8.0 WATER RESOURCES

8.1 Surface Water and Floodplain Resources

8.1.1 Existing Resources

The project area is in the upper reaches of the Dead River watershed. The subwatersheds that make up this area include the headwaters of Spencer Stream and streams that flow into the North Branch of the Dead River. Kibby Stream, located between Kibby Range and Kibby Mountain, is the largest water body in the project area and flows into Spencer Stream, which in turn is tributary to the Lower Dead River. Like most of the smaller streams in the area, it has a rocky substrate at the higher elevations, flowing over boulders and cobbles, with few stretches of flat water. Many other smaller streams, mostly unnamed, flow from the mountains. Gold Brook is one of the named smaller streams, and it drains into the North Branch of the Dead River.

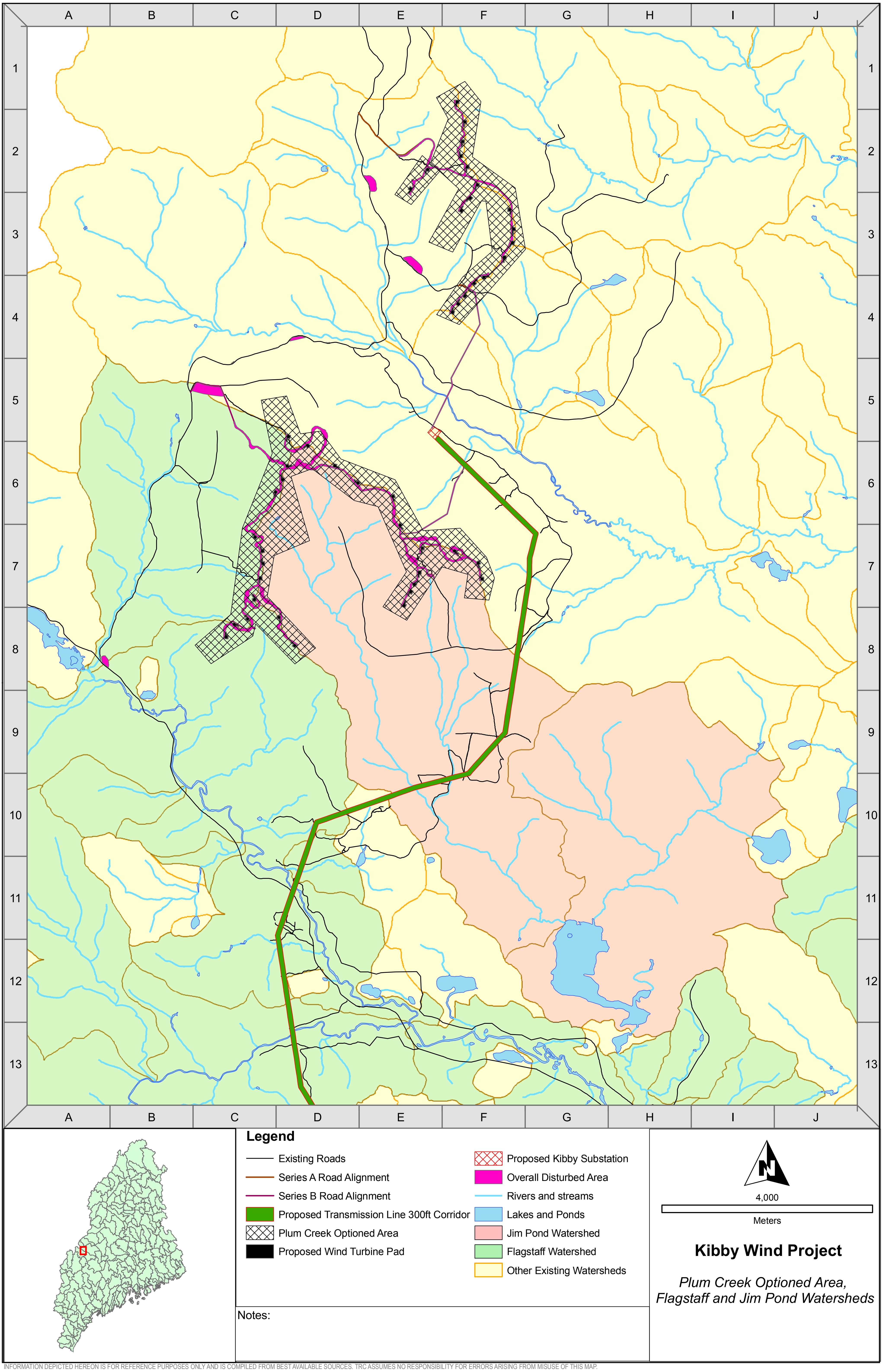
There are two great ponds close to the project area, Hurricane Pond and Douglas Pond. These are relatively small (20 acres each) and are relatively shallow, with maximum depths of 11 feet and 3 feet, respectively. The project is not in the watersheds of these ponds. The project is within two other great pond watersheds: Jim Pond and Flagstaff Lake (Figure 8-1). Specifically, Northwest Inlet, which drains into Jim Pond, has headwaters on the south side of Kibby Range. Streams draining the western side of Kibby Range are in the North Branch of the Dead River watershed, which in turn drains into Flagstaff Lake. This includes Gold Brook.

The project area is not within a mapped floodplain, and is located primarily in headwater areas. Waterbodies in this area are primarily minor flowing waters, as defined in Chapter 10. These are mostly first and second order streams with high gradients, which typically do not have significant floodplains associated with them. Descriptions of streams are included in the wetland discussion provided in Section 8.5.

8.1.2 Anticipated Construction Impact

Direct impact to surface water will be limited to roadway construction across one perennial and several intermittent stream channels within the B Series construction area (as discussed in detail in Section 8.5). In such locations, the crossing has been selected to minimize the area of potential impact to stream and associated wetland resources. Crossing standards, as found in Section 10.27,D of Chapter 10, will be followed at these crossing locations. Temporary measures like equipment mats will be used to span streams during initial construction efforts. Construction will include installation of drainage features, including culverts or bridges in areas of channelized flow that will allow for the continued unimpeded movement of water through these channels. No floodplain areas will be influenced by construction that would cause the potential for downstream flooding to increase.

Direct and indirect effects to surface waters will be minimized through the use of erosion and sedimentation control measures in accordance with 10.25,M of Chapter 10. These measures,



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addressed below and in Section 2.5, will prevent siltation of local stream channels and will ensure that ground conditions remain stable throughout the construction effort. Vehicle use and construction activities will be limited to a pre-defined work area. Since establishing the road and associated drainage system will be among the earliest activities conducted at the site, the potential for accidental spill of construction materials can also be controlled. Each construction vehicle will include spill kits for immediate response in the event of an unanticipated spill. The potential for effect to surface water bodies is low.

8.1.3 Anticipated Operational Impact

Once construction is complete, no impact to surface water bodies or floodplains is anticipated. Drainage features will be incorporated into roadway design to ensure the unimpeded flow of water, and ground stabilization will limit the potential for erosion and siltation. Stormwater runoff from project features with discharge to natural, undisturbed vegetated buffers. Although small quantities of lubricating oils and other supplies will be used for maintenance at the turbine sites, a spill prevention plan (addressed in Section 8.2.4) will be implemented to ensure that potential for associated impact is minimal.

8.2 Groundwater Resources

8.2.1 Existing Resources

At present, there is no published groundwater information available for the proposed wind turbine site. Based on observations during field programs, the surface groundwater table at the site is typically located less than 10 feet (3 m) from the surface. Sand and gravel aquifer mapping (Maine Geological Survey 1981) is available for the regions surrounding the proposed site, as discussed below.

The area surrounding the Kibby Wind Power Project site is located in a geologically low-grade metamorphic region. The bedrock is characterized by Precambrian gneiss and breccia. These fractured gneisses are presumed to transmit groundwater to produce well yields of low to moderate flow volumes, suitable for domestic use. The surficial soils of the general area, as interpreted from surficial materials maps from the Merrill Mountain, Jim Pond and Stratton quadrangles are of glacial outwash sand and gravel deposits with esker deposits located in the bottoms of the major stream valleys. These deposits are most likely sand and gravel aquifers, though no information exists on their thickness or potential yields. Other sand and gravel deposits that have been mapped within the area are unlikely sources of significant groundwater due to their limited extent and occurrence at higher slope elevations.

Surficial sand and gravel deposits with a moderate to good potential groundwater yield of greater than 10 gpm are within the Chain of Ponds area located approximately 2 miles (3.2 km) west of the project site. These deposits consist of glacial sand and gravel but can include areas of sandy till and alluvium, which may exceed 50 gpm in deposits hydraulically connected with surface-water bodies, or in extensive subsurface deposits. The quality of the groundwater within these surficial deposits is currently unknown.

Based on available information, it is anticipated that well yields will be greater from sand and gravel deposits along river valleys. Well yields at higher elevations are anticipated to be lower and are unknown. The depth to groundwater will be determined as part of geotechnical investigations conducted prior to final design.

8.2.2 Anticipated Construction Impact

It is expected that shallow groundwater will be encountered during construction activities. Temporary dewatering of excavations for foundations may occur in high groundwater table areas. However, this will have only negligible, short-term impacts on the groundwater table, and will be limited to within a few feet of the excavation itself. Appropriate BMPs will be used to ensure that discharge of intercepted groundwater is controlled for erosion and sedimentation potential. Shallow groundwater flow will be maintained to the extent possible during construction via planned stormwater control measures, as discussed in Section 8.6.

Groundwater will be utilized during construction for batch plant operations. Approximately 28,000 gallons per 8-hour period is estimated to be required during the period of construction that is focused on foundation installation. A groundwater well (yielding approximately 60 gpm) will be established proximate to the location of the permanent service building so the established well can be transitioned to potable use following completion of construction. A water storage tank will be provided in order to regulate the use of the groundwater well and meet construction requirements. The well would not be expected to measurably diminish local groundwater resources. Sanitary water use will also occur during construction, and will utilize the well established for the batch plant in addition to the well proposed to provide water for the service building (discussed in Section 8.2.3). Water for other construction uses (for example, dust control) may be trucked to the site by off-site vendors, as required and will not impact local groundwater supplies.

Indirect impact potential for groundwater due to unanticipated spills will be limited as discussed in Section 8.2.4.

8.2.3 Anticipated Operational Impact

Following construction, water use from the on-site well will be limited to potable needs associated with the service building. With a maximum of 15 employees, water demand will be extremely low.

Sanitary wastewater disposal from the service building will be treated via an on-site septic system, as discussed further below.

Measures to ensure that groundwater quality is protected from accidental spills are addressed in Section 8.2.4.

TransCanada will maintain the proposed cleared areas with a minimal amount of disturbance and alteration of existing habitats necessary, with little or no potential for adverse groundwater impacts due to long-term vegetation maintenance. Once construction is completed, there will be little need for vegetation management along the ridgelines. Vegetation will be allowed to reestablish in the laydown areas, on cut and fill slopes, and along the shoulders of access roads. Growth of trees capable of growing into electrical conductors along the route of the electrical connections will be prevented through periodic mechanized cutting, and a basal stem herbicide may be used to prevent re-sprouting of cut hardwood stems. In general, the use of herbicides for long-term vegetation management will be kept to a minimum for this project. Only herbicides that are registered with U.S. EPA and the Maine Pesticide Control Board and approved for this use will be utilized. All herbicide applications will be carried out by licensed applicators in accordance with approved procedures.

