SPRUCE MOUNTAIN WIND, LLC
Site Location of Development Act//Natural Resources Protection Act
Spruce Mountain Wind Project

STORMWATER

- Excerpts from application, dated January 19, 2010
- Review comments from the Department's Division of Watershed Management, dated April 22, 2010 (with the licensee's response in "red")
- Review comments from Division of Watershed Management dated June 11, 2010 and July 8, 2010
- Review comments from Department of Agriculture dated February 3, 2010 with licensee's response in "red"
- Long term inspection & maintenance plan
- Detail and cross-section of access road showing rock sandwich revised June 17, 2010

12.0 STORMWATER MANAGEMENT PLAN

12.1 Overview

The Spruce Mountain Wind Project (Project) is an 18- to 20-MW wind energy generation project proposed on approximately 2,879 acres of land located in Woodstock, Oxford County, Maine. The proposed Project includes construction of access roads, up to 11 wind turbines, and transmission lines needed to connect the project to the power grid. Power from the turbines will be collected in a 34.5-kV underground collector line system buried within the ridgeline access road work limits. The underground electric collector line will transition to an aboveground transmission line at the southern end of the turbine string and continue aboveground, mounted on wood poles, to the public right-of-way on Cushman Road. An operations and maintenance building will be constructed at the northern end of the project adjacent to the new access road.

The Project includes approximately 18,500 linear feet of new roads, 11 turbine foundations, and an approximately 1,750-square-foot O&M building that would be considered new impervious area pursuant to the Maine Stormwater Management Law (38 MRSA. § 420 et al. and Chapter 500-Rules). Because the Project consists primarily of linear features it is regarded as a linear project pursuant to the Stormwater Law. Disturbed areas not considered part of permanent Project facilities will be restored and revegetated following construction. Access roads will be built 24 feet wide to allow access to the crane roads located along the ridgeline. The crane roads along the ridgeline will be constructed at 32 feet wide to allow for large construction equipment to assemble the turbines. In an effort to minimize Project impacts, construction access roads and crane roads will be reduced to a final width of only 12 feet to be used during operations. These roads will also have periodic turnouts to allow for passing vehicles. The road base and cross section will remain in place, but the temporary gravel road surfaces (12 feet and 20 feet wide, respectively) will be loamed and seeded and maintained as permanent vegetated meadow buffers.

The Project requires a DEP Site Location of Development Act permit and is required to meet the Basic Standards, General Standards, and the Flooding Standard of the Maine Stormwater Law (38 M.R.S.A. § 420-D.1, *Standards*, and Chapter 500-Rules). The Phosphorus Standards will apply to a small portion of the site within the watershed of a great pond.

Presently, the project area is wooded and used as commercial timber land. Disturbed areas, excluding permanent facilities, will be reseeded and revegetated in a manner that will allow these areas to revert to natural conditions (refer to Section 14 – Basic Standards). Although construction of the facility will involve the disturbance of approximately 50.8 acres of land, only 6.6 acres of impervious area will remain following construction. This site is not located in the direct watershed of an Urban Impaired Stream as listed in Chapter 502, Appendix B. The drainage from the site runs to either Big Concord Pond or Shagg Pond located north and northeast of the site, and to other unnamed ponds to the west, south, and east that eventually drain to the Concord River (north of the Project), Little Androscoggin River (south of the Project), and the west branch of the Nezinscot River (east of the Project). Adjacent properties are generally undeveloped and used primarily for commercial timber harvesting operations, like the project site. Eventually, the project area drains to the Androscoggin River, which flows into the Atlantic Ocean.

Spruce Mountain Wind, LLC (SMW) is proposing low-impact design methods using natural buffers to treat stormwater runoff from the project. These natural buffers will convey treated stormwater runoff

from impervious areas as sheet flow, similar to existing site conditions. Stormwater calculations for the project site demonstrate that there will be an insignificant increase in peak flow rates or runoff volume from the project. Stormwater detention facilities are not warranted since there will be insignificant increases in peak flows associated with storm events. As a result, SMW is requesting a waiver from the Flooding Standard pursuant to Chapter 500(4)(E)(2).

Each natural buffer area was designed in relation to the affected area to be treated. These buffers were sized using the proposed site conditions and amount of impervious area draining to each buffer, based on *Stormwater Management for Maine* and Chapter 500 buffer standards. Attachment 12-1 includes the HydroCAD® reports, calculations, and drainage plans for modeling assumptions, subcatchments, flowpaths, drainage reaches, etc. Runoff calculations were performed for the 2-year, 10-year, and 25-year storm events for the existing and developed conditions.

12.2 Methodology

Natural Resources Conservation Service (NRCS) maps were used to obtain regional rainfall data. The Soil Conservation Services' (SCS) Technical Release (TR)-20 computer modeling method was used within HydroCAD® 9.10 to perform hydrologic and hydraulic calculations. This method accounts for existing soils and land use, topography, vegetative cover and proposed land use. The conditions of the Project site were evaluated to determine pre-development and post-development peak stormwater flows, drainage patterns, flow velocities, and other attributes of the site. These conditions were analyzed using data for a Type III, 24-hour storm distribution, with a frequency of occurrence of 2 years, 10 years, and 25 years. Rainfall amounts for these storm intervals are 3.0 inches, 4.5 inches and 5.20 inches, respectively. The hydrologic calculations can be found in Attachment 12-1.

12.3 Topography and Vegetation

The majority of the project area is comprised of undeveloped forest land and commercial forestry operations with moderately-steep to steep mountainside slopes. Elevations generally range between 1,010 feet above sea level (asl) in the vicinity of the O&M building to 2,190 feet asl in the vicinity of the turbine sites located along the ridgeline. Slopes range from 0 percent to 60 percent but mostly occur at 30 percent or less in the vicinity of the ridgeline access road and turbine sites. Forest stands in the project area are typical of lands subject to commercial forestry operations. The project area was assumed to be in poor condition for the purpose of runoff calculations. HydroCAD® evaluates poor forest conditions using a higher curve number, which yields a higher runoff rate. This makes the runoff calculations more conservative.

Wetlands, streams, and similar water resources were mapped in the project vicinity and impacts to these resources were avoided and minimized where possible.

12.4 Site Soils

Site specific soils mapping, in conformance with Class B (High Intensity) and Class L (Linear) standards, was performed for the project site (see Section 11). According to these surveys, the site consists of very-shallow (<10 inches of mineral soil over bedrock) to moderately-deep (20 to 40 inches of mineral soils over bedrock) soils on the ridge and side slopes. At elevations less than 1,200 feet asl, mapped soils were generally deep (>40 inches over bedrock). The soil mapping units produced as a result of this soil survey were overlaid on the engineering drawings and used for the stormwater analysis and design. For

stormwater calculation purposes, the soils were grouped by Hydrologic Soils Group (HSG), drainage classifications defined by the NRCS. These groups are shown on the drainage plans in Attachment 12-2. The soils on the site are predominantly HSG C and D. The ridgeline is mostly HSG D rocky/ledge soils, while the side slopes and lower elevation areas are generally HSG C and D soils.

12.5 Stormwater Quality Best Management Practices

The Project was designed to comply with the requirements of Maine DEP's best management practices (BMPs) for stormwater, identified in the *Stormwater Management for Maine* manual, published by the Maine DEP in January 2006. The Project design incorporates many of the BMPs contained in this manual, including level spreaders, stone berms, and checkdams, and the design also integrates features geared towards minimizing the effects on ground and surface water flow.

The General Standards, Section 4(B)(2) of the Chapter 500 Rules require that runoff from no less than 95 percent of the impervious area and no less than 80 percent of the developed area that is impervious or landscaped is controlled and treated using accredited BMPs. Because this project is primarily made up of roads, it is considered linear in accordance with Section 4(B)(3)(c) of the General Standards and will require treatment for no less than 75 percent of the runoff volume from the impervious area and no less than 50 percent of the developed area that is impervious or landscaped. This project achieves treatment of more than 90 percent of the total impervious and developed area as well as treatment of essentially 100 percent of the total disturbed and non-impervious area, which will be stabilized with erosion-controlling mix mulch blankets and reverted to a condition similar to natural vegetative conditions.

The proposed utility corridor does would include only negligible new impervious areas associated with the proposed power poles. Areas disturbed during construction will be restored to pre-construction contours and revegetated following construction. In addition, the revegetated corridor will be maintained in accordance with Maine DEP's Chapter 375, *Minimum Performance Standards for Electric Utility Corridors*. SMW has prepared a Post-Construction Vegetation Management Plan (Attachment 10-1, Section 10 of this application) that will be reviewed and approved by Maine DEP as part of this permit application. Because the utility corridor will be built and operated in compliance with the criteria specified in Section 4(B)(3)(d) of the General Standards, the electric transmission line portion of the Project is not subject to the Chapter 500 General Standards.

12.6 Pre-Development Conditions

With the exception of logging roads and associated landings, the project site is currently wooded and undeveloped, though used for commercial timber harvest. Like a typical logged forest, it is fair to poorly vegetated with a mix of mature deciduous and coniferous trees, well-established medium and young trees, and thick brush, grasses and meadow vegetation. Stormwater runoff from the existing project site is grouped into five large subcatchments, covering approximately 2,900 acres, as described below and shown in the map in Attachment 12-1.

Subcatchment A is located north of the ridgeline and east of the access road. This drainage area includes approximately 293 acres of wooded mountainside within land controlled by SMW. The area contains primarily HSG D soils with smaller areas of C soils. There are a few existing dirt roads, but otherwise the area is undeveloped. The runoff curve number for this subcatchment is 82 with a 25-year storm peak flow rate of 527 cubic feet per second (cfs).

Subcatchment B is located northeast of the ridgeline. This drainage area includes approximately 115 acres of wooded mountainside within land controlled by SMW. The area contains primarily HSG D soils with smaller areas of C soils. There are a few existing dirt roads, but otherwise the area is undeveloped. The runoff curve number for this subcatchment is 82 with a 25-year storm peak flow rate of 198 cfs.

Subcatchment C is located west of the ridgeline. This drainage area includes approximately 384 acres of wooded mountainside controlled by SMW. The area contains primarily C soils near the top of the ridge and D soils towards the bottom. There are a few existing dirt roads, but otherwise the area is undeveloped. The runoff curve number for this subcatchment is 82 with a 25-year storm peak flow rate of 684 cfs.

Subcatchment D is located east of the ridgeline. This drainage area includes approximately 694 acres of wooded mountainside. The area contains primarily D soils. There are a few existing dirt roads, but otherwise the area is undeveloped. The runoff curve number for this subcatchment is 82 with a 25-year storm peak flow rate of 1,222 cfs.

Subcatchment E is located south of the ridgeline. This drainage area includes approximately 1393 acres of wooded mountainside. The area is primarily C and D soils except on the flatter ridge where B soils are present. There are a few existing dirt roads, but otherwise the area is undeveloped. The runoff curve number for this subcatchment is 82 with a 25-year storm peak flow rate of 2,129 cfs.

