5.0 EARTH RESOURCES

5.1 Topography

Mountaintops in the Kibby Wind Power Project area rise generally to around 3,000 feet (915 m) above sea level, with the highest peaks around 3,500 feet (1,067 m) in elevation. The surficial topography along the ridge tops is broad and flat with intermittent saddles and areas with steep slopes. The mountainside slopes are generally very steep and forested. Most areas are forested above 2,700 feet (823 m); some mountain top areas show evidence of past clearing as evidenced by decaying stumps.

The project site is located on two distinct ridge tops in the area: the southern portion of Kibby Mountain (known as Series A) and Kibby Range (known as Series B). The general topography of each is discussed below; a graphic depiction of existing topography can be seen on maps provided in Appendix 1-A.

A number of clear cuts up to approximately 2,700 feet (823 m) elevation are located around the base of Kibby Mountain with long slopes leading down to wet toe slopes. The Series A ridgelines are generally gently sloping (1 to 8 percent) with limited rock outcrop exposures and few areas of steep and very steep slopes. The steep slopes tend to be short in length and unavoidable. The proposed work areas for Series A will occur approximately between elevations 2,650 and 3,100 feet (808 and 945 m). An effort has been made in the design of the project to locate proposed access roads and turbines along areas with gentler topography, where possible.

The “wishbone” shaped Series B development area on Kibby Range has distinct southwesterly and southeasterly ridgelines spanning approximately 5.3 miles (8.5 km). A number of clear cuts up to approximately elevation 2,700 feet (823 m) are located on Kibby Range, with long grades leading down to wet toe slopes. The wind turbine sites and workspaces are proposed on the gently sloping areas. Road locations have been sited to utilize gentler grades, where possible; however, some of the proposed road locations have steep slope gradients. The proposed work areas for Series B will occur approximately between elevations 2,300 feet (701 m) near the southwesterly ridge area (closest to Gold Brook Road), approximately 3,000 feet (915 m) along the southeasterly ridge area, with the highest work area at approximately 3,280 feet (1,000 m) in elevation.

5.2 Soils Analysis

Soils mapping and analysis of the project area was conducted to provide a basis for access road design and construction, and to demonstrate compliance with LURC standards for Erosion and Sediment Control. Members of the project team met with Mr. David Rocque, State Soil Scientist from the Maine Department of Agriculture, at the site in August 2006 to discuss specifically the intensity and scope of the soil survey, project hydrology and protection of the natural resources of the project area. Mr. Rocque requested a Class “C” Medium High-Intensity Soil Survey for the proposed project.

A Class C Medium High-Intensity Soil Survey has the following requirements:

- Map units do not contain dissimilar limiting inclusions larger than 5 acres.
- The scale will be 1 inch = 500 feet or larger.
- Dissimilar limiting inclusions may total more than 5 acres per map unit delineation in the aggregate, if not contiguous.
- Ground control for test pits is established through the use of a compass, chaining, pacing or taping from known survey points, or other methods of equal accuracy.
- A base map with 5-foot contour intervals should be developed.

A copy of the soil survey for this project is provided as Exhibit D.

Field investigations in support of the soil survey were conducted in August and September 2006 following the above requirements. Test pits were located with the use of sub-meter accuracy global positioning system (GPS) units.

The information collected was used to identify, classify, describe and map the soils in the areas of proposed development of the Kibby Wind Power Project. Soil mapping included the proposed access roads and proposed workspace areas required for construction of the project. The results of those activities are presented in the Class "C" Medium High-Intensity Soil Survey Report provided as Exhibit D, and are summarized below. The soil information contained in the report (soil properties, drainage classifications, rock outcroppings, surface conditions, and slope ranges), have been used by project engineers to refine the engineering design of the access roads, workspace areas, turbine placement, and stormwater management controls. The soil profile descriptions, soil map and soil narrative included in the report were completed in accordance with the standards adopted by the Maine Association of Soil Scientists and the Board of Certification of Geologists and Soil Scientists. As agreed to with Mr. Rocque, the soil survey focused on areas with proposed roads, laydown areas, turbine construction sites and other areas with potentially significant soil disturbances associated with construction of the proposed facilities and access roads.

The survey goal was to obtain the necessary soil data for completing the survey while limiting damage to live trees, avoiding and/or minimizing wetland disturbances and avoiding damage to the existing trail network. The required soil observations were achieved by traversing the project areas and selecting areas that were representative and/or that displayed variations in the landscape, including topographical, surficial features or variations in vegetative stands. Soil observations were accomplished through the use of hand-dug test pits, hand borings, existing burrow pit areas, road cuts and surficial observations.