The Kibby Wind Power Project will not significantly alter existing surface water drainage characteristics, as discussed in Section 8.6. Groundwater recharge characteristics will not be permanently affected by the operation of the project. Temporary impacts to surface water drainage are likely to occur during construction, but will be minimized through the appropriate application of best management practices. To ensure that the use of petroleum and hydrocarbon products during construction and operation will not impact groundwater quality, a detailed spill prevention control and countermeasures (SPCC) plan will be developed and implemented, as discussed in Section 8.2.4. Accordingly, neither construction nor operation of the project is expected to adversely affect groundwater resources.

8.2.4 Spill Prevention Control and Countermeasures (SPCC)

During the construction phase, the potential sources of contamination will be fuel, and hydraulic and lubricating oils used in the operation of vehicles and construction equipment. Were they to occur, spills of these substances from vehicles or equipment would likely be small and of short duration and, when properly cleaned up, would not pose any risk to groundwater quality. Procedures for handling these substances and preventing spills will be addressed in a project-specific protocol to be provided to the contractor prior to beginning construction. These plans, to be provided with the final development approval application, will include descriptive procedures for safe storage and handling of materials in order to prevent spills, and to address the event of a spill, will include spill reporting procedures, emergency contact phone numbers (including state and federal agencies), and oil spill cleanup guidelines. Employees will be trained to promptly contain, report, and clean up any spills of oil or hazardous materials in accordance with these procedures. In addition, as a standard operating procedure, all operational vehicles will carry an oil spill kit that contains materials for conducting initial containment and clean up of spills.

Routine operation and maintenance of the wind turbines and substation will involve the use of common lubricants, petroleum products, or other chemical products. These products will be integral to the equipment used on site, such as in oil-filled transformers, capacitors, batteries or other apparatus. As required by 40 CFR Part 112.3(b), an SPCC Plan will be developed for the proposed substation and turbine transformers within six months of beginning oil storage activities at the site.

Storage of containerized chemical products used for maintenance on turbine and substation sites is limited, incidental and contained within the service building. Examples of these products include lubricating oils, aerosol lubricants, pesticides, herbicides, fertilizer or other products not stored on site.

8.3 Water Supply

8.3.1 Project Water Needs

Activities undertaken during the project construction requiring the use of water include:

- Water used for fugitive dust control on access and on-site roads;
- Water used for mixing concrete for the turbine foundations, substation, and service building foundations; and
- Water used by the construction crew.

During project operations, water demand will be even more limited. Potable water will be supplied to the service building, for use by operations and maintenance personnel. Uses will include washing, vehicle maintenance, and potable use.

Anticipated water use, both during construction and operations, is provided in Table 8-1.

Table 8-1: Estimated Water Use Requirements

Building	Number of People	Sanitary Water Use/Person (gpd) [1]	Total Potable Water Use (gpd)	Estimated Total Water Use/ 8 Hours [2]	Estimated Well Yield Required (gpm) [2]
Construction Control Center and Parking	150	15	2,250	2,250	5
Service Building Area	15	15	225	225	1
Potential Concrete Batch Plant and Material Handling Storage Area (3)	N/A	N/A	N/A	28,000[3]	60

[1] Water Use/Person of 15 gallons per day (gpd) is based on the design flow for employees at place of employment with no shower.

[2] Numbers were rounded up to the nearest whole number

[3] Assumes 700 cubic yards of concrete required per day for gravity foundations and 40 gallons of water is required per cubic yard of concrete. Assumes that one foundation will be installed per day. A gravity foundation has the highest water use of foundation types under consideration. Note that this is the worst case, as it is anticipated that a socket foundation will be used, requiring 400 cubic yard per day during construction.

8.3.2 Proposed Water Source

The water necessary for dust control and incidental construction uses would be trucked in by construction crews. Water needs associated with on-site concrete mixing will be met by establishing an on-site groundwater well and utilizing water storage. Construction crews will be responsible for provision of their own potable water to the wind turbine site.

Water for operations and maintenance personnel (up to 15 people) will be supplied at the proposed service building utilizing the same well used during the construction period. As noted in Table 8-1, water demand on that well will be low.

8.3.3 Impact Evaluation

The groundwater well will be sited in a location where sufficient water is available without impact on nearby surface waters or other groundwater well users, and in accordance with applicable LURC standards. Based on the minimal water demand proposed for operations, the required water quantities will not significantly impact the project area aquifers or surface waters.

8.4 Wastewater

8.4.1 Characterization of Project Wastewater

During the construction phase, sanitary facilities would be provided by portable latrines or flush toilets with holding tanks located at the construction control center. Wastewater will be collected on a regular basis and transported via a licensed hauler to be disposed in an existing municipal sewage treatment facility.

The service building will have a toilet and washbasin, the effluent of which will be treated by a conventional septic system consisting of a septic tank and leachfield as required by the Maine State Plumbing code. Table 8-2 provides information about anticipated system characteristics.

Table 8-2: Estimated Sanitary System Requirements

Building	Number of People	Total Sanitary System Requirements (gpd) [2]
Construction Control Center and Parking (temporary during construction)	150	2,250
Service Building Area	15	225
Potential Concrete Batch Plant and Material Handling Storage Area[1]	NA	NA

[1] Water Use/Person of 15 gallons per day (gpd) is based on the design flow for employees at place of employment with no shower listed in Table 501.2- Design flow for other facilities in Chapter 5 of the Maine Subsurface Waste Water Disposal Rules 10-144 CMR 24

[2] Numbers were rounded up to the nearest whole number

8.4.2 Impact Evaluation

Based on the minimal wastewater generation for the proposed project, the wastewater quantities produced at the site will not be significant to the project area aquifers or surface waters.

8.5 Wetlands/Vernal Pools

8.5.1 Delineation and Functional Assessment

The study area for wetland and vernal pool identification efforts initially covered the original planned footprint of the proposed project. The study area, however, was expanded throughout stages of project planning as project boundaries were adjusted to avoid identified wetlands and vernal pools. Upon completion of fieldwork, the survey area encompassed approximately 2,883 acres; 443 acres of this area comprise the final project construction area. The resultant wetland study area is depicted in Figure 8-2.

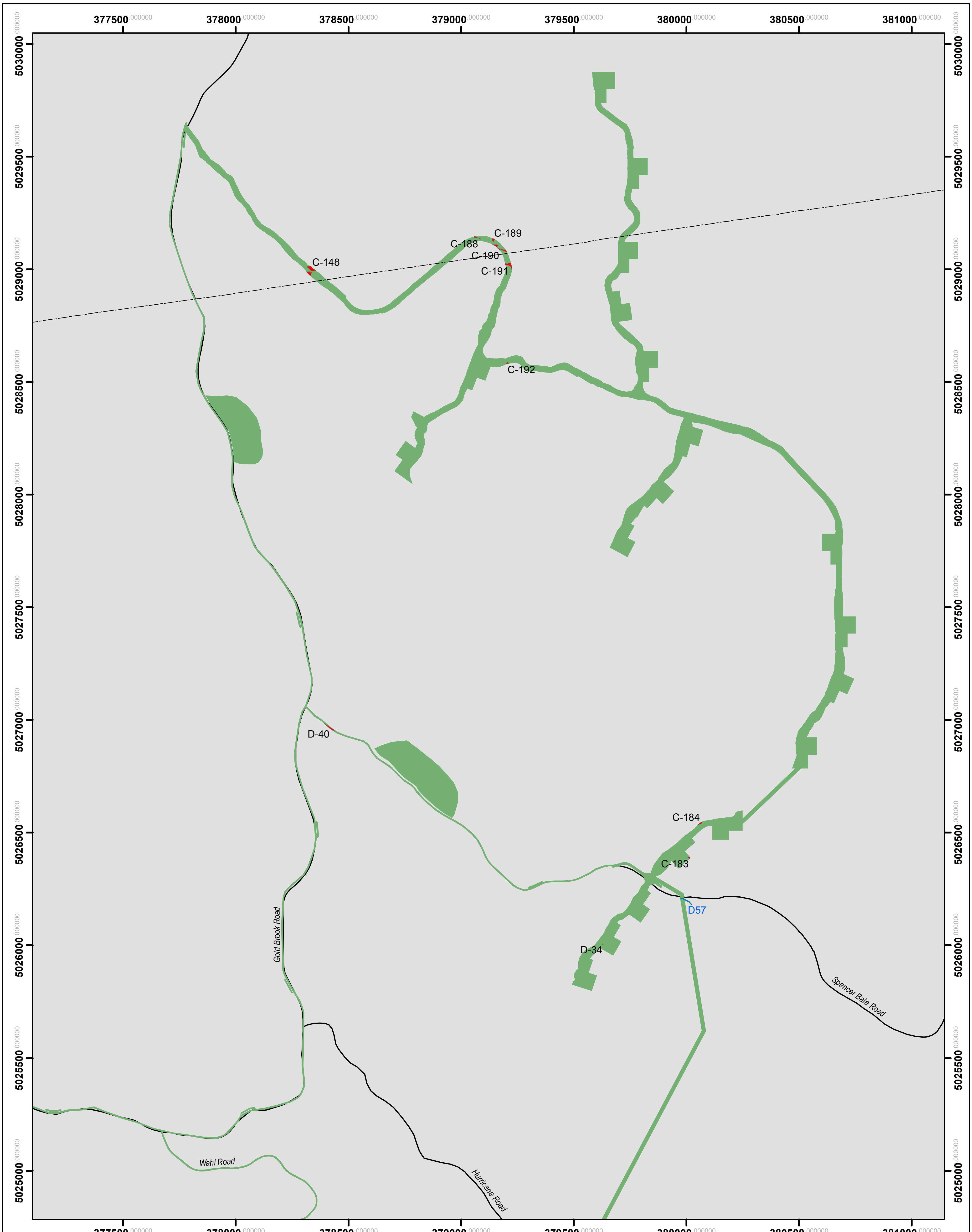
8.5.1.1 Vernal Pools

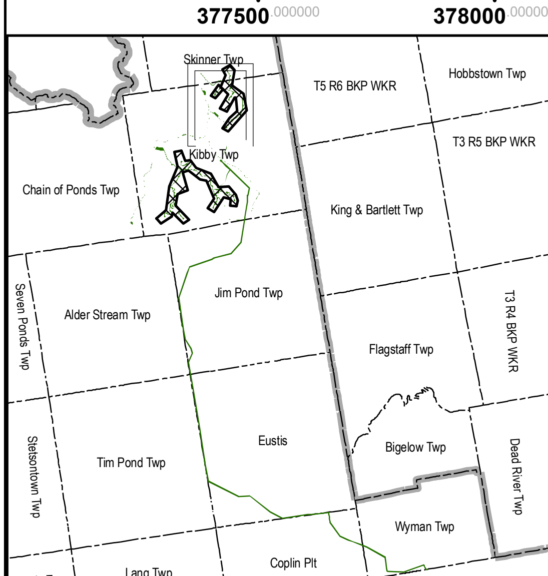
A vernal pool survey was conducted (as presented in Appendix 8-A) during the spring of 2006. The specific purposes of the vernal pool survey were to: 1) identify pools within the potential project area; 2) determine if pools were being used by breeding amphibians; and 3) determine if any of the pools meet the necessary criteria for designation as Significant Vernal Pools in accordance with the DEP Chapter 335 using accepted agency protocols.

A draft protocol for this effort was prepared and distributed to MDIFW, LURC, and USFWS on April 27, 2006. Information and procedures utilized for this protocol were consistent with current agency consensus, and all comments received on the draft protocol were incorporated into the final version. Consistent with protocol requirements, all field efforts for the vernal pool surveys were conducted between May 3, 2006 and May 19, 2006, and within appropriate conditions for such survey efforts.

