a wetland layer currently maintained by NBDERD). Collectively, these are referred to as "mapped wetlands". The amount of GeoNB-mapped wetland, PSW, and NBHN wetland intersected by each substation option is included in the analysis.

In addition to mapped wetlands obtained from the Province, field-delineated and desktop-interpreted wetlands were included in the analysis. Field-delineated wetlands were delineated in August 2016 for the proposed 30 m transmission line right of way, outside of each of the substation option footprints but within their 500 m buffers. Desktop interpretation of wetlands was completed for within 500 m of the substation footprints. The area of field-delineated and desktop-interpreted wetlands within the substation footprints and their 500 m buffer study areas was calculated.

2.1.1.2 Protected Areas and Conservation Areas

Protected areas include Protected Natural Areas (PNAs), protected wellfields, and protected watersheds. Crown land conservation areas were also compiled. All protected areas and conservation areas within 500 m on each side of each substation option were identified.

2.1.1.3 Existing Corridors

Existing cleared corridors (roads, pipelines, transmission lines, and railways) were identified within 500 m of each substation option. The area of each substation within an existing cleared area was calculated.

2.1.1.4 Species at Risk, Species of Conservation Concern, and Sensitive Areas

Several datasets were used to identify Species at Risk (SAR) and Species of Conservation Concern (SOCC) in New Brunswick, as well as potential environmentally sensitive areas. Any identified SAR, SOCC and sensitive areas (including Environmentally Significant Areas (ESAs), managed areas and other sensitive areas) were assessed in the constraints analysis.

SAR are here defined as species listed as extirpated, endangered, threatened, or special concern under the New Brunswick *Species at Risk Act* (NB *SARA)*, the federal *Species at Risk Act* (*SARA)*, or by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). While some SAR included under this definition currently have regulatory protection under Schedule 1 of *SARA* or the *Prohibitions Regulation* of NB *SARA*, the above definition also includes those species on the NB *SARA List of Species at Risk Regulation* and COSEWIC listings that are candidates for further review which have potential to become protected within the timeframe of this Project.

Locations of wildlife and plant SAR were obtained from the Atlantic Canada Conservation Data Centre (AC CDC). These data include rare bird species data from the Maritimes Breeding Bird Atlas (MBBA). If data exists, wildlife and plant SAR which are known to occur within 500 m of the substation options are displayed on the maps and listed in the results. Where SAR were observed during field-studies conducted by Stantec in support of the proposed Woodstock to Houlton, Maine 69 kV International Transmission Line, these records are also displayed on the maps and listed in the results.

SOCC are not listed under federal or provincial legislation, but are considered rare in New Brunswick. SOCC are typically included in the assessment of any project as a precautionary measure, reflecting observations and trends in the provincial population status. SOCC are defined as species that do not meet the above definition of SAR but are ranked by the AC CDC as S1 (critically imperilled), S2 (imperilled), or S3 (vulnerable). Known locations of wildlife and plant SOCC were obtained from the AC CDC. These data include rare bird species data from the Maritimes Breeding Bird Atlas. Wildlife and plant SOCC which occur within 500 m of the substation options are displayed on the maps and listed in the results.

Field observations of SAR and SOCC identified during field surveys of the proposed 30 m transmission line right of way within 500 m of the substation options are displayed on the maps and listed in the results.

ESAs are natural features that are likely sensitive to disturbance, and may represent known locations or important habitat for SAR. ESAs were identified in the 1990's by the Nature Trust of New Brunswick (NTNB), in partnership with the New Brunswick Department of Environment and the New Brunswick Department of Natural Resources and Energy (Tims and Craig 1995). There is no legislation protecting ESAs within New Brunswick, but NBDELG considers these sites when evaluating and reviewing EIAs and environmental permit applications. The database of ESAs was provided by AC CDC.

Managed areas include wildlife management zones, deer wintering areas, Ducks Unlimited Canada (DUC) wetlands, and other managed or regulated areas.

ESAs, managed areas, and other sensitive areas occurring within 500 m of each substation option are included in the analysis.

2.1.1.5 Forested Areas

Forested areas as identified by NBDERD were compiled within 500 m of each substation option.