Refer to Attachment 12-1 for a further description of the various subcatchment areas.

12.7 Stormwater Calculations and Results

A post-development drainage analysis of Spruce Mountain was performed to determine if the project would increase runoff from the site and therefore require stormwater detention for the 2-, 10-, and 25-year storm events.

Hydrologic soil group areas were identified for each watershed based upon the soil survey. The most distant hydraulic travel length was identified for each of the five watersheds. Length and width of all existing roadways within the watershed boundaries were estimated and assumed to have a runoff curve number (RCN) of 98, assuming impervious roadways (HSG C). All wooded areas were assumed to be in poor condition as a result of commercial timber harvest and the presence of bedrock at or near the ground surface in many locations.

Stormwater calculations assumed a 12-foot-wide impervious road, a 50-foot by 50-foot area for each gravel crane pad, and a 1,135-square-foot concrete area for each turbine base. The post-development watershed areas are the same as the pre-development watershed areas. The time of concentration was assumed to remain the same in both pre- and post-development. Results of the stormwater runoff calculations are shown in Table 12-1.

Table 12-1. Existing and Post-Development Peak Flow Rates and Runoff Volumes

	Watershed A	Watershed B	Watershed C	Watershed D	Watershed E
Watershed Area (acres)	293	115	384	694	1393
Increase in Impervious Area (acres)	1.9	0.2	2.6	0.7	1.2
Increase in Impervious Area (% of Total Watershed)	0.6%	0.2%	0.7%	0.1%	0.1%
Existing Peak Flow Rate (cubic feet per second)	527	198	684	1222	2129
Existing Runoff Volume (acre-feet)	75	28	98	174	355
Post-Development Peak Flow Rate (cubic feet per second)	527	198	684	1222	2129
Post-Development Runoff Volume (acre-feet)	75	28	98	174	355

12.8 Post-Development Conditions

The Project's stormwater management low-impact development system was designed to mitigate the impacts of the proposed gravel roadways while maintaining simplicity in the design. This simplicity is important because it requires a minimum amount of maintenance to ensure its proper function, which in turn provides a higher probability of long-term effectiveness.

In general, there will be very little change in the runoff characteristics of the site after completion of the Project. In all cases, there will be a ditch located along the upstream side of the roadway that will intercept flow coming downhill. These ditches will run a maximum of 400 feet before allowing the discharge to continue downstream through a culvert. However, the ditches will also discharge flow through smaller, 4-inch, perforated PVC pipes at 100-foot intervals. Pre-developed mountain side slopes have an approximate grade of 20 to 60 percent; however, the proposed roadside ditches will have a maximum slope of only 13 percent, enabling them to slow the upstream flow, thereby decreasing the runoff for areas intercepted by the roadway. While there will be a slight increase in overall runoff due to the roadway, it will generally be mitigated by this decrease in upstream runoff.

No significant changes in runoff are expected following development of the site. This is primarily due to the impervious area proposed in each subcatchment being a relatively small percentage of the whole. For example, in Subcatchment C, 2.6 acres of impervious surface are proposed, but that represents only about 0.7 percent of the entire 384-acre watershed within the project area, as shown in Table 12-1.

Much of the project site has thin soils over bedrock that are conducive to producing large volumes of stormwater runoff. Because large mountain side watersheds already have large volumes of runoff, the increase in runoff due to construction of gravel roadways and turbine foundations would be minimal. Both the relatively small increase in impervious area and the minimal change in runoff volumes following construction contribute to insignificant changes in runoff characteristics post-construction. The HydroCAD® calculations in Attachment 12-1 also demonstrate no significant changes in the rate or volume of runoff are anticipated from post-development site conditions.

Low-Impact Development (LID) is the general term used to describe a design strategy that minimizes disturbance and aims to maintain the pre-development hydrologic regime through the use of design techniques and BMPs. A combination of hydrologic functions such as runoff storage, infiltration, groundwater recharge, vegetation and buffer filtration, time of concentration, and sheet flow are preserved through the use of stormwater management BMPs, buffers, reduction of impervious surfaces, conservation of natural areas and control of runoff close to the source.

Traditionally, the impact of development to a watershed is measured in terms of increases in peak flow rates and changes in flow regimes. Conventional stormwater management methods direct all stormwater to channel-like flow. Through the use of ditches, storm drains, and other "end-of-pipe" controls, the stormwater is carried to detention ponds and other point sources of discharge as quickly as possible. The end-of-pipe system is designed for the larger and more infrequent events such as the 10- and 25-year storms. Such a system is not designed to manage smaller, more frequent events such as the 1- and 2-year events that make up 90 to 95 percent of all rainfall events. As a result, these smaller, more frequent storms over-drain a site managed by conventional stormwater practices and eventually erode natural streams, causing downstream pollution due to the rapidly transported pollutants. In contrast to conventional stormwater management methods, LID methods control stormwater at the point of collection. Instead of channeling the water to a detention pond, stormwater runoff is discharged in a more natural condition, as sheet flow. The Project objectives are to minimize disturbance and maintain a pre-development hydrology regime. The Project will replicate existing runoff conditions and drainage patterns through the use of a LID system, instead of using more conventional end-of-pipe systems.

The provisions of the Maine Stormwater Law and Site Location of Development Act typically require stormwater detention practices in order to meet the flooding standard required for large projects such as this. Results of these analyses indicate that the Project will produce little or no increases in peak flow rates; therefore, SMW is requesting a waiver of the Flooding Standard per the General Standards, Section 4(E)(2)(b) of the Chapter 500 Rules.

12.9 Stormwater Quantity Management

The primary concept of the Project's stormwater management system is to minimize the amount of water traveling over the newly created roadway. This will be accomplished by first intercepting the surface water flow on the uphill side of the roadway with a ditch that will be constructed along the upper edge of the road. Water will flow from the ditch through a culvert system, allowing the water to pass under the roadway. At the outlet of the culverts, small sumps with level spreader systems will be provided to allow the flow to be disbursed downstream. In addition to these cross culverts, the Project will use stone checkdams coupled with perforated lines to allow the clean, up-stream water to be infiltrated into the roadway sub-base (a rocky granular system) and continue to travel downstream. Furthermore, at the naturally-occurring low points in the roadway, a stone and geotextile filtering system (commonly referred to as a rock sandwich) will be installed under the roadway sub-base to allow upstream ground and surface waters to travel under the roadway unimpeded by the new construction. This system will maintain flows as close to sheet flow as possible.

Runoff from the final gravel roadway system will be directed through an artificially created meadow buffer approximately 20 feet wide and will then travel through a forested buffer at least 35 feet wide. These buffers will be protected with deed restrictions. Sample deed restrictions for meadow and forested buffers can be found in Attachments 12-5 and 12-6, respectively. Buffers were sized using the

Stormwater Management for Maine manual and in consultation with Maine DEP. Stone berms will also be implemented in steeper buffer areas to slow flows and guarantee proper treatment. This filtering system will remove sediment before the surface water travels downstream.

Frequent culverts, level spreaders, buffers and other erosion control measures will be used throughout the Project in order to control runoff and erosion. Culvert sizes, locations, and elevations are specified on the design drawings (Exhibit 1), but final culvert locations may need to be adjusted in the field based on site-specific conditions. The final locations and elevations of culverts will be noted and included on the as-built plans.

Results of the stormwater runoff calculations are shown in Table 12-1. Complete printouts for stormwater data, calculations, modeling assumptions and HydroCAD® reports for the pre-development and post-development conditions can be found in Attachment 12-1. The peak flow rates and runoff volumes from the pre-development site conditions are not significantly affected by the proposed development as indicated by the post-development calculations. Based on these results, no flooding or adverse stormwater-related impacts are anticipated in association with development of the site. Although the project will add impervious area, the overall RCN remains the same for the pre-development and post-development conditions of the site. The increase in peak flow post-development will be insignificant for all storm events. Therefore, stormwater mitigation for water quantity is not required for this project, per the *Stormwater Management for Maine* manual.

12.10 Erosion and Sedimentation Control

Erosion and sedimentation control plans were prepared for the Project and are incorporated into the civil design plans (Exhibits 1 and 2). During construction, a variety of stabilization measures will be used to prevent sedimentation from soils due to wind and water action. The locations and details of proposed stabilization measures are illustrated in the drawings in Exhibits 1 and 2. All erosion control and stabilization measures have been designed to adequately address the requirements of the basic stabilization standards as defined in Chapter 500, *Stormwater Management Rules*. See Section 14, Basic Standards, of this application for a detailed description of proposed erosion and sedimentation control practices.

12.11 Water Quality

Stormwater quality, specifically the phosphorus budget, was evaluated using the methodology contained in Volume 2 of the *Stormwater Management for Maine* manual. Because a relatively small portion of the project area will be developed, the Project is far below the allowable phosphorous discharge values without any treatment. Taking into account treatment provided through the vegetated buffers, the amount of phosphorus leaving the property after development is negligible and completely within accepted standards. The phosphorus calculations are shown on the worksheets in Attachment 12-7.

Phosphorus is a naturally-occurring element and is normally present in low concentrations within the soil structure. The main concern regarding development and phosphorus production is the introduction of excess phosphorous into waterbodies as a result of human activity. Phosphorous is found in fertilizers used on lawns and gardens, in sewage and waste water, and in other sources like dishwashing detergent, deicing agents, and car washes. Excessive amounts of phosphorous in a waterbody can lead to harmful algal blooms.

Stormwater from the project site will be treated using a grouping of level spreaders and natural buffers for treatment of roads and turbine pads. Part of the site is within the direct watershed of two great ponds: Shagg Pond and Big Concord Pond. Development in these areas will need to meet the phosphorus standards dictated by Maine DEP and shown in Table 12-2. Areas not draining to a pond will need to provide treatment BMPs meeting the General Standards (see Attachment 12-8).

Table 12-2. Project Phosphorus Budgets for Nearby Watersheds

Watershed	Phosphorus Standard: Project Phosphorous Budget (PPB) (Lbs P/Yr.)	Pre-Treatment Project Phosphorous Export (Lbs P/Yr.)	Post-Treatment Project Phosphorous Export (Lbs P/Yr.)
Shagg Pond	0.444	0.125	0.05
Big Concord Pond	4.165	1.625	0.65

The Project includes approximately 18,500 linear feet of new roads that are considered new impervious area for the purposes of determining phosphorus export or required treatment in accordance with the stormwater standards of the Chapter 500 Rules. Phosphorus export from impervious areas such as roads prior to treatment is 1.75 lbs/acre/year, assuming a high export factor, in accordance with Table 3.1, Volume II, *Stormwater Management for Maine*. Disturbed areas other than impervious surfaces will be reseeded in a manner that will allow these areas to revert to natural conditions; therefore, the disturbed area is considered insignificant and generally limited to impervious or developed areas. Since the project is considered linear and will incorporate BMPs to treat the entire length of the project, any incidental disturbed areas, such as road ditches, will be treated at the same locations as related impervious areas.