5.2.1 Soil Survey Overview

Site-specific soil information was collected by three soil survey teams, comprised of one Certified Soil Scientist and two Soil/GPS technicians each. Soil data were collected in August and September 2006 from test pits at various locations throughout the Series A and Series B development areas, including access road areas. Test pit locations were selected based on topographic relief and vegetation stands, which typically are indicative of soil type variations, and test pits were hand dug to bedrock or refusal. Within each test pit, soil was examined to identify soil colors, rock content, texture, consistency, root depths, redoximorphic features, and depth to bedrock. Test pit locations were marked by GPS and plotted to aid in the preparation of soil mapping for the project area. Soil mapping and drainage classifications utilized criterion located in the *Guidelines for Maine Certified Soil Scientists for Soil Identification and Mapping*, published by the Maine Association of Soil Scientists in 1990, revised in 2000.

5.2.2 Soils Mapping

Soils mapping depicting the location, size and types of soils underlying the site have been prepared based on the field activities completed in August and September 2006. Soil mapping was used to identify hydrologic soil group ratings for calculations determining stormwater runoff curve values. Soil complexes were used to define the mapping units shown on the Class "C" Medium-High Intensity Soil Survey map provided in Exhibit D.

Soil complexes consist of two or more dissimilar soils occurring in a regular pattern in the landscape, and can varying greatly in terms of the proportions found each soil type. However, the soil mapping units delineated on the soil survey are limited by the level of intensity or number of soil test pits observed. Therefore, the mapping units were designed to identify distinct separations between dissimilar soils relative to the proposed site development. The following soil complexes or soil map unit symbols were found underlying the site:

- Abram (AbA, AbB, AbC);
- Abram-Mahoosuc Complex (AMD);
- Abram-Rock Outcrop-Lyman Complex (ARB, ARC);
- Abram-Saddleback (ASA, ASB);
- Colonel-Brayton Complex (CBA);
- Chesuncook-Telos Complex (CTB);
- Enchanted-Surplus Complex (ESA);
- Monarda-Burnham (MBA);
- Saddleback-Abram-Rock Outcrop (SAA, SAB, SAC, SAD);
- Saddleback (SaA, SaB, SaC, SaD);
- Surplus-Bemis Complex (SBB);
- Saddleback-Enchanted Complex (SEB, SEC);

- Sisk (SiD);
- Saddleback-Sisk Complex (SKB, SKC, SKD);
- Sisk-Mahoosuc (SMC);
- Saddleback-Rock Outcrop Complex (SRB, SRC);
- Surplus-Ricker Complex (SrC);
- Saddleback-Surplus Complex (SSB, SSC);
- Surplus (SUB, SUC);
- Tunbridge-Bemis Complex (TBB); and
- Telos-Monarda Complex (TMB).

The soil survey map, in the soil survey provided as Exhibit D, depicts the size and location of soil map units relative to each other and existing site features.

Each soil map unit consists of three letters (e.g., SaA), with the first two letters representing soils for the established soil series found within soil map unit areas. The soil map unit is a representation of the soil characteristics, such as texture, stoniness, drainage, and depth to bedrock, all of which may affect the use and management of the soil. The third capitalized letter represents the surface slope gradient of the area within the soil map unit, ranging from A to C, with A representing lesser slopes (0 to 3 percent). Therefore, in this example, "SaA" is interpreted as Saddleback, fine sandy loam on a 0 to 3 percent slope.

There may be small areas of different or dissimilar soils within a soil map unit, known as inclusions. Inclusions may exist within a delineated soil map unit, although the size of the inclusion may be too small alone to stand as a soil map unit.

5.2.3 Soil Characteristics

The soils series identified at the site include the:

- excessively and somewhat excessively drained Abram, Lyman, Mahoosuc and Ricker (also well drained) soils;
- the well drained Marlow, Saddleback, Sisk and Tunbridge soils;
- the moderately well drained Chesuncook and Surplus soils;
- the somewhat poorly drained Brayton (also poorly drained), Colonel and Telos soils;
- the poorly drained Bemis, Brayton and Monarda soils; and
- the very poorly drained Burnham soils.