2.1.2 Socio-economic Criteria

Socio-economic criteria are existing or historic land uses that could be interacted with by construction or operational activities. The following sections describe the socio-economic constraint and attribute datasets that were compiled.

2.1.2.1 Designated Lands and Private Land

The area of each substation option within public and private properties was calculated and the number of private properties intersecting each option was tabulated. Municipal areas, mining claims, military bases and First Nations Communities within 500 m of each option were identified; areas within these features, if present, were determined.

2.1.2.2 Public Land Use

Locations of potential public land use were identified within 500 m of each option. These include cemeteries, educational buildings, religious buildings, towers, transformer stations, and recreation sites (i.e., picnic areas, sports fields, arenas, race tracks, campgrounds, community centers, exhibition grounds, golf courses).

2.1.2.3 Industrial Land Use

Locations of potential industrial land use were identified within 500 m of each option. These include gravel pits, quarries, mines, and any other industrial activity identified as such by NBDERD.

2.1.2.4 Agricultural Land Use

Locations of potential agricultural land use were identified within 500 m of each option. These include blueberry fields, fallow pastures, and other agricultural land uses.

2.1.2.5 Archaeological Resources

Locations of known archaeological resources were provided by Archaeological Services of the New Brunswick Department of Tourism, Culture and Heritage and include registered archaeological sites, palaeo-shorelines, and areas of elevated (high and medium) archaeological potential. Resources within 500 m of each option were identified.

2.1.3 Physical Criteria

Physical criteria are naturally occurring features that could be problematic for construction or operational activities. The following sections describe the physical constraint and attribute datasets that were compiled.

2.1.3.1 Steep Slopes and Bedrock Outcrops

Terrain constraints are naturally occurring features of the landscape that can affect the construction or operation of the Project, such as steep slopes and bedrock outcrops. Potentially problematic terrain was identified within 500 m of each option. Terrain units were delineated using elevation data, with the support of existing cartographic datasets such as surficial geology and bedrock data.

2.1.3.2 Infrastructure Crossings

Existing roads, railways and pipeline datasets were compiled and the number within 500 m was determined for each option.

2.2 RANKING AND WEIGHTED SCORING

The two substation options were evaluated through a weighted ranking process that incorporated the three general categories of constraints: environmental, socio-economic, and physical. Each category was subdivided into smaller components. For each route, individual components within a category of constraints were evaluated and ranked using pre-determined criteria, according to the following methodology.

1. Components were ranked on a scale of 0 – 10 using the team's professional judgment, or using a ranking protocol (Appendix B). A ranking of 10 was given to the most favourable potential options, whereas a ranking of 0 was given to potential options of low favourability based on their respective criteria. Potential options of equal favourability were ranked equally. No rankings of less than 0 were assigned. The alternate methodology of ranking certain components is provided in greater detail in Appendix B.
2. The ranking of each component within a category was then multiplied by a component-specific weighting factor to give a weighted component ranking (score) (Appendix B). The weighting factors were assigned based on the team's professional judgement and past experience with similar projects.
3. All weighted component rankings (scores) were then summed to give an overall category ranking (score) for each of the environmental, socio-economic, and physical criteria categories.
4. The overall category ranking was then multiplied by its weighting factor to give a weighted category ranking.
5. Weighted category rankings from each of the three categories were summed to give an overall weighted score for each option. The overall weighted scores are displayed as a score out of possible score of 100, such that a score of 100 will be an ideal option, while a score of 0 signifies a very unfavourable option. The option with the highest overall weighted score is the preferred option.

3.0 RESULTS

There were several potential environmental, socio-economic, and physical attributes that were not found to be crossed by any of the substation options. As such, there are were no environmental, socio-economic, or physical attributes that factor into the ranking criteria for the two substation options. Specifically, in the areas of review for the two proposed footprints and within 500 m of each option, there were none of the following:

- First Nations Communities
- Military bases
- ESAs
- Deer wintering areas
- Fish hatcheries
- Registered archaeological sites or palaeo shorelines
- Pipelines
- Active railways
- Watercourses and waterbodies

The following sections provide summaries of the constraints identified for the two substation options.

3.1 CONSTRUCTION OF NEW SUBSTATION

The results of the constraints analysis for the two substation options are summarized in Table 3.1.