Using existing information and the sampling methodology described in the protocol, a total of 18 potential vernal pool areas were identified along project ridgelines; each of these locations was assessed to determine if they functioned as vernal pools. Of the 18 total areas identified, 15 contained egg masses but were determined not to be vernal pools (Table 8-3). These areas were deemed not to be vernal pools because they were located in manmade depressions. Most of these manmade pools were in ruts made by skidders or other forest harvesting equipment, and in ditches next to logging roads. Of these 15 manmade non-vernal pools, four contained wood frog egg masses, 10 contained wood frog and spotted salamander egg masses, and one contained wood frog, spotted salamander, and blue-spotted salamander egg masses.

The remaining three natural, functional vernal pools (identified on Table 8-4) were assessed in accordance with both the USACE and Chapter 335 definitions for significant vernal pools. These definitions are detailed in Appendix 8-A.





Legend

- Kibby Wind Power Project Area
- Existing Road
- State Boundary
- County Boundary
- Town Boundary

Resources

- construction_area_streams
- Wetland
- X-### Wetland Identification Number
- X-### Stream Identification Number

Notes: Coordinate Grid: NAD83 UTM, Zone 19N, Meters

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Figure 8-2

Kibby Wind Power Project

Project Layout in Relation to Resources

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Table 8-3: Non-Vernal Pools

I.D. Label	Setting	How Created (if man-made)	Forested Buffer[1]	Location
A2	Man-made	Old logging road	No, clear cut	Ridgeline
A3	Man-made	Old logging road	No, clear cut	Ridgeline
A4	Man-made	Skidder ruts	Sparse (5%)	Ridgeline
A5	Man-made	Skidder ruts	Sparse (5%)	Ridgeline
A6	Man-made	Skidder ruts	Sparse (5%)	Ridgeline
A7	Man-made	Skidder ruts	Sparse (5%)	Ridgeline
B6	Man-made	Ditch next to logging road	Dense (90%)	Ridgeline
B7	Man-made	Borrow pit next to woods road	Dense (90%)	Ridgeline
B9	Man-made	Ditch next to logging road	No	Ridgeline
B10	Man-made	Skidder ruts	No	Ridgeline
B11	Man-made	Skidder ruts	No	Ridgeline
B12	Man-made	Skidder ruts	No	Ridgeline
B13	Man-made	Skidder ruts	No	Ridgeline
B14	Man-made	Skidder ruts	No	Ridgeline
B19	Man-made	Skidder ruts	Dense (80%)	Transmission

[1]When present, forested buffer given as percent of total critical upland/wetland habitat around the assessed area.

Table 8-4: Natural, Functional Vernal Pools in the Proposed Project Area

I.D. Label	Setting (Isolated Upland, Wetland Complex, Beaver Dam, Floodplain)	Size (in feet)[1]	Location	Significant Vernal Pool (Chapter 335)
A1[2]	Wetland Complex	Several acres	Ridgeline	No
A8	Isolated Upland	80 x 30	Ridgeline	No
B8	Wetland Complex	20 x 15	Ridgeline	No

[1] Vernal pool dimensions are presented in feet, with the exception of A1, which is up to several acres in size.

[2] Meets USACE vernal pool definition only, not the Chapter 335 definition.

The USACE and Maine NRPA Chapter 335 definitions are as follows:

USACE Programmatic General Permit

> *"Temporary to permanent bodies of water occurring in shallow depressions that fills during the spring and fall and may dry during the summer. Vernal pools have no permanent or viable populations of predatory fish. Vernal pools provide the primary breeding habitat for wood frogs, spotted salamanders, blue-spotted salamanders, and fairy shrimp, and provide habitat for other wildlife including several endangered and threatened species."*

Maine NRPA Chapter 335

> *"A vernal pool, also referred to as a seasonal forest pool, is a natural, temporary to semi-permanent body of water occurring in a shallow depression that typically fills during the spring or fall and may dry during the summer. Vernal pools have no permanent inlet and no viable populations of predatory fish. A vernal pool may provide the primary breeding habitat for wood frogs (Rana sylvatica), spotted salamander (Ambystoma maculatum), blue-spotted salamanders (Ambystoma laterale) and fairy shrimp (Eubranchipus* sp.*), as well as valuable habitat for other plants and wildlife including several rare, threatened, and endangered species. A vernal pool intentionally created for the purposes of compensatory mitigation is included in this definition."*

Based on field observations, none of these vernal pools appeared to be man-made and all were functioning as vernal pool habitat. Pool A8 contained wood frog egg masses, Pool B8 contained wood frog and spotted salamander egg masses, and Pool A1 contained wood frog, spotted salamander, and blue-spotted salamander egg masses. Pools A1 and B8 occurred as part of larger wetland complexes, ranging in size from several feet in diameter to several acres. Pool A8 was located in an isolated upland setting. Based upon the assessment of DEP and USACE criteria, none of these three natural, functional pools meets the threshold criteria for designation as significant vernal pools.

Pool A1 met the USACE definition of a vernal pool, but did not meet the definition of a vernal pool as described in Chapter 335. Consistent with the USACE definition, A1 is a permanent body of water with no permanent or viable populations of predatory fish. It is very shallow (2 to 3 feet [0.6 to 0.9 m] deep) and, therefore, likely freezes solid during most winters. This pool also has poor water quality for fish. During the spring 2006 survey, Pool A1 was observed to be a breeding habitat for wood frog (600+ egg masses), spotted salamander (70+ egg masses), and blue-spotted salamander (two egg masses). A1 did not meet the definition of a vernal pool under Chapter 335 because: 1) it is permanent rather than semi-permanent body of water; and 2) it has three permanent inlets. However, consistent with Chapter 305 of the Natural Resources Protection Act, A1 is a freshwater wetland of special significance because it contains >20,000 square feet of open water habitat, and is included in the LURC subdistricts PWL-1 and PSL-2.

In addition to identifying potential vernal pools, field crews were instructed to document (if encountered) a suite of state listed species to serve as indicators of significant vernal pools. These species include:

- Ringed boghaunter (dragonfly) – state-listed endangered
- Spotted turtle – state-listed threatened
- Blanding's turtle – state-listed endangered
- Ribbon snake – state-listed special concern
- Wood turtle – state-listed special concern

None of the indicator species listed above were observed during field surveys.

8.5.1.2 Wetlands

<u>Methodology</u>

Wetland and stream delineation and mapping surveys were conducted during the summer and fall of 2006.

The specific objectives of wetland and stream resource surveys were to: 1) identify, delineate, and map wetlands and streams located within the proposed project area; and 2) determine their federal and state jurisdictional status. This information has also been used to analyze project development alternatives to avoid and minimize impacts to wetlands and streams to the maximum extent practicable.

Delineation methodologies and selected boundaries have been confirmed by agency staff from the LURC and USACE, as well as the Maine State Soil Scientist during field visits conducted following completion of survey activities. DEP staff has similarly reviewed delineations along the 115 kV transmission line, as discussed in Volume V.

In preparation for field surveys, National Wetland Inventory (NWI) maps prepared by the USFWS, USGS topographic maps, and available Soil Survey maps produced by the Natural Resources Conservation Service (NRCS) were reviewed to gather background information on the proposed project area. In addition, data collected during spring vernal pool surveys (conducted during May 2006) were reviewed to determine the potential presence of wetlands. After evaluating the available data and the nature of the proposed project, the "Routine On-Site Determination Method" described in the USACE Wetland Delineation Manual (USACE 1987) was selected as the most appropriate wetland delineation technique.

Following the review of background information, wetland and soil scientists performed wetland field studies to determine the types and extent of wetlands located within the proposed project area. The delineation procedure began with general reconnaissance to identify topographical features and obvious vegetation patterns that would indicate the potential presence of jurisdictional wetlands. Once a potential wetland area was identified, field crews thoroughly examined and assessed soils, vegetation, and hydrology indicators to determine if they were indicative of wetland conditions. All wetlands were classified in the field using the USFWS classification system (Cowardin et al. 1979). This system categorizes wetlands based on physical characteristics such as plant cover and hydrology. Wetlands found in the project area are classified as Palustrine Scrub-shrub (PSS), Palustrine Forested (PFO), and Palustrine Emergent (PEM). The majority of the delineation work was conducted during June, July, and August 2006, with additional follow-up work performed in September, October, and November 2006. All of the wetlands within the proposed project area were mapped to facilitate access planning and ensure that potential impacts are avoided and minimized to the maximum extent during the engineering design of project elements.

In addition to the wetland delineation and mapping work, a quality assurance/quality control (QA/AC) review was performed in the fall of 2006. This QA/QC review involved conducting field inspections of randomly selected wetlands that had been mapped during the summer of 2006 to ensure that these areas had been correctly delineated and characterized.

Specific methods for characterizing and evaluating soils, vegetation, and hydrology within each wetland were as follows:

- **Soils** – At each sampling location, a soil auger or tile spade was used to extract a sample to examine the soil for evidence of hydric indicators. Soils were characterized by determining texture, structure, and color. Soil matrix colors were identified by using a Munsell Soil Color Chart (Munsell Color 1993), and hydric indicators such as mottling, gleying, organic matter accumulation, drainage class, and oxidized rhizospheres were noted. In addition, hydric soil criteria were assigned in accordance with the manual *Field Indicators for Identifying Hydric Soils in New England – Version 3* (NEIWPCC 2004).

- **Vegetation** – Dominant plant species in each major vegetation stratum (tree, sapling/shrub, and herbaceous) within the study area were identified and listed. Each plant's wetland indicator status (e.g., OBL, FACW, FAC, FACU, and UPL) was assigned using the USFWS National List of Plant Species that Occur in Wetlands, Region 1 (Reed 1988) to determine if there was a prevalence of hydrophytic vegetation at the site.

- **Hydrology** – Each sampling location was examined for evidence of wetland hydrology. Indicators of wetland hydrology generally include the presence of hummocks, watermarks on vegetation, drift lines, sediment deposits, standing water, soil saturation within 12 inches of the mineral soil surface, and drainage patterns within the wetland.

Surveys were performed by four, three-person field crews that each consisted of two wetland scientists and one environmental technician/GPS operator. Following analysis of soils, hydrology, and vegetation at each potential wetland, a determination was made as to whether or not the site met the criteria for designation as a wetland. Through observation of these three parameters, the approximate wetland boundary was identified and flagged. Streams were identified using the definition of a "river, stream or brook" as described in the NRPA – Statute. All stream channels were marked with flags as well. For streams with bank-to-bank widths greater than 10 feet (3 m), flags were placed on vegetation at the top of each bank. For streams with bank-to-bank widths less than 10 feet (3 m), flags were installed on overhanging vegetation to mark the approximate centerline. In general, flags were installed at each bend in the stream channel. Best professional judgment was used to determine if each stream was perennial or intermittent. Wetland boundaries and streams were recorded using GPS units. All GPS data were corrected using commercial base station control points to ensure a high level of mapping accuracy.

Results

A total of 115 palustrine wetlands were identified, delineated, and mapped in the study area. 26 of these wetlands were identified as P-WL1 Wetland Protection Subdistricts or freshwater wetlands of special significance (WOSS), as defined in the LURC Land Use Districts and Standards – Chapter 10.23,N. Of the 26 total P-WL1 subdistricts, the majority were associated with streams (within 25 feet [7.6 m] of stream channels).

