

**WETLAND NO NET LOSS PLAN**  
**DEVELOPED FOR THE**  
**BIPOLE III TRANSMISSION PROJECT**



**Prepared for:**  
**Manitoba Conservation and Climate**

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## 1.0 INTRODUCTION

Manitoba Hydro (MH) received an *Environment Act* Licence from Manitoba Conservation and Climate (MCC) formerly known as Conservation and Water Stewardship) on August 14, 2013 for the construction, operation, and maintenance of the Bipole III Transmission Project (the Project). Bipole III is a new high voltage direct current (HVDC) transmission project required to improve overall system reliability and dependability. The in-service date for this project was July 2018.

The Bipole III Transmission Project involves the construction of a 500 kilovolt (kV) HVDC transmission line that links the northern power generating complex on the Lower Nelson River with the conversion and delivery system in southern Manitoba. The Project also involves construction of two converter stations (Keewatinohk in northern Manitoba and Riel east of Winnipeg), two ground electrodes, and additional 230 kV transmission line interconnections in the north to tie the new converter station into the existing northern AC system.

The Bipole III Transmission Project occurs in eight ecoregions. From the Hudson Bay Lowlands in the northeast, the transmission Project crosses boreal forest and wetland habitat. In the west central region, the vegetation transitions from boreal forest to mixed woods. The most southerly portion of the transmission line contains forests, wetlands, prairies and agricultural lands.

### 1.1 Purpose

Manitoba Conservation and Climate requested that a No Net Loss (NNL) plan be developed to mitigate the expected loss of wetland habitat associated with the development of the Bipole III Transmission Project.

This wetland NNL plan has been developed to ensure no net loss of wetlands in response to clause 52 in *Environment Act* Licence No. 3055 issued for the Bipole III Transmission Project. Clause 52 states:

52. *To ensure no net loss of wetlands, the Licencee shall, during construction and maintenance of the Development, maintain a minimum 30 meter riparian buffer zone immediately adjacent to wetlands and the shoreline of lakes, rivers, creeks, and streams. Within the riparian buffer zone:*
- a) trees that must be removed shall be cleared using only low impact methods including hand clearing;*
  - b) all existing low growth vegetation such as grasses, shrubs, and willows shall be maintained;*
  - c) the application of herbicides shall be prohibited; and*
  - d) any affected wetland area will be restored, replaced or offset as approved by the Director to ensure no net loss of wetlands.*

In accordance with the clause MH has maintained 30 meter riparian buffer zones where possible and followed the prescribed practices in accordance with sub-clauses 52 a, b, and c. Where the 30 m buffer could not be established and project components intersected wetlands clause 52 d was considered for the restoration, replacement or offset of wetlands. This report summarizes Manitoba Hydro's approach to wetland protection and mitigation, and compensation for unavoidable wetland losses with the goal of no net loss of wetlands as a result of the Bipole III Transmission Project. Extensive mitigation measures have already been prescribed to protect and conserve wetlands during construction. They are documented in Environmental Protection Plans for the Project and also discussed in section 3.1.

## **2.0 WETLANDS**

Wetlands are defined as: *land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation and various kinds of biological activity which are adapted to a wet environment* (National Wetlands Working Group 1988). Wetlands include two broad categories: organic wetlands or peatlands and mineral wetlands.

Wetlands are described in The Canadian Wetland Classification System (CWCS) according to class, form and type. Five wetland classes include bog, fen, swamp, marsh and shallow water. Wetland forms are subdivisions of classes and are defined according to surface morphology and pattern, water type and underlying mineral soil. Wetland types are described according to physiognomic characteristics of vegetation (National Wetlands Working Group 1997). Environment Act Licence No. 3055 for the Bipole III Transmission Project includes a definition of wetland consistent with the above and a definition for bog, a type of organic wetland. For the purposes of wetland area calculations the CWCS could not be used because of limitations in the available dataset. This limitation is outlined and explained in Section 3.3.1. In lieu of this limitation a more suitable and accurate dataset developed for the Bipole III Transmission Project area was used.

### **2.1 Wetland Function**

In Manitoba, wetlands are estimated to cover 233,340 km<sup>2</sup> or 43% of the terrestrial landscape, with peatlands representing 90% of all wetlands (Halsey et al. 1997). Wetlands play an important role within the landscape. Wetland functions or the processes carried out by wetlands include filtration and improving water quality, regulation of water levels, and providing habitat for aquatic and semi-aquatic species. Wetlands are considered one of the most biologically diverse of all ecosystems.

## **3.0 WETLAND ASSESSMENT**

### **3.1 Protection of Wetlands**

Manitoba Hydro recognizes the importance and value of wetlands on the landscape and considered them in routing criteria identified for the Project. Using avoidance as a mitigation measure, protected areas, areas of special interest and salt marshes were part of the vegetation criteria used to evaluate alternative routes. As such, route selection and constraint mapping contributed to avoiding some wetland complexes mainly associated with Wildlife Management Areas, and Ecological Reserves.

Avoidance of all wetlands and associated buffer zones was not possible for the Bipole III route due the extensive area covered by peat wetlands within the Project area. Organic wetlands or peatlands are ubiquitous on the Manitoba landscape as indicated above occurring as bogs, fens, and in permafrost zones.

Where a component of the Bipole III Transmission project intersects wetlands, mitigation is implemented to reduce potential effects. One of the most effective measures to minimize disturbance to wetlands areas is limiting clearing activity to frozen ground conditions. The mitigation approach was also aimed at establishing riparian buffers around wetlands where protective measures were prescribed. The measures include:

- Shrub and herbaceous vegetation will be retained where possible;
- Trees that do not violate MH vegetation clearance requirement will be retained, where possible; and
- Riparian buffers are divided into 2 zones and mitigation applied as per below.
  - 7 meter Machine Free Zone (MFZ) – no equipment within MFZ except at trail crossing. Machinery allowed to reach into zone with cutting equipment but not enter.
  - Management Zone (MZ) – only low disturbance clearing permitted.