Table 3.1 Constraint Analysis Results – Substation Options

Criteria	Weight (%)	Option 3		Option 4	
		Ranking	Score	Ranking	Score
Environmental Criteria					
Watercourse and Waterbodies	25%	10	2.5	10	2.5
Wetlands	20%	10	2	9	1.8
Protected Areas and Conservation Areas	20%	10	2	10	2
Existing Disturbed Land	15%	2	0.3	0	0
Species at Risk, Species of Conservation Concern, and Sensitive Areas	10%	10	1	10	1
Forested Areas	10%	2	0.2	0	0
Score for Environmental Criteria			**8**		**7.3**
Weighted Score for Environmental Criteria	**40%**		**32**		**29.2**
Socio-economic Criteria					
Designated Lands and Private Land	30%	0	0	0	0
Total Number of Properties Crossed	15%	4	0.6	10	1.5
Public Land Use	10%	10	1	10	1
Industrial Land Use	10%	10	1	10	1
Agricultural Land Use	20%	10	2	10	2
Registered Archaeological Sites and Elevated Archaeological Potential Areas	15%	10	1.5	10	1.5

Table 3.1 Constraint Analysis Results – Substation Options

Criteria	Weight (%)	Option 3		Option 4	
		Ranking	Score	Ranking	Score
Score for Socio-Economic Criteria			**6.1**		**7**
Weighted Score for Socio-Economic Criteria	**30%**		**18.3**		**21**
Physical Criteria					
Footprint	50%	10	5	10	2
Steep Slopes and Bedrock Outcrops	25	9	2.25	10	2.5
Infrastructure Interactions	25	10	2.5	10	2.5
Score for Physical Criteria			**9.75**		**10**
Weighted Score for Physical Criteria	**30%**		**29.25**		**30**
Overall Weighted Score			**79.6**		**80.2**

In addition to the summary presented in Table 3.1, a description of the constraints for each substation is provided below. A detailed constraints table for each substation is presented in Appendix A, and includes the constraints that were not crossed by any of the Project components.

A sensitivity analysis was completed to see if minor changes to the weightings would result in differences to the overall weighted scores for each option. Weights that were factors in weighted category scores were changed by 5 percent and the overall weighted scores were re-calculated. The changes in weights still resulted in Option 4 having the highest (preferred) overall weighted score.

3.1.1 Substation Option 3

Substation Option 3 property contains a useable land area of not more than 0.41 ha, due to the severe elevation changes on the perimeter of the property. This option is not situated on wetlands, watercourses, agricultural land, or areas of archaeological potential. Substation Option 3 is primarily forested land (0.40 ha), owned by Public Works Government Services Canada – Canadian Border Service Agency and is situated along the old Route 95 Road.

Overall, it was determined that substation Option 3 ranked first on environmental and second physical and socio-economic criteria weighted scores, and second overall with a weighted score of 79.6

3.1.2 Substation Option 4

Substation Option 4 property contains a useable land area of approximately 3.98 ha. However, the selected location for the substation site will utilize only 0.41 ha. This option is not situated on wetlands, watercourses, agricultural land, or areas of archaeological potential. Substation Option 4 is located entirely on forested and private land, and is situated within 30 m of a wetland.

Overall, it was determined that substation Option 4 ranked second on environmental and first on physical and socio-economic criteria weighted scores, and first overall with a weighted score of 80.2.

4.0 DISCUSSION

NB Power used aerial photographs, GIS based mapping, site visits and, publicly available databases to identify four potential locations for the substation; however, two of these options (1 and 2) were removed, as early engineering analysis indicated they were not suitable for construction. The two remaining options (3 and 4) were selected for consideration based on their close proximity to the NB-Maine border near Houlton, their location relative to the transmission route, and the land size supporting a 0.4 ha substation site. The potential for interactions with wetlands, watercourses, known archaeological sites, and environmentally sensitive areas, among other constraints, was also assessed to minimize interactions with known environmental constraints.

Option 4 is the preferred substation site based on the constraint analysis results.

5.0 CLOSURE

This report has been prepared by Stantec Consulting Ltd. (Stantec) for the sole benefit of the New Brunswick Power Corporation (NB Power). The report may not be relied upon by any other person or entity, other than for its intended purposes, without the express written consent of Stantec and NB Power.