These soils developed in parent materials consisting of glacial till, compact loamy glacial till, dense glacial till, organic deposits over thin mineral soils underlain by bedrock or fragmental colluvium glacial till and glacio-fluvial deposits. The report in Exhibit D presents specific soil information.

The “higher” elevation soils, generally above approximately 2,500 feet (762 m) in elevation were considered to be in a “cryic” temperature regime. According to the *Keys to Soil Taxonomy*, soils in a cryic temperature regime have mean annual temperatures higher than 32°F (0°C), but lower than 46°F (8°C). Of note, cryic soils that have an aquic moisture regime commonly are churned by frost. All isofrigid[1] soils without permafrost are considered to have a cryic moisture regime. Generally, soils below approximately 2,500 feet (762 m) in elevation were considered to be in a “frigid” temperature regime. As described in the *Keys to Soil Taxonomy*, “a soil with a frigid regime is warmer in summer than a soil with a cryic regime, but its mean annual temperature is lower than 46°F (8°C), and the difference between mean summer and mean winter soil temperatures (June-July-August and December-January-February) is more than 9°F (5°C) either at a depth of approximately 20 inches (50 cm) from the soil surface or at a lithic or paralithic contact whichever is shallower.”

Many “cryic” soils tend to have higher amounts of organics in the upper part providing dark “reddish” colors. Many cryic soils are also classified as “thixotropic.” According to *Soil Taxonomy*, by the United States Department of Agriculture (USDA), thixotropic and thixotropic-skeletal soils have a fine earth fraction with an exchange complex dominated by amorphous clays.

The identified soils have similar properties to the established soil series and should respond to use and management as determined and described in the *Soil Series of Maine Soil Interpretations*, published by the Maine Association of Professional Soil Scientists in cooperation with the USDA Soil Conservation Service, dated January 1987 and revised January 1988 and 1989. Soil survey interpretations included in Exhibit D present further soils information and terminology.

5.2.4 Soils Suitability and Limitations

Based on the results of the soil survey activities and analysis, soils in the proposed project area are considered to be suitable for the proposed development. Erosion control structures are, however, needed to meet erosion control standards, and appropriate engineering methods need to be utilized where hydrologic connection should be maintained (e.g., streams, wetlands, seeps or seasonal/storm event drainages).

There are limitations inherent to some of the soils identified at the site including seasonally high water tables, shallow depths to bedrock and steep slopes. These soil limitations may be overcome by site engineering design, including careful siting. Prior to final project design, a

[1] Soils with a mean soil temperature of less than 46°F (8°C) (USDA 1975).

geotechnical investigation will be performed in order to confirm the depth, conditions and type of bedrock at turbine foundations. Foundation assumptions in this application reflect the information currently available to project design engineers, and are anticipated to represent a likely design scenario.

The soil survey identified several conditions requiring consideration in the project design. Each was examined during the soil survey. The following summary outlines key issues and limitations, as well as approach to be taken by the Kibby Wind Power Project.

- ***Steep Slopes*** occur on the side-slopes leading down from the ridgetops toward the valley floors around Kibby Mountain and Kibby Range. Some of these steep areas exceed 45 percent in slope gradient, and will require substantial grading to develop access roads. These areas will require cuts, fills and/or additional engineered structures to accommodate the proposed project. Where possible, the project roads have been sited along more gently sloping areas. However, several areas exist that require access through more steeply sloping areas. In such areas, as for all road construction areas, care will be taken to minimize the work area to the extent possible and utilize appropriate erosion and sedimentation control measures to control stormwater runoff and sedimentation.

- ***Jurisdictional Wetlands*** (as discussed further in Section 8.5) occur intermittently within the project area, and have been avoided to the maximum degree possible in order to minimize impacts to these valuable resources. The project area falls under the wetland jurisdiction of both LURC and the USACE. Avoiding or minimizing impacts to “hydric soils” (poorly and/or very poorly drained soils) will minimize potential hydrologic impacts.

- ***Hydric Soils***, formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part, are also present intermittently within the project area. Hydric soils may be present in areas adjacent to “seeps” or intermittent discharge sites. Hydric soils identified in the project site include the poorly drained Brayton and Monarda soils. These occur primarily within the jurisdictional wetlands previously mapped at the site and impacts will be avoided or minimized.