Wetland protective measures are also prescribed for several other construction activities including grading, drilling, clearing, handling petroleum products, and use of access roads. The mitigation measures for wetland protection as provided in the Construction Environmental Protection Plans have all been approved by MCC.

### **3.2 Potential Loss of Wetlands**

Even with protective mitigation measures in place there are still components of the Bipole III Project such as tower foundations that result in unavoidable loss of wetland area. Portions of wetlands will be potentially lost as a result of clearing and construction activities associated with the following Project components:

- 500 kV Line Tower Foundations
- 500 kV Construction Trail
- 230 kV Collector Lines and Construction Power Tower Foundations
- 230 kV Construction Trails
- Keewatinohk Converter Station Site
- Keewatinohk Lagoon

- Keewatinohk Ground Electrode
- Construction Work Areas
- Excavated Material Placement Areas
- Access Routes

### 3.3 Measuring Potential Loss of Wetlands

#### 3.3.1 Wetland Classification Data

Wetland loss is defined as altering, infilling or physically draining the wetland, any impact to the riparian area and buffers strips, and any type of interference with the hydrology to and from the wetland (Alberta Environment 1997). For the Bipole III Project unavoidable losses of wetlands will occur where the footprint for Project components overlaps wetland areas. A method was developed to estimate and quantify lost wetland area for each Project component by wetland type.

Several wetland data sources were reviewed for potential use in acquiring the information for determining wetland loss. The Land Cover Classification Enhanced Bipole (LCCEB) and Halsey (Halsey *et al.* 1997) datasets were reviewed for cover classification, areal coverage, and utility in creating the required wetland inventory for calculating wetland loss.

The LCCEB represents an enhancement of the national land cover spatial database developed by the federal government Land Cover Classification. The Land Cover Classification is a mapping layer that has been harmonized across the major federal departments involved in land management or land change detection that includes Agriculture and Agri-Foods Canada, the Canadian Forest Service, and the Canadian Centre for Remote Sensing. The LCCEB provides land cover classes that identify the primary ecological and vegetation/habitat conditions of an area. The land cover classes are based on the National Forest Inventory and endorsed by the Canadian Forest Inventory Committee. Land cover classes of wetlands include Wetland Treed, Wetland Shrub and Wetland Herb and are defined as follows:

Wetland Treed: Land with a water table near/at/above soil surface for enough time to promote wetland or aquatic processes; the majority of vegetation is coniferous, broadleaf, or mixed wood.

Wetland Shrub: Land with a water table near/at/above soil surface for enough time to promote wetland or aquatic processes; the majority of vegetation is tall, low, or a mixture of tall and low shrub.

Wetland Herb: Land with a water table near/at/above soil surface for enough time to promote wetland or aquatic processes; the majority of vegetation is herb.

The primary advantage of LCCEB dataset is that it is a practical tool for environmental assessment, with complete coverage of the Bipole III study area. It has a known age of creation, circa 2000 from Landsat ETM satellite data, and known error both spatially and in terms of land cover identification. The LCCEB includes a further harmonization/integration of the National

Stratification Working Group ecological framework database that includes wetland features, fire history, Manitoba forest harvest/depletion layers and data from the Canada Land Inventory. Wetland classes of the Land Cover Classification (Wetland Treed, Wetland Shrub and Wetland Herb) are the most representative of wetland area loss as a result of the Project.

Another wetland data set (Halsey et al. 1997) delineated wetlands from aerial photography which was transferred to 1:250,000 base maps. The data was later digitized for use in GIS programs. Wetlands were classified using a hierarchical wetland classification that included three levels: wetland class, vegetation modifier, and wetland landform modifier. At the scale of mapping used, polygons were composed of wetland complexes with components identified to the nearest 10% cover, and individual wetlands (i.e., bog, fen) were rarely identified. So while the Halsey cover classification was based on the Canadian Wetland Classification System (CWCS), the utility of the polygons for wetland classification at the scale of the Bipole III footprint (66 m right-of-way) was limited. The intersection of a wetland polygon by the transmission line only gave a relative indication of what was affected in that polygon in terms of the wetland classification (bog, fen, etc.). With the polygons being relatively large and containing diverse wetland types in them, it was not possible to indicate wetland loss for Bipole III by CWCS type.

Subsequent to review of the wetland data sets available for the study area the LCCEB spatial database was selected to calculate the extent of wetland loss from the Bipole III Transmission Project. There is a higher confidence level in accurate wetland classification using the LCCEB dataset that removes the interpretive aspect of generalized polygons inherent in the Halsey data.

### 3.3.2 Wetland Loss Calculation

The estimated area of wetlands affected was determined by calculations using a Geographic Information System (GIS) and identified where the footprints of the Bipole III Transmission Project components overlapped identified wetlands from the LCCEB database. See Appendix A, Map 1 – Bipole III Transmission Line Construction Zone and Wetlands & Map 2 – Keewatinohk Area Wetlands and Infrastructure. For transmission line rights-of-way (ROWs), only tower foundations were considered to result in permanent loss of wetland area. The area under the overhead conductors was not included in the calculations as wetland loss except for access and maintenance trails. With the implementation of construction mitigation, areas under conductors not at tower sites will have minimal damage and will re-establish to pre-construction condition naturally.