This report was undertaken exclusively for the purpose outlined herein and was limited to the scope and purpose specifically expressed in this report. This report cannot be used or applied under any circumstances to another location or situation or for any other purpose without further evaluation of the data and related limitations. Any use of this report by a third party, or any reliance on decisions made based upon it, are the responsibility of such third parties. Stantec accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report. The report should not be considered legal advice.

The information provided in this report was compiled from existing documents and data provided by external sources to Stantec and by applying currently accepted industry standard mitigation and prevention principles. The information provided in this review is based on existing information at the time of obtaining the underlying data from the supplying agencies, and is not intended to be all-inclusive. This report represents the best professional judgment of Stantec personnel available at the time of its preparation. Stantec reserves the right to modify the contents of this report, in whole or in part, to reflect any new information that becomes available. If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we request that we be notified immediately to reassess the conclusions provided herein.

Please contact the undersigned if you have any questions or require further information.

Sincerely,

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6.0 REFERENCES

CCEA - CCAE (Canadian Council on Ecological Areas). 2015. CARTS (Conservation Areas Reporting and Tracking System). Available at: http://www.ccea.org/tools-resources/carts/

DEM (Department of Energy and Mines). 2013. Peatland. Available at: http://www.snb.ca/geonb1/e/DC/catalogue-E.asp

IBA Canada. 2015. Canadian Important Bird Areas. Bird Studies Canada and Nature Canada. Available at: http://www.ibacanada.ca/explore_how.jsp?lang=enDownloaded

NBDELG (New Brunswick Department of Environment and Local Government). 2011. Wetlands. Available at: http://www.snb.ca/geonb1/e/DC/catalogue-E.asp

NBDELG. 2014. Protected Watersheds. Available at: http://www.snb.ca/geonb1/e/DC/catalogue-E.asp

NBDELG. 2015a. Protected Wellfields. Available at: http://www.snb.ca/geonb1/e/DC/catalogue-E.asp

NBDELG. 2015b. Municipal Areas. Available at: http://www.snb.ca/geonb1/e/DC/catalogue-E.asp

NBDNR. 2009. Minerals and Petroleum Sections. Available at: http://www.snb.ca/geonb1/e/DC/catalogue-E.asp

NBDNR. 2011. Provincial Parks. Available at: http://www.snb.ca/geonb1/e/DC/catalogue-E.asp

NBDNR. 2014a. New Brunswick Hydrographic Network (NBHN). Available at: http://www.snb.ca/geonb1/e/DC/catalogue-E.asp

NBDNR. 2014b. Protected Natural Areas. Available at: http://www.snb.ca/geonb1/e/DC/catalogue-E.asp

SNB (Service New Brunswick). 1998. Digital Topographic Data Base - 1998 (DTDB), downloaded from the website: www.snb.ca/gdam-igec/e/2900e_e_1c_i.asp (no longer available)

SNB. 2014. Federal Parks and Protected Areas. Available at: http://www.snb.ca/geonb1/e/DC/catalogue-E.asp

SNB. 2015. 2015 Digital Property Maps. Available at: http://www.snb.ca/geonb1/e/DC/catalogue-E.asp

SNB. 2015. New Brunswick Road Network (NBRN). Available at: http://www.snb.ca/geonb1/e/DC/catalogue-E.asp

Tims, J. and N. Craig. 1995. Environmentally Significant Areas in New Brunswick (NBESA). New Brunswick Department of Environment & Nature Trust of New Brunswick Inc.