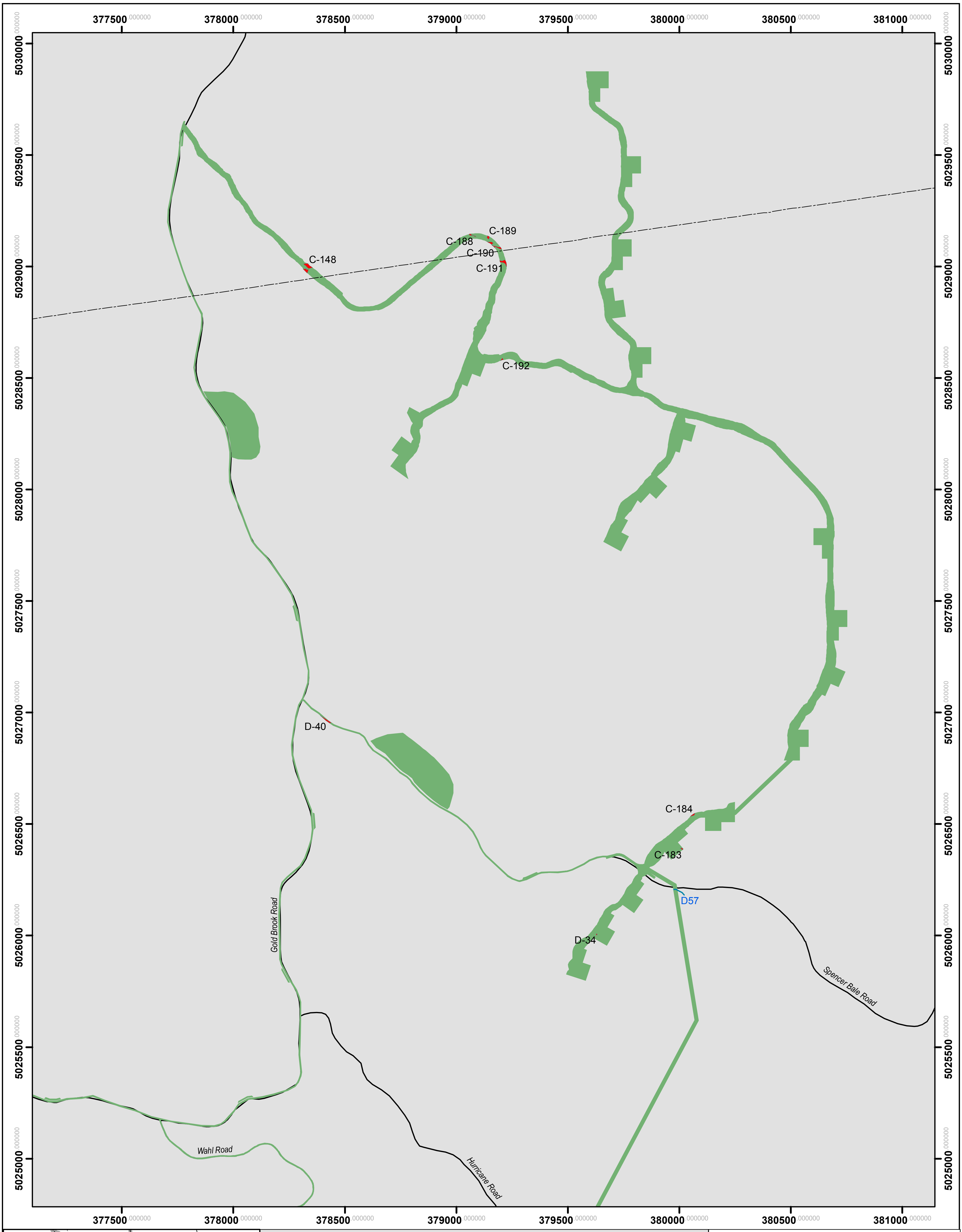
The majority of these wetlands are no longer within the project area, as identification of wetlands was utilized during project layout design to shift and revised the location of project elements in order to accomplish wetland avoidance to the greatest extent possible. As a result of project design refinements, only 28 wetlands and 14 streams remain within the final project construction area. Of these wetlands, only 2 are P-WL1 subdistricts. Both are associated with a stream. These wetland and stream areas are shown in Figures 8-3, 8-4, and 8-5. Each wetland is identified on these figures by an alpha-numeric code made up of the particular field team conducting that specific delineation, followed by the wetland sequence delineated by that team, respectively. These codes will be used to discuss specific wetlands hereinafter.

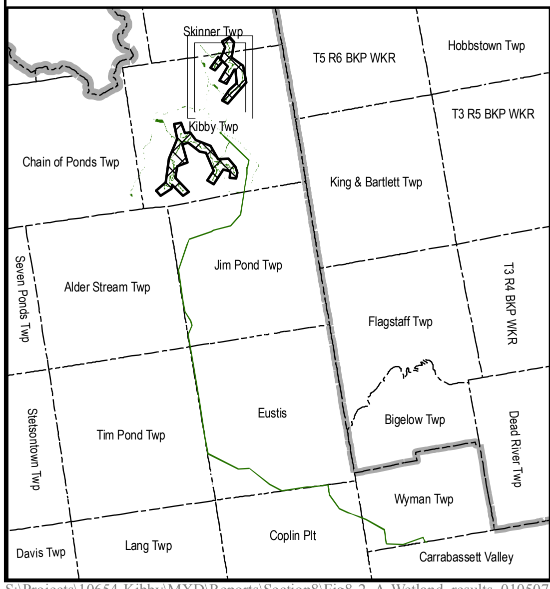
Another eight wetlands may be impacted by widening Wahl Road, an existing road, and were identified by reconnaissance level surveys. These wetlands are not included in these descriptions, however the total area that has the potential to be impacted can be found in Table 8-6. It is important to note that many of the wetlands and some of the streams that were observed and mapped within the proposed project area have been previously impacted by human activities, primarily wood harvesting and associated building of access roads.

The following discussion provides wetland character descriptions of the 28 wetlands and 14 streams that, following layout shifts and refinements, remain within the project area. Wetlands identified within each class (i.e., PSS, PFO, PEM) are similar enough to one another to group and describe wetlands within each class collectively.

Different project elements have varying potential to incur wetland impacts, for this reason, survey areas addressed in this section are divided and discussed within the following categories:

- Areas associated with new access roads and wind turbines;
- Areas associated with electrical collector lines leading from the turbines to a project substation;
- Areas associated with other project facilities (such as the proposed Kibby Wind Power Project substation); and





Legend

- Kibby Wind Power Project Area
- Existing Road
- State Boundary
- County Boundary
- Town Boundary

Resources

- construction_area_streams
- Wetland
- X-### Wetland Identification Number
- X-### Stream Identification Number

Notes: Coordinate Grid: NAD83 UTM, Zone 19N, Meters

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Figure 8-3

Kibby Wind Power Project

Project Layout in Relation to Resources

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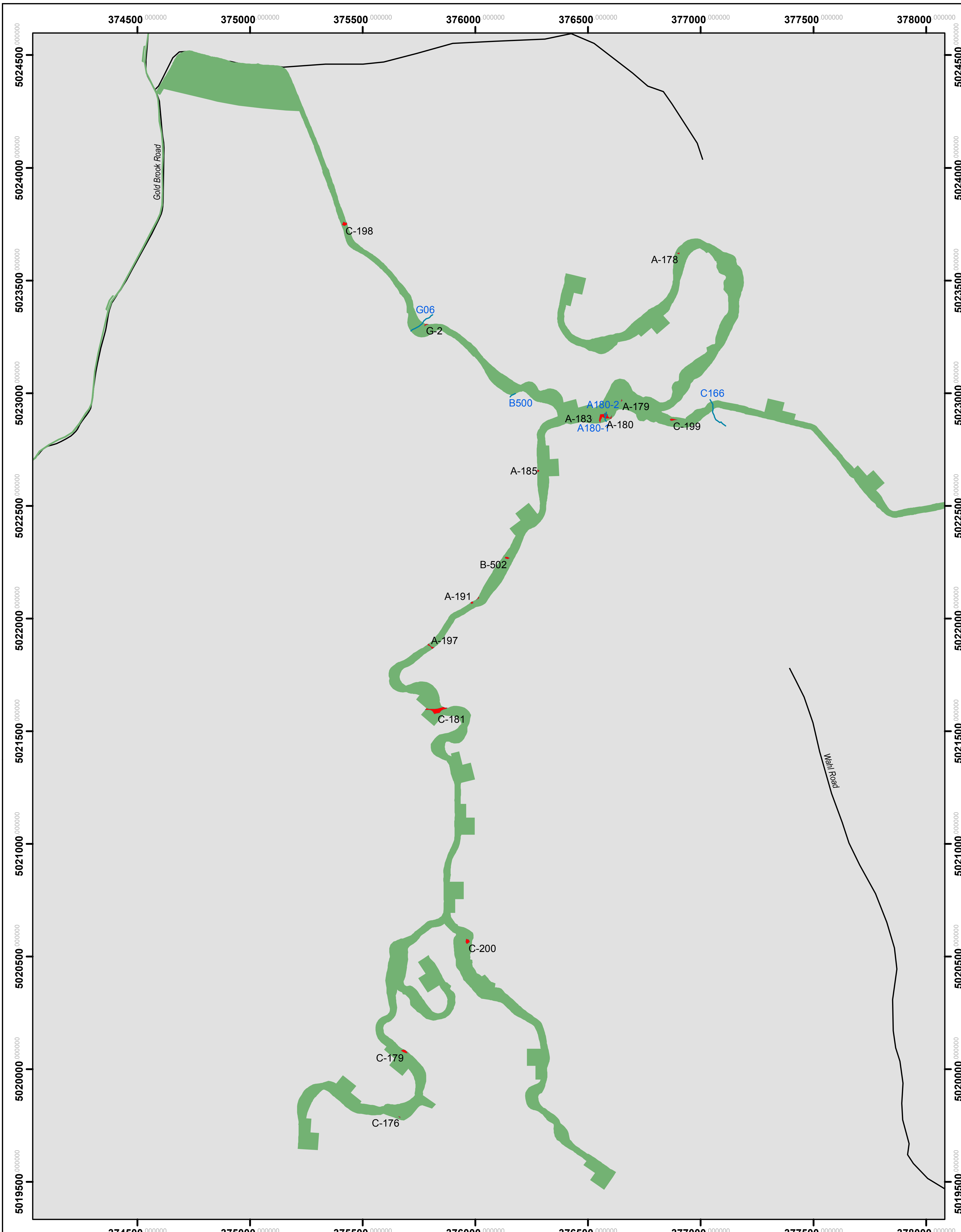

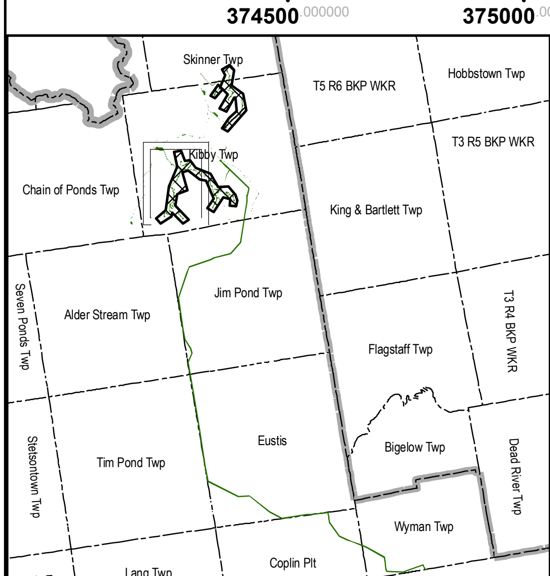

Legend

- Kibby Wind Power Project Area
- Existing Road
- State Boundary
- County Boundary
- Town Boundary