The footprints of the various components of the Project were comprised of a number of groups: 500 kV DC transmission line; AC collector lines; access and maintenance trails, and the various components of the Keewatinohk converter station site. Dimensions of the various tower foundations and other components were calculated and overlain on the wetland layers. Many different tower types are used in the construction of the transmission lines to account for angles, terrain, and different span distances. The calculations for foundation area were based on the

most recent information on transmission line design and tower spotting. Tower dimensions and foundations used in the net loss of wetland calculations are provided in Appendix B.

The estimated area of wetlands affected associated with specific Project components are summarized in Table 1. These calculations are estimates based on design information. Once the project is fully constructed the line will be surveyed an exact area of wetland loss can be calculated. In total, an estimated **118 hectares** (ha) of wetland in all categories are considered as potential wetland loss for the Bipole III Project.

**TABLE 1: Estimated Wetland Area Loss (ha) by Bipole III Project Component.**

Project Component	Wetlands Area Affected (ha)	Estimated Permanent Area Affected %	Estimated Permanent Area Affected (ha)	Description
500 kV Line tower foundations	21	100%	21	Tower Footings
500 kV Construction Trails	219	10%*	22	7m trail width
230 kV Collector Lines and Construction power tower foundations	3	100%	3	Tower Footings
230 kV Construction Trails	16	100%	2	7m trail width
Keewatinohk Converter Station Site	2	100%	2	Planned Infrastructure
Keewatinohk Lagoon	12	100%	12	Planned Infrastructure
Keewatinohk Ground Electrode	6	100%	6	Planned Infrastructure
Construction Work areas	8	100%	8	Planned Infrastructure
Excavated Material Placement Areas	29	100%	29	Planned Infrastructure
Access Routes	139	10%*	14	15m access trail width
<b>Total</b>			<b>118</b>	

\*reflects an estimated extent of trails and routes requiring mitigation (rehabilitation or compensation) as per post-construction survey.

#### **4.0 NO NET LOSS OF WETLANDS**

According to the Environmental Law Institute (2012), compensatory mitigation is defined as:



*The restoration (re-establishment or rehabilitation), establishment (creation), and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.*

Restoration is a preferred method of compensation and involves the re-establishment of the hydrologic regime, biological communities and other natural wetland functions in its original location (Alberta Environment 1997). Replacement involves wetland construction and creation in locations where none existed previously. Financial compensation or mitigation banking is the setting aside of funds and/or creation of wetlands to be used in exchange for wetlands lost through development (Environment Canada 1998). Compensation for wetland loss may also involve securements of wetlands on properties that are to remain protected (Government of Manitoba 2005).

While restoration is a preferred method, the placement of towers and other permanent infrastructure for this project precludes restoration on the majority of developed sites. The majority of the transmission towers for Bipole III transmission project are guyed structures that use steel guy wires to support and anchor the structure. For the purpose of calculating wetland loss for towers, the total foundation area was calculated based size of tower foundations and guy anchors areas. Tower foundation dimensions and diagrams used for wetland calculations are shown in Appendix B and C.

#### **4.1 Restoration**

Restoration would primarily include rut damage repair and stream bank stabilization/re-vegetation along with other restoration techniques as prescribed by a vegetation ecologist. An assessment would be done after construction to evaluate potential for restoration and to develop a plan for restoration. If the assessment indicates restoration is not feasible, then the wetland area would be added to the overall loss of wetlands.

#### **4.2 Compensation**

Manitoba Hydro recognizes the importance of applying compensation ratios for wetland loss in working towards the principle of no-net loss of wetlands in Manitoba. In discussions with MCC, for the southern sections of the Bipole III line (C1, C2 sections) Manitoba Habitat Heritage Corporation is the entity that has been identified to manage a wetland mitigation/compensation fund on behalf of the Province. The Northern portion of the lines (N1, N2, N3 and N4) will be directed toward projects outside of the southern agricultural landscape. Any contributions by Manitoba Hydro in fulfillment of the obligation for wetland compensation for Bipole III would be made to Manitoba Habitat Heritage Corporation to be held in trust for projects deemed appropriate by MCC. Such projects would be carried out by accredited third parties and may include (but are not limited to) restoration of wetlands in the same, adjacent or other Manitoba watersheds; enhancement of existing wetlands and wetland complexes, research directly related to northern wetland restoration methods, improved construction methods to reduce impacts to wetlands and other approved advancements of northern wetland science. MCC will

provide Manitoba Hydro, for information only, with a report on compensation projects funded through money provided by Manitoba Hydro. MCC will be responsible for developing and ensuring that the Manitoba Habitat Heritage Corporation meets the requirements associated with this condition.

**Assessment of Compensation:**

An important consideration in assessing compensation and wetland values is recognition that project routing allowed for the avoidance of unique, rare, and high value wetlands in Manitoba. The following table describes the proportion of wetland area affected based on project section. This information, when viewed with Map 1, demonstrates where the project intersects wetland areas.

**TABLE 2. Percentage of Wetlands Affected based on Bipole III Transmission Project Section.**

<b>Project Section</b>	<b>% of Area</b>
N1	9%
N2	14%
N3	27%
N4	36%
C1	7%
C2	7%
S1	0%
S2	0%

The impacted wetlands for Bipole III have significant ecological and hydrological value. The northern extent of these wetlands (in areas N1 to N4) are considered abundant in Manitoba and is currently under low threat. The majority of these wetlands are on Crown lands and the Province puts high value on them and is committed to maintaining healthy, intact ecosystems. The more southerly extent of the impacted wetlands (in areas C1 to C2) occur in the highly developed agricultural landscape of southern Manitoba. Both boreal and prairie wetlands (fens, bogs, and marshes) are an excellent global carbon storage repository and are very fragile due to climate change pressures. In addition to carbon storage and increased climate change resiliency values, these wetlands provide significant wildlife habitat for many species.

