

productive than those supporting wet Black Spruce forests (e.g., WC1 and WC2). It is a low-elevation ecosystem characterized by Red Spruce dominance and high sphagnum moss cover. The Red Spruce – Balsam Fir/ Cinnamon Fern / Sphagnum Forest is found on lowland plains and gently rolling uplands. It is common on moderately exposed flats, depressions and in lower and toe positions of gentle slopes; aspect of the slope is variable. Soils are usually derived from fine to moderately textured glacial tills with low to moderate nutrient availability. Peat accumulation can be high, and while some stands grow on organic soil, most are on gleyed or heavily mottled mineral deposits. Sites are slightly to moderately mounded and generally have more microtopography than other wet coniferous forests in Nova Scotia. This VT is found throughout Nova Scotia but is more common in the Eastern and Western ecoregions of the mainland.

The evergreen canopy is dominated by Red Spruce with lesser but frequent Balsam Fir. Few other tree species are frequent in the canopy, but it is well developed with moderate to high crown closure. Woody shrub and herbaceous cover is low to moderate. Forest plants common to wet forest (e.g., Cinnamon Fern) are present, but few species are prominent. Sphagnum mosses largely dominate the dense bryophyte layer. Similar to other moderately-productive, wet coniferous VTs (i.e., WC6, WC7 and WC8), Common Green Sphagnum is characteristic.



Photo 5.27 Example of WC5 - Red spruce – Balsam Fir/ Cinnamon Fern / Sphagnum VT.

5.4.7.2 WC6 – Balsam Fir / Cinnamon Fern / Three-Seeded Sedge / Sphagnum

The WC6 – Balsam Fir / Cinnamon Fern / Three-Seeded Sedge / Sphagnum VT is typically associated with wet sites with a low to moderate nutrient content. This early to mid-successional VT is characterized by a dominance of Balsam Fir and lesser amounts of White Spruce, Black Spruce and Red Maple in the tree stratum. The shrub stratum is variably developed and is dominated by regrowth, False Holly, Wild Raisin, with lesser amounts of Lambkill. The moderate herbaceous cover includes common hydrophytic species such as Cinnamon Fern and Three-Seeded Sedge, and upland coniferous species. The ground vegetation is dominated by *Sphagnum* mosses, typically Common Green (*Sphagnum girgensohnii*) and Ladies' Tresses (*Sphagnum capillifolium*).



Photo 5.28 Typical Vegetation of WC6 – Balsam Fir / Cinnamon Fern / Three-Seeded Sedge / Sphagnum VT.

5.4.8 'Wet Deciduous' Forest Group (NS DNRR FEC)

This wet forest is dominated by species such as Red Maple and White Ash and may include mixed wood forest with Balsam Fir. VTs in this group are associated with moderate to

high nutrient content. Regenerating tree species are dominant in the shrub layer. The herb layer is well-developed, and includes many fern and sedge species.

5.4.8.1 WD2 – Red Maple / Cinnamon Fern / Sphagnum

The WD2 – Red Maple / Cinnamon Fern / Sphagnum VT is a widespread maple swamp-type found throughout the province. It is characterized by a relatively high percentage cover of deciduous tree species, most typically Red Maple. The shrub stratum of this VT is typically moderate in cover, but species poor, and may include regeneration of overstory species as well as other shrubs such as Speckled Alder (*Alnus incana*), Winterberry, and Wild Raisin. Herbaceous layer diversity is also characteristically low, but may be of relatively high cover; Cinnamon Fern (*Osmunda cinnamomea*) frequently dominates. Occasional species may include New York fern (*Parathelypteris noveboracensis*), Three-Seeded Sedge (*Carex trisperma*), Sensitive Fern, Dwarf Red Raspberry (*Rubus pubescens*), Violets (*Viola* spp.), Sarsaparilla and numerous others.



Photo 5.29 Typical Vegetation of the WD2 – Red Maple / Cinnamon Fern / Sphagnum VT.

5.4.9 Shrub Swamps (SS)

The hydrology, hydric soil conditions, and typical vegetation of Swamps are described in Section 4.2.1. Both Forested (FS) and Shrub (SS) swamps are present within the Study Area. This section describes the shrub swamp VTs identified within the Study Area. Shrub

swamps are not included within the NS FEC system and have been categorized using alternate habitat classification systems. Shrub Swamps are generally classified according to shrub height, with low shrub swamps consisting of woody vegetation less than 2 m in height and tall shrub swamps dominated by woody vegetation over that height. The following shrub swamp VTs were noted to occur within the Study Area:

- ▶ SS1 - Cutover Swamp
- ▶ SS2 - Alder Seepage Thicket (NCNH adapted)

Each of these VTs are described below.

5.4.9.1 SS1 – Early Successional Cutover Swamp

In many locations within the Study Area, extensive forestry activity has occurred at various points in the past. As a result of harvesting disturbance, many formerly forested wetlands presumably in the 'Wet Coniferous' and 'Wet Deciduous' groups currently exist in an early- to mid-successional stage, which are dominated by a mixed assemblage of deciduous and coniferous regeneration. These sites, owing to their early stage of succession, are challenging to discretely classify or to define diagnostic vegetation – though are often characterized by dense regeneration of tree species such as Balsam Fir, Red Spruce, and Black Spruce, that fall within the shrub stratum in terms of their physical height. In many cases, wet-tolerant ericaceous shrubs such as Sheep Laurel, Labrador Tea, and Rhodora may proliferate in the increased sunlight conditions created by harvesting. Herbaceous vegetation may commonly consist of species such as Cinnamon Fern, Three-Seeded Sedge, Bunchberry which could be considered relict populations from the preceding forest that was harvested. In areas where soil disturbance from harvesting machinery is evident, graminoid species such as Soft Rush and Woolgrass (*Scirpus cyperinus*) are commonly encountered.



Photo 5.30 A typical cutover swamp, in early to mid stage of regrowth.

5.4.9.2 SS2 – Alder Seepage Thicket (NCNH adapted)

This is a tall shrub swamp community that typically occurs in nutrient-enriched depressions and in areas of groundwater influence. Speckled alders are the dominant shrub species, with other species occasionally present including winterberry and meadowsweet (*Spiraea alba*). The herbaceous layer can be diverse, on account of the minerotrophic conditions. Characteristic herbaceous layer species include bluejoint, mannagrasses, spotted touch-me-not (*Impatiens capensis*), sensitive fern, cinnamon fern, crested shield fern (*Dryopteris cristata*), perfect-awned sedge (*Carex gynandra*), and fringed sedge (*Carex crinita*). Bryophytes are conspicuously absent in many sites. These sites are typically saturated at least seasonally and may contain a variety of soils ranging from mineral to organic.



Photo 5.31 Typical vegetation of SS2 – Alder Seepage Thicket.

5.4.10 Bogs (BG)

The hydrology, hydric soil conditions, and typical vegetation of Bogs are described in Section 4.2.2. This section describes the bog VTs identified within the Study Area. Note the bog vegetation communities have not been described for NS, so descriptions have been sourced from classification systems developed for similar regions, such as Maine (MNAP) and New Hampshire (NCNH).

The main bog VT encountered within the Study Area was:

▶ BG1 - Sheep Laurel Dwarf Shrub Bog / Dwarf Shrub Bog (MNAP)

This bog VT is described below.

5.4.10.1 BG1 – Sheep Laurel Dwarf Shrub Bog / Dwarf Shrub Bog

A dense layer of dwarf heath shrubs dominates this common open peatland community. Stunted and scattered Black Spruce and Tamarack trees form <25% cover. Heath shrubs carpet the hummocks and hollows of the peat substrate; sheep laurel or rhodora are

typically dominant. Sedges contribute little cover (usually <15%, occasionally 20-25%); the most common is Tufted Cottongrass (*Eriophorum vaginatum*), whose bright white tufts decorate the bog vegetation early in the summer. Insectivorous plants such as Pitcher Plant (*Sarracenia purpurea*) and sundews (*Drosera* spp.) can be quite numerous. The ground surface is covered by a spongy carpet of peat mosses. The floristic composition varies depending upon bog morphology and nutrient availability. This type occurs within raised portions of peatlands, where ombrotrophic conditions prevail (plant growth is raised above the water table, and virtually all nutrients come from precipitation). Although standing water may not be visible, the peat is commonly saturated with water throughout most of the year. The substrate is highly acidic, with pH 3.9-4.6.