Resources

- construction_area_streams
- Wetland
- X-### Wetland Identification Number
- X-### Stream Identification Number

Notes: Coordinate Grid: NAD83 UTM, Zone 19N, Meters

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Figure 8-4

Kibby Wind Power Project

Project Layout in Relation to Resources

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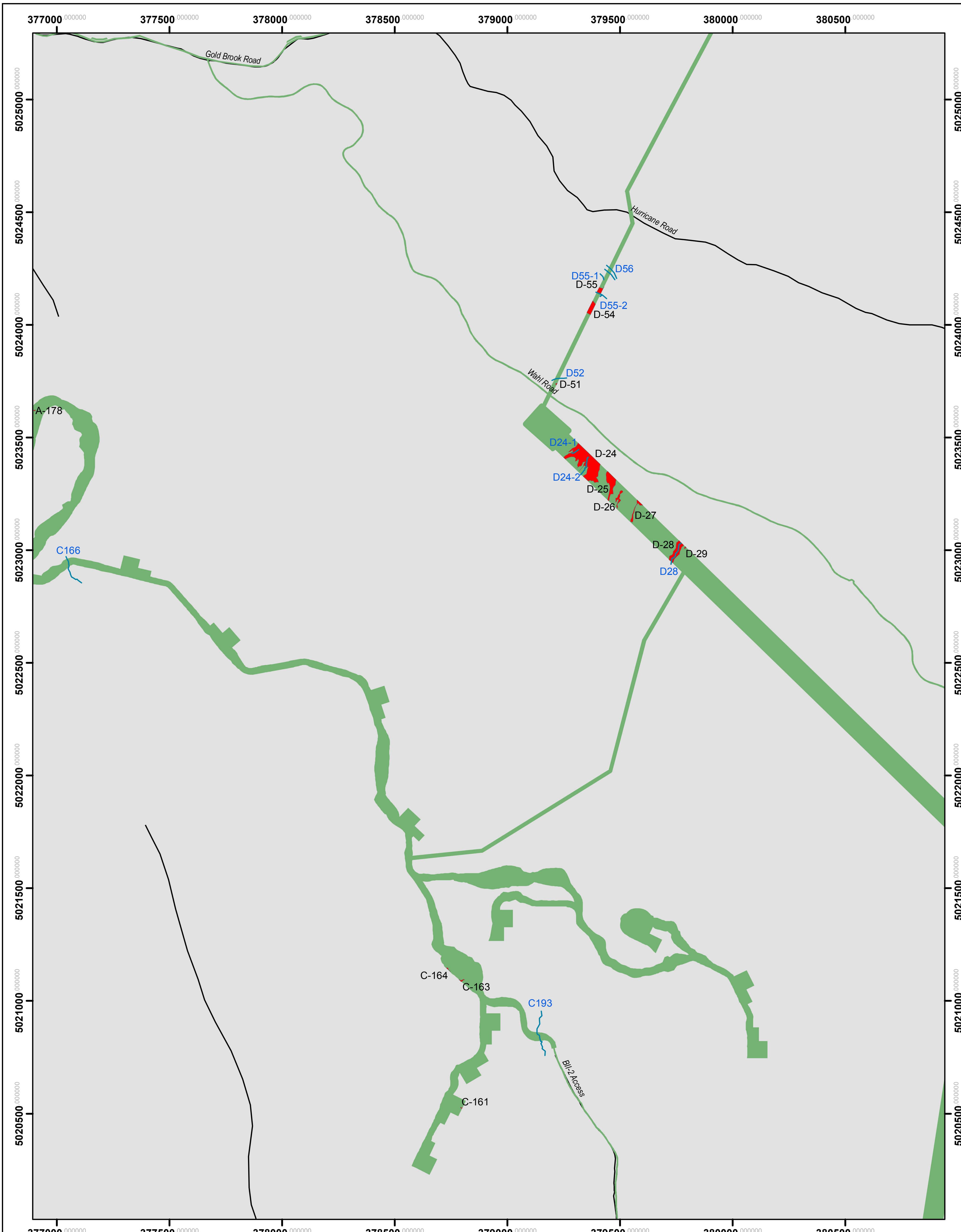

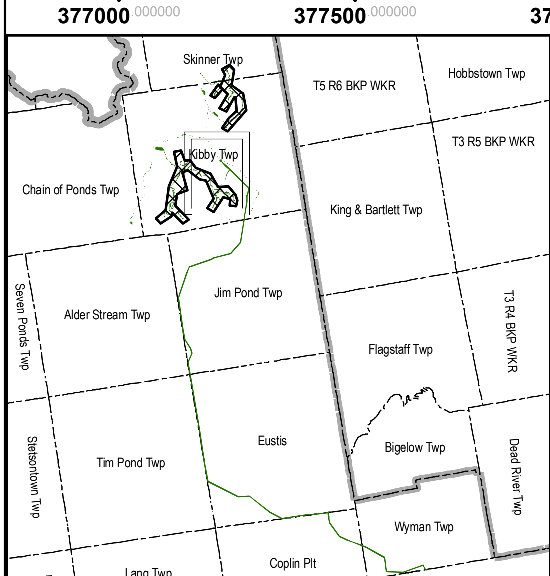

Legend

- Kibby Wind Power Project Area
- Existing Road
- State Boundary
- County Boundary
- Town Boundary

Resources

- construction_area_streams
- Wetland
- X-### Wetland Identification Number
- X-### Stream Identification Number

Notes: Coordinate Grid: NAD83 UTM, Zone 19N, Meters

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Figure 8-5

Kibby Wind Power Project

Project Layout in Relation to Resources

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- Areas associated with improvements to existing roads

Information on the results of the wetland and stream survey along the 115 kV transmission line corridor that will be associated with this project is provided in Volume V.

Wetlands and Streams Associated with Access Roads and Turbines

P-WL2, P-WL1: Palustrine Scrub-Shrub (PSS) Wetlands (A Series [C-183] and B Series [A-179, A-180, A-183, A-185, B-502 and C-198])

Wetlands categorized as *Palustrine Scrub-Shrub (PSS)* were generally comprised of a shrub and sapling community of speckled alder (*Alnus rugosa*), yellow birch (*Betula alleghaniensis*), balsam fir (*Abies balsamea*), hobblebush (*Viburnum lantanoides*), red maple (*Acer rubrum*), northern white cedar (*Thuja occidentalis*), and silky dogwood (*Cornus amomum*). Scattered occurrences of upland shrub species including striped maple (*Acer pensylvanicum*) and red elderberry (*Sambucus pubens*) were observed. The shrub layer was generally not dense as each wetland was surrounded by forested uplands providing heavy shade. The herbaceous layer was also generally sparse due to shading, and was comprised of northeastern mannagrass (*Glyceria melicaria*), rattlesnake mannagrass (*Glyceria canadensis*), pointed broom sedge (*Carex scoparia*), drooping sedge (*Carex crinita*), red raspberry (*Rubus ideaus*), wool-grass (*Scirpus cyperinus*), New York fern (*Thelypteris noveboracensis*), whorled aster (*Aster acuminatus*), New York aster (*Aster novi-belgii*), Canada bluejoint (*Calamagrostis canadensis*), evergreen wood fern (*Dryopteris intermedia*), mountain wood fern (*Dryopteris campyloptera*), Dudley's bromegrass (*Bromus canadensis*), red osier dogwood (*Cornus sericea*), bristly black currant (*Ribes lacustre*), wild sarsaparilla (*Aralia nudicaulis*), jewelweed (*Impatiens capensis*), and zigzag goldenrod (*Solidago flexicaulis*). Sphagnum (*Sphagnum* sp.) was abundant in some of these wetlands.

Hydrology in the PSS wetlands consisted of soil saturation within the top 12 inches of the ground as evidenced by observation, drainage patterns, elevated roots on shrubs, scouring, and water-stained leaves. Shallow ponding was observed in some areas and was likely seasonal.

Soils were shallow, less than 12 inches deep within most areas, although they were as thick as 20 inches in some wetlands. The top layer in each wetland was a well decomposed, sapric, organic layer. The B horizon matrix was depleted with either a silt-loam or sandy loam texture. Matrix colors were generally a light yellow-gray with depletions or concentrations.

Each PSS wetland provides groundwater discharge, food chain functions such as nutrient removal and production export, and wildlife habitat. Functions and values such as flood-flow alteration, fish habitat, sediment/toxicant retention, sediment and shoreline stabilization, uniqueness, and visual quality would likely not be provided by these wetlands. Each wetland has the potential to provide areas for recreational hunting although hunters or evidence thereof was not observed. Each of these wetlands also has the potential to be habitat for boreal bedstraw (*Galium kamtschaticum*), a state listed S2 species. This species was observed in the B Series PSS wetlands A-179 and A-180.

One wetland was also associated with a stream, so includes a P-WL1 subdistrict, wetland A-180.

P-WL3: Palustrine Forested (PFO) Wetlands (A Series [C-188, C-189, C-190 and C-191] and (B Series [A-178, A-191, C-161, C-176, C-179, C-199, and G-2])

Palustrine Forested (PFO) wetlands were observed and categorized as such due to a dense canopy cover of yellow birch, balsam fir, black spruce (*Picea mariana*), and red spruce (*Picea rubens*). Generally canopy species were of moderate diameters from 6 to 18 inches. The midcanopy layer in each wetland was a mixture of speckled alder, hobblebush, and pole and sapling individuals of the canopy species. The herbaceous layer was typically sparse due to dense shade cover. Herbaceous species present were a mixture of flat-topped white aster (*Aster umbellatus*), northeastern mannagrass, Canada bluejoint, gold thread (*Coptis trifolia*), cinnamon fern (*Osmunda cinnamomea*), New York fern, whorled aster, purple stem aster (*Aster puniceum*), bunchberry (*Cornus canadensis*), clammy ground-cherry (*Physalis heterophylla*), lady fern (*Athyrium filix-femina*), three-seeded sedge (*Carex trisperma*), sallow sedge (*Carex lurida*), and white avens (*Geum canadense*), Boreal bedstraw, a state-listed S2 species, was observed in three wetlands (C-188, C-189, and C-191), primarily along the wetland/upland border at or near groundwater discharge areas.

Hydrology and soils, in the PFO wetlands, were similar to those conditions observed in the PSS wetlands. Soil saturation with some shallow ponding was characteristic with shallow organic and A horizons underlain by depleted matrices, depletions, and concentrations. Furthermore, wetland functions were comparable with one exception. Wildlife habitat in the forested wetlands favored avian species that use trees for nesting and foraging such as finches, warblers and woodpeckers.

P-WL2: Palustrine Emergent (PEM) Wetlands (A Series [C-184, C-192 and D-34] and B Series [A-197, C-163, C-164, C-181 and C-200]

Palustrine Emergent (PEM) wetlands were categorized based on a dense herbaceous plant cover comprised of northeastern mannagrass, sallow sedge, drooping sedge, pointed broom sedge, sensitive fern (*Onoclea sensibilis*), common flat-topped goldenrod (*Euthamia graminifolia*), whorled aster, Canada jointgrass, wool grass, white avens, three seeded sedge, lady fern, coltsfoot (*Tussilago farfara*), tall meadow rue (*Thalictrum pubescens*), northern willow herb, (*Epilobium strictum*), white snake root (*Ageratina altissima*), long beech fern (*Dryopteris phegopteris*), false hellbore (*Veratrum viride*), white turtlehead (*Chelone glabra*), jewelweed, red raspberry, flat-topped aster, and soft rush (*Juncus effusus*). These wetlands typically occurred in areas of openings in the forest canopy.