Manitoba Hydro has determined that 118.0 hectares of wetlands will be permanently lost as a result of the Bipole III Transmission project. For the loss of wetlands in southern Manitoba, a compensation ratio of 3:1 will be used. This aligns with the current regulations under *The Water Rights Act*.

A value of \$500.00 per hectare at a 3:1 ratio will be used to calculate compensation in sections N1 to N4, the northernmost range of the Bipole III Transmission project. A value of \$14,820 per hectare at a 3:1 ratio is used to calculate compensation, in the C1 and C2 sections of the project. Table 3 outlines the calculation details.

**TABLE 3. Wetland Loss Calculation per Bipole III Project Section**

Project Section	% of Area (total area = 118 ha)	Hectare	Ratio	Valuation	Total Cost
N1	9%	10.62	3	\$500	\$15,930.00
N2	14%	16.52	3	\$500	\$24,780.00
N3	27%	31.86	3	\$500	\$47,790.00
N4	36%	42.48	3	\$500	\$63,720.00
C1	7%	8.26	3	\$14,820	\$367,239.60
C2	7%	8.26	3	\$14,820	\$367,239.60
Total Loss	100%	118.00			\$886,699.20

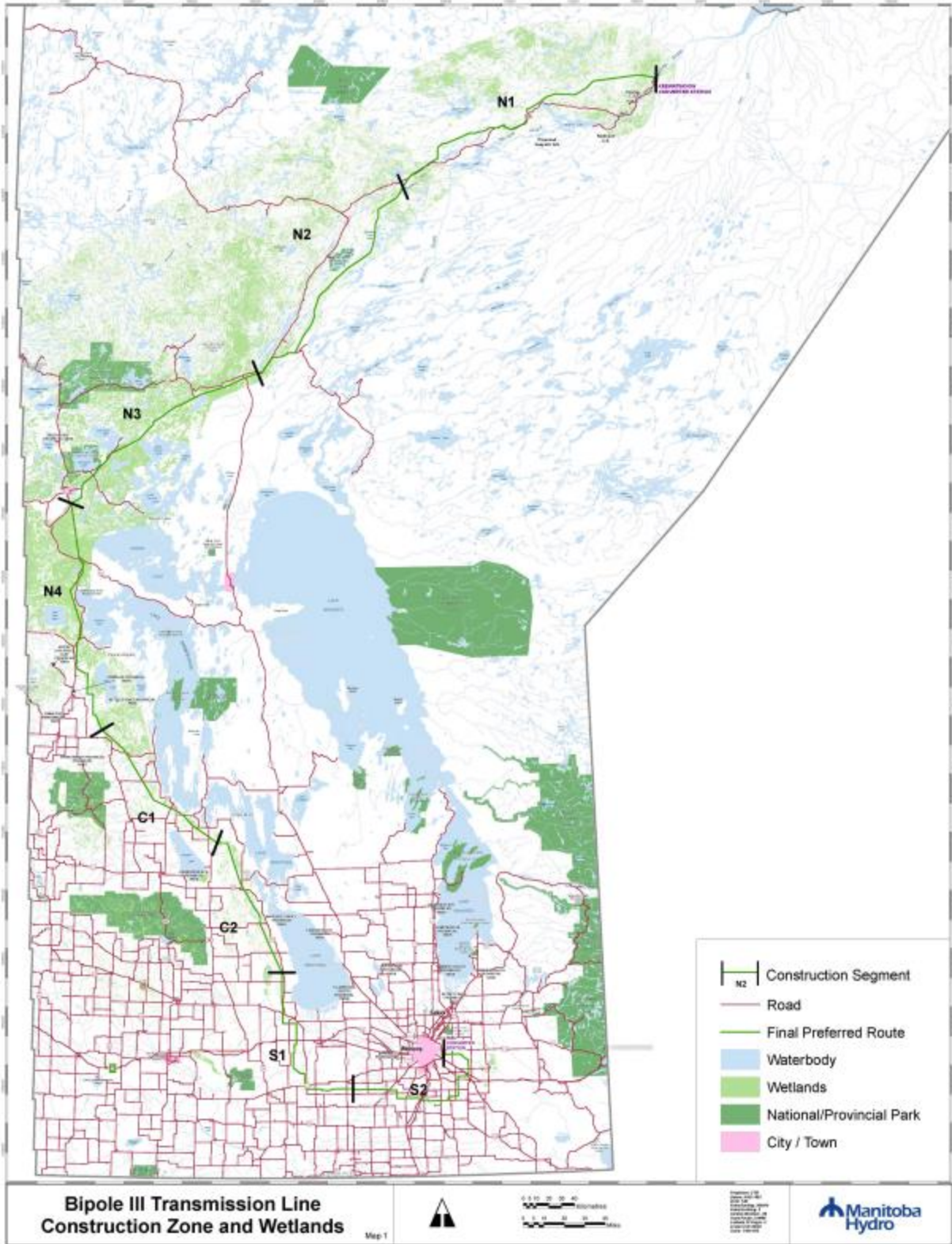
## 5.0 SUMMARY

An inventory of Bipole III Transmission Project component overlap with wetlands was conducted using the LCCEB database. Areal extent of permanent wetland loss was calculated based on Project intersection with wetlands where avoidance or restoration was not feasible. There were an estimated 118 hectares of wetland in three classifications considered as potential wetland loss. A price of \$500.00 per hectare at a 3:1 ratio will be used to calculate compensation in sections N1 to N4, the northernmost range of the Bipole project. A price of \$14,820 per hectare at a 3:1 ratio is proposed to calculate compensation, in the C1 and C2 sections of the project. This process demonstrates Manitoba Hydro's commitment towards the goal of not net loss of wetlands for the Bipole III Transmission project.