Erosion and sedimentation control measures will be put in place prior to actual construction where feasible. During the construction phases of the project, an on-site inspector will be provided to make engineering decisions refining the specific techniques to be utilized at roadway wet crossing areas. Techniques described for this project follow recommendations received from Mr. Rocque regarding design measures to protect the soils of the project area. These recommendations were discussed at several meetings over the course of the preparation of this application, including participation from a broad range of agency personnel in discussions. Agency recommendations have been incorporated into the project and roadway design where appropriate.

A specific location for the on-site septic system has not yet been identified. A Licensed Site Evaluator (LSE) will conduct soil investigations for suitable locations in advance of the project's final design.

5.3 Geological Assessment

5.3.1 Geological Reconnaissance

The area proposed for development of the Kibby Wind Power Project has been included in multiple geological publications. The *Bedrock Geologic Map of Maine* (Osberg et al., 1985) maps the bedrock in the area as migmatite gneiss of the Chain Lakes Massif. The Maine Geologic Survey (MGS) describes the Chain Lakes Massif as being Precambrian age (>650 million years old). Publications by Albee (1972), Boone (1989), Boudette (1989), Cheatham et al. (1989), Gerbi (2005), Perry (1998), and Solar (2001) also provide details on the geological setting of the area. These publications were reviewed as part of a preliminary geological evaluation of the development area conducted by a Maine Certified Senior Geologist. This geological reconnaissance was conducted within the Series A and Series B ridge development areas for the proposed project as requested by the Maine State Geologist to support this LURC application. The purpose of this reconnaissance was to characterize the bedrock outcropping on the ridges and their potential for producing acidic water when excavated or utilized as gravel construction material and exposed to rainfall. The geological reconnaissance report is provided as Appendix 5-A. Additional geological information will be gathered prior to the project's final design through a detailed geotechnical investigation focusing on specific turbine locations, roadways and ancillary facilities.

Field observations during soil and preliminary geological investigations indicate that general conditions along the ridgelines primarily consist of a thin mantle of glacial till underlain by bedrock; angular boulder blocks overlying bedrock; or exposed bedrock. Glacial till consists of varying quantities of silt, clay, sand, gravel, cobbles and boulders. At peak areas it may be absent or only present in thin layers, with thicker layers typically in saddle areas. Various-sized boulders are present throughout the development area and bedrock is typically found within 10 feet (3 m) throughout the area proposed for turbine development.

Available published geological literature indicates that the diatexitic Chain Lakes Massif has highly variably textures that are arguably the result of melting-driven disaggregation of a volcanic-sedimentary stratigraphy (Lippitt 2006). Gerbi (2005) describes four facies within the Chain Lakes Massif: the quartzofeldspathic McKenney Stream, Sarampus Falls, and Twin Bridges; and an Amphibolite. The primary distinguishing feature between the three quartzofeldspathic facies is the nature of the compositional banding. The facies are described as:

- McKenney Stream Facies – contains no compositional banding;
- Sarampus Falls Facies – contains schlieric to highly contorted wispy bands throughout the facies; and
- Twin Bridges Facies – retains lithic layering on a centimeter scale.

The Amphibolite Facies are described as occurring as lenses of medium-grained, well-foliated hornblende-plagioclase-quartz rocks. Goldsmith (1985) indicates that some amphibolites retained pillow structures, while Gerbi (2005) also included a diorite mapped by Albee and Boudette (1972) in the Amphibolite Facies.

The Series A and Series B areas are underlain by the Twin Bridges and Sarampus Falls Facies. The Amphibolite Facies was previously mapped in a small area at the south end of the B Series.

Bedrock samples were collected from seven locations along the A Series, and four samples from the B Series. In addition, reference samples were collected from outcrops at Ledge Hill (east of Bag Pond) and north of Sarampus Falls (along Route 27). Sample locations were surveyed using sub-meter GPS, and are shown in Figure 5-1. Sample locations were selected to be generally representative of the proposed work areas.

Hand specimens were observed to be generally fresh samples of variably banded quartzofeldspathic rock. Oxidation observed in association with weathering occurred as thin (less than 0.2 inches) weathered rims on the exposed portion of the outcrop. Sample descriptions and photographs are included in the geological reconnaissance report provided as Appendix 5-A.

Acid generation potential (acid base accounting) analyses were conducted on field samples to calculate Maximum Potential Acidity (MPA) and Net Neutralization Potential (NNP), both of which are expressed in calcium carbonate equivalent tons/100 tons of material. Details are provided in the geological reconnaissance report (Appendix 5-A).