Photo 5.32 Typical Vegetation of the Sheep Laurel Dwarf Shrub Bog VT.

5.4.11 Fens (FE)

The hydrology, hydric soil conditions, and typical vegetation of Fens are described in Section 4.2. This section describes the fen VTs identified within the Study Area. Note that fen vegetation communities have not been described for NS, so descriptions are based on similar habitats from other, similar regions, such as Maine and New Hampshire.

The main fen VTs encountered within the Study Area were:

- ▶ FE1 - Sweet Gale Mixed Shrub Fen (MNAP adapted)
- ▶ FE2 - Tall Shrub Fen (MNAP)

5.4.11.1 FE1 – Sweet Gale Mixed Shrub Fen

The Sweet Gale – Meadowsweet – Tussock Sedge Fen VT discussed here has been adapted from the NCNH VT of the same name, due to some key NH species being much less abundant within NS.

This community is dominated by Sweet Gale (*Myrica gale*) and Leatherleaf. White Meadowsweet (*Spiraea alba*) and Speckled Alder are usually present in lesser abundance. Other tall shrubs are often sparse or absent. In more nutrient poor areas, shrub species makeup may be characterized by Rhodora, Sheep Laurel, Labrador Tea, and Bog Rosemary. This VT may occur either as part of larger peatlands bordering open water, or in impounded areas with peat or muck soils (e.g., beaver flowages). The community contains moderately decomposed peat near the surface and tends to be hummocky.

Herb species present may include Tussock Sedge (*Carex stricta*), Bluejoint Reed Grass, Slender Sedge (*Carex lasiocarpa*), Northern Beaked Sedge (*Carex utriculata*), Broad-Leaved Cattail (*Typha latifolia*), Swamp Yellow Loosestrife, and Silvery Sedge (*Carex canescens*). Herbaceous species are usually mixed with the shrubs but are less abundant (averaging around 20% cover). The bryoid layer is usually very minor, and when present it is dominated by Sphagnum mosses.



Photo 5.33 Example of Sweetgale Mixed Shrub Fen Observed within Study Area.

5.4.11.2 FE2 – Tall Shrub Fen

This peatland VT is characterized by tall shrubs (1-3 m), with spotty tree cover above. Shrub cover is usually >70%, with alder and mountain holly almost always present and with other shrubs locally common. Within the Study Area, Wild Raisin was observed to occur frequently in this VT. Red Maple is typical in the tree layer, along with Black Spruce and Tamarack. The herb layer is patchy, with 10-50% cover. Labrador tea and Pitcher Plants are frequent, though not necessarily in high abundance. Cinnamon fern and Wild Calla (*Calla palustris*) are good indicators. The bryoid layer is mostly Sphagnum peat mosses and is patchy, averaging ~50% cover. Sites occur in peat filled basin wetlands, often at the upland/peatland transition. Areas bordering the upland often have standing water for much of the growing season; however, this community can be found in settings other than the peatland lagg. Substrates are somewhat acidic to circumneutral, with relatively high levels of nitrogen, presumably from the nitrogen fixing alders.



Photo 5.34 Example of Tall Shrub Fen Observed within Study Area.

5.4.12 Marshes (MR)

The hydrology, hydric soil conditions, and typical vegetation of Marshes are described in Section 4.2. This section describes the Marsh VTs identified within the Study Area.

5.4.12.1 MR1 – Tall Graminoid Meadow Marsh

This meadow marsh resembles a meadow that is dominated primarily by tall, clonal grasses or sedges, in this case, Bluejoint Reedgrass. Depending on hydrologic regime, dominant species typically have dense root mats, and may dominate individually or in combinations. This community can be seasonally flooded and can only sustain water at ground surface for short periods of time. Depending on the disturbance history, the shrubs may be low and not easily visible among the grasses, or taller, in which case the vegetation appears as mixed shrub-graminoid. Characteristic species that may become dominant include Bluejoint Reedgrass, Tussock Sedge, Woolgrass, and Reed Canary Grass (*Phalaris arundinacea*). Other species that may be present include mannagrasses (*Glyceria* spp.), Rice Cutgrass (*Leersia oryzoides*), Rushes (*Juncus* spp.), Joe-Pye-Weed, sedges and various spike-rushes (*Eleocharis* spp.). Other herbs can also be present; however, cover and biomass is normally dominated by only a few species.



Photo 5.35 Tall graminoid meadow marsh (S4) / Bluejoint Meadow/ Tall Grass Meadow within Study Area.

5.4.12.2 MR2 – Meadow Marsh / Cutover Swamp

Examples of this disturbed wetland type are relatively common within the Study Area, generally along roadsides or in previously cleared forest areas. In many respects this wetland type is a wetter variant of the ‘SS1 – Early Successional Cutover Swamp’ mentioned previously. In this case, the reduced evapotranspiration resulting from tree removal has resulted in ‘watering up’ of the site, resulting in a condition that is less conducive to the immediate regeneration of tree species. As a result, these sites tend to take on a more marsh-like character, often being dominated by graminoid vegetation such as Woolgrass, Soft Rush, and various sedges. Shrub cover is sparse, but where present, may include ericaceous shrubs such as Sheep Laurel, Leatherleaf, Rhodora, or Labrador Tea. Evidence of ground disturbance, in the form of old logging vehicle ruts, is often present. Sphagnum moss may be present in various quantities, and surface water may be present year-round, particularly in areas where harvesting machinery has rutted the wetland soils.



Photo 5.36 Typical Conditions of MR2 - Meadow Marsh/Cutover Swamp

5.4.13 Disturbed Uplands

As the Study Area occurs within a forested area subject to heavy forestry operations, disturbed upland areas are common. A network of gravel roads and work areas has developed which enable access to much of the uplands. A variety of disturbed upland habitats occur within the Study Area. These are described in the following sections.

5.4.13.1 Clearcuts & Regeneration Areas

Many areas which have been recently subjected to forestry activities are present. These areas are typically treeless, though saplings of both coniferous and deciduous tree species present. Shrubs such as Red Raspberry and Blackberry tend to be common, while common herbaceous species include various sedges and common roadside species. Soils tend to be moss covered, except in areas of very recent ground disturbance. Logging ruts are usually prominent.



Photo 5.37 Typical regenerating conifer stand.



Photo 5.38 Typical regenerating deciduous stand.

5.4.13.2 Coniferous Plantations

As much of the Study Area is subject to forestry operations, areas of coniferous plantations are common. These generally consist of evenly-spaced stands of Red Spruce or Black Spruce trees of similar age, and frequently exhibit evidence of silvicultural activities such as weeding and spacing. The shrub community in these areas is often poorly developed depending upon the age of the planted stand, and the density of the canopy; similarly, the ground vegetation community is also quite sparse and of low diversity. Understory herbs generally consists of species common in coniferous forest, such as Wild Lily of the Valley, Bunchberry, and Wood Ferns. One small stand of Jack Pine (*Pinus banksiana*), which may have been planted, was also noted within the Study Area.



Photo 5.39 Regenerating deciduous stand observed within Study Area.

5.4.13.3 Exposed Bedrock

Exposed bedrock is common throughout the Study Area, particularly on hilltops. Scattered large boulders are present as well. A small number of old quarries are also present within the Study Area. It is unclear how long these quarries have been inactive.



Photo 5.40 Exposed bedrock area with quarry observed within Study Area.