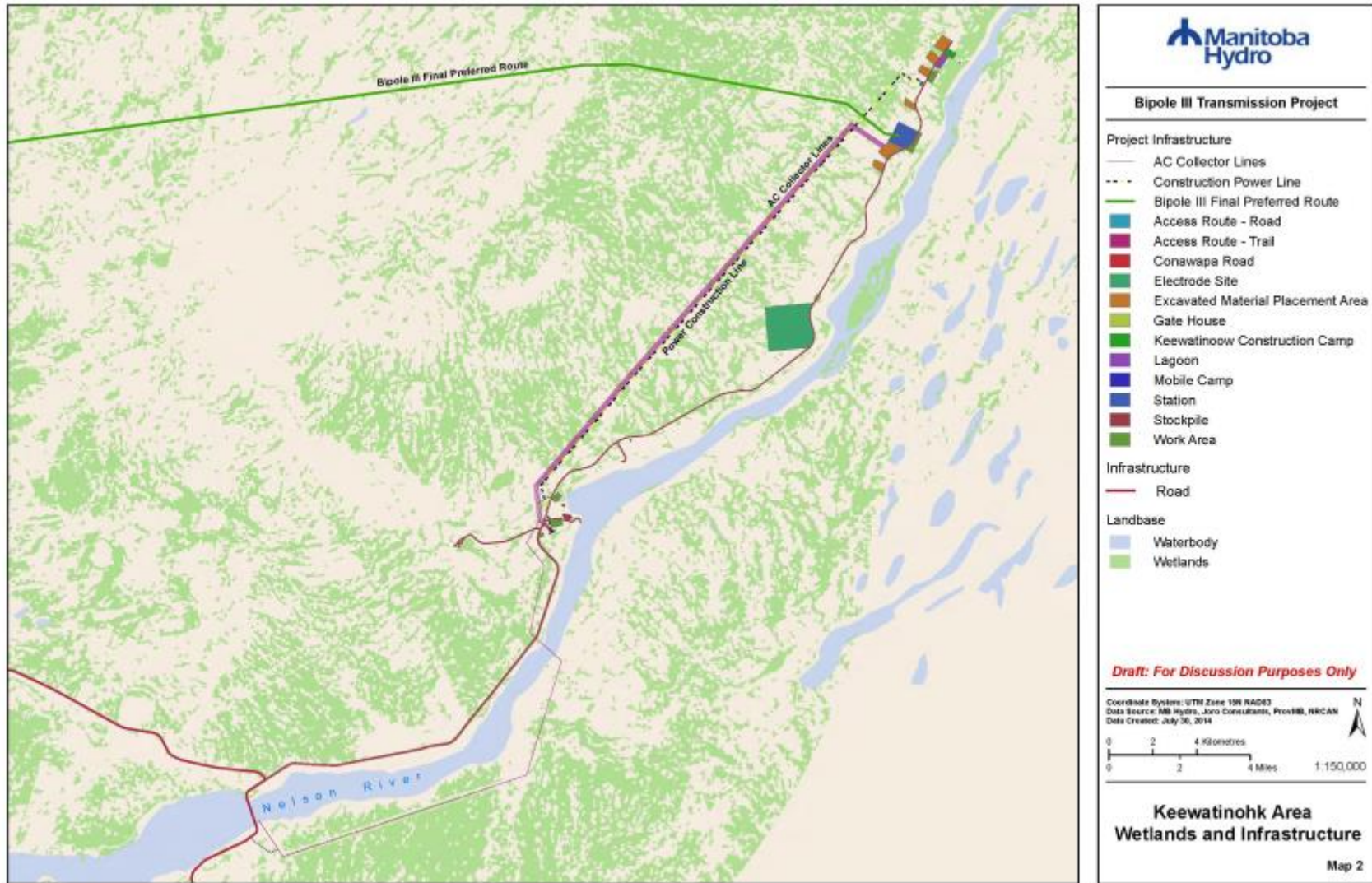
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**Appendix A: Transmission Line Construction Zone and Wetlands**



Map 1. Bipole III Transmission Line Construction Zone and Wetlands



Map 2. Bipole III Transmission Line Construction Zone and Wetlands

## **Appendix B: Tower Foundation and Anchor Dimensions**



**Table B: Approximate Dimensions for 500 kV and 230 kV Tower Foundations and Anchors**

<b>TOWER TYPE</b>	<b>EARTH SUBSTRATE</b>	<b>STANDARD SUBSTRATE</b>	<b>ROCK SUBSTRATE</b>	<b>SPECIALTY SUBSTRATE</b>
<b>A-530</b>	244 m <sup>2</sup>	244 m <sup>2</sup>	66 m <sup>2</sup>	9 m <sup>2</sup>
<b>A-531</b>	245 m <sup>2</sup>	245 m <sup>2</sup>	66 m <sup>2</sup>	9 m <sup>2</sup>
<b>A-532</b>	244 m <sup>2</sup>	244 m <sup>2</sup>	66 m <sup>2</sup>	9 m <sup>2</sup>
<b>A-540</b>	47 m <sup>2</sup>	47 m <sup>2</sup>	47 m <sup>2</sup>	9 m <sup>2</sup>
<b>B-530</b>	245 m <sup>2</sup>	245 m <sup>2</sup>	66 m <sup>2</sup>	9 m <sup>2</sup>
<b>B-540</b>	47 m <sup>2</sup>	47 m <sup>2</sup>	47 m <sup>2</sup>	22 m <sup>2</sup>
<b>C-530</b>	733 m <sup>2</sup>	733 m <sup>2</sup>	198 m <sup>2</sup>	28 m <sup>2</sup>
<b>C-540</b>	63 m <sup>2</sup>	63 m <sup>2</sup>	63 m <sup>2</sup>	16 m <sup>2</sup>
<b>D-540</b>	76 m <sup>2</sup>	76 m <sup>2</sup>	76 m <sup>2</sup>	22 m <sup>2</sup>
<b>P-530</b>	263 m <sup>2</sup>	263 m <sup>2</sup>	66 m <sup>2</sup>	9 m <sup>2</sup>