Results of the sampling determined that rocks from the project area are:

- Not considered toxic (those with NNP less than -5 parts per thousand (ppt) are considered toxic, and all project samples have NNP's greater than 2 ppt);
- Not considered acid toxic (all project samples have a potential of hydrogen [pH] of 6.0 or greater);
- Not a significant source of alkalinity or considered to produce alkaline drainage; and
- Not considered to produce acid or acid drainage.

NOTES :

1. WORK AREA AND SAMPLE LOCATIONS SURVEYED BY OTHERS.
2. ACCESS ROAD LOCATIONS SHOWN ARE TENTATIVE FOR DESIGN PURPOSES.

LEGEND

◆	BGS-1	OUTCROP SAMPLE LOCATION
◇		OUTCROP LOCATION

S.W.COLE ENGINEERING, INC.

AMEC - KIBBY WIND FARM PROJECT

SAMPLE LOCATIONS AND WORK AREAS

Series "A" Ridge & Series "B" Ridge

T1 R6, Maine

Job No. 06-0039.1 G Scale 1" = 1,000'

Date: 11/29/06 Sheet 2

Four of the six samples have a sulfur concentration of 0.005 percent or less. Two samples from the Series B area contained the highest amounts of sulfur (S) (0.012 percent S and 0.021 percent S). Sulfur fractionation analyses measured a variation in the total sulfur for all four samples tested. This is interpreted to be a result of natural variability the sample, and to be associated with the sulfur distribution associated with the size of the sample.

Based on mapping by others and observations from the geological reconnaissance, the bedrock samples analyzed are considered to be generally representative of the bedrock in the Series A and Series B areas, and therefore, the results from the acid-base accounting are also representative.

Field observations of rock types and sulfide minerals will be logged during proposed future geotechnical investigations, and additional sampling and analyses will be conducted as appropriate.

5.3.2 Geotechnical Assessment

TransCanada will initiate geotechnical investigations of the site development area to support final design activities for turbine foundations and other facilities. At this time, based on available information compiled through the preliminary soils and geological investigations, it is not anticipated that any unusual foundation requirements will be identified. Foundation assumptions discussed in Section 2.4.3 reflect likely requirements for the project based on conservative assumptions.

5.4 Seismic Analysis

A review of seismological ratings for the project area has been conducted to evaluate the potential for seismological events to impact the project area and to guide design of the project features including wind turbine foundations, access roads, and ancillary structures. As can be seen in Figure 5-2, the project is located in Seismic Zone 1, representing the least seismic activity. No significant seismic issues are anticipated to exist for the project.

5.5 Potential Construction Impact

5.5.1 Access Roads

To construct the Kibby Wind Power Project, improvements to existing roads and construction of new roads will be required. The site is located within Plum Creek lands and, as such, has a network of existing and planned logging roads. TransCanada has utilized existing roads to the maximum extent practicable. Existing logging road improvements will include some grade adjustments, widening, and clearing of brush growth that encroaches on the roadway, as discussed in Section 2.4.3. Road improvements may also include temporary or permanent widening of curves at intersections to allow turning radius for long loads required to deliver the wind turbine components, and the establishment of pull-off areas to safely accommodate construction traffic with ongoing forestry operations.