Appendix A

Constraints Summary Tables

Table A.1 Option 3 Constraints Summary Table

Feature	Area in Footprint (Area in ha)	Details	Study Area 500 m (Number of Features Within, or area in ha)
Total Footprint	0.41	-	60.7 ha
Area in Existing Cleared Area	0.08	-	-
Required New Footprint	0.33	-	-
Watercourses, Wetlands and Waterbodies			
Watercourse (< 30m wide)	-	-	-
Watercourse Crossings (> 30m wide)	-	-	-
GeoNB Mapped Wetlands	-	NBDELG	-
Field-delineated / Interpreted Wetlands	-	-	3.7 ha
Provincially Significant Wetlands	-	NBDELG	-
30 m Buffer of Watercourses, Wetlands and Waterbodies	-	-	-
Potentially Wet Areas (UNB)	-	UNB Depth to water table of 25 cm	-
Waterbodies	-	-	-
Designated Lands/Public vs. Private Lands			
Crown Land	-	-	-
Private Land	0.41	-	-
Freehold Land	-	-	-
First Nations Lands	-	-	-
Military Base	-	-	-
Municipal Areas	-	-	-
Existing Mining Claims	-	-	-
Mining Agreements	-	-	-
Protected Areas			
Protected Natural Areas	-	-	-
Candidate/Proposed Protected Natural Areas	-	-	-
Provincial Parks	-	-	-
Federal Protected Areas	-	-	-
Protected Wellfields	-	-	-
Wildlife Refuges and Management Areas	-	-	-
Deer Wintering Areas		-	-
Formerly Designated Deer Wintering Areas	-	-	-
Old Forest Communities and Old Forest Wildlife Habitats	-	-	-
Formerly Designated Old Forest Communities and Old Forest Wildlife Habitats	-	-	-
Protected Watersheds	-	-	-
Infrastructure			
Pipelines	-	-	-
Number of Roads	-	-	2
Number of Railway Lines	-	-	-
Number of Trails Crossings	-	NBFSC Trail	1

Feature	Area in Footprint (Area in ha)	Details	Study Area 500 m (Number of Features Within, or area in ha)
Sensitive Areas/Species at Risk			
ACCDC Managed Areas	-	-	-
Environmentally Significant Areas	-	-	-
Fish Hatcheries	-	-	-
ACCDC Fish Habitat	-	-	-
Rare Species (Species at Risk or Species of Conservation Concern)	-	*Juglans cinerea*	1
Socio-economic			
Pits/Quarries/Mines	-	-	-
Educational Building	-	-	-
Cemeteries	-	-	-
Religious Buildings	-	-	-
Buildings	-	SNB (General Points)	-
Land Reserved for Residential Purposes	-	NBDERD Non Forest	-
Towers	-	SNB (General Points)	-
Landfills	-	-	-
Historic Sites	-	-	-
Industrial Sites	-	-	-
Land Reserved for Industrial Purposes	-	NBDERD Non Forest	5.5 ha
Recreational Sites	-	Sports Field - SNB (General Points)	-
Land Reserved for Recreational Purposes	-	Land used for recreational purposes (NBDERD Non Forest)	-
Transformer Stations	-	SNB (General Points)	-
Land Reserved for Transportation, Communication and/or Utilities	-	NBDERD Non Forest	-
Area Within Agriculture	-	NBDERD Non Forest	-
Area Within Forest	0.32	NBDERD Forest	21.7 ha
Area Within Shrub land	-	NBDERD Non Forest	-
Area Within Blueberry Fields	-	-	-
Physical			
Steep Slopes (> 25 %) Based on 5 m Elevation Model	0.04	Based on a 5 x 5 m LiDAR derived Digital Elevation Model	-

Feature	Area in Footprint (Area in ha)	Details	Study Area 500 m (Number of Features Within, or area in ha)
Area Within Rock Outcrop	-	-	-
Archaeology			
Palaeo Shoreline	-	-	-
Registered Sites	-	-	-
High Potential	-	-	-
Medium Potential	-	-	-
Watercourse Confluence	-	-	-
Waterbody Confluence	-	-	-