Hydrology and soils, in the PEM wetlands, were comparable to those characteristics observed in the PSS and PFO wetlands. Furthermore, wetland functions were comparable, except that wildlife habitat favored species that may use herbaceous habitat. None of these areas would provide habitat for waterfowl and wading birds. Boreal bedstraw was observed in several of these areas, specifically C-164 and C-200.

P-SL2: Streams (A Series [None] and B Series [A-180-Channels 1 and 2, B-500, C-158, C-166, C-193, D-52 and G-6]

No streams are associated with the project construction area on the A-Series ridge. However, several small streams are located in the vicinity of the B Series access road. Most of the streams are intermittent, primarily receiving seepage from adjacent uplands and surface flow from headwater wetlands. One of these streams, C-193, is a perennial stream. Stream banks are generally cut by erosive action and stream beds are a mixture of sand, gravel, and cobble. A small population of lesser wintergreen (*Pyrola minor*), a state-listed S2 plant, was found along stream channel C-193.

Impacts to individuals of this species can be avoided through a preconstruction survey and reviewing the proposed culvert location with the project engineers and construction managers.

Wetlands and Streams Associated with Collector Line Corridors

The ridgeline locations for the collector lines are included in the roadway discussion above, as the collector lines will extend within the roadway impact corridor. However, where the collector lines for A Series and B Series descend towards the proposed Kibby Substation, additional wetland reconnaissance was conducted to substantially avoid the need for wetland impact. Wetlands and streams located along the proposed corridors are described below. All of the collector line wetland crossings will span the wetlands, thereby avoiding direct impacts or impacts related to fill and permanent alteration.

LURC Subdistricts P-WL2, P-WL1: Palustrine Scrub-Shrub (PSS) Wetlands (A Series Collector Line Corridor [D-51, D-54 and D-55] and B Series Collector Line Corridor [D-26, D-27, and D-28]

Three *Palustrine Scrub-Shrub (PSS)* wetlands are located within the proposed A Series collector line corridor. Wetlands D-51 and D-54 are a diverse mixture of speckled alder, black spruce, northern white cedar, silky dogwood, and balsam fir with wool grass, soft rush, drooping sedge, pointed broom sedge, sensitive fern, whorled aster, and evergreen wood fern. Soils in these wetlands are comprised of a shallow organic layer and a lower horizon of a depleted matrix. Hydrology is shallow seasonal inundation with areas of saturation. Wetland D-55 is dominated by speckled alder and is part of a beaver (*Castor canadensis*) impoundment. Because this wetland is also associated with a stream, the portion within 25 feet of the stream is designated as a P-WL1. Herbaceous and canopy vegetation is minimal due to the deep levels of inundation. Soils are sandy and hydrology is permanent inundation with areas of open water.

Three PSS wetlands are located within the proposed B Series collector line corridor in the section that will be co-located with the 115 kV transmission line. The shrub layer in these wetlands is hobblebush, long-beaked willow (*Salix bebbiana*), red maple, and mountain maple (*Acer spicatum*), also with scattered occurrences of trees including yellow birch, balsam fir, red spruce, and red maple. Herbaceous species were generally diverse being comprised of tussock sedge (*Carex stricta*), sensitive fern, northeastern mannagrass, oak fern (*Gymnocarpium dryopteris*), sallow sedge, goldthread, sweet white violet (*Viola blanda*), small-headed aster (*Aster vimineus*), Culver's root (*Veronicastrum virginicum*), Clinton's wood fern (*Dryopteris* *clitoniana*), and tall meadow-rue (*Thalictrum pubescens*). Hydrology within these wetlands was soil saturation and shallow seasonal inundation, as evidenced by surface scouring and drainage patterns. Drainage patterns were observed as small flows between boulders and indistinct channels. Wetland D-28 likely provides groundwater discharge into a stream that drains through the wetland. Because this wetland is also associated with a stream, the portion within 25 feet of the stream is designated as a P-WL1.

Soils were categorized as a dark A or organic horizon overlaying a depleted matrix, yellow-gray color, with depletions and concentrations. Textures varied between loamy sand and silt loam. Soils were saturated within each wetland and extended from 10 to 20 inches deep.

Each wetland provides some groundwater discharge, food chain functions such as nutrient removal and production export, and wildlife habitat. Each wetland has the potential to provide areas for recreational hunting although hunters or evidence thereof was not directly observed. Hunters were observed using the general area and driving nearby Wahl Road.

LURC Subdistrict P-WL3, P-WL1: Palustrine Forested (PFO) Wetlands (A Series Collector Line Corridor [none] and B Series Collector Line Corridor [D-24 portion and D-25])

Two wetlands categorized as *Palustrine Forested (PFO)* are within the B Series collector line section that is co-located with the 115 kV transmission line corridor. These wetlands had canopy species of yellow birch and red maple with understory vegetation of cinnamon fern, sensitive fern, goldthread, interrupted fern (*Osmunda claytoniana*), jewelweed, and northeastern mannagrass. A small portion of D-24 was forested, estimated at approximately 25 percent, with the remaining categorized as PEM, which is described below.

Hydrology within each wetland was soil saturation; evidence of surface scouring and drainage patterns were also observed. Soils displayed a dark A horizon underlain by a depleted matrix of a yellow-gray color and fine-sandy-loam texture.

Functions and values that each of these wetlands likely provides are similar to those expected from the PSS communities, except that each can provide some habitat for avian species that require a forested habitat component.

LURC Subdistricst P-WL2, P-WL1: Palustrine Emergent (PEM) Wetlands (B Series Collector Line Corridor [D-24])

Wetland D-24 is primarily a *Palustrine Emergent (PEM) wetland*, but has a small PFO component as well, as described above. Herbaceous vegetation includes black girdled woolgrass (*Scirpus atroviriens*), jewelweed, soft rush, northeastern mannagrass, drooping sedge, and Canada bluejoint.

Hydrology in D-24 was soil saturation with a few areas of shallow ponding as evidenced by surface scouring and drainage patterns. Furthermore, morphological adaptations including buttressed trees and elevated roots were observed on some trees. Two streams traverse this wetland and it appears that the wetland contributes seepage to the drainage. Soils were a dark A horizon underlain by a yellow-gray depleted matrix of fine-sandy-loam texture.

Functions and values as discussed for the PSS wetlands are likely provided by D-24, with the exception that habitat values provided would be restricted to those provided by herbaceous vegetation and not shrub or tree layers.

LURC Subdistrict P-SL2: Streams (A Series Collector Line Corridor [D-55, D-56, and D-57] and B Series Collector Line Corridor [D-24 Channels 1 & 2 and D-28 Channel 1])

The collector corridor for the A Series will span three streams. Stream channel D-55 is associated with the beaver impoundment and shrub wetland. This stream is intermittent and shallow (less than 12 inches deep) with a sandy substrate.

Channel D-56 is Kibby Stream, which is a large water course that drains much of the eastern and northern part of Kibby Range and the southwestern slopes of Kibby Mountain. At the time of the survey the channel was approximately 30 to 50 feet (9 to 15 m) wide and 2 to 3 feet (0.6 to 0.9 m) deep, with pools 5 to 6 feet (1.5 to 1.8 m) deep. The substrate is cobble and medium sized boulders.

Channel D-57 is a small intermittent stream with a boulder substrate. Flow is very shallow at one to two inches deep, and the channel is narrow, averaging one to three feet wide.

The collector line from the B Series will also span three streams along the section that will be co-located with the 115 kV transmission line. These streams are associated with wetlands D-24 (two channels), and wetland D-28 (one channel). The stream channels in wetland D-24 are 3 and 4 feet (0.9 and 1.2 m) wide and 4 and 6 inches (0.1 and 0.2 m) deep, respectively. Both are intermittent water courses with substrates comprised of organics, silt-mud, and sand and gradual to undercut banks. The stream associated with D-28 is a perennial watercourse 5 feet (1.5 m) wide with flow up to 10 inches (0.3 m) deep. The bank is undercut with a boulder, gravel, and cobble substrate.

Wetlands and Streams Associated with Other Project Features

Detailed delineations will be conducted prior to final design. Results of these delineations will be used to ensure that wetland and stream areas are avoided by other project features, such as the Kibby Substation and service building, and construction-related work areas. As a result, no wetlands or streams will be associated with project facilites other than those discussed above.

Wetlands and Streams Associated with Improvements to Existing Roads

Wetland delineations have been conducted along portions of an unnamed access road and the lower portions of Spencer Bale Road, both of which are existing access to the A Series. Two PSS wetlands and one stream were identified in these areas. The PSS Wetlands (C148 and D-40) have been impacted by recent harvesting activities, as they are adjacent to the existing roads. They are similar to those described above.

A reconnaissance-level survey of potential wetlands and streams has been conducted along Wahl Road, the lower section of an unnamed access road at the northern extent of the A Series, and the upper section of Spencer Bale Road, where wetland delineations have not been performed. Reconnaissance surveys consisted of locating wetland boundaries and stream crossings at road intersects with sub-meter accurate GPS. Project impacts to these wetlands were estimated based upon an average widening of 10 feet (3 m) off set from the road fill edge. A total of eight wetland areas and 29 existing stream crossings were identified along Wahl Road. One existing stream crossing each was identified along the unnamed access road and Spencer Bale Road.

Improvements to Gold Brook Road will consist of pull-offs, which will be located in non-wetland areas. Avoiding wetland and stream resources will be a final design goal and wetland delineations will be conducted prior to final design to ensure no such resources exist within these proposed improvement areas.

8.5.2 Unavoidable Impacts to Vernal Pools, Wetlands and Streams

Results of the vernal pool, wetland, and stream surveys described above were used to modify preliminary project plans to avoid or minimize impacts to these resource areas wherever practicable. Significant focus has been placed on adjusting layout during early stages of project design to avoid vernal pool, wetland and stream impact where possible.

8.5.2.1 Vernal Pools

During the project planning process, field identification of vernal pools was used to site the final project layout with sensitivity to avoiding such habitats. As a result, no direct impacts to vernal pools will be incurred by project construction.

8.5.2.2 Wetlands

A total of 28 wetlands occur within the project construction area and will be impacted, to some degree, by the construction of access roads and turbines. The total impact area will be approximately 1.42 acres (61,812 square feet). In addition, another eight wetlands have been identified (by reconnaissance level surveys only) along the existing access road, Wahl Road. Widening this road to accommodate project construction will impact approximately 0.22 acre (9,380 square feet). Cumulatively, the total impact to these 36 wetlands will be approximately 1.63 acres (71,192 square feet). These impacts are summarized in Table 8-5. The majority of these impacts are small in relation to each individual wetland and, for the most part, will be isolated to wetland edges. For a detailed summary of individual wetland impacts and justification, see Table 8-6.

Table 8-5 Wetland Impact Summary

New Access and Turbines	
LURC Subdistrict	**Impact Area (acres)**
P-WL1	0.1
P-WL2	0.941
P-WL3	0.378
Subtotal	1.419
Wahl Road Improvements	
P-WL2	0.22
Subtotal	0.22
GRAND TOTAL	1.639 acres

Nine wetlands are traversed by the A Series and B Series collector line corridors, with no direct impact anticipated due to the project (see Table 8-7). The collector line poles will be sited to avoid direct impact to wetland and stream resources. No vegetation clearing for the collector line corridor will be required in wetlands D-26, D-27, D-28, D-51, D-54, D-55 and part of D-24 because the nature of the vegetation in these areas will not interfere will the collector lines. The construction of the collector line will result in removal of the canopy to wetland D-25, and part of D-24, and the forest cover will be converted to a shrub or herbaceous community. The acreage of conversion as a result of tree clearing for wetlands D-24 (approximately 25 percent of the wetland's total impacted area) and D-25 totals 0.28 acre. Impacts to wetland functions and values along this collector line corridor will be minimal. Fill impacts will be avoided as the poles can be located in adjacent uplands. Three of these wetlands are designated as P-WL1 subdistrict area since they are adjacent to streams: D-28, D-55, and D-24.