5.4.13.4 Rock Barrens

One other type of ‘barren’ habitat was observed frequently within the Study Area which does not adequately match any described vegetation types. These ‘rock barrens’ consist of areas of exposed or shallow bedrock generally occurring along trails, and in cutovers within the Study Area. Soils are patchy and usually consist of a thin, mostly organic layer, creating dry conditions. Vegetation communities are somewhat limited, and dominated by *Cladonia* lichens such as *C. boryi*, *C. stellaris*, and *C. rangiferina* in the rockiest areas. Low ericaceous shrubs, particularly Sheep Laurel and Back Huckleberry occur in areas with thin soils. Other low herbs, graminoids, and shrubs such as Eastern Teaberry and Late Lowbush Blueberry may also occur. Tree cover is limited to scattered stunted Eastern White Pine and Black Spruce. Areas of this habitat are generally quite small. It is possible these habitats have been created as a result of frequent ground disturbance, likely the result of harvesting a softwood site with limited regeneration capacity.



Photo 5.41 Example of Rock Barren VT Observed within Study Area.

6 Results: Project Ecological Land Classification

As mentioned previously, the P-ELC is primarily a GIS-based mapping tool to assist NSPI in conducting specific habitat analysis in support of future Environmental Assessment applications. The data itself is best suited for usage within a desktop GIS setting where the data set can be queried to extract specific habitat parameters; as such, the P-ELC outputs are provided as a digital deliverable in GIS format, as indicated in Table 6-1.

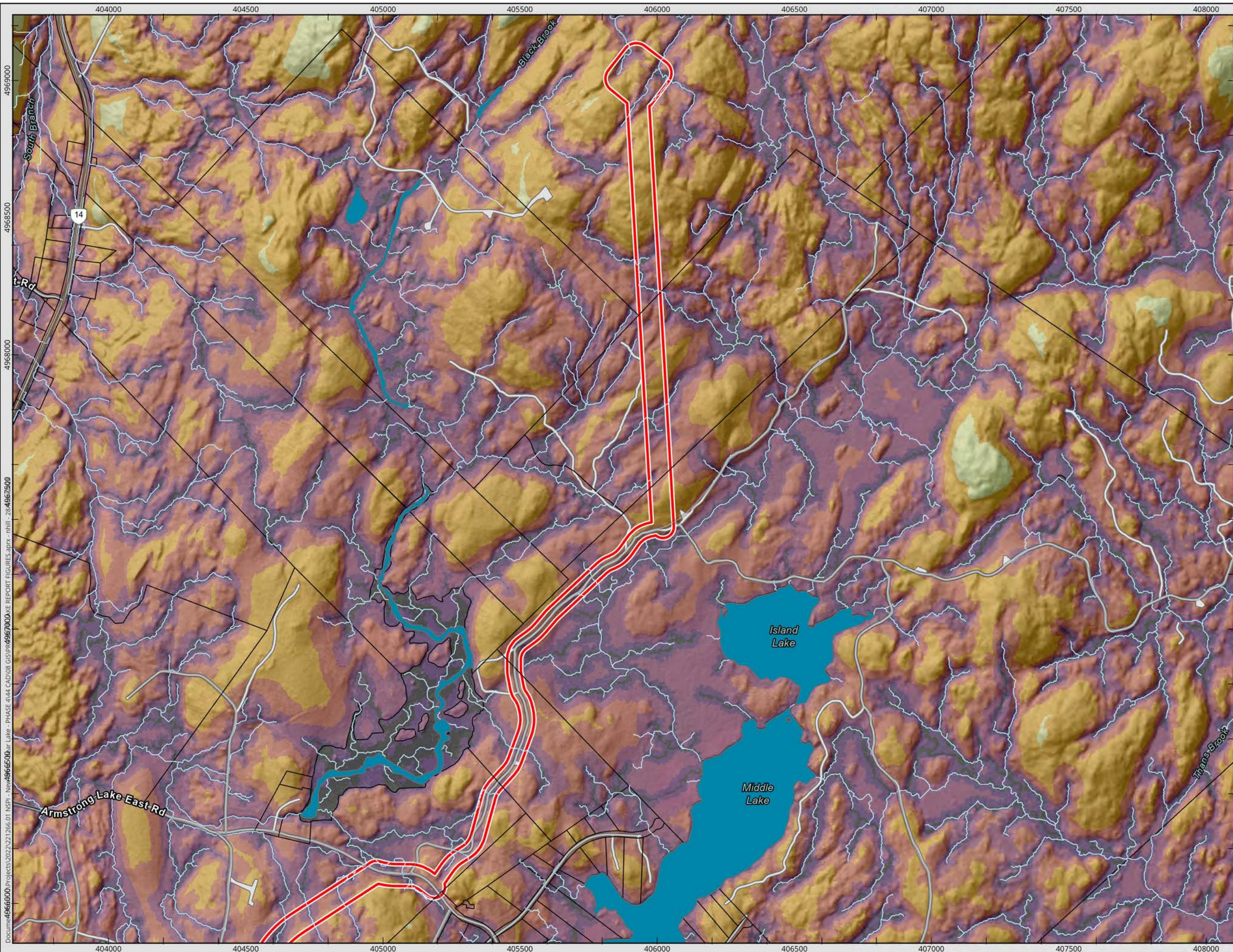
Table 6-1 Summary of P-ELC GIS Deliverables

Layer Name	Description	Format
FINAL OUTPUTS		
BL_PELC	Raster version of P-ELC	Raster, 1m resolution
BL_PELC_Polygon_A1 BL_PELC_Polygon_A2 BL_PELC_Polygon_A3 BL_PELC_Polygon_A4 . . BL_PELC_Polygon_H1 BL_PELC_Polygon_H2 BL_PELC_Polygon_H3 BL_PELC_Polygon_H4	Polygon version of P-ELC, provided in 2 km x 2 km grids	Polygon Feature Class
BL_PELC_CODES		Table
SUPPORTING DATA		
BL_DTW_1ha	Depth to Water (DTW) model results	Raster, 1m resolution
BL_DTW_RC	Reclassified DTW results	Raster, 1m resolution
BL_CHM	Canopy Height Model (CHM) results	Raster, 1m resolution
BL_CHM_RC	Reclassified CHM results	Raster, 1m resolution
BL_LC	Classified Landcover Image	Raster, 1m resolution
BL_NDVI	Normalized Differential Vegetation Index (NDVI)	Raster, 1m resolution
BL_PELC_DOMAIN	Analytical extent for P-ELC	Polygon Feature Class
BL_PELC_Grid_2km	Gridding scheme for P-ELC Polygons	Polygon Feature Class

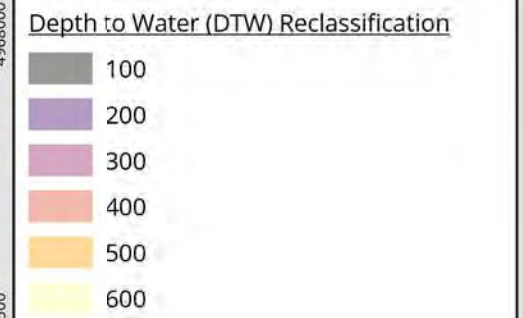
A series of maps illustrating the P-ELC component layers are provided as indicated below:

- ▶ Depth to Water Component: Figure 6-1, Figure 6-2, Figure 6-3 and Figure 6-4
- ▶ Canopy Height Component: Figure 6-5, Figure 6-6, Figure 6-7 and Figure 6-8
- ▶ Landcover Component: Figure 6-9, Figure 6-10 , Figure 6-11 and Figure 6-12

A figure illustrating the 2 km grid used for the P-ELC Polygons is provided in Figure 6-13.