Development of gravel roadways to access wind turbines should not lead to significant phosphorus in stormwater runoff. Re-vegetated areas along Project roadways will not be fertilized after initial growth is established, thus minimizing the addition of phosphorus. By using the generic phosphorus generation rates for roadways, we have overestimated the amount of phosphorus runoff from the Project. However, even with this conservative estimate the values in Table 12-2 and the calculations in Attachment 12-7 show that the amount of phosphorus generated by the project is well below the Project's budgeted allowance.

12.12 Conclusions

The Project was designed to comply with the Basic Standards, General Standards, and the Flooding Standard of the Maine Stormwater Law. The post-development drainage analysis shows a negligible increase in runoff volume for 2-, 10-, and 25-year storm events. A series of BMPs and buffers have been incorporated into the design to moderate increases in phosphorus export to the lakes and to accommodate the channel protection volumes as required by the Stormwater Law. The Project's post-development drainage analysis shows no increase in peak flow rates; therefore, SMW is requesting a waiver from the Flooding Standard. The Project will not increase the likelihood of flooding downstream of the site and will meet stormwater quality and channel protection standards. The proposed LID BMPs and natural buffers will provide sufficient stormwater quantity and quality management without producing adverse impacts. The proposed stormwater management system will be constructed and maintained in accordance with Maine DEP standards and is designed to closely replicate pre-development stormwater conditions at the site and, therefore, will not result in flooding or degradation of existing water quality.

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Applicant response in "Red" is ✓

Site Location of Development
TECHNICAL REVIEW MEMORANDUM
Bureau of Land and Water Quality

TO: **Dawn Hallowell, Project Manager**
FROM: **David A. Waddell -- Division of Watershed Management**
DATE: **April 22, 2010**
RE: **Woodstock – Spruce Mountain Wind LLC.**

APPLICANT: Patriot Renewables LLC. and Spruce Mountain Wind LLC.
DEP#: L-24838-24-A-N/L-24838-2G-B-N
Town: Woodstock
Engineer who prepared application: Engineering and Management Service LLC.
Parcel Size: 2879 acres
Site Description: Managed forest ant woodlands with steep slopes.
Project description: 11 turbine wind farm with 18,500 feet of access road and 4.1 miles of associate transmission lines.
Size of new impervious area: 6.7 ✓
Size of new developed area: 0 ✓
Watershed (waterbody): Big Concord Pond, Shagg Pond, Tributaries of Concord River, Little Androscoggin River, and the west Branch of the Nezinscot River.
Watershed type: sensitive / threatened, sensitive / threatened, other

PLANS USED FOR REVIEW:
Pre-development: Drawings C-100.1-30 to C-100.4-30, "Spruce Mountain Existing conditions and Layout Plan," revised date 1/12/2010.
Post-development: Drawings C-201-30 to C-220-30, "Spruce Mountain Plan and Profile," revised date 1/12/2010.
Erosion and Sediment Control Plans: Drawings C-201-30 to C-220-30, "Spruce Mountain Plan and Profile," revised date 1/12/2010.
Note: Other plans may have been reviewed that are not noted here.

STORMWATER MANAGEMENT

The applicant is proposing an eleven turbine wind power project with 18,500 feet of access road called Spruce Mountain Wind. This project lies within the watershed of Big Concord Pond, Shagg Pond, Tributaries of Concord River, Little Androscoggin River, and the west Branch of the Nezinscot River. This proposed project will create approximately 6.6 acres of developed area and 6.6 acres of impervious area. This project has been determined to trigger the Site Location of Development Act and must meet the Basic, General, and Flooding Standards. Under the General Standards the applicant is applying the phosphorus methodology to address impacts to Big Concord Pond and Shagg Pond. As such, the applicant is required to use the Phosphorous Methodology outlined in "Phosphorous Control in Lake Watersheds: A Technical Guide to Evaluating New Development" to assess the development. This project is being reviewed under the 2006 Stormwater Management rules and the design and sizing of the proposed BMPs for this project are based on the "Stormwater Management for Maine" January 2006.

Stormwater quality treatment will be achieved with numerous water quality buffers.
Stormwater flooding mitigation will be achieved with numerous water quality buffers.

The following comments need to be addressed:

BASIC STANDARDS:

Note: *As always the applicant's erosion control plan is a good starting point for providing protection during construction. However, based on site and weather conditions during construction, additional erosion and sediment control measures may necessary to stop soil from leaving the site. In addition, other measures may be necessary for winter construction. All areas of instability and erosion must be repaired immediately during construction and need to be maintained until the site is fully stabilized or vegetation is established. Approval of this plan does not authorize discharges from the site.*

1. Sedimentation barriers such as silt fencing, geosynthetic berms, and erosion control mix berms are intended to be installed along the contour as noted in their respective details on C-411-30 and C-412-30. On the Plan and profile sheets the barriers are routinely shown crossing contours. Follow relative contours with in 100 feet of flow and turn ends up slope where necessary. Please correct.

   This has been addressed. ✓

2. Through out the project plan sheets a ditch lines are shown mostly on the upgradient side of the proposed road and sometimes at the toe of fill slopes. At points detail C-407-30 is referred to but for the majority of the ditches C-401-30 called for. Detail C-401-30 does not indicate the appropriate ditchline protection. It is typical that for slopes greater than 5% riprap underlain with a non woven geotextile is necessary. In some cases (where soil will accommodate) a reinforced erosion control mat may be used up to 8% ditch slope. For all grass lined ditches a basic erosion control mat is required. It is typical that the location map use some sort of shading or symbol to indicate the type of ditchlining that is appropriate proposed.

   This is addressed on sheet C-401-30. All ditches will be lined with 1 foot of 6" stone and filter fabric in unsuitable areas. ✓

3. C-401-30 and C-407-30 does not provide any sizing criteria for riprap lining of ditches. Rip rap is typically sized by a d50 standard and backed by an appropriate non woven geotextile. Please provide a detail that addresses the sizing and a construction detail for riprap swale installation.

   This is addressed on sheet C-401-30. All ditches will be lined with 1 foot of 6" stone and filter fabric in unsuitable areas. ✓

4. C-402-30 details the culvert crossings used for standard drainage relief culverts. These crossings are specifically used for passing surface water runoff to the down gradient side of the road and are standardly followed by a level spreader to distribute flow safely down slope with out causing erosion. At the culvert outlet it is typical for some form of energy dissipation to be used such as riprap apron to prevent erosion of the area between the culvert and the level spreader.

   This is addressed on sheet C-402-30 and C-403-30. Culvert outlets will be properly stabilized. ✓

5. C-402-30 Culvert Detail. Riprap inlets and outlets are appropriate on all culvert crossings. Please provide details for both.

   This is addressed on sheet C-402-30. Inlets and outlets will be properly stabilized. ✓

6. C-402-30 All level spreaders need to be installed along the contour to allow for flow to be distributed evenly to the slope. The detail provided creates this condition by putting a "soil center" to the overflow berm. The department has found that this type of constructed level lip spreader fails too often. A level lip created along a natural in situ soil contour with a berm of stone material on the lip and pool behind the lip has proved more successful. Please review the details provided in the Maine E+S BMPS and the Stormwater BMP Manual. This needs to be reflected in the plan view location sheets as well.

   This has been addressed. Level spreaders have been reoriented to follow the contours. ✓

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7. It appears that some checkdam berms are being used to divert flow into culverts. The detail shows that these checkdams are constructed of rock (¾" to 3"). This will not divert flow efficiently enough for treatment purposes. The ditch line diversions will need to be made of soil (well compacting gravel) with a stable overflow and lining like a spillway.

   With the change in our ditch detail. These checkdams are no longer needed. ✓

8. C-405-30 Checkdam Detail. I am unsure of what is intended with this detail. Regular maintenance of the checkdams and removal of sediment until the ditch is stabilized would eliminate the need for the drain pipe. The center of the checkdam in the detail needs to be lower than the edges. Please see the details in the Maine E+S BMPs.

   With the change in our ditch detail. These checkdams are no longer needed. ✓

Streams

9. Streams for the site appear to fall into two categories; streams of special significance and typical streams. From the information submitted under the NRPA application and the plan sheets submitted with the site location application, I see eight streams that are noted, one of which that is not mentioned specifically. The streams are located at stations 17+00, 30+90 (special sig.), 32+00 (special sig.), 35+70 (not noted on plans), 38+90, 40+75 (noted in the NRPA documents as special sig., but not in the site app.), 54+10, and 77+60.

10. Are there three streams of special significance or only two?? Are the streams of special significance the ones that are NRPA regulated? The term "stream" for the department has a specific definition. Any "streams" that are not NRPA regulated or defined should **not** be referred to as streams.

    There will be 3 streams that we will use our Culvert for Special Stream Crossing at. ✓

11. C-403-30 Culvert for Special Stream Crossings Detail and Notes. The clear span noted on this detail and footings need to be somewhat wider that the bankfull flow of the streams that are being crossed. Is this the case for all three streams?

    The sections meet the 1.2 times bank width standard at all 3 streams. ✓

12. C-406-30 Stream-Ditch Intersection Detail. The preservation of natural drainage patterns is imperative for water quality, prevention of erosion control issues, and preservation of habitat. The department is trying to currently address this issue and is sensitive to the problems that this situation causes for the constructor and unintended consequences of flow diversion. It is the department's goal to reconnect these natural corridors from one side of the road to the other. This detail does not show that connection and implies the truncation of the stream channel. The plan profiles in each of these situations show a culvert at these drainages. It may be more clear to add the culvert into the detail to show that flow is being passed across the road and natural drainage is being preserved. This type of crossing would not be appropriate for a NRPA regulated stream crossing.

    A culvert pipe has been added to drawing C-408-30 for clarity. ✓

13. A stream – ditch intersection is proposed at R1 sta 38+90. At this point the "stream" runs parallel to the road and with the proposed culvert extending beyond the ditch and connecting to the stream. This area appears to need additional detail for construction purposes. Please present this area in a scale that shows more detail.

    This has been adjusted on sheet C-204-30. ✓

14. Verify that the "stream" at R1 35+75 does not follow the channel downslope of the road and truly is diverted to the wetland below. If not please provide a culvert crossing to reconnect this drainage channel.

    This has been adjusted on sheet C-204-30. ✓

Power Line

15. There was little information about the erosion controls used on the power line potion of this project. For other power line projects in the past, applicants have outlined what E+S BMPs will be used on the line and the situations in which they will be used but not the location specific information. This line is short enough that it may be easier to just locate all E+S BMPs with little difficulty. Information about the streams crossed during construction will be necessary to show that the techniques proposed will be appropriate. Please address.