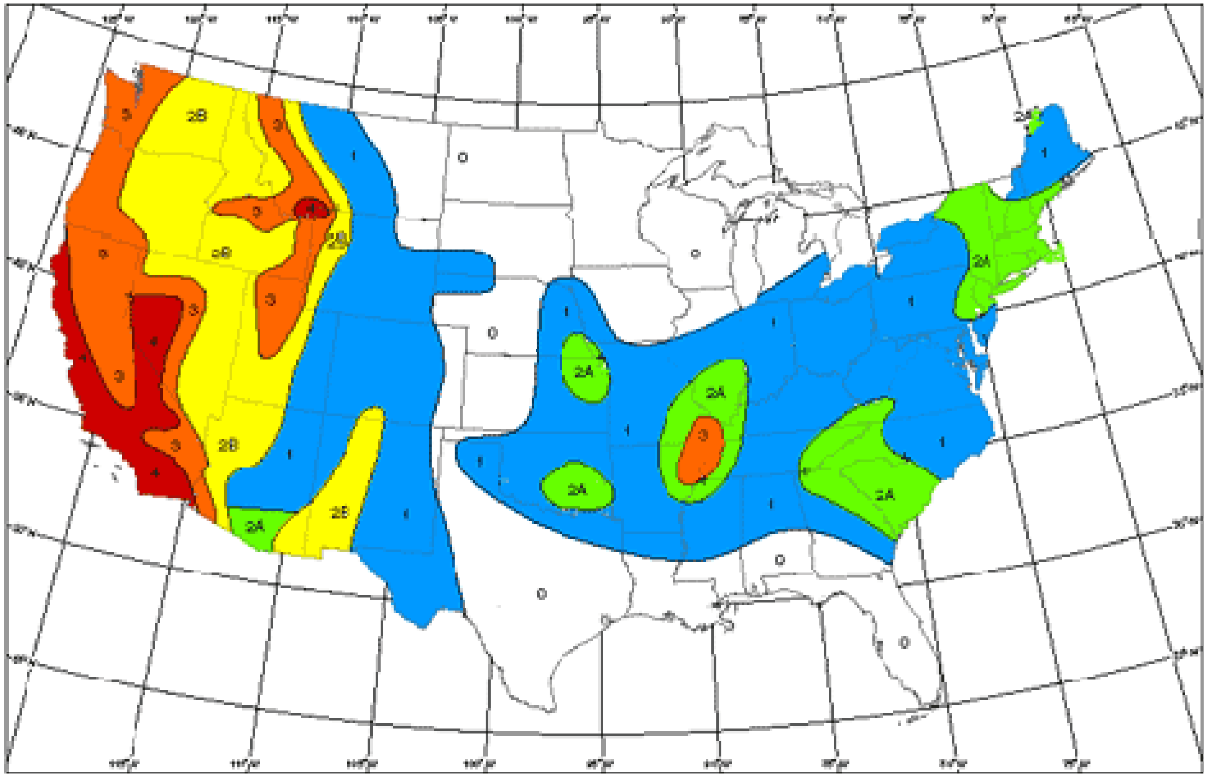

Figure 5-2

United States Seismic Zones

New access roads will be required to access the wind turbine sites from the existing access roads. These new roads are required to support construction activities and will remain as permanent access for maintenance of the wind turbines. Planned roads providing access to ridgelines will be 20 to 25 feet (6.1 to 7.6 m). In order to accommodate crane movement between proposed turbines, road travel width along the ridgelines will be 34 feet (10.7 m). Additional information with regard to road construction is provided in Section 2.4.3.

Road construction will include clearing and grubbing, as well as rock excavation and grading activities. Blasting will also be necessary to fracture rock for excavation. A detailed erosion and sedimentation control plan (discussed in Section 5.5.4) will be implemented to minimize potential impacts. Potential blasting impacts and protocols are discussed in Section 5.5.5.

Soils in the mountain terrain are subjected to lower than normal temperatures and more freeze-thaw cycles than valley soils. This tends to loosen and soften soils, as well as provide fissures for more steady penetration of moisture. Also, the typically steep topography and shallow depth to bedrock on mountain slopes tends to keep the water flow velocities high. These factors, coupled with a generally high fines content can result in an increased susceptibility of the mountain soils to erosion if good water seepage and stormwater management practices are not observed. Although the mountain soils are more susceptible to erosion because of the above factors, their overall composition provides a natural resistance to unchecked erosion. Specifically, soils encountered along the proposed access road and trail alignments in the project area generally contain a high percentage of stones and rock fragments. These materials will help to limit the amount of soil erosion that can occur, provided roads and road drainage are designed in accordance with proven techniques to control drainage and limit water flow velocity. Details regarding stormwater control measures included in the project design are provided in Section 8.6.

Rock excavated during construction will be crushed and used for road building and other construction needs. The project will also likely require a source (or sources) of construction gravel for the purposes of road and general construction. It is planned that additional gravel needed for the project will be obtained from existing permitted gravel pits owned by regional gravel/stone operations. The development of on-site gravel pits is not planned. Existing logging roads throughout the proposed project area are constructed mainly from excavating immediate upslope till, removing large boulders, and using the excavated material to fill the downslope portion of the road section.

The access roads for the project have been located on as flat a grade as possible; however, because of the generally mountainous terrain which comprises the project area, sustained grades of up to 10 percent are anticipated. During layout of roadways, consideration was given to avoiding excessive slope as well as to avoiding or minimizing impact to wetland areas. The measures detailed in Section 2.4.3 outline specific design elements that have been incorporated into the project, through consultation with agency staff, in order to respond to these issues.