- DTW Water Flow Path (Min 1 Ha CA)
- Provincially Mapped Waterbody
- Study Area (Phase 4)
- Property Boundaries
- Roads

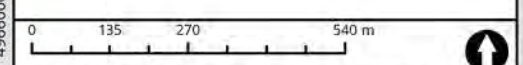


**BEAR LAKE WIND
Vegetation & Wetlands**

**P-ELC Component Overview
Depth to Water Reclassification
(Page 1 of 4)**

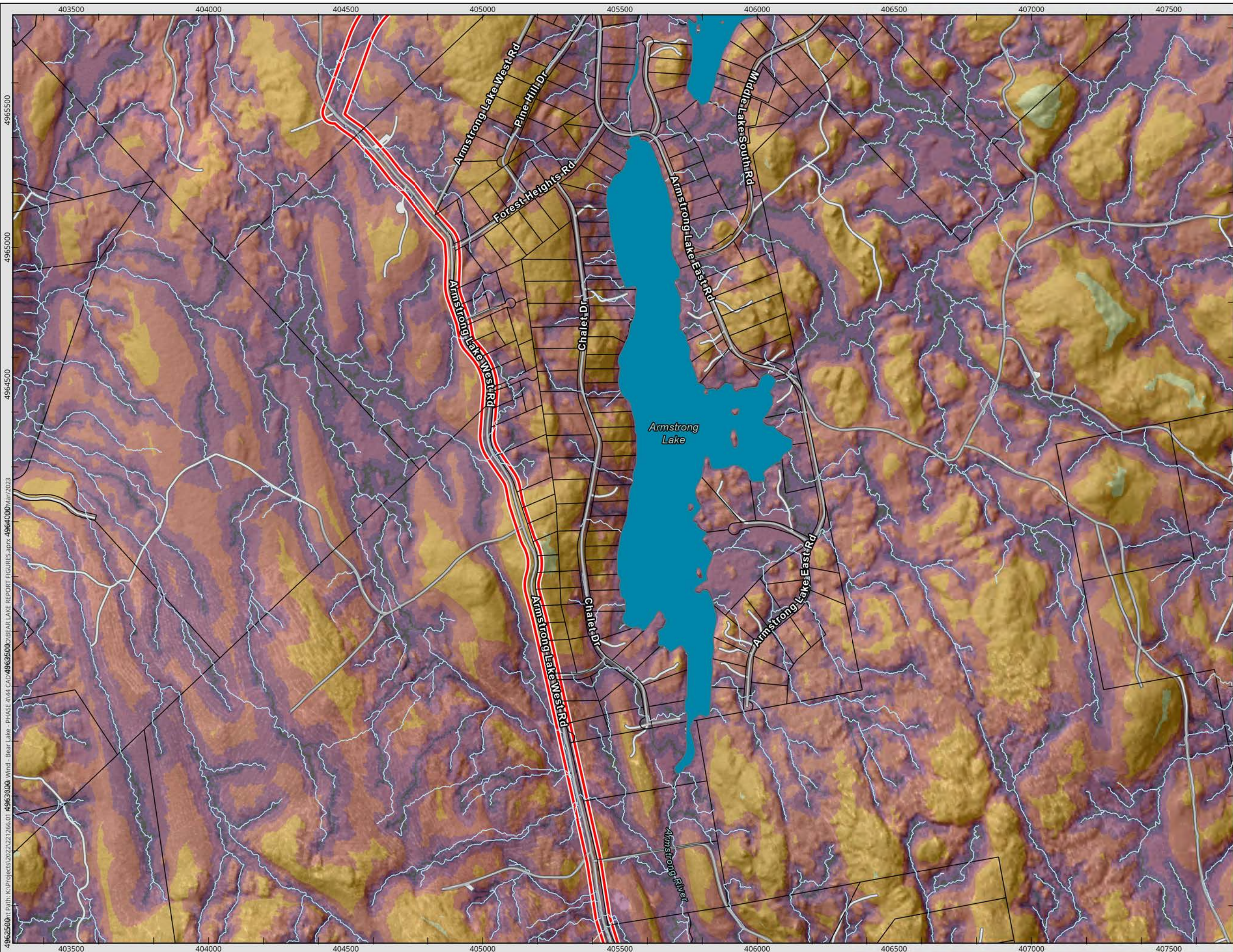
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NOTES:



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Units: Meter

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- DTW Water Flow Path (Min 1 Ha CA)
 - Provincially Mapped Waterbody
 - Study Area (Phase 4)
 - Property Boundaries
 - Roads
- Depth to Water (DTW) Reclassification**
- 100
 - 200
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 - 400
 - 500
 - 600



**BEAR LAKE WIND
Vegetation & Wetlands**

**P-ELC Component Overview
Depth to Water Reclassification
(Page 2 of 4)**

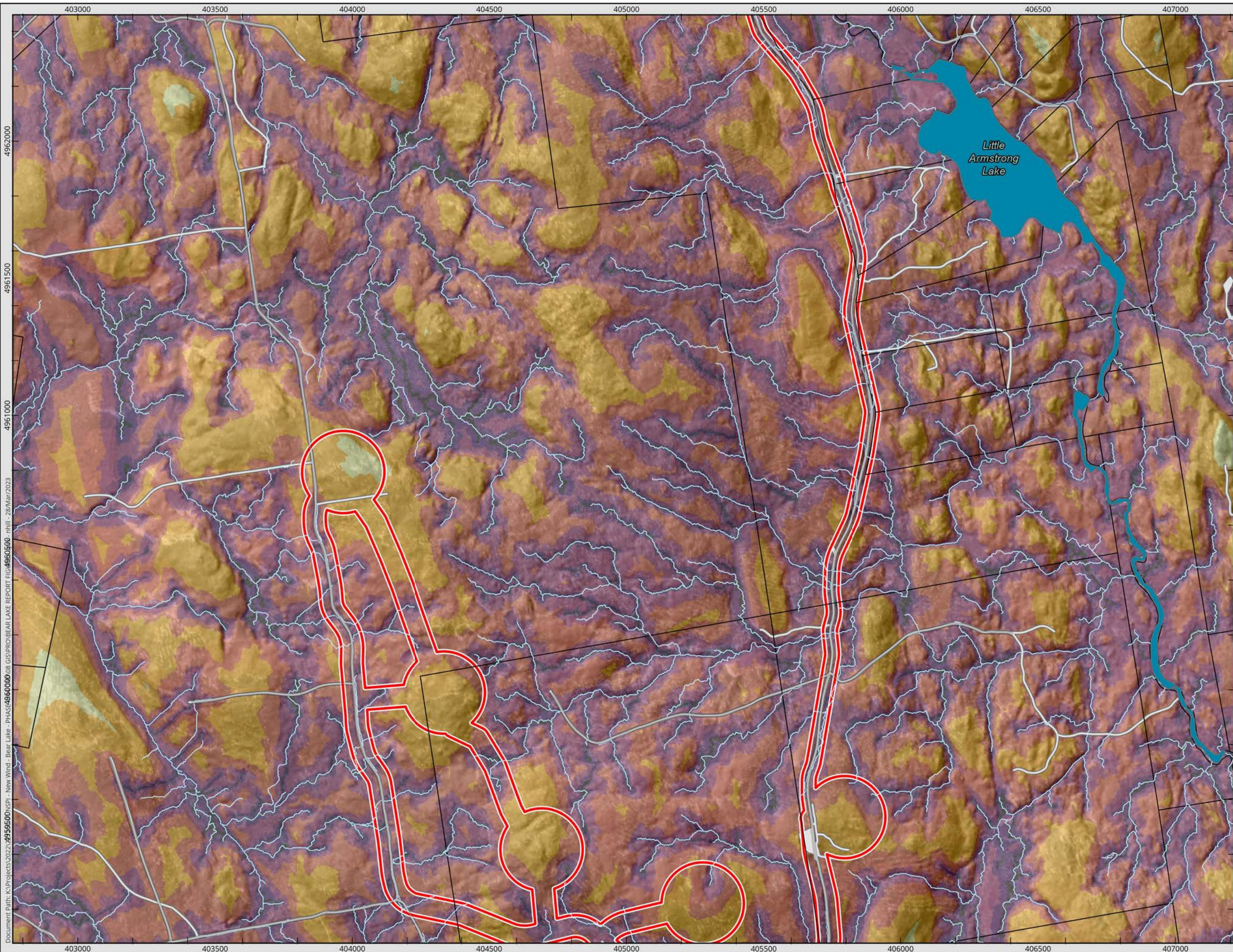
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- DTW Water Flow Path (Min 1 Ha CA)
 - Provincially Mapped Waterbody
 - Study Area (Phase 4)
 - Property Boundaries
 - Roads
- Depth to Water (DTW) Reclassification**
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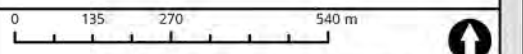