Table A.2 Option 4 Constraints Summary Table

Feature	Area in Footprint (Area in ha)	Details	Study Area 500 m (Number of Features Within, or area in ha)
Total Footprint	0.41	-	71.0 ha
Area in Existing Cleared Area	0.01	-	-
Required New Footprint	0.40	-	-
Watercourses, Wetlands and Waterbodies			
Watercourse (< 30m wide)	-	-	-
Watercourse Crossings (> 30m wide)	-	-	-
GeoNB Mapped Wetlands	-	NBDELG	-
Field-delineated / Interpreted Wetlands	-	-	7.9 ha
Provincially Significant Wetlands	-	NBDELG	-
30 m Buffer of Watercourses, Wetlands and Waterbodies	0.04	-	-
Potentially Wet Areas (UNB)	-	UNB Depth to water table of 25 cm	-
Waterbodies	-	-	-
Designated Lands/Public vs. Private Lands			
Crown Land	-	-	-
Private Land	0.41	-	-
Freehold Land	-	-	-
First Nations Lands	-	-	-
Military Base	-	-	-
Municipal Areas	-	-	-
Existing Mining Claims	-	-	-
Mining Agreements	-	-	-
Protected Areas			
Protected Natural Areas	-	Smith Brook	1.2ha
Candidate/Proposed Protected Natural Areas	-	-	-
Provincial Parks	-	-	-
Federal Protected Areas	-	-	-
Protected Wellfields	-	-	-
Wildlife Refuges and Management Areas	-	-	-
Deer Wintering Areas	-	-	-
Formerly Designated Deer Wintering Areas	-	-	-
Old Forest Communities and Old Forest Wildlife Habitats	-	-	1.2 ha
Formerly Designated Old Forest Communities and Old Forest Wildlife Habitats	-	-	-
Protected Watersheds			
Infrastructure			
Pipelines	-	-	-
Number of Roads	-	-	2
Number of Railway lines	-	-	-
Number of Trails	-	-	-

Feature	Area in Footprint (Area in ha)	Details	Study Area 500 m (Number of Features Within, or area in ha)
Sensitive Areas/Species at Risk			
ACCDC Managed Areas	-	-	-
Environmentally Significant Areas	-	-	-
Fish Hatcheries	-	-	-
ACCDC Fish Habitat	-	-	-
Rare Species (Species at Risk or Species of Conservation Concern)	-	-	-
Socioeconomic			
Pits/Quarries/Mines	-		-
Educational Building	-		-
Cemeteries	-		-
Religious Buildings	-		-
Buildings	-	SNB (General Points)	-
Land Reserved for Residential Purposes	-	NBDERD Non Forest	-
Towers	-	SNB (General Points)	-
Landfills	-	SNB (General Points)	-
Historic Sites	-	-	-
Industrial Sites	-	-	-
Land Reserved for Industrial Purposes	-	NBDERD Non Forest	0.5 ha
Recreational Sites	-	Sports Field - SNB (General Points)	-
Land Reserved for Recreational Purposes	-	Land used for recreational purposes (NBDERD Non Forest)	-
Transformer Stations	-	SNB (General Points)	-
Land Reserved for Transportation, Communication and/or Utilities	-	NBDERD Non Forest	-
Area Within Agriculture	-	NBDERD Non Forest	0.2 ha
Area Within Forest	0.40	NBDERD Forest	19.4 ha
Area Within Shrub land	-	NBDERD Non Forest	-
Area Within Blueberry Fields	-	-	-
Physical			
Steep Slopes (> 25 %) Based on 5 m Elevation Model	-	Based on a 5 x 5 m LiDAR derived Digital Elevation Model	-
Area Within Rock Outcrop	-	-	-

Feature	Area in Footprint (Area in ha)	Details	Study Area 500 m (Number of Features Within, or area in ha)
Archaeology			
Palaeo Shoreline	-	-	-
Registered Sites	-	-	-
High Potential	-	-	-
Medium Potential	-	-	-
Watercourse Confluence	-	-	-
Waterbody Confluence	-	-	-

Appendix B

Component Ranking Methodology and Detailed Results

Methodology for Component Ranking

The ranking of environmental and socio-economic criteria was determined by comparing the amount of a particular constraint to the amount of that constraint in a larger surrounding study area. The larger study area was selected to be a 500 m buffer around the proposed substation options based on availability of constraint data and similarities in land classification.

Most of the environmental criteria ranking classes were determined by first calculating the percentage of the specific criteria within the proposed substation options. A grid was then created throughout the study area with a cell size of 90 m² (the area of the largest substation option) to determine the mean amount of the environmental criteria in each cell. This grid was then summarized to determine the mean amount of the environmental criteria for all 90 m² cells in the study area. The standard deviation was then calculated and the mean values broken into classes based on their deviation from the mean. Those standard deviation classes were then used to develop comparative ranking scores for the two substation options. Wetland area, forest, steep slope, and existing ranking classes were all determined through this process. For example, for forested area, the mean for all cells within the study area was calculated to be 47.8% with a standard deviation of 42%. The means were broken into classes based on their difference from 0.25 of the standard deviation. A ranking of 5 was therefore calculated by adding 10.5 to 42.5 (the high break value for ranking 6) to get 53.0.