## Appendix C: Tower Foundations Photos and Diagrams



Photo 1. Photo of a transmission tower in a wetland in frozen ground conditions.



Photo 2. Photo of a transmission tower in a wetland under non-frozen ground conditions.



Photo 3. Photo of a transmission tower and guy wires in wetland in non-frozen ground conditions.

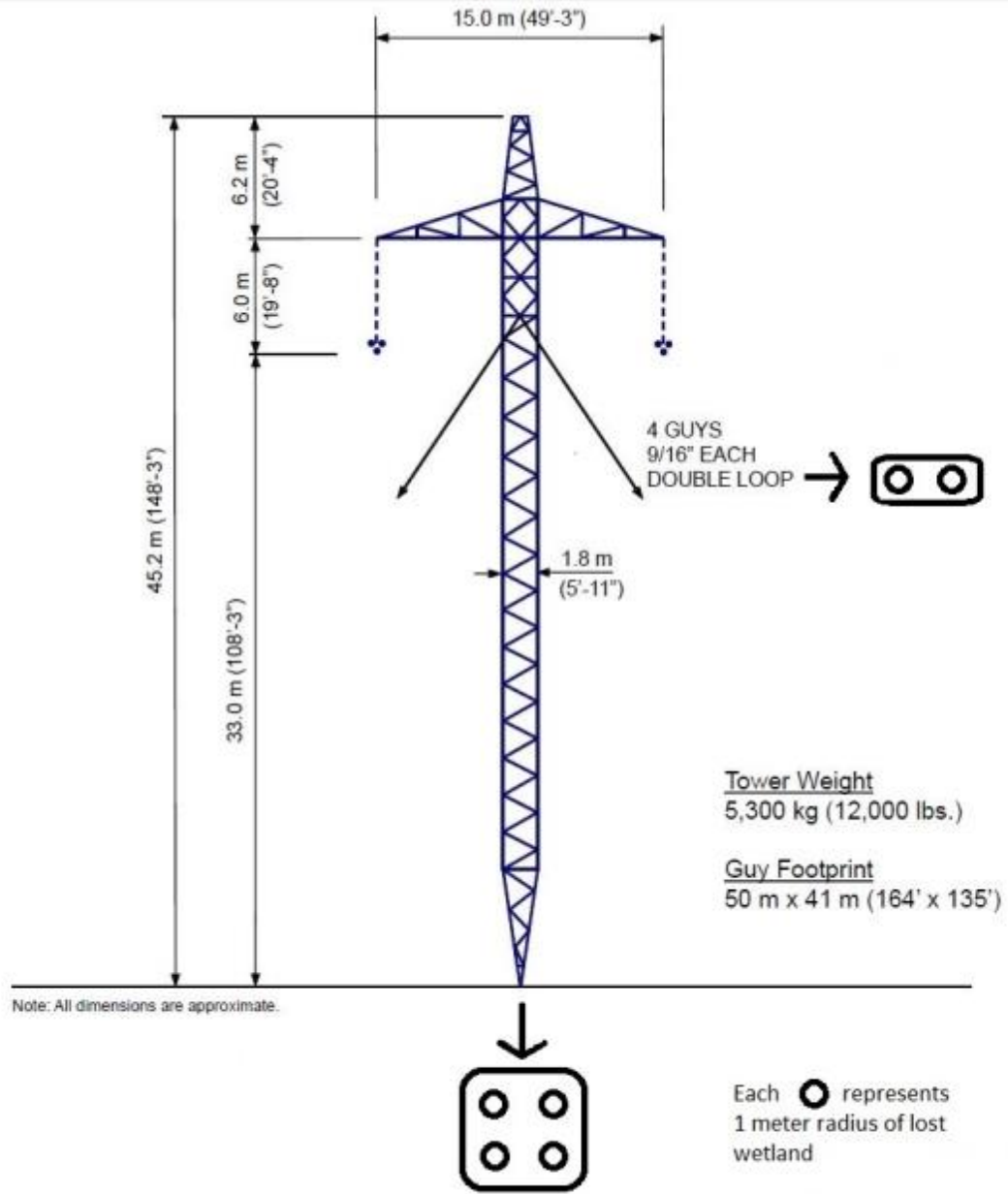


Diagram 1. Typical Bipole III Guyed Suspension Tower Configuration.