**BEAR LAKE WIND
Vegetation & Wetlands**

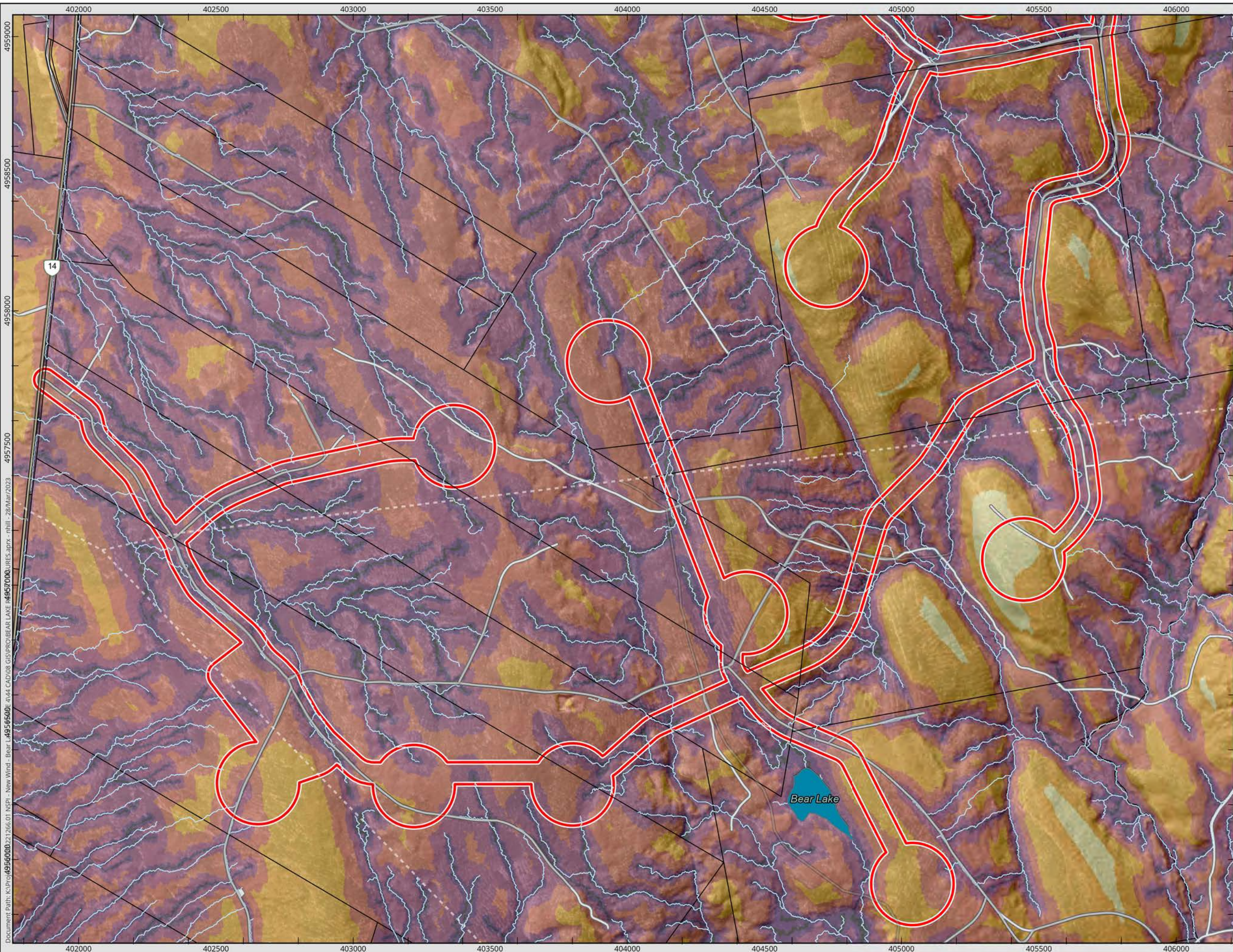
**P-ELC Component Overview
Depth to Water Reclassification
(Page 3 of 4)**












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-  DTW Water Flow Path (Min 1 Ha CA)
 -  Provincially Mapped Waterbody
 -  Study Area (Phase 4)
 -  Property Boundaries
 -  Roads
- Depth to Water (DTW) Reclassification**
-  100
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 -  600

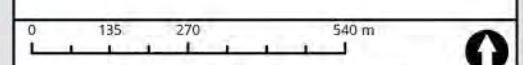


**BEAR LAKE WIND
Vegetation & Wetlands**

**P-ELC Component Overview
Depth to Water Reclassification
(Page 4 of 4)**

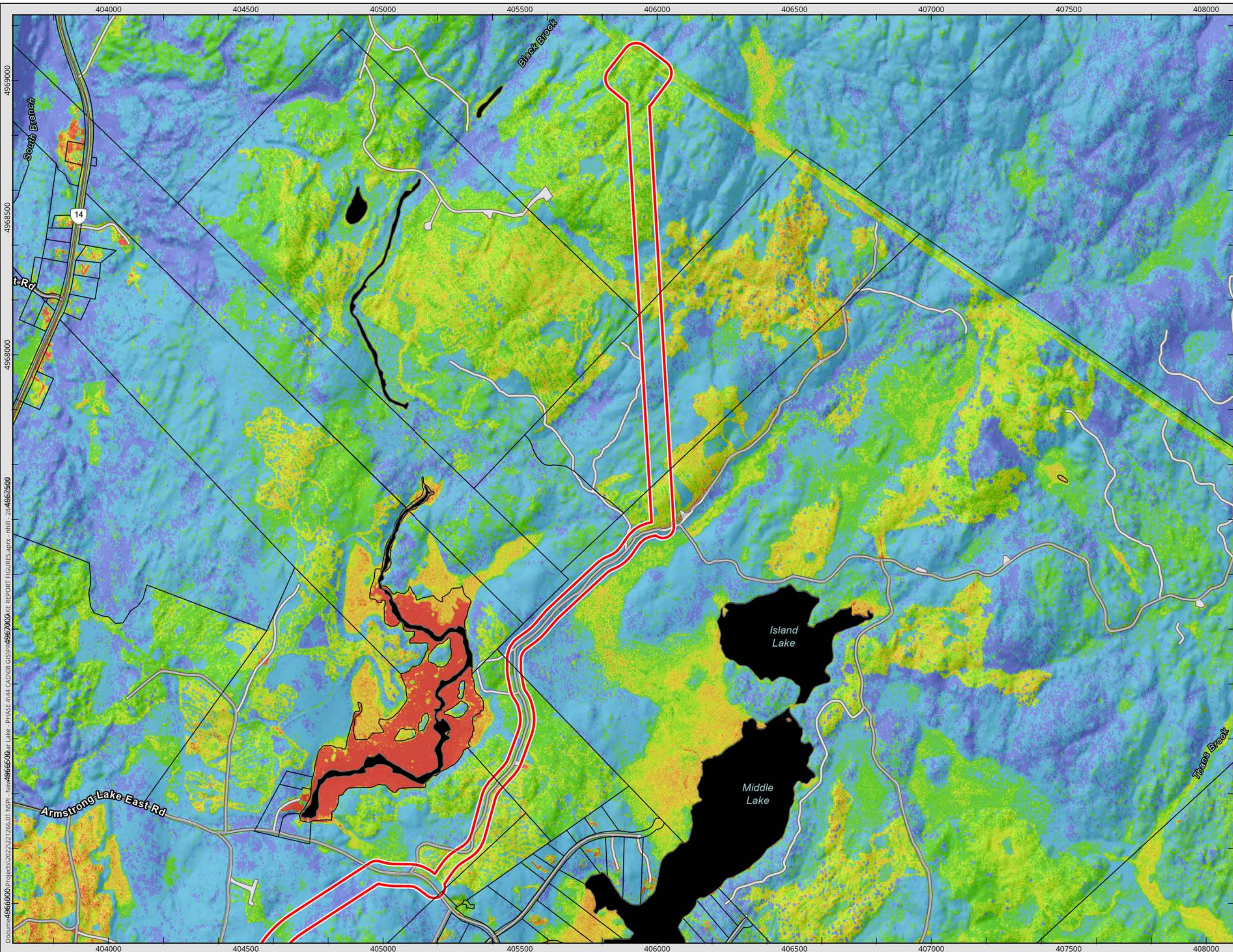
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-  Property Boundaries
-  Study Area (Phase 4)
-  Roads
-  Provincially Mapped Waterbody