5.5.2 Wind Turbines

The turbines are located along ridgelines. Site observations and soil mapping presented previously in this report indicate that foundation conditions along the mountain ridges consist of glacial till underlain at shallow depth by bedrock; angular boulder blocks underlain at shallow depth by bedrock; or exposed bedrock. Glacial till is an unsorted soil consisting of variable amounts of silt, clay, sand, gravel, cobbles and boulders. Where till exists, it is likely to be thicker in saddles and become thinner or sometimes non-existent toward peaks. Angular boulder blocks are variably sized angular fractured rock fragments, usually forming an open matrix with little or no fines material, and were observed on some mountain tops. Bedrock is likely to be within 10 feet (3 m) of the ground surface.

Foundation support for the proposed turbines is anticipated to be the socket type of foundation, as discussed in Section 2.2.4.2. A geotechnical investigation will be undertaken to provide information confirming appropriate foundation design.

5.5.3 Substation and Service Building

The substation and service building will be located in areas with suitable subsurface conditions or suitable materials will be brought to the site. Geotechnical work will confirm field conditions; in addition, soil resistivity testing will also be conducted for confirmation of stability and grounding design requirements. Design consideration will be given to the depth of the frost zone in defining depths of footings and insulation or heating requirements for utilities. Finished site grade will slope away from the proposed structures to promote site drainage.

5.5.4 Erosion and Sedimentation Control Plan

Preliminary erosion and sediment control plans have been developed based on preliminary designs and associated grading plans for project access roadways and turbine pads. Detailed discussion is presented in the Construction and Stormwater Narrative provided in Appendix 2-K. 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.

Erosion and sediment control of construction-related runoff will primarily be managed by using sediment barriers and sediment traps. The sequence of construction will require that all perimeter controls, including the off-site diversion channels and culverts, temporary sediment barriers, and temporary sediments traps be installed before commencing earthwork activities. Where necessary, temporary diversion berms will be used to direct construction runoff to the traps. Natural vegetative buffers are proposed to be maintained down-slope of silt fence and trap outlets to further filter out any sediment-laden runoff.

TransCanada will incorporate all appropriate erosion and sediment control design features to protect soils, hydrology and natural resources in the development area in its final design. The preliminary design will be revised as appropriate following the completion of final geotechnical investigations and final access road alignment and selection of locations for ancillary features.

5.5.5 Blasting Analysis

The locations of the proposed Series A and Series B development areas and access roadways have been selected in part to minimize the potential need for blasting. Nevertheless, in light of the shallow depth to bedrock and surficial boulder features located throughout the development areas, it is anticipated that blasting will be necessary. The extent and locations of such blasting will be determined during the geotechnical analyses to be conducted to support final foundation and site development design.

The need for blasting versus bedrock excavation through ripping will depend on the hardness/strength, quality and amount of weathering of the bedrock at the different locations. It may be feasible to remove softer bedrock (sedimentary or weathered) by ripping. Where blasting is required, it will be conducted in accordance with the United States Department of the Interior Office of Surface Mining Reclamation and Enforcement Blasting Guidance Manual to limit peak particle velocity and ground vibration to safe levels, as well as with applicable state and local requirements. Proper stemming techniques will be used as needed to minimize noise and air blast effects. Blasting mats will be used to protect against flyrock.

TransCanada will develop a detailed blasting plan addressing airblast limits, ground vibrations and maximum peak particle velocity; reporting requirements; procedures for storage and transportation of blasting equipment and materials; safety measures; and other requirements as appropriate and as based on appropriate procedures (an example is provided in Appendix 5-C). TransCanada has installed thousands of miles of buried pipelines through rock in various parts of Canada and the United States, frequently using blasting techniques for rock removal in pipe ditches. Through the use of specially qualified blasting companies and TransCanada construction inspectors, excavation through blasting is a safe, efficient and effective practice.

Local authorities will be consulted and notified as appropriate prior to commencement of any blasting activities.

5.6 Potential Operational Impact

Following completion of construction, potential impacts to earth resources will be minimal. Unused laydown and other work areas will be stabilized and allowed to revegetate naturally. Only 20 feet (6.1 m) of the 34-foot (10.4 m) wide ridgelines roads will be maintained; the balance will be allowed to revegetate. Operational staff will observe road conditions on a regular basis to identify the need for any augmentation of stabilization or repairs.

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