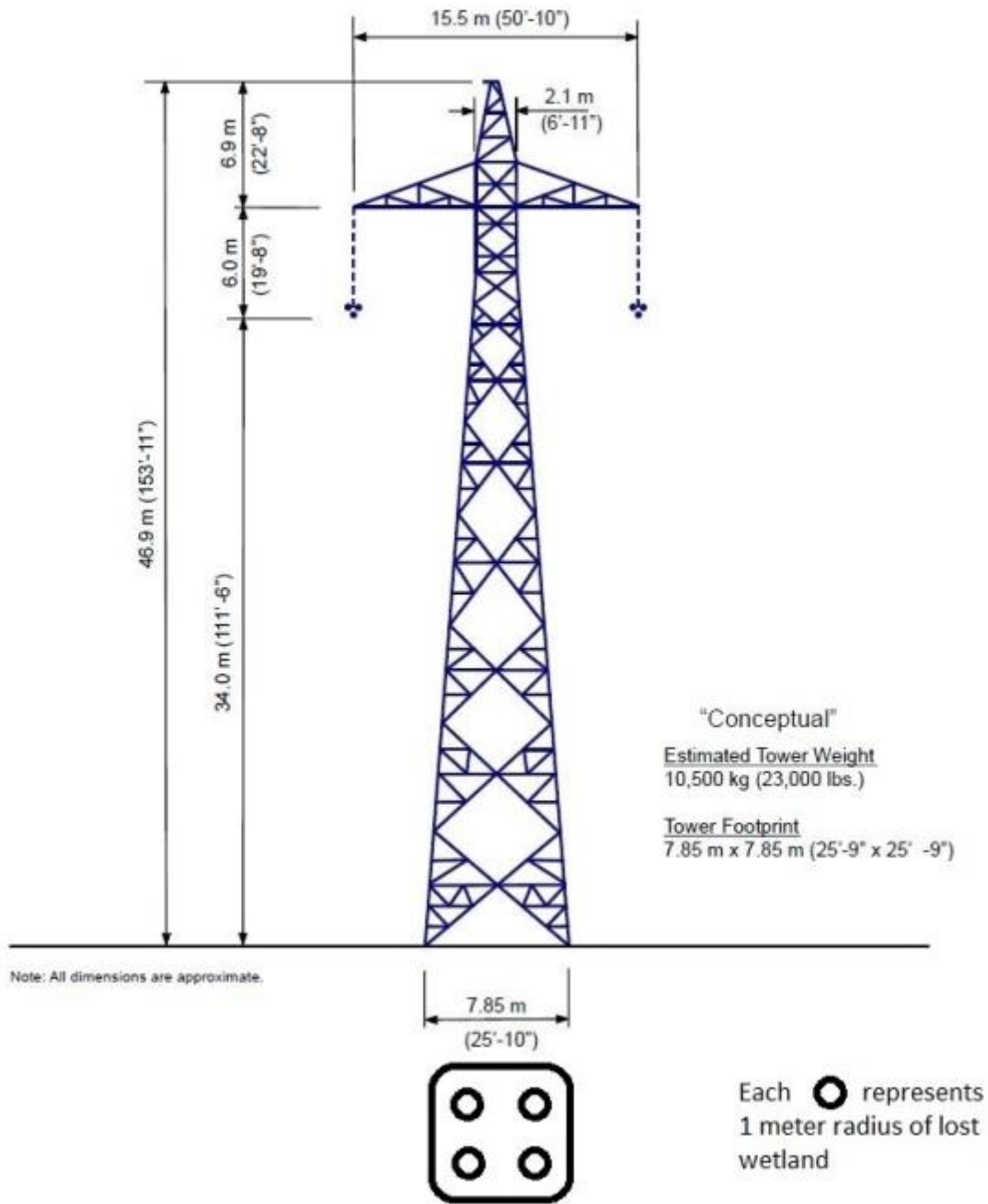


Diagram 2. Typical Bipole III Free Standing Suspension Tower Configuration.