    This has been addressed on sheet C-414-30 and C-415-30. ✓

Proposed Condition: Due to the level of disturbance, steep slopes, and its close proximity to on site water resources, an independent third party site inspector reviewing erosion and sedimentation control is suggested for this project. The applicant will retain the services of an approved site inspector to inspect the erosion and sedimentation controls on the site. Inspections shall consist of weekly visits to the site to inspect erosion and sedimentation controls from initial ground disturbance to final stabilization. If necessary, the inspecting engineer will interpret the erosion and sedimentation control plans and notes for the contractor. Once the site has reached final stabilization, the inspector will notify the department in writing within 14 days to state that the construction has been completed. Accompanying the engineer's notification must be a log of the engineer's inspections giving the date of each inspection, the time of each inspection, and the items inspected on each visit.

GENERAL STANDARDS

Engineering

16. C-408-30 More detail is necessary for the "Treatment Berm Detail." The intent of the treatment berms was to help slow and redistribute flow where the slope exceeded the typical buffer requirements. This would allow the buffer to be more efficient and overcome the limitations of slope. To do this the berms need to meet the "Stone Berm Level Lip Spreader" requirements in Chapter 500 Appendix F. They will need to be installed similarly to sedimentation barriers; along the contour and with the ends of the berm turned up slope. Overlapping berms may be necessary to accomplish this task. The detail needs to include the Berm material specification from Chapter 500 Appendix F. The detail should also include appropriate detail notes for construction about placement and site preparation.

    Sheet C-410-30 has been adjusted. ✓

17. Detail C-402-30 does not meet the specifications for a "vegetated buffer with a stone bermed level lip spreader" that meets the General Standards. Please provide a separate detail for these treatment spreaders with buffers. The berm will be similar to those described above on C-408-30 and the comments above apply here. These structures are **sized** according to the amount of impervious and developed area contributing to the spreader, the treatment depth of the buffer and the hydrologic soil class of the soils in the buffer. These are defined in the associated table in Chapter 500 Appendix F.

    Sheet C-402-30 has been adjusted. ✓

18. Roadside buffers that run perpendicular to the road do not allow for flow to spread out and act more like a ditch. In these cases a ditch turn out buffer would be more appropriate. For example look at R1 sta 8+00 - 10+25, and R1 sta 15+00 – 15+75. Please review the proposed buffer for additional areas where ditch turn outs would be appropriate.

1750

With the change in our erosion control and clearing, the buffers are now adjusted to encourage sheet flow. See sheet C-201-30 ✓

19. For both the phosphorus standard and the general standard, turbine pads need to have the appropriate buffer at the toe of the turbine fill pad. Turbine pads though included in the linear portion of project need larger buffers than road side buffers please determine the appropriate size buffer and extend it from the toe of the slope of the turbine pad. The standard buffer depending upon soil type is typically between 100 and 150 feet in length.

    These buffers have been adjusted. ✓

20. The applicant has provided an alternative buffer design that the department has reviewed and agreed to. The forested buffer with additional treatment berm uses the revegetated portion of the crane path and access road in its analysis and though the natural slope is greater than the standard buffer tables allows the department staff feels that the additional treatment berm will improve the buffers efficiency to meet the standard buffer treatment. Buffer treatment in this case is also preferable to the use of more physical treatment such as soil filters or ponds. This kind of approval is made on a case by case basis and is applicable only to this application.

General Standards

Linear Portion
Percent of Impervious Treated: 77.95% (75% required) ✓
Percent of Developed Treated: N/A (50% required) ✓

21. C-501-30, Spruce Mountain Stormwater Management Calculations. The table provided does not break the out the treatment areas as per the resource basin. It is noted that there are 5 major sub-watersheds on the site: Big Concord Pond, Shagg Pond, Concord River, Little Androscoggin River, and the West Branch of the Nezinscot River. The table should separate out the station locations and tower sites by watershed. This may require more divisions within the table since some portions indicated in the station location section will need to be broken apart. Additional columns in the table need to address the impervious are draining to an indicated LSF and the appropriate length of level spreader for treatment.

    The treatment areas have been divided into watersheds. ✓

22. On the treatment table, confirm that the Hydrologic Soil Group is correct for R2 sta 2+00 - 4+00R.

    This has been corrected ✓

23. The calculation of the percent treatment provided by the applicant included all of the area meeting the phosphorus standard. This would be inaccurate. As noted above, the watershed divides separate out the drainage going to Big Concord Pond and Shagg Pond from the drainage meeting the general standard (Concord River, Little Androscoggin River, and the West Branch of the Nezinscot River) The calculation for the percentage of treatment for the linear portion of the project should only include drainage going to these three river watersheds.

    The treatment areas have been divided into watersheds. ✓

24. The proposed project does not appear to include landscaping and lawn areas. As such, the impervious area for linear treatment is assumed to be the same as the developed area for treatment. Is this correct??

    Yes ✓

25. My calculation of the percent treatment of r the project is around 97% if all of the proposed treatment is acceptable and 73% treatment if those areas with buffers slopes requiring additional stone berm distribution are removed.

Phosphorus Standard

26. The approach taken to address phosphorus in the application is too simplistic to meet the model needs for the project. Just like when addressing the general standards, the road portion is broken into segments that are treated by specific bmps and length of road not treated. This same kind of detail is expected in the phosphorus analysis.

    The treatment areas have been divided into watersheds. ✓

27. Both analyses use the low export option from table 3.1. This option is only available for roads that are paved. In previous discussions paving of the roads was not discussed. Please adjust both models.

    The model has been adjusted to the high export option. ✓

Big Concord Pond

28. The phosphorous calculations for Big Concord Pond did not address the Small Watershed Threshold calculations. As was discussed in pre submission meetings, other wind power projects had run afoul of this in the past. The small watershed threshold calculation redistributes the allocation for projects that are tying up large amounts of the total developable acreage in the watershed. This trigger value is set at 58 acres for Big Concord Pond and is exceeded since the project acreage is 119 acres. The calculation brings the Project Phosphorus Budget for this pond down to 2.4351 lbs P/year.

    The small watershed threshold has been included in the phosphorus calculations. ✓

29. The phosphorus analysis on Worksheet 2 does not take into consideration that some portions of the road way are not treated by any BMPs (wetland crossings for instance). The analysis does not appear to include the O+M building either.

    This has been adjusted. ✓

30. I have recalculated the discharge to Big Concord Pond and have presented it in table below. This is provided as guidance only and the applicant's own analysis will need to be adjusted to meet comments above.

Phosphorus to Big Concord Pond

Per Acre Phosphorus Budget (PAPB):	0.035 lbs / acre / yr
Project Acreage (eligible for allocation)(A):	293 acres
Small Watershed Threshold Value	58 acres (Exceeded)
Project Phosphorus Budget (PPB):	2.4351 lbs / yr
Total Phosphorous Mitigation Credit (SEC + STC):	0.0000 lbs / yr
Total Pre-treatment Phosphorus Export (Pre-PPE:	5.3114 lbs / yr
Total Post-treatment Phosphorous Export (Post-PPE):	2.3808 lbs / yr
Project Phosphorus Export:	2.3803 lbs / yr
Level of Control:	adequate

(Note: the above table is subject to change with response to comments.)

Shagg Pond

31. The analysis for Shagg Pond appears (though lacking the individual portions and treatment being broken out) to be accurate. The table that follows is compiled from the applicant's model.

Phosphorus to Shagg Pond

Per Acre Phosphorus Budget (PAPB):	0.037 lbs / acre / yr
Project Acreage (eligible for allocation)(A):	12 acres
Small Watershed Threshold Value	35 acres
Project Phosphorus Budget (PPB):	0.444 lbs / yr
Total Phosphorous Mitigation Credit (SEC + STC):	0.0000 lbs / yr
Total Pre-treatment Phosphorus Export (Pre-PPE:	0.1750 lbs / yr
Total Post-treatment Phosphorous Export (Post-PPE):	0.0700 lbs / yr
Project Phosphorus Export:	0.0700 lbs / yr
Level of Control:	adequate

(Note: the above table is subject to change with response to comments.)

Location Specific

Note: though these specific location need to be addressed other area may have the same or similar problems as noted on comments above. Please review the entire proposed plands for areas where similar impacts occur.

32. R1 Station 32+00 to 32+50 treatment collapses with no reasonable means to provide a buffer. Please address.

    This has been addressed. ✓

33. R2 2+00 to 4+00 indicate treatment by a forested level spreader buffer. I was unable to find this associated buffer.

    This section of road is direct to a forested level spreader buffer. ✓

34. R2 0+00 to 1+00 and 6+50 to 7+00 (L) the contours provided seem irregular. Please address.

    A note has been added to address this. ✓

35. Plan sheet C-216-30. The matchline between sheets C-216-30 to C-217-30 is located in the wrong location.

    The matchline has been fixed. ✓

Proposed Conditions

Proposed Condition: The applicant will retain the services of a professional engineer to inspect the construction and stabilization of the stone bermed level spreaders to be built on the site. Inspections shall consist of weekly visits to the site to inspect each level spreaders construction, stone berm material and placement, settling basin from initial ground disturbance to final stabilization of the level spreader. If necessary, the inspecting engineer will interpret the stone bermed level lip spreader's location and construction plan for the contractor. Once the stone bermed level lip spreaders are constructed and stabilized, the inspecting engineer will notify the department in writing within 14 days to state that the level lips have been completed. Accompanying the engineer's notification must be a log of the engineer's inspections giving the date of each inspection, the time of each inspection, the items inspected on each visit, and include any testing data or sieve analysis data of the berm media.

Proposed Condition: The applicant will retain the services of a professional engineer to inspect the construction and stabilization of the road ditch turnouts to be built on the site. Inspections shall consist of weekly visits to the site to inspect each turnout construction, turnout's stone berm material and placement, from initial ground disturbance to final stabilization of the level spreader. If necessary, the inspecting engineer will interpret the turnout's location and construction plan for the contractor. Once the turnouts are constructed and stabilized, the inspecting engineer will notify the department in writing within

14 days to state that the turnouts have been completed. Accompanying the engineer's notification must be a log of the engineer's inspections giving the date of each inspection, the time of each inspection, the items inspected on each visit, and include any testing data or sieve analysis data of the berm media.

FLOODING STANDARDS

The applicant has provided a Hydro-cad model that shows the project's impact on the weighted curve number of each watershed and the subsequent impact to peak flows for these watersheds for the 25 year, 24 hour storm. The evidence shows that the weighted curve number for each sub watershed changes little (on average a change of 0.034 or 3 /100ths). This change is well within model tolerances and does not take into consideration the redistribution of flows into the buffer areas that will lengthen the time of concentration for all of the watersheds. For this project the model indicates that the project meets the flooding standard requirement of maintaining the preconstruction peak flows for the 2, 10, and 25 year, 24 hour storm at the property boundary.