Canopy Height Model (CHM)
Reclassification

	10
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**BEAR LAKE WIND
Vegetation & Wetlands**

**P-ELC Component Overview
Canopy Height Reclassification
(Page 1 of 4)**

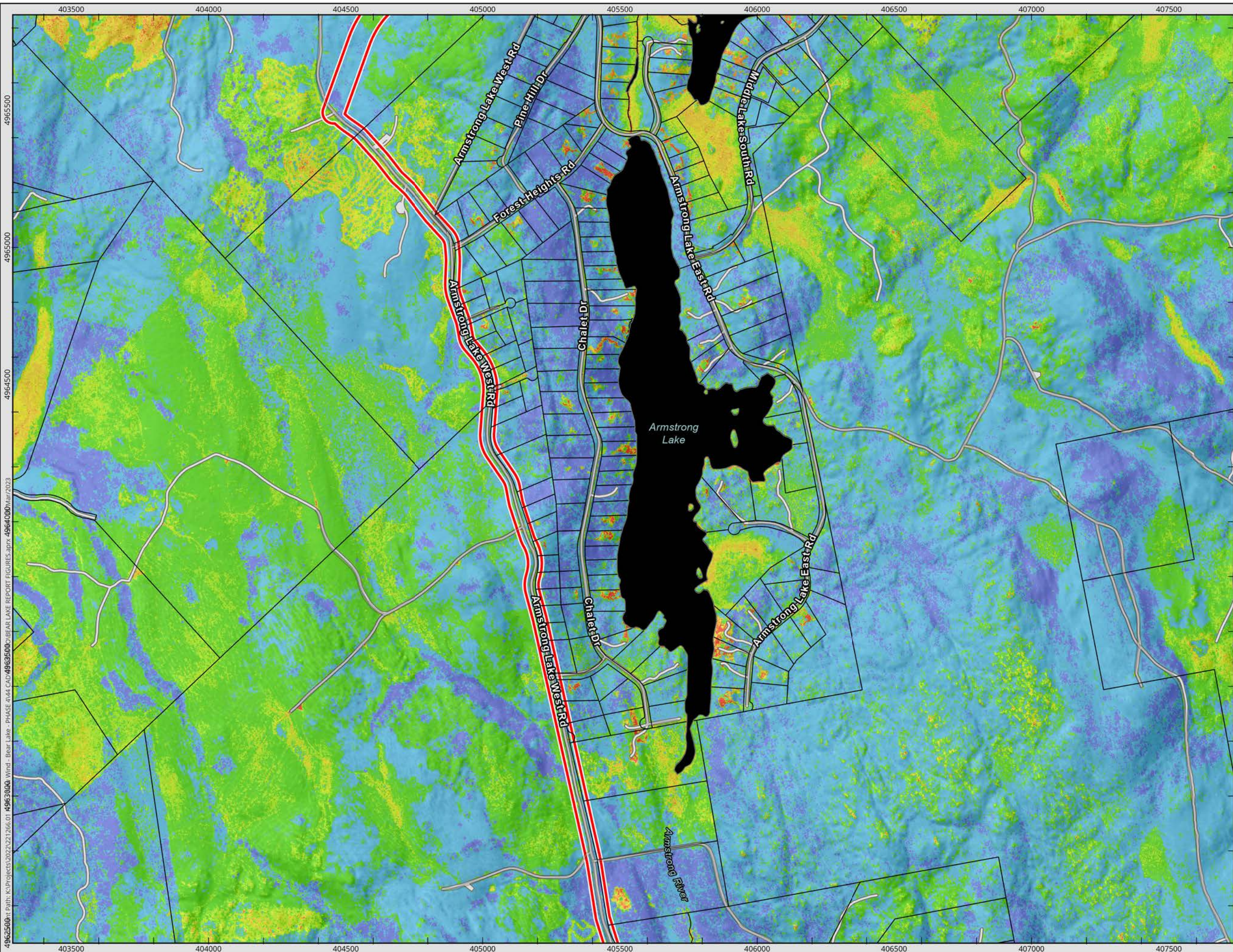
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-  Property Boundaries
 -  Study Area (Phase 4)
 -  Roads
 -  Provincially Mapped Waterbody
- Canopy Height Model (CHM)
- Reclassification
-  10
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**BEAR LAKE WIND
Vegetation & Wetlands**


**P-ELC Component Overview
Canopy Height Reclassification
(Page 2 of 4)**

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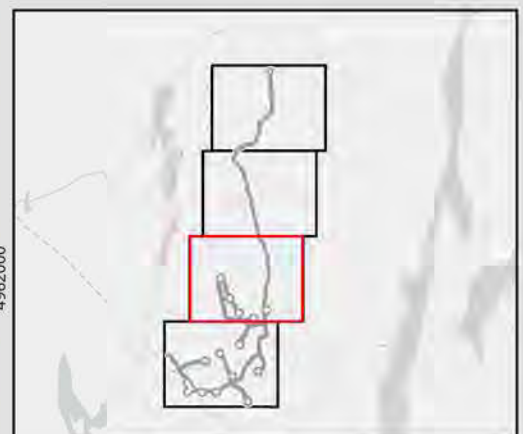
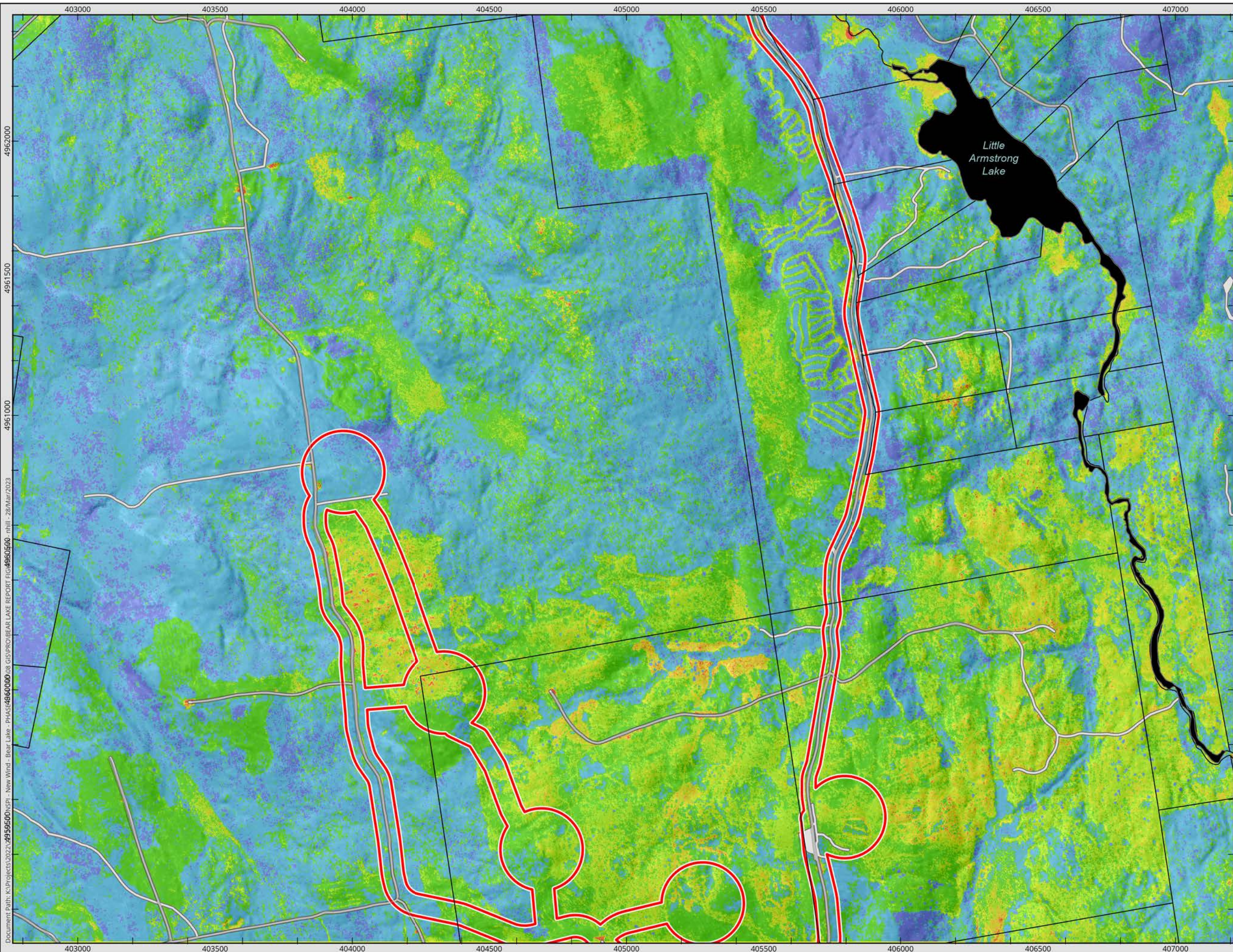
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- Property Boundaries
- Study Area (Phase 4)
- Roads
- Provincially Mapped Waterbody