The ranking score for the area of each option was determined by the relative difference of the option areas compared to the option with the smallest footprint.

Ranking Classes and Results

A summary of the ranking classes for the environmental and socio-economic criteria described above follows. Criteria that did not contain any features within the substation footprints were assigned ranks of 10.

Table B.1 Wetland Ranking Classes and Results

Ranking Classes	
Classes (Percentages)	**Ranking**
0 – 0.8	10
0.9 – 5.3	9
5.4 – 18.6	8
18.7 – 31.9	7
32.0 – 45.2	6
45.3 – 58.5	5
58.6 – 71.8	4
71.9 – 85.1	3
85.2 – 98.3	2
98.4 – 99.4	1
99.5 - 1	0

Ranking Results		
	Substation Option 3	**Substation Option 4**
Total Area of Substation (ha)	0.41	0.41
Area of Wetland (ha)	0	0.04
Percentage	0	4.9
Rank	10	9

Table B.2 Steep Slope Ranking Classes and Results

Ranking Classes	
Classes (Percentages)	**Ranking**
0 – 5.0	10
5.1 – 11.2	9
11.3 – 22.6	8
22.7 – 34.0	7
34.1 – 45.4	6
45.5 – 56.8	5
56.9 – 68.2	4
68.3 – 79.6	3
79.7 – 91.0	2
91.1 – 95.1	1
95.2 - 1	0

Ranking Results		
	Substation Option 3	**Substation Option 4**
Total Area of Substation (ha)	0.41	0.41
Area of Steep Slope (ha)	0.04	0
Percentage	9.8	0
Rank	9	10

Table B.3 Forest Ranking Classes and Results

Ranking Classes	
Classes (Percentages)	**Ranking**
0 – 0.5	10
0.6 – 11.0	9
11.1 – 21.5	8
21.6 – 32.0	7
32.1 – 42.5	6
42.6 – 53.0	5
53.1 – 63.5	4
63.6 – 74.0	3
74.1 – 84.5	2
84.6 – 95.0	1
95.1 - 1	0

Ranking Results		
	Substation Option 3	**Substation Option 4**
Total Area of Substation (ha)	0.41	041
Area of Forest (ha)	0.32	0.4
Percentage	78.0	98.8
Rank	2	0

Table B.4 Existing Disturbed Area Ranking Classes and Results

Ranking Classes	
Classes (Percentages)	**Ranking**
99.7 – 1	10
88.9 – 99.6	9
78.1 – 88.8	8
67.3 – 78.0	7
56.5 – 67.2	6
45.7 – 56.4	5
34.9 – 45.6	4
24.2 – 34.8	3
13.4 – 24.1	2
2.6 – 13.3	1
0 – 2.5	0

Ranking Results		
	Substation Option 3	**Substation Option 4**
Total Area of Substation (ha)	0.41	0.41
Existing Disturbed Area (ha)	0.08	0.01
Percentage	19.5	2.4
Rank	2	0

Table B.5 Footprint Size Ranking Classes and Results

Ranking Classes	
Classes (Percentages)	**Ranking**
100	10
90.1 – 99.9	9
80.1 - 90	8
70.1 - 80	7
60.1 - 70	6
50.1 - 60	5
40.1 - 50	4
30.1 - 40	3
20.1 - 30	2
10.1 – 20	1
0 - 10	0

Ranking Results		
	Substation Option 3	**Substation Option 4**
Total area (ha)	0.41	0.41
Percentage	0.41/0.41 = 100	0.41 / 0.41 = 100
Rank	10	10

Table B.6 Properties Crossed Ranking Classes and Results

Ranking Classes	
Classes (Percentages)	**Ranking**
100	10
90.1 – 99.9	9
80.1 - 90	8
70.1 - 80	7
60.1 - 70	6
50.1 - 60	5
40.1 - 50	4
30.1 - 40	3
20.1 - 30	2
10.1 – 20	1
0 - 10	0

Ranking Results		
	Substation Option 3	**Substation Option 4**
Properties Crossed	2	1
Percentage	1/2 = 50	1 / 1 = 100
Rank	4	10