36. Curve numbers used in the TR20 model of Hydrocad are defined by the TR55 model. By definition for "woods" to be considered in the "poor" condition they must be "destroyed by heavy grazing or regular burning." This is not typical in Maine and as such the "good" condition is used in almost all cases. The Woods/ grass combination assumes that the woods and grass are evenly distributed between each other and is stated as a good description of orchard or tree farm areas. Please correct this in the stormwater model.

    The model has been adjusted. ✓

37. The application states that the amount of impervious area for the project is around 6.6 acres. The stormwater model provided only accounts for 5.05 acres of the impervious area. The list of general standard road treatment totals to 8.296 acres of impervious area. Please address and correct the model appriately.

    This has been fixed. ✓

38. Any of the above changes in the peak flow model should be reflected in the culvert analysis for consistency.

    The culvert analysis has been adjusted. ✓

MAINTENANCE:

NOTE: The applicant and contractor will be responsible for the maintenance of all proposed stormwater management structures, i.e. ponds, swales, culverts and discharge outlets during construction. Thereafter, each stormwater management structure should be cleaned and cleared of debris yearly at a minimum. Sweeping of all pavements is recommended on an annual basis. The DEP may request to inspect the site at a future date.

39. For this project the primary maintenance responsibilities are for permanent erosion controls such as level spreaders and ditches. Certain of the treatment BMPs will also need their own maintenance plan. Please direct me to or provide a maintenance plan that addresses the stormwater improvements on the site such as (but not limited to) the ditches, culverts, detention pond, level spreaders, and buffers. This should include maintenance time frames and actions to be taken should problems be found. Please identify the contact individual responsible for the long-term inspection and maintenance of the stormwater management system. Please provide a blank log for applicant's use in following the maintenance requirements. Logs will need to include the required information noted in Appendix B of chapter 500.

DESIGN REVIEW RESPONSIBILITY

1754

This review only ensures that the proposed plan is meeting the minimum standards set by the department for erosion control management and for stormwater management. It does not guarantee that the design is appropriate for the level of work suggested and for the functionality of the facility.

Site Location of Development
TECHNICAL REVIEW MEMORANDUM
Bureau of Land and Water Quality

TO: **Dawn Hallowell, Project Manager**
FROM: **David A. Waddell -- Division of Watershed Management**
DATE: **June 11, 2010**
RE: **Woodstock – Spruce Mountain Wind LLC.**

I have reviewed the additional information that was submitted by the applicant in response to my memo of 4/22/10. I have found five remaining issues that need to be addressed by the applicant to meet the standards set forth in the Chapter 500 rules. Should these final concerns be addressed I would recommend approval of the project in its current form.

The following information has changed from my previous memo:

APPLICANT: Patriot Renewables LLC. and Spruce Mountain Wind LLC.
DEP#: L-24838-24-A-N / L-24838-2G-B-N
Town: Woodstock
Engineer who prepared application: Engineering and Management Service LLC.
Parcel Size: 2879 acres
Site Description: Managed forest ant woodlands with steep slopes.
Project description: 11 turbine wind farm with 18,500 feet of access road and 4.1 miles of associate transmission lines.
Size of new impervious area: 6.7 acres
Size of new developed area: 6.7 acres
Watershed (waterbody): Big Concord Pond, Shagg Pond, Tributaries of Concord River, Little Androscoggin River, and the west Branch of the Nezinscot River.
Watershed type: sensitive / threatened, sensitive / threatened, other

PLANS USED FOR REVIEW:
Pre-development: Drawings C-100.1-30 to C-100.4-30, "Spruce Mountain Existing conditions and Layout Plan," revised date 5/20/10.
Post-development: Drawings C-201-30 to C-220-30, "Spruce Mountain Plan and Profile," revised date 5/20/10.
Erosion and Sediment Control Plans: Drawings C-201-30 to C-220-30, "Spruce Mountain Plan and Profile," revised date 5/20/10.
Note: Other plans may have been reviewed that are not noted here.

STORMWATER MANAGEMENT

The applicant is proposing an eleven turbine wind power project with 18,500 feet of access road called Spruce Mountain Wind. This project lies within the watershed of Big Concord Pond, Shagg Pond, Tributaries of Concord River, Little Androscoggin River, and the west Branch of the Nezinscot River. This proposed project will create approximately 6.7 acres of developed area and 6.7 acres of impervious area. This project has been determined to trigger the Site Location of Development Act and must meet the Basic, General, and Flooding Standards. Under the General Standards the applicant is applying the phosphorus methodology to address impacts to Big Concord Pond and Shagg Pond. As such, the applicant is required to use the Phosphorous Methodology outlined in "Phosphorous Control in Lake Watersheds: A Technical Guide to Evaluating New Development" to assess the development. This project is being reviewed under the 2006 Stormwater Management rules and the design and sizing of the proposed BMPs for this project are based on the "Stormwater Management for Maine" January 2006.

1756

Stormwater quality treatment will be achieved with numerous water quality buffers.
Stormwater flooding mitigation will be achieved with numerous water quality buffers.

The following comments need to be addressed:

BASIC STANDARDS:

Note: *As always the applicant's erosion control plan is a good starting point for providing protection during construction. However, based on site and weather conditions during construction, additional erosion and sediment control measures may necessary to stop soil from leaving the site. In addition, other measures may be necessary for winter construction. All areas of instability and erosion must be repaired immediately during construction and need to be maintained until the site is fully stabilized or vegetation is established. Approval of this plan does not authorize discharges from the site.*

1. Addressed.
2. Addressed.
3. Rip rap is typically sized by a d50 standard. This means that 50% of the riprap is smaller than the proposed rock size and 50% is greater than the proposed rock size. For a d50 of 6 inches the smallest rock would be around 2 inches and the largest rocks would be no larger than 15 inches. This gradation of material is far more likely to remain stable and not move in large flow events since it is knitted together with large stone and smaller stones filling the voids. The rock should be angular (not round) and backed by an appropriate **non-woven** geotextile. The detail provided states that the sizing of the riprap will be 6 inches. Is this a 6 inch d 50? The fabric is stated as filter fabric. Is this fabric woven? Do you have a fabric of choice or a generic spec. for the fabric?. **This information is appropriate for all BMPs that include riprap. Please review other details and determine where this information is necessary.**
4. Addressed.
5. Addressed.
6. Addressed.
7. Addressed.
8. Addressed.

Streams

9. Addressed.
10. Addressed.
11. Addressed.
12. Addressed.
13. Addressed.
14. Addressed.

Power Line

15. The additional detail sheets give us a good look at what will be used but little information as to when. Please provide the narrative to accompany the details to indicate when these BMPs are anticipated for use and to give guidance to line crews on their use. Please address.

Proposed Condition: Due to the level of disturbance, steep slopes, and its close proximity to on site water resources, an independent third party site inspector reviewing erosion and sedimentation control is suggested for this project. The applicant will retain the services of an approved site inspector to inspect the erosion and sedimentation controls on the site. Inspections shall consist of weekly visits to the site to inspect erosion and sedimentation controls from initial ground disturbance to final stabilization. If necessary, the inspecting engineer will interpret the erosion and sedimentation control plans and notes for the contractor. Once the site has reached final stabilization, the inspector will notify the department in writing within 14 days to state that the construction has been completed. Accompanying the engineer's notification must be a log of the engineer's inspections giving the date of each inspection, the time of each inspection, and the items inspected on each visit.

GENERAL STANDARDS

Engineering

16. C-410-30 The current detail states "Stone graded from peastone to 3" diameter". The material proposed in the berm structure needs to meet the standard outline in Chapter 500 Appendix F. The detail needs to include the Berm material specification from Chapter 500 Appendix F. (page 52.)
17. Detail C-403-30. The current detail states ¾ inch to 3 inch stone The material proposed in the berm structure needs to meet the standard outline in Chapter 500 Appendix F. The detail needs to include the Berm material specification from Chapter 500 Appendix F. (page 52.)
18. Addressed.
19. Addressed.
20. Addressed.

General Standards

The applicant has provided an alternative buffer design that the department has reviewed and agreed to. The forested buffer with additional treatment berm uses the revegetated portion of the crane path and access road in its analysis and though the natural slope is greater than the standard buffer tables allows the department staff feels that the additional treatment berm will improve the buffers efficiency to meet the standard buffer treatment. Buffer treatment in this case is also preferable to the use of more physical treatment such as soil filters or ponds. This kind of approval is made on a case by case basis and is applicable only to this application.

Linear Portion

Percent of Impervious Treated: 77.49% (75% required)
Percent of Developed Treated: 77.49% (50% required)

21. Addressed.
22. Addressed.
23. Addressed.
24. Addressed.
25. Addressed.

Phosphorus Standard

26. Addressed.
27. Addressed.

Big Concord Pond

28. Addressed.
29. Addressed.
30. Addressed.

Phosphorus to Big Concord Pond

Per Acre Phosphorus Budget (PAPB):	0.035 lbs / acre / yr
Project Acreage (eligible for allocation)(A):	119 acres
Small Watershed Threshold Value	58 acres (Exceeded)
Project Phosphorus Budget (PPB):	2.435 lbs / yr
Total Phosphorous Mitigation Credit (SEC + STC):	0.0000 lbs / yr
Total Pre-treatment Phosphorus Export (Pre-PPE:	3.506 lbs / yr
Total Post-treatment Phosphorous Export (Post-PPE):	2.006 lbs / yr
Project Phosphorus Export:	2.006 lbs / yr
Level of Control:	adequate

(Note: the above table is subject to change with response to comments.)

Shagg Pond

31. Addressed.

Phosphorus to Shagg Pond

Per Acre Phosphorus Budget (PAPB):	0.037 lbs / acre / yr
Project Acreage (eligible for allocation)(A):	12 acres
Small Watershed Threshold Value	35 acres
Project Phosphorus Budget (PPB):	0.444 lbs / yr
Total Phosphorous Mitigation Credit (SEC + STC):	0.000 lbs / yr
Total Pre-treatment Phosphorus Export (Pre-PPE:	0.191 lbs / yr
Total Post-treatment Phosphorous Export (Post-PPE):	0.086 lbs / yr
Project Phosphorus Export:	0.086 lbs / yr
Level of Control:	adequate

(Note: the above table is subject to change with response to comments.)

Location Specific

Note: though these specific location need to be addressed other area may have the same or similar problems as noted on comments above. Please review the entire proposed plans for areas where similar impacts occur.

32. Addressed.
33. Addressed.
34. Addressed.
35. Addressed.

Proposed Conditions

Proposed Condition: The applicant will retain the services of a professional engineer to inspect the construction and stabilization of the stone bermed level spreaders to be built on the site. Inspections shall consist of weekly visits to the site to inspect each level spreaders construction, stone berm material and placement, settling basin from initial ground disturbance to final stabilization of the level spreader. If necessary, the inspecting engineer will interpret the stone bermed level lip spreader's location and construction plan for the contractor. Once the stone bermed level lip spreaders are constructed and stabilized, the inspecting engineer will notify the department in writing within 14 days to state that the level lips have been completed. Accompanying the engineer's notification must be a log of the engineer's inspections giving the date of each inspection, the time of each inspection, the items inspected on each visit, and include any testing data or sieve analysis data of the berm media.