8.5.2.3 Streams

Stream crossings for A Series access and turbine work areas is limited to improving up to six existing stream crossings, per Level A Road Project standards. Stream impact for B Series access and turbine work areas includes new crossings of one perennial stream and seven intermittent streams. Widening existing roads for access to the B Series may also include improvements to up to 29 existing stream crossings, per Level A Road Project standards. Hydrology for new stream crossings for B Series access will be maintained by culverts appropriately sized to maintain the current flow, so that flow is not interrupted or reduced. Water quality during construction will be maintained through BMPs as discussed in Section 2.4.3 to control and prevent erosion and sedimentation.

Table 8-6: Unavoidable Wetland Impacts

Wetland ID	LURC Subdistrict	Wetland Type	Total Impact (Acres)	Need for Unavoidable Impact/Special Considerations
				Series A: New Access and Turbines
C-148	P-WL2	PSS	0.150	All wetland impacts are associated with widening an existing unnamed access road off of Gold Brook Road. By utilizing the existing road to the extent possible, additional wetland impacts are minimized, and new road development is avoided.
C-183	P-WL2	PSS	0.012	The impact is for a turbine pad work area. The location of the turbine has been moved to avoid and minimize impacts to this wetland, nonetheless a small impact is unavoidable. Other site constraints such as steep slopes limit placement of the turbine to this location.
D-40	P-WL2	PSS	0.056	All wetland impacts are associated with widening an existing access road (Spencer Bale Road). By utilizing the existing road to the extent possible, additional wetland impacts are minimized, and new road development is avoided.
C-188	P-WL3	PFO	0.022	Steep grades necessitate a switchback to access the ridgeline in this location. Wetlands have been avoided to the extent possible, but requirements for turning radius and other engineering requirements make this limited wetland impact unavoidable. Boreal bedstraw is located in this wetland. Impacts to this plant may be unavoidable; however, attempts to minimize impact to this plant at this site will include a preconstruction survey, marking the area as a “sensitive resource area,” and reviewing the proposed crossing location with the project engineers and construction managers. (See Section 7.3.2).
C-189	P-WL3	PFO	0.027	Steep grades necessitate a switchback to access the ridgeline in this location. Wetlands have been avoided to the extent possible, but requirements for turning radius and other engineering requirements make this limited wetland impact unavoidable. Boreal bedstraw is located in this wetland. Impacts to this plant may be unavoidable; however, attempts to minimize impact to this plant at this site will include a preconstruction survey, marking the area as a “sensitive resource area,” and reviewing the proposed crossing location with the project engineers and construction managers. (See Section 7.3.2).
C-190	P-WL3	PFO	0.077	Steep grades necessitate a switchback to access the ridgeline in this location. Wetlands have been avoided to the extent possible, but requirements for turning radius and other engineering requirements make this limited wetland impact unavoidable.
C-191	P-WL3	PFO	0.079	Steep grades necessitate a switchback to access the ridgeline in this location. Wetlands have been avoided to the extent possible, but requirements for turning radius and other engineering requirements make this limited wetland impact unavoidable. Boreal

Wetland ID	LURC Subdistrict	Wetland Type	Total Impact (Acres)	Need for Unavoidable Impact/Special Considerations
				bedstraw is located in this wetland. Impacts to this plant may be unavoidable; however, attempts to minimize impact to this plant at this site will include a preconstruction survey, marking the area as a “sensitive resource area,” and reviewing the proposed crossing location with the project engineers and construction managers. (See Section 7.3.2).
C-184	P-WL2	PEM	0.024	The impact is for the alignment of the access road to avoid steep slopes that would restrict construction of the road. The road alignment has been modified to the extent practicable to minimize impacts to this wetland.
C-192	P-WL2	PEM	0.013	The impact is for the alignment of the access road to avoid steep slopes that would restrict construction of the road. The road alignment has been modified to the extent practicable to minimize impacts to this wetland.
D-34	P-WL2	PEM	0.005	The impact is for construction of a turbine pad. The turbine site is limited to this location due to the narrow width of the ridge and adjacent steep slopes.
				Subtotal: 0.465 acre
				Series B: New Access and Turbines
A-179	P-WL2	PSS	0.008	The impact is for the access road between turbine pads. The current road location is necessary to avoid steep slopes and bedrock outcrops, which would require a much larger disturbed area of cut and fill for the same purpose.
A-180	P-WL2; P-WL1	PSS	P-WL1: 0.1 P-WL2: 0.125	The impact is for the access road between turbine pads. The current road location is optimal due to moderate grades. Nearby steep slopes and bedrock outcrops limit road relocation and realignment to the current location.
A-183	P-WL2	PSS	0.002	The impact is for the access road between turbine pads. The current road location is optimal due to moderate grades. Nearby steep slopes and bedrock outcrops limit road relocation and realignment to the current location.
A-185	P-WL2	PSS	0.017	The impact is for aligning the access road with the two adjoining turbine pads and to take advantage of the moderate slopes in this area. Road realignment is not feasible due to steep slopes. Traversing the steep slopes near this location will require significantly more cut and fill than the current road location.

Wetland ID	LURC Subdistrict	Wetland Type	Total Impact (Acres)	Need for Unavoidable Impact/Special Considerations
B-502	P-WL2	PSS	0.032	The impact is for aligning the access road with the two adjoining turbine pads and to take advantage of the moderate slopes in this area. Road realignment is not feasible due to steep slopes. Traversing the steep slopes near this location will require significantly more cut and fill than the current road location.
C-198	P-WL2	PSS	0.066	The impact is necessary based on the location of an existing access road and the proposed ridge access road. This wetland is part of a larger wetland, which is perpendicular to the road alignment and crossing it is unavoidable. Using the existing road and the proposed alignment minimizes wetland impacts.
A-178	P-WL3	PFO	0.010	The impact is for the access road to approach two turbine locations. Steep slopes and bedrock outcrops require a switchback to access the ridge. These conditions constrain and limit the location of the access road resulting in an unavoidable impact.
A-191	P-WL3	PFO	0.029	The impact is necessary to align the access road westerly to avoid construction impacts to the watershed of unique wetlands that provide potentially valuable habitat.
C-161	P-WL3	PFO	0.008	The impact is to locate a turbine pad within an area of relatively flat terrain. The wetland traverses the area perpendicular to the road alignment that is the best route from an engineering perspective and as such must be crossed for construction.
C-176	P-WL3	PFO	0.006	The impact is for the access road. This section of the road needs to be aligned to avoid a steep ridge and ledges that traverse this area.
C-179	P-WL3	PFO	0.061	The impact is to access a turbine pad. This wetland laterally traverses the area and as such must be crossed by the alignment and is unavoidable.
C-199	P-WL3	PFO	0.041	The impact is to align the access road to avoid steep slopes, which are a constraint to construction. Impacts are thus unavoidable.
G-2	P-WL3;	PFO	0.018	The impact is necessary for construction of an access road that originates from an existing road. The wetland crosses the proposed road perpendicularly, and the location of the road in this area was moved to avoid larger wetland impacts and thus minimizes impacts.
A-197	P-WL2	PEM	0.043	The impact is necessary to align the access road westerly to avoid construction impacts to the watershed of unique wetlands that provide potentially valuable habitat.
C-163	P-WL2	PEM	0.024	The impact is for the access road between turbine pads. This location is optimal due to moderate grades and needs to be aligned with other portions of the road to avoid engineering constraints such as turning radius and slope.

Wetland ID	LURC Subdistrict	Wetland Type	Total Impact (Acres)	Need for Unavoidable Impact/Special Considerations
C-164	P-WL2	PEM	0.017	The impact is for the access road between turbine pads. This location is optimal due to moderate grades and needs to be aligned with other portions of the road to avoid engineering constraints such as turning radius and slope.
C-181	P-WL2	PEM	0.281	The impact is for the access road between turbine pads. This location is optimal due to moderate grades and needs to be aligned with other portions of the road to avoid engineering constraints such as turning radius and slope.
C-200	P-WL2	PEM	0.066	Impact is for the access road. This section of the road needs to be aligned to avoid a steep ridge to the north and use moderate grades where it is currently sited.
				Subtotal: 0.954 acre
		Wahl Road Improvements		
	P-WL2	PSS	0.22	Wetlands along Wahl Road may be impacted by widening of the road in some areas. All eight wetlands located along the road by a reconnaisence level survey were considered as potentially impacted by a ten foot widening along the entire length of the road. Expanding into wetlands along an existing road helps to minimize new impacts to wetlands that would be incurred by construction of a new road.
				Subtotal: 0.22
				GRAND TOTAL: 1.639 acres

Table 8-7: Wetlands Spanned by Collector Lines

Wetland ID	LURC Subdistrict	Wetland Type	Total Area (Acres)	Comments/Special Considerations
A Series: Collector Line Wetlands				
D-51	P-WL2	PSS	0.009	No clearing required. Conversion will not be necessary. Fill impacts not required.
D-54	P-WL2	PSS	0.252	No clearing required. Conversion not necessary. Fill impacts not required.
D-55	P-WL2; P-WL1	PSS	P-WL1: 0.03 P-WL2: 0.09	No clearing required. Conversion not necessary. Fill impacts not required.
Subtotal: 0.381 acres spanning with no clearing				
B Series: Collector Line Wetlands				
D-26	P-WL2	PSS	0.048	No clearing required. Conversion will not be necessary. Fill impacts not required.
D-27	P-WL2	PSS	0.019	No clearing required. Conversion will not be necessary. Fill impacts not required.
D-28	P-WL2; P-WL1	PSS	P-WL1: 0.09 P-WL2: 0.033	No clearing required. Conversion will not be necessary. Fill impacts not required.
D-24 partial	P-WL3;	PFO	0.180	Conversion required for minimum clearance from electric conductors. Wetland is perpendicular to the ROW and crossing it is unavoidable. Fill impacts not required.
D-25	P-WL3	PFO	0.096	Conversion required for minimum clearance from electric conductors. Wetland is perpendicular to the ROW and crossing it is unavoidable. Fill impacts not required.
D-24 partial	P-WL2; P-WL1	PEM	P-WL1: 0.28 P-WL2: 0.24	No clearing required. Conversion will not be necessary. Fill impacts not required.
Subtotal: 0.276 acre of clearing; 0.71 acre of spanning with no clearing				
Total Wetland Area in Collector Lines: 1.367 acres (includes 0.276 acre of clearing)				

Impacts to streams from collector line construction will be minimal. Fill impacts will not occur, as collector line poles will be placed in upland locations to span streams, and crossing of streams during construction can largely be avoided. Erosion and sedimentation control measures will be utilized to provide for water quality protection and clearing will be minimized to maintain water temperatures in perennial streams.

It should be noted that lesser wintergreen, a state-listed S2 plant, has been identified along stream channel C-193. Impacts to individuals of this species will be avoided through a preconstruction survey and by reviewing the proposed culvert location with the project engineers and construction managers.

Table 8-8 identifies unavoidable impacts to each stream associated with access and turbine work areas. Table 8-9 lists streams that will be spanned by collector lines. Streams located along existing access roads, and identified by reconnaissance level surveys to date, will be further investigated as a part of project final design.