Canopy Height Model (CHM)
 Reclassification

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**BEAR LAKE WIND
 Vegetation & Wetlands**

**P-ELC Component Overview
 Canopy Height Reclassification
 (Page 3 of 4)**

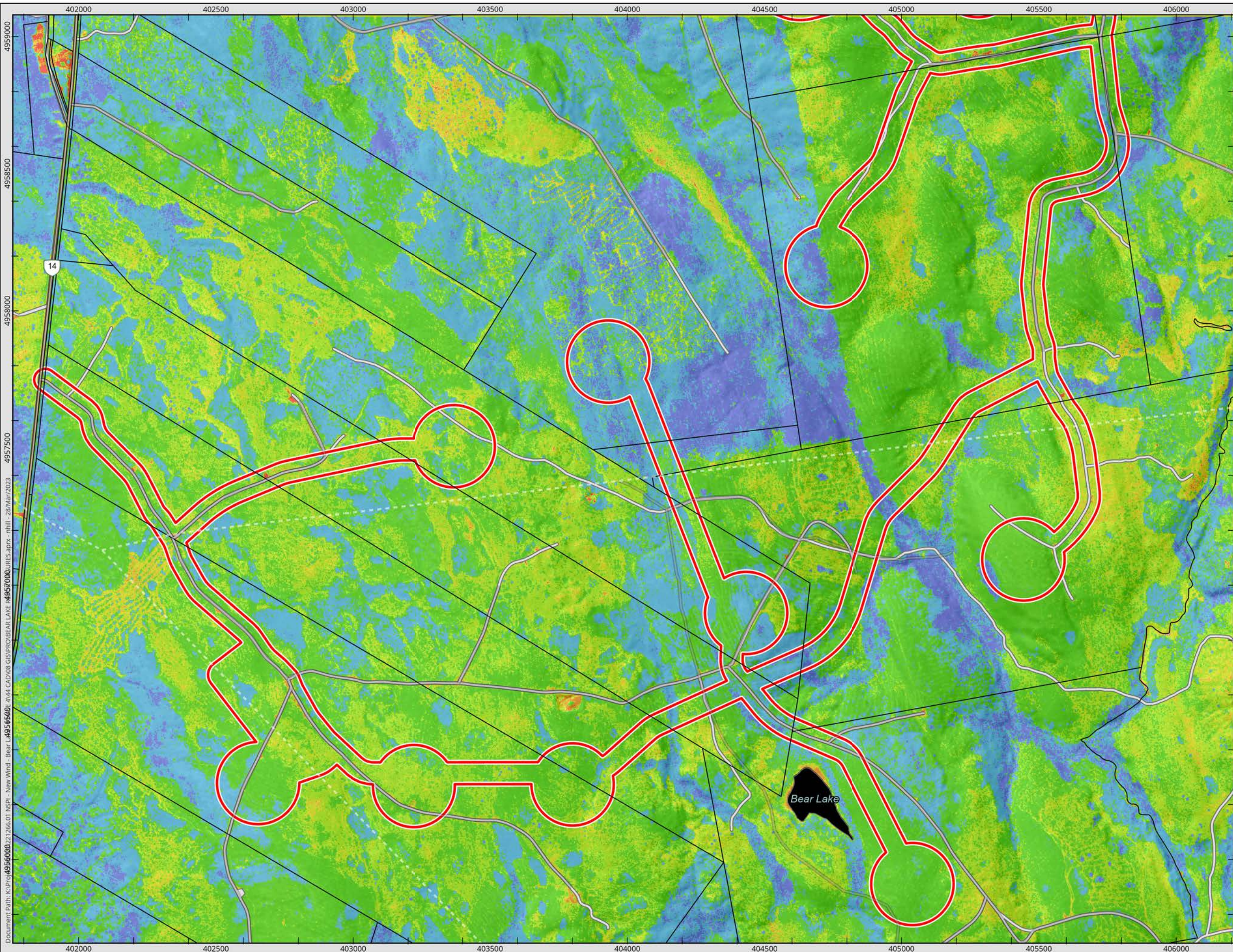
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-  Property Boundaries
-  Study Area (Phase 4)
-  Roads
-  Provincially Mapped Waterbody