Proposed Condition: The applicant will retain the services of a professional engineer to inspect the construction and stabilization of the road ditch turnouts to be built on the site. Inspections shall consist of weekly visits to the site to inspect each turnout construction, turnout's stone berm material and placement, from initial ground disturbance to final stabilization of the level spreader. If necessary, the inspecting engineer will interpret the turnout's location and construction plan for the contractor. Once the turnouts are constructed and stabilized, the inspecting engineer will notify the department in writing within 14 days to state that the turnouts have been completed. Accompanying the engineer's notification must be a log of the engineer's inspections giving the date of each inspection, the time of each inspection, the items inspected on each visit, and include any testing data or sieve analysis data of the berm media.

FLOODING STANDARDS

The applicant has provided a Hydro-cad model that shows the project's impact on the weighted curve number of each watershed and the subsequent impact to peak flows for these watersheds for the 25 year, 24 hour storm. The evidence shows that the weighted curve number for each sub watershed changes little (on average a change of 0.034 or 3 /100ths). This change is well within model tolerances and does not take into consideration the redistribution of flows into the buffer areas that will lengthen the time of concentration for all of the watersheds. For this project the model indicates that the project meets the flooding standard requirement of maintaining the preconstruction peak flows for the 2, 10, and 25 year, 24 hour storm at the property boundary.

36. Addressed.
37. Addressed.
38. Addressed.

MAINTENANCE:

NOTE: The applicant and contractor will be responsible for the maintenance of all proposed stormwater management structures, i.e. ponds, swales, culverts and discharge outlets during construction. Thereafter, each stormwater management structure should be cleaned and cleared of debris yearly at a minimum. Sweeping of all pavements is recommended on an annual basis. The DEP may request to inspect the site at a future date.

39. For this project the primary maintenance responsibilities are for permanent erosion controls such as level spreaders and ditches. Certain of the treatment BMPs will also need their own maintenance plan. Please direct me to or provide a maintenance plan that addresses the stormwater improvements on the site such as (but not limited to) the ditches, culverts, detention pond, level spreaders, and buffers. This should include maintenance time frames and actions to be taken should problems be found. Please identify the contact individual responsible for the long-term inspection and maintenance of the stormwater management system. Please provide a blank log for applicant's use in following the maintenance requirements. Logs will need to include the required information noted in Appendix B of chapter 500.

DESIGN REVIEW RESPONSIBILITY

This review only ensures that the proposed plan is meeting the minimum standards set by the department for erosion control management and for stormwater management. It does not guarantee that the design is appropriate for the level of work suggested and for the functionality of the facility.

1760

Site Location of Development
TECHNICAL REVIEW MEMORANDUM
Bureau of Land and Water Quality

TO: **Dawn Hallowell, Project Manager**
FROM: **David A. Waddell – Division of Watershed Management**
DATE: **July 8, 2010**
RE: **Woodstock – Spruce Mountain Wind LLC.**

I have reviewed the additional information that was submitted by the applicant in response to my memo of 6/11/10. I have that the remaining issues that needed to be addressed by the applicant were, and that the project appears to meet the standards set forth in the Chapter 500 rules in its current form.

The following information has changed from my previous memo:

APPLICANT: Patriot Renewables LLC. and Spruce Mountain Wind LLC.
DEP#: L-24838-24-A-N / L-24838-2G-B-N
Town: Woodstock
Engineer who prepared application: Engineering and Management Service LLC.
Parcel Size: 2879 acres
Site Description: Managed forest ant woodlands with steep slopes.
Project description: 11 turbine wind farm with 18,500 feet of access road and 4.1 miles of associate transmission lines.
Size of new impervious area: 6.7 acres
Size of new developed area: 6.7 acres
Watershed (waterbody): Big Concord Pond, Shagg Pond, Tributaries of Concord River, Little Androscoggin River, and the west Branch of the Nezinscot River.
Watershed type: sensitive / threatened, sensitive / threatened, other

PLANS USED FOR REVIEW:
Pre-development: Drawings C-100.1-30 to C-100.4-30, "Spruce Mountain Existing conditions and Layout Plan," revised date 5/20/10.
Post-development: Drawings C-201-30 to C-220-30, "Spruce Mountain Plan and Profile," revised date 5/20/10.
Erosion and Sediment Control Plans: Drawings C-201-30 to C-220-30, "Spruce Mountain Plan and Profile," revised date 5/20/10.
Note: Other plans may have been reviewed that are not noted here.

STORMWATER MANAGEMENT

The applicant is proposing an eleven turbine wind power project with 18,500 feet of access road called Spruce Mountain Wind. This project lies within the watershed of Big Concord Pond, Shagg Pond, Tributaries of Concord River, Little Androscoggin River, and the west Branch of the Nezinscot River. This proposed project will create approximately 6.7 acres of developed area and 6.7 acres of impervious area. This project has been determined to trigger the Site Location of Development Act and must meet the Basic, General, and Flooding Standards. Under the General Standards the applicant is applying the phosphorus methodology to address impacts to Big Concord Pond and Shagg Pond. As such, the applicant is required to use the Phosphorous Methodology outlined in "Phosphorous Control in Lake Watersheds: A Technical Guide to Evaluating New Development" to assess the development. This project is being reviewed under the 2006 Stormwater Management rules and the design and sizing of the proposed BMPs for this project are based on the "Stormwater Management for Maine" January 2006.

Stormwater quality treatment will be achieved with numerous water quality buffers.

Stormwater flooding mitigation will be achieved with numerous water quality buffers.

The following comments need to be addressed:

BASIC STANDARDS:

Note: *As always the applicant's erosion control plan is a good starting point for providing protection during construction. However, based on site and weather conditions during construction, additional erosion and sediment control measures may necessary to stop soil from leaving the site. In addition, other measures may be necessary for winter construction. All areas of instability and erosion must be repaired immediately during construction and need to be maintained until the site is fully stabilized or vegetation is established. Approval of this plan does not authorize discharges from the site.*

1. Addressed.
2. Addressed.
3. Addressed.
4. Addressed.
5. Addressed.
6. Addressed.
7. Addressed.
8. Addressed.

Streams

9. Addressed.
10. Addressed.
11. Addressed.
12. Addressed.
13. Addressed.
14. Addressed.

Power Line

15. Addressed.

Proposed Condition: Due to the level of disturbance, steep slopes, and its close proximity to on site water resources, an independent third party site inspector reviewing erosion and sedimentation control is suggested for this project. The applicant will retain the services of an approved site inspector to inspect the erosion and sedimentation controls on the site. Inspections shall consist of weekly visits to the site to inspect erosion and sedimentation controls from initial ground disturbance to final stabilization. If necessary, the inspecting engineer will interpret the erosion and sedimentation control plans and notes for the contractor. Once the site has reached final stabilization, the inspector will notify the department in writing within 14 days to state that the construction has been completed. Accompanying the engineer's notification must be a log of the engineer's inspections giving the date of each inspection, the time of each inspection, and the items inspected on each visit.

GENERAL STANDARDS

Engineering

16. Addressed.
17. Addressed.
18. Addressed.
19. Addressed.
20. Addressed.

General Standards

The applicant has provided an alternative buffer design that the department has reviewed and agreed to. The forested buffer with additional treatment berm uses the revegetated portion of the crane path and access road in its analysis and though the natural slope is greater than the standard buffer tables allows the department staff feels that the additional treatment berm will improve the buffers efficiency to meet the

standard buffer treatment. Buffer treatment in this case is also preferable to the use of more physical treatment such as soil filters or ponds. This kind of approval is made on a case by case basis and is applicable only to this application.

Linear Portion
Percent of Impervious Treated: 77.49% (75% required)
Percent of Developed Treated: 77.49% (50% required)

21. Addressed.
22. Addressed.
23. Addressed.
24. Addressed.
25. Addressed.

Phosphorus Standard
26. Addressed.
27. Addressed.

Big Concord Pond
28. Addressed.
29. Addressed.
30. Addressed.

Phosphorus to Big Concord Pond

Per Acre Phosphorus Budget (PAPB):	0.035 lbs / acre / yr
Project Acreage (eligible for allocation)(A):	119 acres
Small Watershed Threshold Value	58 acres (Exceeded)
Project Phosphorus Budget (PPB):	2.435 lbs / yr
Total Phosphorous Mitigation Credit (SEC + STC):	0.0000 lbs / yr
Total Pre-treatment Phosphorus Export (Pre-PPE:	3.506 lbs / yr
Total Post-treatment Phosphorous Export (Post-PPE):	2.006 lbs / yr
Project Phosphorus Export:	2.006 lbs / yr
Level of Control:	adequate

(Note: the above table is subject to change with response to comments.)

Shagg Pond
31. Addressed.

Phosphorus to Shagg Pond

Per Acre Phosphorus Budget (PAPB):	0.037 lbs / acre / yr
Project Acreage (eligible for allocation)(A):	12 acres
Small Watershed Threshold Value	35 acres
Project Phosphorus Budget (PPB):	0.444 lbs / yr
Total Phosphorous Mitigation Credit (SEC + STC):	0.000 lbs / yr
Total Pre-treatment Phosphorus Export (Pre-PPE:	0.191 lbs / yr
Total Post-treatment Phosphorous Export (Post-PPE):	0.086 lbs / yr
Project Phosphorus Export:	0.086 lbs / yr
Level of Control:	adequate

(Note: the above table is subject to change with response to comments.)

Location Specific

Note: though these specific location need to be addressed other area may have the same or similar problems as noted on comments above. Please review the entire proposed plans for areas where similar impacts occur.

32. Addressed.
33. Addressed.
34. Addressed.
35. Addressed.

Proposed Conditions

Proposed Condition: The applicant will retain the services of a professional engineer to inspect the construction and stabilization of the stone bermed level spreaders to be built on the site. Inspections shall consist of weekly visits to the site to inspect each level spreaders construction, stone berm material and placement, settling basin from initial ground disturbance to final stabilization of the level spreader. If necessary, the inspecting engineer will interpret the stone bermed level lip spreader's location and construction plan for the contractor. Once the stone bermed level lip spreaders are constructed and stabilized, the inspecting engineer will notify the department in writing within 14 days to state that the level lips have been completed. Accompanying the engineer's notification must be a log of the engineer's inspections giving the date of each inspection, the time of each inspection, the items inspected on each visit, and include any testing data or sieve analysis data of the berm media.
Proposed Condition: The applicant will retain the services of a professional engineer to inspect the construction and stabilization of the road ditch turnouts to be built on the site. Inspections shall consist of weekly visits to the site to inspect each turnout construction, turnout's stone berm material and placement, from initial ground disturbance to final stabilization of the level spreader. If necessary, the inspecting engineer will interpret the turnout's location and construction plan for the contractor. Once the turnouts are constructed and stabilized, the inspecting engineer will notify the department in writing within 14 days to state that the turnouts have been completed. Accompanying the engineer's notification must be a log of the engineer's inspections giving the date of each inspection, the time of each inspection, the items inspected on each visit, and include any testing data or sieve analysis data of the berm media.