8.6 Stormwater Management

In general, stormwater management for the project has been designed to ensure that existing drainage patterns are maintained to the extent possible. Maintaining overland flow has been prioritized in the design, and permanent structures that would require on-going maintenance avoided where possible. Design measures have been identified that will be used as project refinements are made during the final design stage and through the construction effort in response to field conditions.

8.6.1 Stormwater Management During Construction

To the extent possible, overland flow will be maintained during and after construction. Accordingly, erosion and sediment control of construction related runoff will primarily be managed through the use of temporary sediment barriers (Figure 2-20), essentially consisting of mulch berms. Where concentrated flow is unavoidable, temporary sediement traps will be used to to trap sediment-laden runoff during construction.

Off-site runoff will be collected in diversion channels and conveyed around and through the construction site to minimize the quantity of runoff entering the construction site. Off-site runoff will be conveyed through cross-culverts and re-distributed with level spreaders to create a stable outfall.

All perimeter controls, including the off-site diversion channels and culverts, sediment barriers, and sediment traps will be installed before commencing earthwork activities. Temporary diversion berms will be used, as necessary, to temporarily direct construction runoff to the traps. Natural, undisturbed vegetative buffers will be maintained down-slope of sediment barriers and traps to further filter out the sediment-laden runoff.

Table 8-8: Unavoidable Stream Impacts

Stream ID	LURC Subdistrict	Intermittent or Perennial	Width (feet)	Need for Unavoidable Impact/Special Considerations
B Series: Access and Turbines				
C-193	P-SL2	Perennial Stream	6	A small population of lesser wintergreen (*Pyrola minor*), a state-listed S2 plant, was found along stream channel C-193 (see Section 7.2.3). The road alignment has been modified to avoid impacts to this population. A preconstruction survey, marking the area as a "sensitive resource area," and reviewing the proposed crossing location with the project engineers and construction managers will all help avoid impacts to this plant at this site.
A-180-1	P-SL2	Intermittent Stream	3	The impact is for the access road to cross the stream. The stream flow is perpendicular to the road alignment, necessitating a crossing. An appropriately sized culvert will be installed to maintain flow.
A-180-2	P-SL2	Intermittent Stream	2	The impact is for the access road. The stream flow is perpendicular to the road alignment, necessitating a crossing. An appropriately sized culvert will be installed to maintain flow.
B-500	P-SL2	Intermittent Stream	2	The impact is for the main access road to the B Series. The stream flow is perpendicular to the road alignment, necessitating a crossing. An appropriately sized culvert will be installed to maintain flow.
C-158	P-SL2	Intermittent Stream	1	The impact is for the access road. The stream flow is perpendicular to the road alignment, necessitating a crossing. An appropriately sized culvert will be installed to maintain flow.
C-166	P-SL2	Intermittent Stream	3	The impact is for the access road. The stream flow is perpendicular to the road alignment, necessitating a crossing. An appropriately sized culvert will be installed to maintain flow.
D-52	P-SL2	Intermittent Stream	2	The impact is for the access road. The stream flow is perpendicular to the road alignment, necessitating a crossing. An appropriately sized culvert will be installed to maintain flow.
G-6	P-SL2	Intermittent Stream	1	The impact is for the main access road to B Series. The stream flow is perpendicular to the road alignment, necessitating a crossing. An appropriately sized culvert will be installed to maintain flow.
D-57	P-SL2	Intermittent Stream	3	Spanning with electric conductors only. Fill impacts not required.

Table 8-9: Streams Spanned by Collector Lines

Stream ID	LURC Subdistrict	Intermittent or Perennial	Width (feet)	Comment/Special Considerations
A Series: Collector Line Streams				
D-55	P-SL2	Intermittent Stream	3	Spanning with electric conductors only. Fill impacts not required.
D-56 (Kibby Stream)	P-SL2	Perennial Stream	30 – 50	Spanning with electric conductors only. Fill impacts not required.
D-57	P-SL2	Intermittent Stream	3	Spanning with electric conductors only. Fill impacts not required.
B Series: Collector Line Streams				
D-24-1	P-SL2	Intermittent Stream	3	Spanning with electric conductors only. Fill impacts not required.
D-24-2	P-SL2	Intermittent Stream	4	Spanning with electric conductors only. Fill impacts not required.
D-28	P-SL2	Perennial Stream	5	Spanning with electric conductors only. Fill impacts not required.

The Maine Erosion and Sediment Control BMP Manual, Sections G-1 and G-2, were used to guide the design, and determine in more detail the design requirements. Detailed design basis for construction-related storm water and erosion control measures are provided in Appendix 2-K.

Stabilization during construction will utilize erosion control mix or seeding, as appropriate to each location and weather condition. Detailed information about construction stabilization measures is also provided in Appendix 2-K.

8.6.2 Post-Construction Stormwater Management

In accordance with DEP Chapter 500 Rules, measures were included in the design to mitigate potential impacts to storm water quality and quantity. The categories of storm water standards that could apply to project disturbing one or more acres include: “basic,” “general,” “flooding,” and/or “urban impaired stream.” There are no urban impaired streams in Franklin County, so this standard would not apply. However, the remaining three standards apply to projects involving 3 or more acres of impervious areas or 20 or more acres of developed area (as is the case for this project). The “basic standard” consists of erosion and sedimentation control measures during construction; inspection and maintenance; and housekeeping measures. The “general standard” applies BMP standards and phosphorus standards to address post-construction water quality. The “flooding standard” mitigates for post-construction increases in peak runoff flow rates for the 2-, 10-, and 25-year/24-hour storms.

TransCanada has identified the appropriate stormwater control measures based on the current site design and determined that the project will meet the applicable stormwater control requirements. As part of the final design for the project, TransCanada will submit the detailed calculations that support the stormwater analysis. A summary of the key stormwater control measures and the basis for those control measures is provided below. Additional detail is provided in Section 2.4.3 and Appendix 2-J.

To address the “basic standards,” runoff from disturbed areas passes through erosion and sediment control measures before leaving the site, as described in Section 8.6.1.

The “general standard” will be applied for post-construction water quality by directing on-site runoff through vegetated buffers via overland (sheet) flow where possible. Where concentration is unavoidable, flow will be redistributed through level spreaders and released through vegetative buffers with the shortest practical spacing. Frequent release of off- and on-site runoff will sometimes not be feasible, particularly along roadway switchbacks and along longer sections of cut slopes on both sides of the road. In such cases, flow splitters/overflow weirs will be placed along the channels to distribute the concentrated flow before releasing the stormwater over level spreaders.

To address the “flooding standard,” a hydrologic analysis was conducted for the 2-, 10- and 25-year/24-hour storms. In general, the project will result in slight increases, of approximately 1 percent or less, or decreases, in peak flow rates. Decreases in peak flow rates typically occurred due to increased time-of-concentration created by channel diversions and the re-distribution of flow through level spreaders.

The preliminary design for the stormwater management during operation has been based on:

- DEP's Chapter 500 Rules, Stormwater Management, Revised November 16, 2005 and December 7, 2006.
- DEP's Stormwater Management for Maine, Volume I – Stormwater Management Manual, January 2006.
- State of Maine, DEP, Stormwater Management for Maine, Volume III – BMPs Technical Design Manual, January 2006.
- State of Maine, DEP, Erosion and Sediment Control BMP Manual, March 2003.
- Maine Land Use Regulation Commission, Chapter 10 of the Commission's Rules and Standards, November 7, 2005.

The NRCS Technical Release 55 (TR-55), Urban Hydrology for Small Watersheds, was used to compute parameters, including time of concentration (Tc) and runoff curve numbers (RCN), needed to conduct the hydrologic analyses that were used to design the channels and culverts and to compute the pre- and post-development peak discharge values at design points.

Other parameters included 24-hour rainfall depths, temporal rainfall distribution, and drainage area. 24-hour rainfall depths were obtained from the NRCS for Franklin County, Maine. The standard NRCS Type II rainfall distribution was applied in the model to establish the temporal distribution of each design storm. Drainage boundaries for existing conditions were obtained from existing topographic mapping. Drainage boundaries for developed conditions were obtained from the project site grading and drainage plan. Antecedent moisture condition II was assumed for both existing and developed conditions. Details regarding the results of this analysis and various drainage design features are provided in Appendix 2-K.

8.6.3 Phosphorus Removal

Ensuring appropriate phosphorus removal in project stormwater is important, especial when drainage contributes to lake watersheds. As noted in Section 8.1, the project's Kibby Range (B Series) ridgelines are within the watersheds of two great ponds, Jim Pond and Flagstaff Lake, and therefore, the issue of phosphorus control has been specifically addressed.

Figure 8-1 illustrates the contributing portions of the site to the Jim Pond and Flagstaff watersheds.

The Jim Pond Watershed has a total watershed area of approximately 12,880 acres. The total project construction area within this watershed (excluding the 115 kV transmission line, discussed in Volume V) represents approximately 0.84 percent of the watershed area. The total acreage of land optioned by the project from Plum Creek (and, thus, over which TransCanada will have control) that is within the watershed is approximately 7 percent of the watershed area.

The Flagstaff Watershed has a total watershed area of approximately 241,820 acres. The project construction area within this watershed is approximately 0.04 percent of the total watershed area, with the optioned property located within the watershed representing about 0.24 percent of the watershed area.

Although the project will not contribute significantly to flows within the watershed, the project has been designed with phosphorus control in mind through the use of vegetated buffers. Vegetated buffers are effective for phosphorus removal when designed in accordance with the BMP manual (DEP 2006, and provided as part of Appendix 2-K). For the Kibby Wind Power Project, three types of vegetated buffers will be employed as part of the stormwater management plan, depending upon the specific location and use: a buffer with a stone-bermed level lip spreader; a buffer adjacent to the downhill side of a roadway; and a ditch turn-out buffer.

The effectiveness of these buffers depends on the buffer flow path length (or width), buffer slope, hydrologic soils class, size of drainage area, and density of vegetation (woods or meadow). Above all, the vegetated buffer dimensions must be protected and maintained. In order to successfully maintain these project buffers, adequate land must be available within the project property boundaries to provide buffer flow path length meeting the BMP Manual Design Standards. Any buffers that extend beyond the project property boundaries are at risk of being encroached by logging or development activities.

To determine if the Kibby Wind Power Project property provides an adequate amount of land for effective vegetated buffers, an initial assessment was performed. For final design, the dimension and type of vegetated buffers will vary throughout the project site depending on the outfall conditions.

Preliminary calculations were conducted to determine the quantity of phosphorus (in pounds) available for algae growth in the Jim Pond and Flagstaff watersheds exported from the project. Standard export rates from DEP were used for grass and gravel roadway cover.

A calculation was then performed to determine the weighted treatment factor for the vegetative buffers, a value from 0 to 1, located just downslope of fill areas and level spreaders. The buffer treatment factor is a function of slope, soil type, and width. DEP provides standard treatment factors for slopes ranging from 0 – 3 percent, 3 – 8 percent, 8 – 15 percent, and 15 – 30 percent, depending on the hydrologic soil group (HSG) and buffer width. Slopes over 30 percent do not provide a significant treatment of phosphorus. A slope analysis was conducted for a 250-foot wide area adjacent to the project. Areas were computed for each of the above slope categories to determine an overall weighted treatment factor for Jim Pond and Flagstaff watersheds.

The computed export rates, after treatment, for Jim Pond and Flagstaff, are 21.8 and 13.4 pounds, respectively. The corresponding allowable export rates provided by DEP are 30.1 and 26.4 pounds, respectively. Therefore, according to the preliminary calculations, the project is not exporting more phosphorus than is permitted.

8.7 References

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