Canopy Height Model (CHM)
 Reclassification

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	80
	90



**BEAR LAKE WIND
 Vegetation & Wetlands**

**P-ELC Component Overview
 Canopy Height Reclassification
 (Page 4 of 4)**

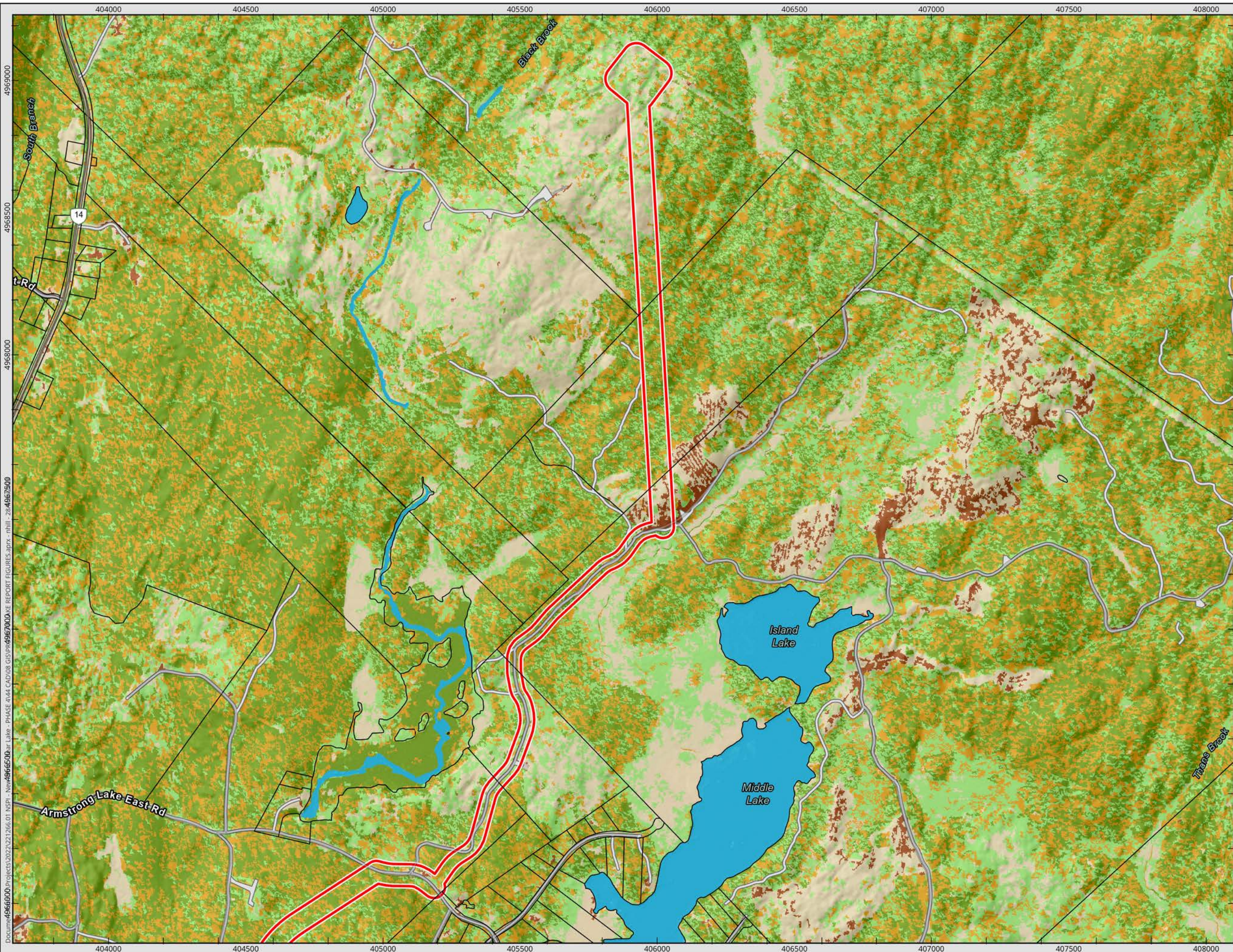
DATE: 2023-03-28	PROJ N°: 221265.01	FIGURE: 6-8
DRAWN BY: NH	CHECKED BY: BC	APPROVED: IB

NOTES:

0 135 270 540 m

SCALE: 1:13,000 Coordinate System: NAD 1983 CSRS UTM Zone 20N
 Units: Meter

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-  Property Boundaries
-  Study Area (Phase 4)
-  Roads
- Major Landcover**
-  Bare Ground/ Moss/ Gramminoid
-  Broadleaf/ Gramminoid
-  Broadleaf
-  Mixed
-  Coniferous
-  Water

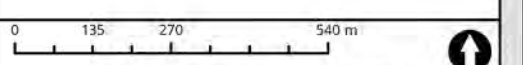


**BEAR LAKE WIND
Vegetation & Wetlands**

**P-ELC Component Overview
Major Landcover (Page 1 of 4)**

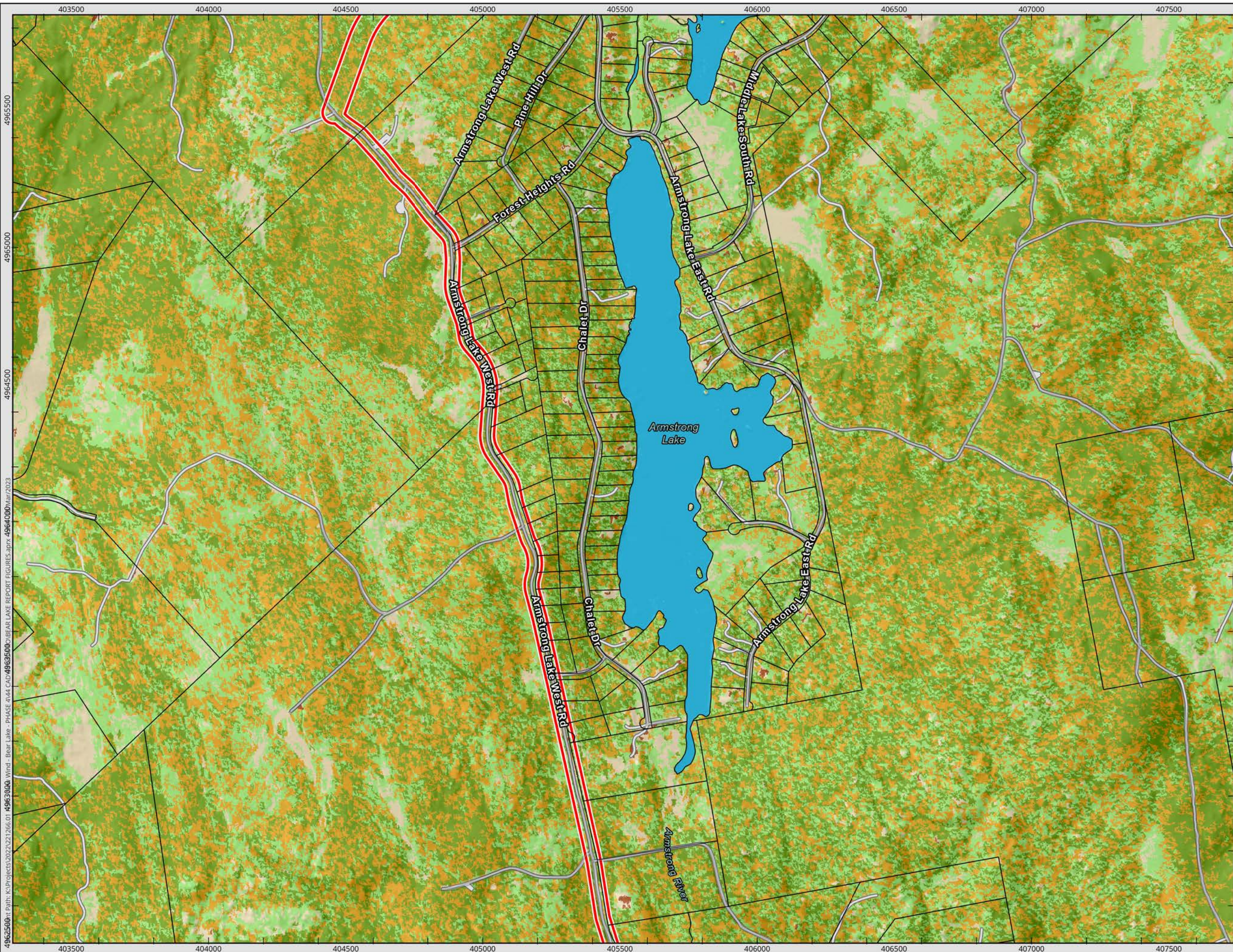
DATE: 2023-03-28	PROJ N°: 221266.01	FIGURE: 6-9
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NOTES:



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Units: Meter

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-  Property Boundaries
-  Study Area (Phase 4)
-  Roads
- Major Landcover**
-  Bare Ground/ Moss/ Graminoid
-  Broadleaf/ Graminoid
-  Broadleaf
-  Mixed
-  Coniferous
-  Water

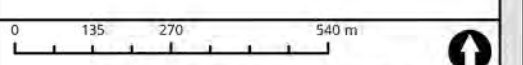


**BEAR LAKE WIND
Vegetation & Wetlands**

**P-ELC Component Overview
Major Landcover (Page 2 of 4)**

DATE: 2023-03-28	PROJ N ^o : 221266.01	FIGURE: 6-10
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NOTES:



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-  Property Boundaries
-  Study Area (Phase 4)
-  Roads
- Major Landcover**
-  Bare Ground/ Moss/ Graminoid
-  Broadleaf/ Graminoid
-  Broadleaf
-  Mixed
-  Coniferous
-  Water

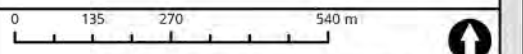


**BEAR LAKE WIND
Vegetation & Wetlands**

**P-ELC Component Overview
Major Landcover (Page 3 of 4)**

DATE: 2023-03-28	PROJ N ^o : 221266.01	FIGURE: 6-11
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NOTES:



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