FLOODING STANDARDS

The applicant has provided a Hydro-cad model that shows the project's impact on the weighted curve number of each watershed and the subsequent impact to peak flows for these watersheds for the 25 year, 24 hour storm. The evidence shows that the weighted curve number for each sub watershed changes little (on average a change of 0.034 or 3 /100ths). This change is well within model tolerances and does not take into consideration the redistribution of flows into the buffer areas that will lengthen the time of concentration for all of the watersheds. For this project the model indicates that the project meets the flooding standard requirement of maintaining the preconstruction peak flows for the 2, 10, and 25 year, 24 hour storm at the property boundary.

36. Addressed.
37. Addressed.
38. Addressed.

MAINTENANCE:

NOTE: The applicant and contractor will be responsible for the maintenance of all proposed stormwater management structures, i.e. ponds, swales, culverts and discharge outlets during construction. Thereafter, each stormwater management structure should be cleaned and cleared of debris yearly at a minimum. Sweeping of all pavements is recommended on an annual basis. The DEP may request to inspect the site at a future date.

39. Addressed.

DESIGN REVIEW RESPONSIBILITY

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This review only ensures that the proposed plan is meeting the minimum standards set by the department for erosion control management and for stormwater management. It does not guarantee that the design is appropriate for the level of work suggested and for the functionality of the facility.

Applicant response in "Red"

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MAINE DEPARTMENT OF AGRICULTURE
FOOD AND RURAL RESOURCES
OFFICE OF THE STATE SOIL SCIENTIST
STATE HOUSE STATION # 28
AUGUSTA, MAINE 04333
PHONE: (207) 287-2666
E-MAIL: DAVID.ROCQUE@MAINE.GOV

MEMO

To: Dawn Hallowell, MDEP Project Manager
From: David P. Rocque, State Soil Scientist
Re: Spruce Mountain Wind, LLC, Woodstock
Date: February 3, 2010

After reviewing the subject application, I offer the following comments:

My two biggest concerns with any development project are impact upon the natural hydrology and soil erosion and sedimentation. The concern about impact on the natural hydrology increases for projects located near waterbodies or in high elevation areas. For the most part, I prefer to see roads built above grade so that ditches are either not needed or are excavated quite shallow so that they do not extend below the seasonal groundwater table. With wind farm projects, it is not always possible to build roads above grade in soils with a shallow seasonal groundwater table due to the need maintain a road grade that turbine parts can be transported up. For that reason, other methods of reconnecting the natural hydrology are needed and are the primary focus of my comments which follow:

1. **Rock Sandwich Detail** – The rock sandwich detail shows a culvert that extends to the bottom of the upslope road ditch. The purpose of a rock sandwich is to transmit upslope groundwater from one side of the road to the other equally through its length. If a culvert is installed at an elevation as low as the bottom of the rock sandwich, the culvert will take all or most of the water, circumventing the rock sandwich. If a culvert is to be used, it should be as an emergency overflow and not to be the primary conveyance mechanism, unless the wetland has a stream or drainage swale in it that needs to be reconnected. I therefore recommend that the culvert invert be a few inches higher in elevation than the bottom of the stone sandwich. As for the 4" perforated pipes installed in the middle of the stone sandwich, they will not do any harm but will not serve any useful purpose either. I therefore suggest they be eliminated from the detail. I would also like to see a detail for a rock sandwich to be installed where there is a road cut in a soil with a high seasonal groundwater table. In such instances, it is

necessary to extend a stone layer along the upslope cut face so that slumping soil does not migrate down and cover the face of the rock sandwich. Rock sandwiches designed as recommended above have been used successfully on the Stetson and Kibby wind farm projects and in a number of subdivision roads.

This detail has been adjusted. See C-406-30.

2. **Check Dam Detail** – This detail shows a level top of the stone check dam which is incorrect. The top of the stone check dam should be lower in the middle so if overtopped, it will not erode the ditch sides. The detail does not indicate stone size which should be 2"-3" diameter. The check dam detail shows an immediate upslope 4" perforated cross-drain pipe with a mesh cover over the inlet end. I like the idea of frequently passing any water in an upslope road ditch to the other side but I do not think this technique will be effective. I am concerned the ¼" mesh will plug and prevent water from using the cross-drain. In addition, an elevated drain pipe that is designed to handle overflows will freeze in winter. I believe a more effective method would be what I call a "rock burrito" which is a narrow rock sandwich complete encircled by filter fabric except for the ends. These do not freeze if they are handling groundwater because of the latent heat in it. The pipe was proposed to be installed above the ditch bottom (leaving some water in the ditch to move downslope) whereas the burrito should be installed at or (even better) slightly below the ditch bottom allowing the ditch to be completely drained.

   Checkdams have been eliminated.

3. **Typical Road Cross-Section Detail** – The typical road cross-section detail shows an excavated ditch on the upslope side. If the road is to be built above grade (as shown) and the road sub-base is highly permeable material such as blasted ledge, no excavated road ditch should be needed (unless there is a cut on both sides of the road). The road itself will form a ditch and little water will collect and run downslope because it will pass through the road base to the other side of the road. This helps to avoid intercepting groundwater in the ditch and then transporting the water to another location for transmission to the other side of the road.

   Rock Maki section used to encourage water under the road. See C-407-30.

4. **Stone Berms** – How does the applicant intend to install the stone berms along the lower edge of undisturbed buffers? I do not believe they are needed if upslope water is frequently enough transmitted to the other side of the road. Rock burritos installed at every stone check dam should provide for this. Small amounts of water will be infiltrated quickly by the forested buffer, especially as the road moves higher in elevation and the organic duff layer becomes thicker. Installing the stone berm should not be necessary and, if installed, will cause harm to the buffer which will no longer be undisturbed.

We talked with Dave Waddell about this technique for stormwater management.

5. **Stream-Ditch Intersection Detail** – The stream-ditch intersection detail shows an intercepted stream at a road cut entering a road ditch and then apparently flowing down the road ditch to outlet in another location. I recommend the intercepted stream be reconnected to the other side of the road from where it is intercepted so that it can continue to flow in its existing channel (reconnecting the natural hydrology). Otherwise, a new channel will be scoured or the water will be spread out in a long level spreader. Either way, it will not reconnect the natural hydrology.

   The detail has been adjusted. Streams will not be carried in ditches, they will immediately travel under the road and preserve the natural hydrology. See C-408-30.

6. **Rip-Rap Channel** – The rip-rap channel detail shows a rip-rap lined channel along the downslope toe of fill for a road. This does not make sense to me since there should not be a ditch along the downslope toe of road fill. Runoff from the downslope fill extension should sheet off into the forested buffer and not be collected in a rip-rap lined road ditch.

   This detail has been removed in this situation.

7. **Detail of Slope at Top of Bedrock Cuts** – This detail shows a road ditch with an invert elevation below the road base material. Unless the cut is for both sides of the road, I see no reason for a road ditch. The road material should form a ditch and any water collected should pass easily through the porous road base to the other side of the road (it will most likely be built of blasted rock).

   The ditch has been reduced. See C-401-30.

8. **Erosion and Sediment Control** – The application requires silt fence to be installed prior to any grubbing work but I did not see where it is supposed to be installed on the drawings. It has been my experience with high elevation construction that erosion control mulch berms are easier to install and equally if not more effective. I prefer these berms to silt fence. In some instances, where the soil surface is stony or bouldery and the road is more or less perpendicular to the slope, silt fence is even counter productive. Trenching to install silt fence creates a flow path for surface and groundwater so that the water becomes concentrated. In these cases, no temporary erosion control measures may be needed. If the soil surface is very irregular due to trees and stones, it provides a temporary E&S measure. This was the case on Kibby Mountain. I recommend the plans be revised to show where specific erosion control measures are to be used. Otherwise, a contractor will install silt fence everywhere and likely create a problem.

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The application also calls for permanent stabilization by loam and seed. I have a few concerns with loaming and seeding all disturbed soil areas that are to be restored. One is that this will likely require importing loam; particularly for use in the higher elevation areas (forested soils do not usually have any topsoil suitable for establishing grass type vegetation). This loam is a source of material for erosion and sedimentation if not quickly and properly vegetated. I prefer to see erosion control mulch used as a permanent stabilization measure. It is easy to apply and immediately stabilizes the soil beneath it. It provides a more natural substrate to establish a forested cover and is not a source of sediment. The higher in elevation, the more I prefer erosion control mulch over loam and seed. It also is much preferable to loam and seed for repairing wetland disturbance. This material also replicates an organic soil that is not wet (a folist, which is organic matter over stones or boulders) if used as cover for blasted rock road or turbine pad fill. This will vegetate naturally and on steep slopes whereas applying a thin layer of loam over blasted rock will likely either wash away, infiltrate the stone or become too droughty to support grasses.

9. The proposed road is shown crossing an NaC soil mapping unit just above the O&M building area. NaC soils are described as being poorly drained by the applicant's soil scientists. If that is the case, a rock sandwich should be used when crossing this soil map unit.

   A Rock Maki section will be used here.

10. A rock sandwich is proposed to be used for the road crossing of wetland RW 28. According to the soil map, there is a map unit of NaB soils adjacent to this wetland crossing. NaB soils are described by the applicants soil scientists as being poorly drained. If that is the case, the rock sandwich should be expanded to include the NaB soils as well as the wetland.

    A Rock Maki section will be used here.

11. The applicant is proposing a road cut through wetland AW 74. That will make it difficult to reconnect the wetland without significant alteration of the wetland. If possible, I would prefer to see other methods used to reduce the slope of this road section (more fill can be used before reaching this section of road for example). Station 16 + 25 to 19 + 25 +/- shows a cut that will likely be below the seasonal groundwater table for the soil type. If that is the case, there will need to be some type of cross drains installed (rock sandwich, rock burritos, culverts etc.).

    This section has been adjusted. The Rock Sandwich has been expanded.

12. Turbine TO9 is proposed to be installed substantially in a NaB soil which is poorly drained (hydric). Is it possible to avoid this wet soil?'

No, the turbine locations were very restricted.

13. Turbine TO1 is proposed to be partially installed in a Brayton soil which is poorly drained (hydric). Is it possible to avoid this wet soil?

    No, the turbine locations were very restricted.

14. Station 22 + 75 to 24 + 50 and 26 + 75 to 28 + 75 are cuts in a soil that will likely result in intercepting the seasonal groundwater table. If that is the case, there will need to be some type of cross drains installed (rock sandwiches, rock burritos, culverts etc.).