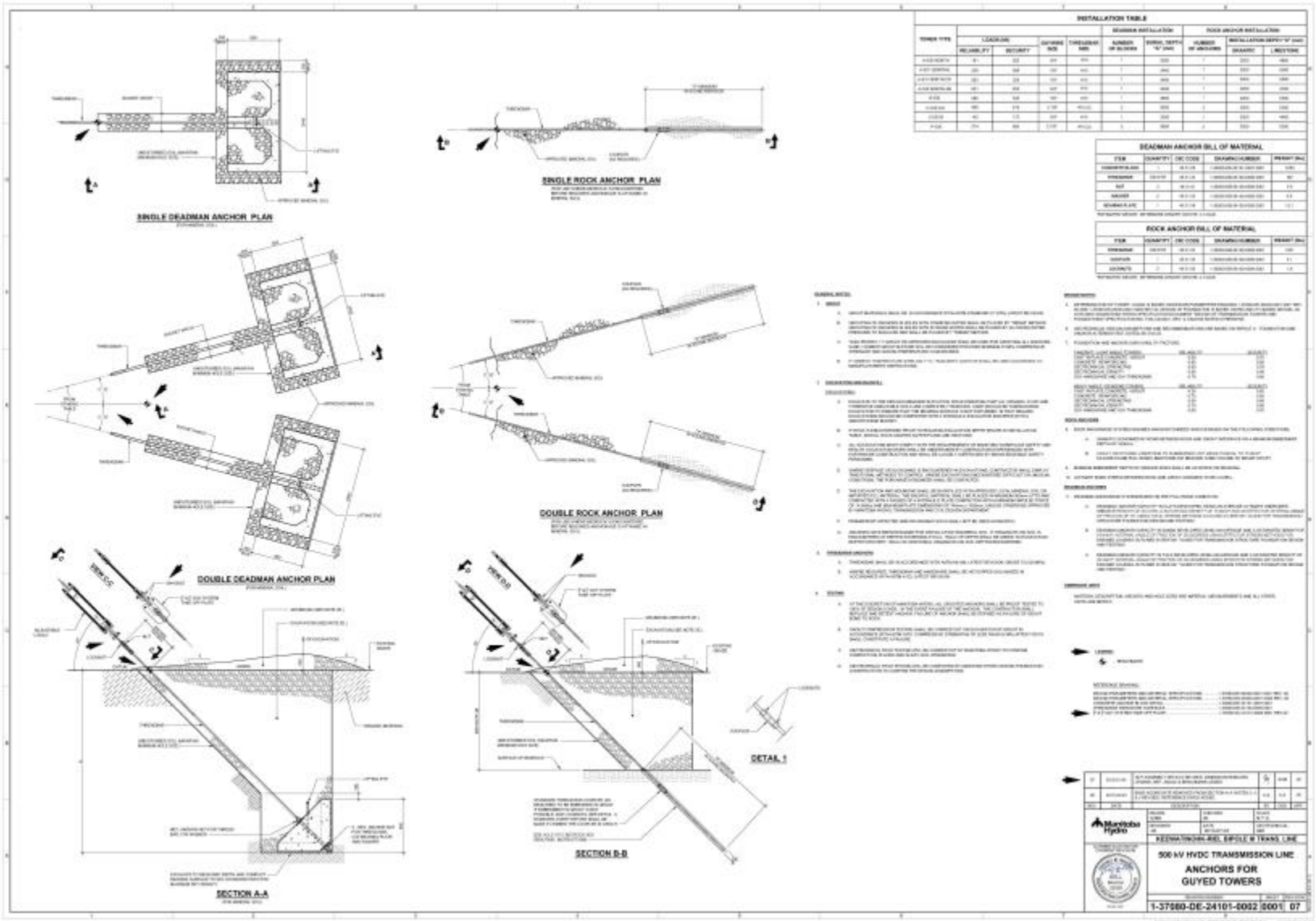


Diagram 4. Engineered Drawing of Anchors for Guyed Towers.

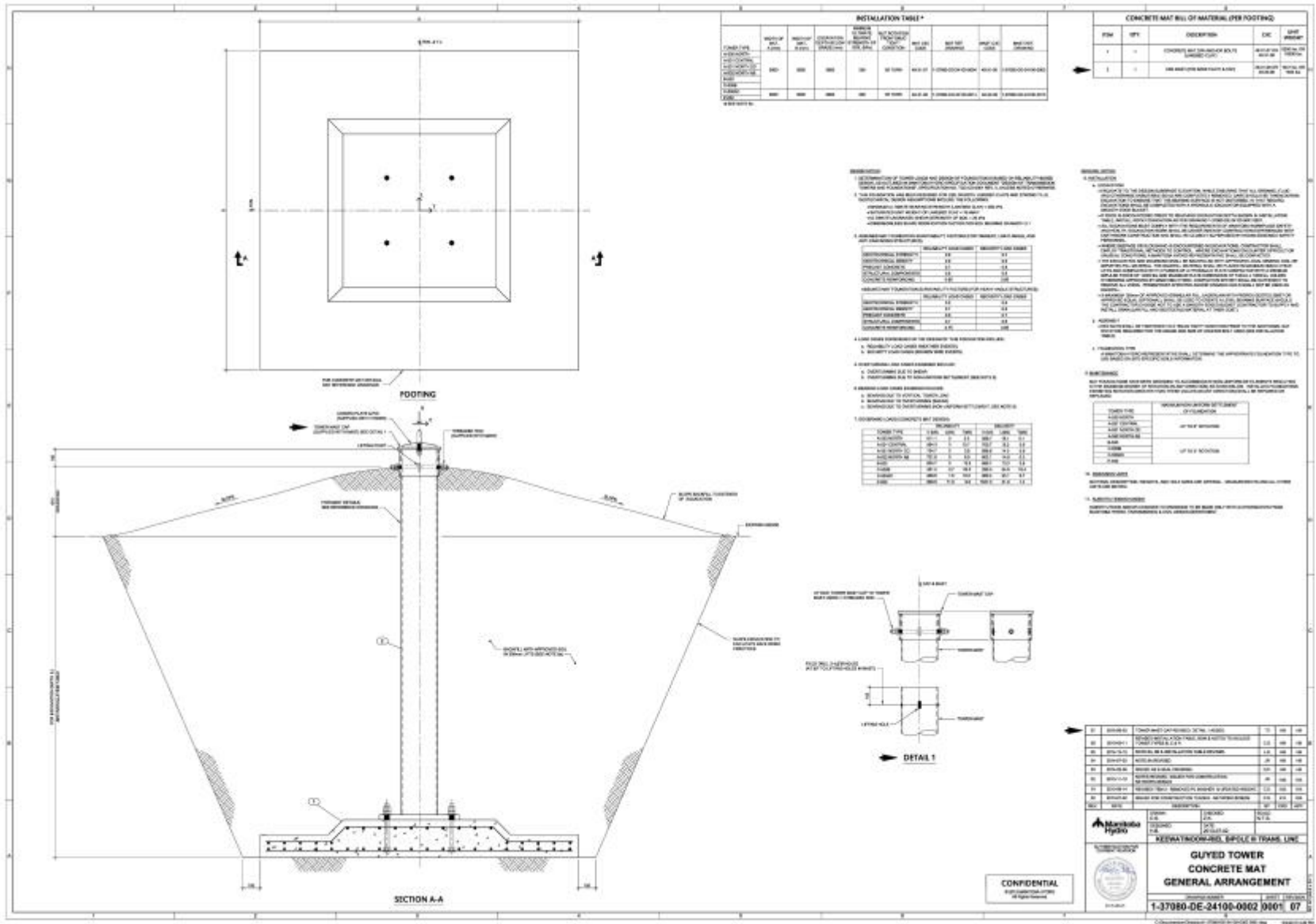


Diagram 4. Engineered Drawing of Guyed Tower Concrete Mat.