    A Rock Maki section will be used here.

15. **Stone Level Lip Spreaders** – The detail showing a stone level spreader calls for a soil filled interior with stone placed on the top of the fill. I believe a much more effective stone level spreader is one that is constructed entirely of stone. The soil filled spreader requires precise construction techniques to assure that the top of the soil fill is level. Otherwise, it will not be level and all or most of the water will pass over the lowest section. If a berm of stone is used to create a level spreader, water is controlled by passing through the voids in the stone. The greater the amount of water reaching the spreader, the more length and height of spreader is used. In this way, the spreader slows down the velocity of the water and spreads it out. It is nearly impossible to build one out of just stone that does not work (unless too small or too large stone is used) and no site grading is required to install one as compared to those with a solid soil core.

    The level lip spreader detail has been modified. See C-402-30.

Let me know if you have any questions.

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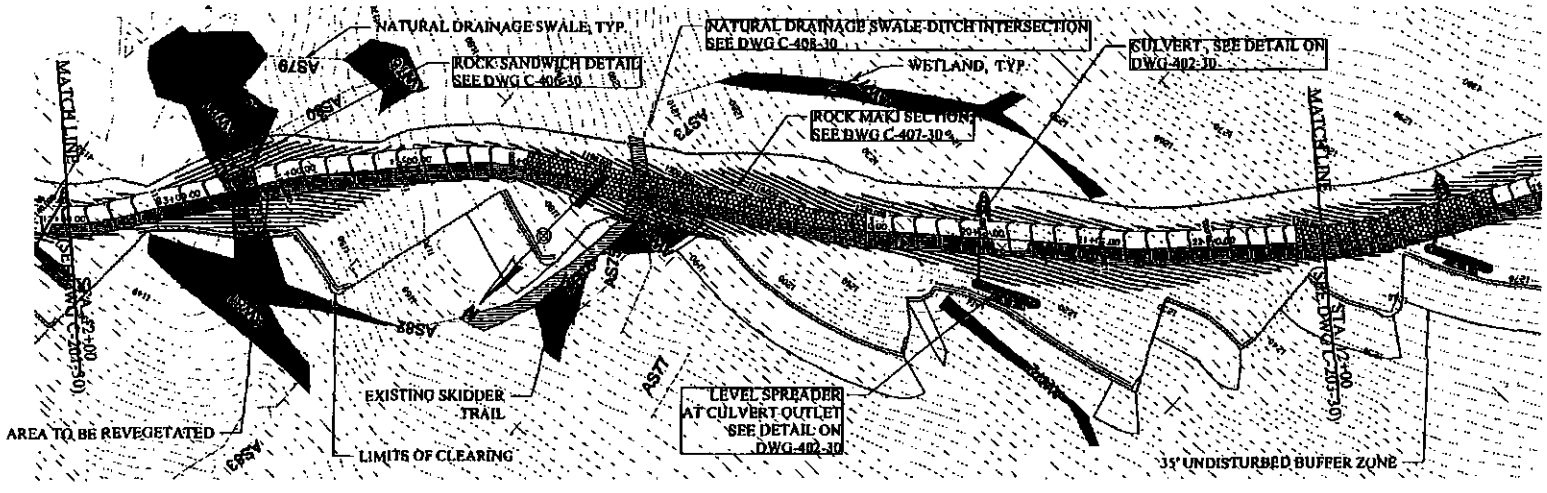
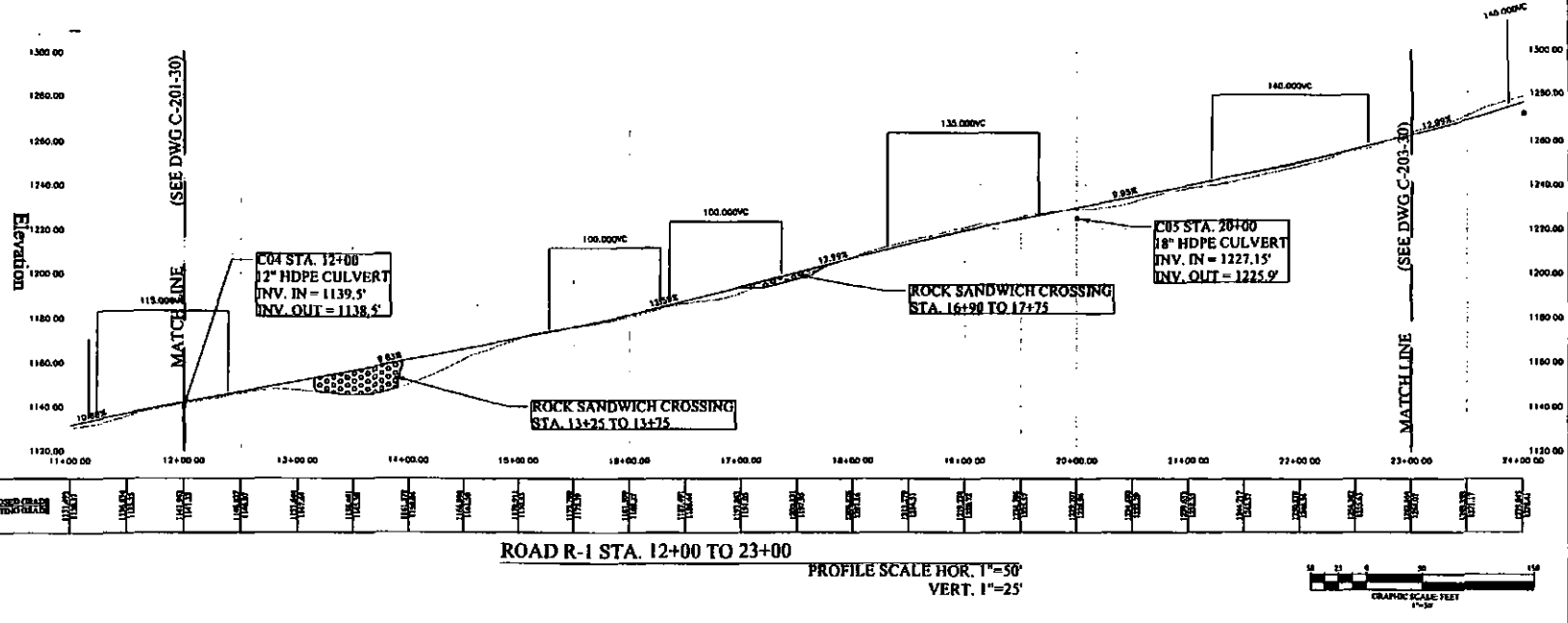
Long-Term Inspection & Maintenance Plan

	Spring	Fall or Yearly	After a Major Storm	Every 2-5 Years
Vegetated Areas				
Inspect all slopes and embankments	X		X	
Replant bare areas or areas with sparse growth	X		X	
Armor areas with rill erosion with an appropriate lining or divert the erosive flows to on-site areas able to withstand concentrated flows.	X		X	
Stormwater Channels				
Inspect ditches, swales, and other open stormwater channels	X	X	X	
Remove any obstructions and accumulated sediments or debris	X	X		
Control vegetated growth and woody vegetation		X		
Repair any erosion of the ditch lining		X		
Remove woody vegetation growing through riprap		X		
Repair any slumping side slopes		X		
Replace riprap where underlying filter fabric or underdrain gravel is showing or where stones have dislodged		X		
Culverts				
Remove accumulated sediment and debris at the inlet, at the outlet, and within the conduit	X	X	X	
Repair any erosion damage at the culvert's inlet and outlet	X	X	X	
Roadways				
Grade gravel roads and gravel shoulders	X			
Ensure that stormwater is not impeded by accumulations of material or false ditches in the shoulder	X			
Buffers				
Inspect treatment buffers for evidence of erosion, concentrated flow, or encroachment by development		X		
Repair any sign of erosion within a buffer		X		
Inspect and repair down-slope of all spreaders and turn-outs for erosion		X		
Install more level spreaders, or ditch turn-outs if needed for a better distribution of flow		X		
Clean-out any accumulation of sediment within the spreader bays or turn-out pools		X		
Other Practices and Measures				
Contact the department for appropriate inspection and maintenance requirements for other drainage control and runoff treatment measures				



ROAD R-1 STA. 12+00 TO 23+00

PLAN SCALE 1"=50'



ROAD R-1 STA. 12+00 TO 23+00

PROFILE SCALE HOR. 1"=50'
VERT. 1"=25'

GRAPHIC SCALE: FEET

GENERAL NOTES:

1. SCALES NOTED ARE APPLICABLE TO FULL SIZE (22"X34") DRAWINGS ONLY. SCALE REDUCED DRAWINGS ACCORDINGLY.
2. NORTH AS SHOWN HEREON IS REFERENCED TO GRID NORTH, NAD83 Maine State Planes, West Zone, US Foot.
3. ELEVATIONS AS SHOWN HEREON ARE REFERENCED TO NAD 83.
4. EXISTING TOPOGRAPHIC AND PLANIMETRIC SURVEY INFORMATION AS SHOWN HEREON IS THE RESULT OF AERIAL TOPOGRAPHIC MAPPING COMPILED BY PHOTOGRAMMETRIC TECHNOLOGY, INC. DEVELOPED FROM AERIAL PHOTOGRAPHY COMPLETED BY PHOTOGRAMMETRIC TECHNOLOGY, INC.
5. SOIL MAPPING AS SHOWN HEREON COMPLETE BY PHILLIPS GEOSERVICES.
6. ENVIRONMENTAL RESOURCE MAPPING (WETLANDS, STREAMS, VERNAL POOLS, ETC.) AS SHOWN HEREON BY TETRA TECH.
7. PROPERTY LINES AS SHOWN HEREON ARE THE RESULT OF ACTUAL SURVEY LINES SURVEYED BY KENNEBEC RIVER COMPANY, INC.
8. INVERTS SHOWN ON PROPOSED CULVERTS MAY BE ADJUSTED BASED ON FIELD CONDITIONS.

No.	Revision/Issue	Date
C	DEP REVISIONS	08/17/10
B	MAINE DEP SITE LOCATION OF DEVELOPMENT PERMIT APPLICATION	01/13/10
A	WOODSTOCK SITE PLAN REVIEW	11/03/09

PATRIOT RENEWABLES

EMS

STATE OF MAINE ROBERT S. CARTER

SPRUCE MOUNTAIN ROAD PLAN AND PROFILE

ROAD R-1
STA. 12+00 TO 23+00

Date	Scale
06/17/10	1" = 50'
Drawn by: ACO	Chk'd by: RSC

Project: SPRUCE MOUNTAIN WIND PROJECT WOODSTOCK, ME

Client: SPRUCE MOUNTAIN WIND LLC

Sheet Number: 11 of 47

Dwg No.: C-202-30

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